# Catalyst™

## INTERACTIVE COMMUNICATIONS SYSTEM

With Alarmware™ Configuration Software

## Operator's Manual

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**RACO**®

**REMOTE ALARMS AND CONTROLS**

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# Introduction

## 1.0  Welcome to the Catalyst

### 1.1 What is an Autodialer/RTU?

The Catalyst RTU (Remote Telemetry Unit) functions as an auto-dialing remote alarm monitor and data logger. Auto-dialers and RTUs are typically used at remote, unattended locations, to monitor the condition of automatic equipment. The mission of an Autodialer/RTU is to compare inputs against alarm criteria. Then if alarm violations occur, the RTU calls maintenance personnel (or a central station computer) to inform them of the "out of normal" condition at the remote site. Alarm notification reports are typically made to operators as voice reports. However, data reports to central computers can be made as well.

All user programming configurations, including recorded messages, are maintained in permanent non-volatile flash memory within the Catalyst. This information can also be stored on a local hard disk with the use of Alarmware™.

The Catalyst RTU incorporates extremely thorough and effective electrical surge protection, as well as overall rugged construction, to deliver reliable operation under real-world conditions.

The RTU is factory equipped with 4 physical inputs known to the RTU as **Channels**. In the Catalyst RTU channels are of two classes**: Physical Input Channels** and **Industrial Network Channels**. The RTU can input data from channels of both classes - physical and industrial network. Furthermore, both physical and industrial network channels can be one of two data types - **Discrete** or **Analog**.

- **Physical Channels** are channels whose input circuitry is *physically* a part of the RTU hardware. Physical Input channels are monitored and controlled directly by the RTU microprocessor hardware. The connection between the RTU and its physical channels cannot be broken. So they will never cause communications failure alarms, or, be unable to access channel data.
- **Industrial Network Channels** are channels that are not physically a part of the RTU hardware. In fact, the RTU may access Industrial Network Channels that:

   (a)  physically reside in several different units simultaneously
   (b)  are located in different types of equipment
   (c)  may be from many different manufacturers
   (d)  need not be located in close proximity to the RTU

Industrial Network Channel data is monitored and controlled over industrial networks. Industrial networks are usually, but not always, serial data communications interfaces. Common types of industrial networks are Modbus, Modbus Plus, and Allen-Bradley DH-485.

**The most common type of device interfaced to the Catalyst RTU via an industrial network is the Programmable Logic Controller (PLC).** Data in a PLC resides in its *data table*. Individual locations in the PLC data table are called *data registers*. Data registers can represent inputs, outputs, general-purpose memory, and PLC status points. Almost any data register in a PLC can become a channel to the RTU.

Industrial network channel data is kept current by the RTU continually scanning (making queries to) PLC data registers. However, unlike physical channels, industrial network interfaces may get interrupted or broken or may become congested by network traffic. Therefore, industrial network channel data may

become inaccessible. Industrial networks that become inaccessible can cause communications failure alarms.

When a channel's configured alarm violation condition occurs and persists for the programmed Alarm Trip Delay time, the channel goes into an **Unacknowledged Alarm state,** and the RTU begins the process of communicating with designated **destinations** to deliver the specific alarm information.

**The most common type of Destination is telephone numbers**, to which the Catalyst places alarm calls and delivers specific corresponding voice messages which the user has pre-recorded to identify the exact nature of the alarm condition.  However, destinations can also include other items, such as a pager, a Fax Machine, or a remote data terminal.

The process of alarm notification continues until a proper acknowledgement has been received by the RTU.

Certain special "global" events not associated with any particular channel can also cause alarms.  Examples are; interruption of primary power to the product, which would cause a **power failure alarm (PFAIL)**, or failure of industrial network interfaces to PLCs, which would cause a **communications failure alarm.**

Delivery of the alarm message may be in the form of a **voice call** directly to personnel, as described above. Alternatively, calls may be made in **data mode**. With data mode calls, the product establishes modem communication with a called device for the purpose of transmitting information in a non-voice data format.

The RTU can also be programmed to take **data samples** ("snapshot" readings) from its active channels on a regular interval basis. These channel data samples can be stored in the RTU Log File and/or written to the local data logger (printer). The RTU can be called for retrieval of Log File data by a remote data terminal or Alarmware. The Catalyst can complete scheduled Log File downloads to a configured destination. In addition, a configurable parameter of the RTU allows for RTU initiated automatic transfer of logged data to the central computer, should the Log File reserve approach the overflow level before the data is scheduled to be sent to a permanent storage device.

Input channels may also optionally be configured to export their contents to **specific Destination Network Addresses (DNA)**.  This function can be used to link one point in a network to another point. This export process refreshes at the scan rate of the industrial networks involved in the transfer process.

*Note: DNA are not to be confused with destinations, to which reports are delivered only under certain conditions such as an Unacknowledged Alarms.*

## 1.2 Placing Phone Calls to the RTU

You may call the Catalyst RTU at any time from any telephone. The product will wait the configured number of rings before answering and beginning a voice status report. The status report starts with the Unit ID message, followed by a request for entry of any touch-tone digit. Entering a tone will establish that this is to be a voice mode session, rather than a data mode (modem) session.

*Exception: If PINs (Personal Identification Numbers) have been configured, the RTU will require entry of a valid PIN before proceeding.*

Next, the session will follow any special warning messages, followed by a channel status report. The channel status report will report only the channels whose alarm state is "other than normal". If there are no channels whose alarm state is "other than normal," then channel status report will simply consist of a statement that, "All Channels Are Normal."

*Note: "Other than normal" channels can include channels which were at one time unacknowledged, became acknowledged, and are now still acknowledged but awaiting the end of the alarm reset time before becoming rearmed.*

After the channel status report (or "All Channels Are Normal" message) the user will hear a prompt consisting of a menu of available options.

**The purpose of this prompt is to invite the user do one of the following:**

- To acknowledge any unacknowledged alarms
- To terminate the call without acknowledging any alarms
- To repeat the channel status report
- To enter other RTU modes such as PROGRAM, SEARCH, or "READ-ONLY PROGRAM"

In program mode, the user can enter keycodes to perform configuration changes. While in "read-only program" mode the user can listen to configuration information, but cannot make any configuration changes.

## 1.3 Voice and Text Messages

**The RTU is capable of using both *voice messages* and *text* (data mode) messages:**

**Voice Messages:**
- The RTU incorporates its own resident vocabulary of "canned" speech, and it also allows users to record their own voice messages for more meaningful and descriptive reports.
- The resident speech is used to support programming operations when programming at the Front Panel or over the phone.
- Resident speech is also used to create factory default voice messages for use in voice reports to personnel until the user replaces them with their own recorded voice messages.

**Text Messages:**
- In addition to voice messages for communicating directly with personnel, the RTU provides text messages that are included in reports to destinations such as an alphanumeric pager, a remote data terminal, email recipient, or a Fax machine.
- As with voice messages, the RTU has factory default "generic" messages, but allows users to configure their own text messages.

**Message organization (applies to both voice and text messages):**

- The RTU provides for two voice messages and two corresponding text messages for use in communicating the status of each input channel.  The specific way these two messages are used in reports depends upon whether the input channel is configured for analog (having a continuous range of possible values) or discrete (having just two possible values, 0 or 1) data type.

**Tag Words:**

- In addition to these user configurable messages, the RTU automatically appends Tag Words to the end of each channel's status message in reports.  These Tag Words provide additional indication of the channel's state (Alarm, Normal, etc.) as distinct from its current status reading.  Factory default Tag Words are provided, but as with messages, the user may customize them in the configuration process.

## 1.4 The RTU Front Panel

MICROPHONE

## Catalyst™

### INTERACTIVE COMMUNICATIONS SYSTEM

CHECK STATUS MODE

NORMAL MODE

INDUSTRIAL NETWORK STATUS

PHONE LINE FAILURE

| NET1 | NORM | PROGRAM | 1 | 5 | 9-12 | 25-32 | 57-64 | 89-104 | 153-168 | 217-232 |
| NET2 | CHECK | RECORDING | 2 | 6 | 13-16 | 33-40 | 65-72 | 105-120 | 169-184 | 233-248 |
| NET3 | LOBAT | DISARMED | 3 | 7 | 17-20 | 41-48 | 73-80 | 121-136 | 185-200 | 249-256 |
| TFAIL | PFAIL | PHONING | 4 | 8 | 21-24 | 49-56 | 81-88 | 137-152 | 201-216 | ----- |

BATTERY CHARGING OR DISCHARGING *

AC POWER FAILURE: RUNNING ON BATTERY **

PUTS UNIT IN PROGRAM MODE

RETURNS TO NORMAL MODE. IF ALREADY NORMAL, GIVES CHECK STATUS REPORT

NORMAL / CHECK STATUS     PROGRAM

NUMERIC KEY

ACCESS PHONE LINE; DIALS DIGITS AS THEY ARE PRESSED; PRESS TO TALK

DIAL / PRESS TO TALK     ENTER

EXECUTES PROGRAM CODE ENTRY

DISARMS UNIT. IF ALREADY DISARMED, RE-ARMS AND CLEARS ALL OLD ALARMS

DISARM / REARM     CANCEL

CANCELS PROGRAM CODE ENTRY

TOGGLE ON/OFF

POWER ON OFF     RECORD     POINT *     0     MINUS #

SPEAKER

RECORDS SELECTED MESSAGE UNTIL RELEASED

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* A discharged battery may take up to a day to fully charge. Meanwhile, the light may remain on.

** During Primary power failure, all illuminated LEDs will flash to conserve battery power.

**The Front Panel keys operate as follows:**

| | |
|---|---|
| NORMAL / CHECK STATUS | Returns Catalyst to NORMAL mode. If already NORMAL, gives Check Status report (a report of any channels in alarm). Also terminates calls and reports. |
| DIAL OUT / PRESS TO TALK | Accesses phone line; prepares to dial digits as they are pressed. Press to talk and release to listen. |
| DISARM / RE-ARM | Disarms unit (which prevents notification). If already disarmed, re-arms unit and clears old alarms. |
| POWER ON / POWER OFF | Turns unit OFF. If already OFF, turns unit ON. |
| PROGRAM | Puts unit in PROGRAM mode. |
| ENTER | Executes program code entry. |
| CANCEL | Cancels program code entry. |
| RECORD | Records message while pressed. Requires key code in PROGRAM mode to enable. |

*Note: If there are any unacknowledged alarms, pressing any of the keys listed above will acknowledge the alarms, regardless of any PIN settings.*

**Front Panel LEDs operate as follows:**

| | |
|---|---|
| **NORM** | ON when in NORMAL mode. |
| **CHECK** | ON when in CHECK STATUS mode, local report being delivered. |
| **LOBAT** | ON when battery voltage falls below a threshold value. With fully charged battery, light should go OFF within a few minutes of turning ON. A discharged battery may take up to a day to fully recharge.<br>• If there is a BFAIL (battery below threshold value) and a PFAIL (power failure), the LOBAT LED is ON and the battery is LOW.<br>• If there is a BFAIL, but no PFAIL, the LOBAT LED is ON, but the battery is CHARGING. |
| **PFAIL** | ON during primary power failure and running on battery. During primary power failure, all LEDs will blink faster than normal. Upon return of power, all LEDs will stop blinking. |
| **TFAIL** | ▪ OFF if there is no unacknowledged TFAIL<br>▪ BLINK fast during unacknowledged TFAIL |

| | |
|---|---|
| **NET** | <u>Net 1 PLC</u><br>▪ OFF if scan is OFF<br>▪ ON if scan is ON<br>▪ BLINK if scan is ON and any channels on this net are in Communication ALARM (whether acknowledged or not)<br><u>Net 2 Printer:</u><br>▪ ON when enabled<br>▪ OFF when disabled<br>▪ Blink if device is flow-controlling the port<br><u>Net 3 Alarmware:</u><br>▪ OFF if no Alarmware™ session is active<br>▪ ON if Alarmware™ session is active<br><u>Net 4 Log File:</u><br>▪ ON when enabled<br>▪ OFF when disabled<br>▪ Blink when data is being lost |

| PROGRAM | ON when in PROGRAM mode via Front Panel, Over the Phone, or Alarmware™. |
|---|---|
| RECORDING | ON when message is being recorded. |
| DISARMED | BLINK when unit is disarmed. |
| PHONING | ▪ ON when off-hook for any reason<br>▪ SLOW BLINK during intersession delay.<br>▪ Otherwise LED is OFF |
| CHANNEL LEDs | ▪ BLINK when channel in ALARM state<br>▪ ON when alarm acknowledged<br>Regardless of when a channel is alarmed, the channel alarm LED will be in sync with all active channel alarm LEDs. |
| --- | ▪ BLINK when Log File is Full<br>▪ ON when Log File is ENABLED<br>▪ OFF when Log File is DISABLED |

*Note: Front panel LED representations in Alarmware™ should behave exactly as the Front Panel LEDs behave.*

## 1.5 Manually Dialing Out and Conversing through the RTU

Occasionally it is desirable to manually place outgoing calls from the RTU in order to converse with someone by phone line connection.

**The following describes how to do this:**

- At the Front Panel, starting in the Normal mode, press the DIALOUT/PRESS TO TALK key, wait until you hear a dial tone, then press the digits of the phone number you want to dial. Each digit you press will be dialed as you press it. You will then hear the sound of the ringing at the other end.
- When you hear the phone answered, press and hold the same DIALOUT/PRESS TO TALK key as you speak to the person on the line. Release the key to listen. Continue the conversation in this manner.  The microphone at the top of the front panel will capture your voice for this purpose.
- To end the call, press NORMAL.
- If you are at the Front Panel when a phone call is in progress, you may suspend the message report and converse with the person on the other end by pressing the DIALOUT/PRESS TO TALK key as described above. There will be no additional dialing, since connection has already been established. To end the call, press NORMAL.

*NOTE: Pressing these keys on the front panel will automatically acknowledge any unacknowledged alarms, regardless of any PIN configurations.*

## 1.6 Programming/Configuring the RTU

**There are three different methods to configure the Catalyst RTU:**

1. Using the keypad at the Front Panel
2. Using the touch-tone keys of a voice telephone
3. Using the Alarmware™ configuration software

*One Important Exception: User Recorded Voice Messages*

*The initial recording of user recorded voice messages must be done either at the RTU front panel or via a voice phone call to the RTU*, rather than from Alarmware™.  However once the messages are recorded, the recorded message data can be transferred back to the computer running Alarmware™ just as with other configuration data, to be saved for later use.  This transfer process does take substantial time, since recorded messages require a lot of data in comparison with other configuration settings.

## 1.6.1 Programming with Alarmware™ Configuration Software

Alarmware™ is an application program used primarily to configure the Catalyst. The application runs on personal computers running the Microsoft Windows 98, 2000, NT and XP operating systems.

**In addition to configuring the Catalyst, Alarmware™ can be used to:**

- Monitor alarms
- Observe channel values and statuses
- Transfer and manipulate RTU Log Files
- Perform various diagnostic procedures relevant to the Catalyst
- Update Catalyst firmware

Using Alarmware™, configuration files can be created, retrieved from storage, and retrieved from, or sent to the Catalyst.  Configuration files can also be edited off line, with any changes exported to the RTU a later time. This transfer of configuration files between the RTU and a PC computer running Alarmware™ can be accomplished locally via a serial port connection to the RTU, or remotely via a telephone/modem connection.

## 1.6.2 Programming from the Front Panel or Over the Phone

In addition to programming via Alarmware™, many configurable settings may also be programmed from either the Catalyst Front Panel, or by using touch-tone entries from a voice phone.

*Note: There is some configuration changes that are only available when connected to the unit with Alarmware.*

# 2.0 The Alarmware™ Program: Brief Overview

## 2.1 What is Alarmware™?

*Please Note: This set of topics is meant to provide a basic overview of the Alarmware™ software program. The Operator's Manual section covers terminology, concepts, and the use of Alarmware™ in more detail.*

Alarmware™ is a software application designed for use in combination with personal computers running Microsoft Windows™ and RACO's Catalyst. Alarmware™ allows an operator to configure an RTU, to monitor alarms, and to perform various diagnostic routines relevant to the RTU.

*Caution: Configurations changed by means other than Alarmware™, including speech data, should still be subsequently imported into Alarmware™ so that they will be available should there ever be need to restore configurations for the RTU.*

**When opened, Alarmware™ presents three top menu choices in addition to Help and Exit:**

SELECT RTU     Used to select which RTU to manage. *This is the most commonly selected top menu item.*

OPTIONS     Includes settings for:
- The com port and modem on the computer running Alarmware™
- An optional Alarmware™ retained PIN (Personal Identification Number)
- Session timeout limit for Alarmware™ (not the Catalyst)
- AutoSave interval for automatic saving of configuration files to disk when working offline.

LOG FILE     Allows opening a currently saved Log File for a specific RTU.

## 2.2 Selecting an RTU and Using Alarmware™ to Configure It

Alarmware™ can be used to configure the Catalyst RTU online or offline. First, a database configuration file must been created within Alarmware™. To create a Catalyst database, use the ADD or EDIT buttons on the initial Select RTU dialog box. You now have three choices:

1) By connecting with the RTU to be configured, via Phone or via Serial port, and working online. When you make configuration changes as required from the Configuration Settings menu, both the connected RTU and the corresponding Alarmware™ configuration file for that RTU will be updated immediately as each change is made.

2) By delaying connection and working offline. Selecting the RTU and making configuration settings or changes within Alarmware™ as required. After ending the offline session you would again select the same RTU to be configured or updated, and then make online connection as described above. In this case, a Database Mismatch dialog will appear (because the two databases no longer match). Choose Export to RTU. Alarmware™ will write (export) the data back to the RTU. When the process is completed, your RTU will now be configured as its corresponding file within Alarmware™ was configured.

3)   By using one RTU configuration file as the starting point for the configuration of another RTU. Using the Copy feature, available from the top menu after a configuration session is underway.  This can save substantial time in systems with multiple RTUs requiring similar configurations.

*Note: When an RTU is added, the model number must be correctly selected from the list presented before proceeding.*

When working with an RTU configuration offline, an Offline Status Window shows a representation of the front panel LEDs.  When offline, clicking on channel LEDs, or on Net LEDs, brings up a corresponding configuration dialog box for the item selected.

When working with an RTU configuration online, an Online Status Window shows a similar representation of the front panel LEDs, but in this case the window provides a "live" display of how they actually appear currently on the RTU Front Panel.

From this Online Status window, you can click on the PLC LED, to view the status and error history for the PLC Net. Click on the Printer, Aware, or LogFile LED to view or change the device settings.

Also from this Online Status window, you can click on a channel LED to view the current Direct Channel Reading for that channel, along with its Raw Value reading and "Alarm/Normal" state.

The Online window also contains 4 button controls, to Arm/Disarm, Acknowledge Alarms, Disconnect RTU and check an External Net Address.

In either case, clicking Configuration on the menu allows you to proceed with RTU configuration.

*Note: At the end of any Alarmware™ online session, if there are any unacknowledged alarms, they will be cleared out (corresponding to what otherwise happens when the respective Alarm Reset Timers time out).  Then, if there are any alarm criteria violations existing, after the respective Alarm Trip Delays elapse, new unacknowledged alarms will be created.*

## 2.3 Configuration Items within Alarmware™

With a Catalyst selected, and working online or offline, the following configuration items will be available from the Alarmware™ Configuration menu:

- **Channel Settings** – Alarm violation criteria, reporting formats, etc.
- **Device Settings** – Phone, Printer, Log File, and various port settings
- **Destination Settings** – Phone numbers, destination types, etc.
- **Message Settings** – Text messages of all types
- **Session Parameter Settings** – Timeouts, Delays, Redial Attempts, etc.
- **Annunciation Settings** – Common trip delay, phone fault test, etc.
- **PIN Settings** – Personal Identification Numbers
- **Cleardown** – Features ability to clear all Catalyst configuration changes back to factory default

## 2.4 Channel Settings

The Channel Settings dialog box allows you to select any particular channel you need to configure. Each channel to be used must be given a *Source Network Address (SNA)*.  The SNA identifies the specific address location on the RTU or industrial network that this channel will continually scan. The physical channel data

types (discreet or analog) should be correctly set before entering other channel settings.  *See 2.10.2 Device Settings, Physical IO tab in Operator's Manual* to set the physical channel data types.

You may also optionally enter a *Destination Network Address (DNA)*.  The DNA (not to be confused with destinations), identifies an address location to which the channel would continually write its value at the RTU scan rate.

**Other Available Channel Settings:**

- The Reporting Format and Value Scaling (advanced setting) that specify how raw values scanned are translated into readings and reports.
- The Alarm Violation Criteria, which specifies what (if anything), constitutes an alarm violation.
- The Alarm Trip Delay (if different from the factory default or from your own established Common Alarm Trip Delay).
- This dialog box also includes a Messages button that provides a shortcut to the corresponding Messages dialog box for this particular channel.
- Channels can also be grouped to report only to specific destinations.
- Copy From and Copy To buttons facilitates setting up similar channels within a given RTU configuration.  Messages (voice and text) are not included in this copying process.

## 2.5 Device Settings

**The Device Settings dialog box includes tabs for the following device settings:**

- **Phone Configuration**: Contains parameters for phone configuration
- **Physical Inputs:** Allows you to select the channel type (analog or discrete) for physical channels.
- **Modbus Port:** Ability to modify Modbus parameters and timers
- **Alarmware Port:** The only parameter that can be changed is the baud rate connecting the Catalyst and Alarmware.
- **Time & Date:** Set the clock and associated parameters
- **Log File:** When enabled, allows you to save Catalyst data, filtered by selection.
- **Printer:** When enabled, text messages are sent to the local data logger, filtered by selection.
- **RTU Modem settings:** (not normally a user configured item)
- **ISP:** This is your internet service provider information to be used in email reporting.

## 2.6 Destination Settings

The Destination Settings dialog box is used to establish the Destination number and Destination type, as well as a name that will be assigned to this Destination in text reports.  The text ID name entry is important in order for the text reports to be fully descriptive.

In general, a Destination is considered a "receiver" of reports that are sent by the Catalyst when certain conditions (such as an Unacknowledged Alarm) exist.

**<u>Available Destination types include:</u>**

- **Telephone** (for personnel to receive alarm calls)
- **Numeric/Beeping Pager**
- **Alphanumeric Pager**
- **Fax Machine**
- **Remote Data Terminal** (a central computer running a terminal program)
- **PA/Local Paging System**
- **Email Reporting**

The selection of Destination type in turn determines the other relevant configuration items for this Destination, which is displayed under various tabs in the Destination Settings dialog box.  For example, the most common Destination type is Telephone, for which a telephone number is an important parameter to set.

The Destination Settings dialog box also has a **Groups** button, which takes the user to the Destination / Channel Groups dialog box. This provides a convenient means to link selected destinations to selected channels (or alternatively, channels to destinations).  For example, grouping might be used to cause channels dealing with electrical problems to report to the electrical crew, plumbing problems to report to the plumbing crew, etc.

The *factory default is for all channels to be linked to all destinations.*

The Copy From and Copy To buttons facilitate the easy configuring of multiple destinations with similar settings.

## 2.7 Message Settings

**First select a Message "type".  The choices are:**

- RTU Name
- Net Name
- Destination Name
- PIN Name
- Channel Status

For each type selection, a specific corresponding format is presented for entry of the corresponding name(s) or message(s) to be used in text reports. *In the case of channel status messages, there are two text messages for each channel.*  The specific way in which the two messages are used to report the status of the channel depends upon whether the channel is analog type (having a continuous range of possible values) or discrete type (having only two possible values, 0 or 1).  In either case, the dialog box provides guidance as to how to enter the desired text messages.

There is also a **Tag Words** button that presents a dialog box for entry of user-defined Tag Words, which are automatically included in channel status text reports to indicate the state of a channel, as distinct from its current reading.

Provision is also included for limited management of user recorded speech messages corresponding to the selected message item.

## 2.8 Session Parameters

**The Session Parameters dialog box includes settings for:**

- The number of **redial attempts** to reach a given Destination (if a busy signal is detected on the first try)
- The **Session Inactivity timeout** period after which the RTU will terminate a Front Panel, Over the Phone or Alarmware™ session if user interaction ceases
- The **Intersession Delay** between alarm call reports
- **Microphone listening** on/off (provides for a listening period via the RTU built-in microphone)
- During voice sessions, give the **Menu Prompt** the number of times configured here.

## 2.9 Annunciation Settings

**The Annunciation Settings dialog box allows the user to set:**

- **Common Alarm Trip Delay --** which is used by default for all active channels. This value may be customized for each channel.
- **Power Failure Alarm Trip Delay** – separate from Channel trip delays.
- **Alarm Reset Time** -- Controls how long, after acknowledgement, a channel will have its Acknowledged Alarm state cleared to NORMAL. The channel is reset so that it will be capable of tripping into alarm when the next violation occurs.
- **Interval for checking phone line** – Phone line connection test schedule.
- **Test Callback Schedule** – set base time and frequency of Autocalls.

- **Calls to RTU Acknowledge Alarms?** -- Whether or not an incoming call automatically acknowledge alarms.

## 2.10 PIN Settings

The PINs dialog box allows you to add and edit PINs (Personal Identification Numbers).  When PINs are configured, the RTU will require entry of a valid PIN number before allowing various levels of operations.

**Each PIN configuration requires:**

- an ordinal **PIN number**
- the **PIN code**
- a **PIN Name** which will be included in text reports to provide an audit trail for various operations
- a **Privilege** level which determines the individual's ability to listen to reports, acknowledge alarms, change RTU configurations (excluding PIN settings), and perform administrative level operations (including PIN settings).

A Separate provision is made for an optional retaining of one of these configured PINs. This feature enables the PIN to be entered automatically upon connecting with an RTU.  This will save the Alarmware™ operator from having to manually enter the PIN.

*Note: Even if PINs are programmed, access to front panel operations on the RTU does **not** require PIN entry.*

## 2.11 Cleardowns

The Cleardowns dialog box is used to clear down RTU settings and messages to factory default values. Cleardown should be used with caution. It takes considerable time to record a large set of voice messages, and the voice messages will be deleted as part of the cleardown process.

# 3.0 Using this Documentation

## 3.1 Typographic Conventions

Throughout this documentation, both in the Online Help System and in this User's Manual, various conventions are used to identify pertinent information.

- All *Notes* and *Exceptions* are placed in *Italics*. Notes and Exceptions represent important additional information.  Also, some Help topics which are associated with the Help button within certain dialog boxes, have an italicized description of how to access the dialog box, appearing at the beginning of the topic, for the benefit of users who are referring to the printed manual version of the Help System.
- In the Online Help System, Links to other Help pages are underlined and green in color.
- Items that are ALL CAPITALS reference the names of keys, lights, LEDs, or when referring to a mode to which the RTU is placed (for example, PROGRAM mode).

## 3.2 Helpful References

While using this documentation, there are several sections that you may find quite helpful as references. This is true for both the User's Manual, and the Online Help System. For Online Help you may wish to utilize the Bookmark feature within Windows Help to mark these sections for easy reference.

## 3.3 How To Print Documentation

- **Help Topics** — To print a Help Topic, click on the Print button at the top of the topic window.
- **Tables** — To print a table, select desired table and click on the Print Topic button at the top of the topic window.
- **Worksheets** — When Worksheets are selected, the file will be launched in the appropriate application. To print the worksheet, select "Print" from the application's File menu.
- **Code Table** — To print the Code Table that contains the Keycodes for use in Front Panel or Over the Phone programming of the RTU, click on the Keycodes button on the Help toolbar of any help topic. Next, click on the Print Keycode Table link.
- **Entire Help Manual or Large Numbers of Help Topics** — To print large numbers of help topics start from the Help Contents dialog box. This is the dialog box you first see when selecting Help from the Alarmware™ main menu. Alternatively, in any help topic click on the Contents button. Select the Contents tab in the dialog box. Any selected book or page (topic) will be printed when the Print button (at the bottom of the dialog box) is clicked. When a book is selected for printing everything within that book will be printed including all topic pages plus other books and pages within the selected book. By selecting in turn, each of the outermost books in the table of contents, the entire Help System could be printed.

# Installation Guide

## 1.0 Installing Alarmware™

### 1.1 Computer and Operating System Requirements

**The following requirements apply to a computer that is to run Alarmware™:**

| | |
|---|---|
| **PROCESSOR** | Pentium Class or better |
| **SPEED** | 200MHz or better |
| **MEMORY** | 32 MB or better |
| **HARD DRIVE SPACE** | At least 10 MB + 5MB for each Catalyst added** |
| **WINDOWS VERSIONS** | Windows 98/NT/2000/XP |
| **SERIAL PORT** | 16550 (or equivalent) high speed interface chips |

** Does not include space required to download Log File data.

### 1.2 Installing the Alarmware™ Program

To install the Alarmware™ program, insert CD in your CD ROM drive.  The CD Browser should automatically launch. If the CD fails to launch, run the application "Welcome" found on the Catalyst CD. Follow the instructions for installation as detailed by the CD Browser. If the CD Browser fails to launch automatically, install Alarmware by performing the following operations. Click on the Start button and select Run from the menu. Use the browse feature to select the setup.exe program located on the CD. Click on the Run button. Follow the instructions provided by the installer.

Alarmware™ Directory Structure

The Alarmware™ directory structure is organized into one main directory, and three sub-directories. The main directory contains the Alarmware™ application and the corresponding initialization files. It contains the Online Help application and the worksheet files associated with online help. The main directory also contains a MESSAGE.TXT file that will keep an appended record of all Alarmware™ transactions.

The three Alarmware™ sub-directories are created when the first RTU is configured:
\Data     .NVM files contain RTU configuration data (cannot be edited manually).
\Bak      .BAK files contain backup RTU configuration data.
\Log      Contains Log Files downloaded to Alarmware™.

### 1.3 Catalyst Memory Allocation Tool

The Catalyst Memory Allocation Tool has been included with your Alarmware installation files. It will be located in the same directory that you installed Alarmware (**CatalystMemoryAllocationTool.xls**). This tool is designed to help you determine the recommended Log File reserve size, and to plan how to allocate memory for user-recorded speech messages. Your Catalyst has been shipped with either 1 or 5 megabytes of non-volatile memory. This tool will help you plan how that memory will be allocated.

**The Log File reserve size is controlled by the following factors:**
1. The amount of NVRAM installed
2. The number of channels to be sampled and saved in the Log File
3. How often the data channels are sampled
4. The maximum number of hours between Log File data transfers

The Memory Allocation Tool will then help you plan the length and content of your user-recorded messages. Totals are accumulated as each message is recited. You also have the ability to print these messages for reference when you do the actual recording from the Catalyst front panel, or by calling the unit over the phone.

It is recommended that you perform a "Save As" selection and rename the file for each Catalyst. For example, change the filename (CatalystMemoryAllocationTool.xls) to one that contains the RTU's serial number e.g. (CatalystS00001.xls).

## 1.4 Log File Transfer Utility (LOGTRAN)

For Catalyst's with firmware version 1.76 or higher, there is a utility that has been developed to aid the retrieval of Log Files. This command line "Log File Transfer Utility" will allow you to download Catalyst Log Files, without the need for third party terminal applications, such as ProComm. The Log File Transfer Utility can be scheduled to transfer Log Files without operator interaction. Log files are saved in the Aware\Log directory.

To provide greater flexibility with how the data is retrieved, the transfer session will use the "Transfer Options" parameters set within Alarmware. Transfer Options enable data filtering and control over Log File names and formats. In addition, LOGTRAN will perform error detecting and correcting due to line noise.

The session is initiated by delivering a command line to the Windows command line interpreter. This is accomplished by:

- Typing at the command prompt in a console window
- Clicking on a configured desktop icon
- Selecting a configured Start Menu item
- Adding a "Scheduled Task" using the Windows Scheduler

The command line syntax is either:

**LOGTRAN "RTU name" direct** Logtran will use Alarmware's comport settings to connect

**LOGTRAN "RTU name" dial** Logtran will use Alarmware's modem settings to connect

The RTU name argument must be identical with the RTU name configured with Alarmware's "Select RTU" dialog. If there are any blank spaces in the name, quotation marks must be used. All arguments must be specified. There are no abbreviations.

When the session has been initiated, LOGTRAN will attempt a session with the specified Catalyst using the specified communications resource. A small dialog window will indicate the session progress. The session may be aborted at any time.

**LOGTRAN notes:**

- If PINs are configured, Alarmware PIN must have a privilege of ACKNOWLEDGE or greater.
- If Alarmware is running, while LOGTRAN is running, then they cannot share the same communication resource. If Alarmware has control of the port, then the LOGTRAN session will fail.

**Instructions for setting up a desktop icon:**

1. Right-click on an empty space on your Windows desktop
2. Select "New" and "Shortcut"
3. Click the "Browse" button to locate "logtran183."
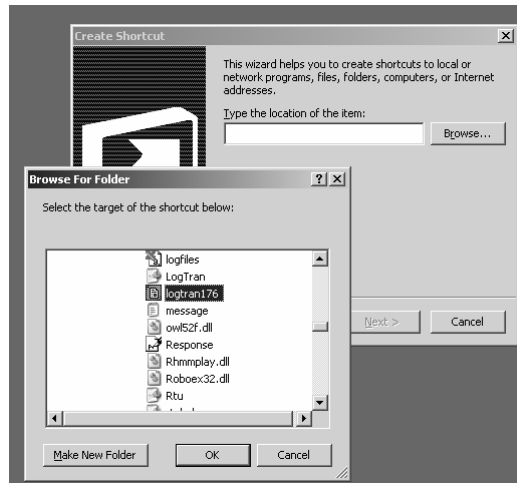


4. Click OK.
5. Click Next.
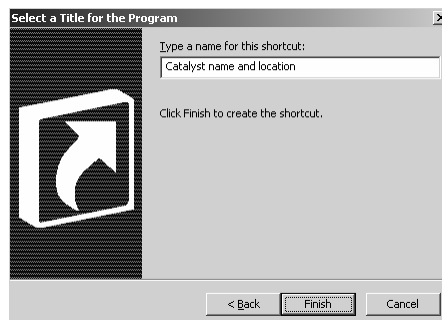


6. Enter a title for the icon. Describe the Catalyst's duties or location.
7. Click Finish.

8.  When the icon has been created on the desktop, right click on the icon and select "Properties."
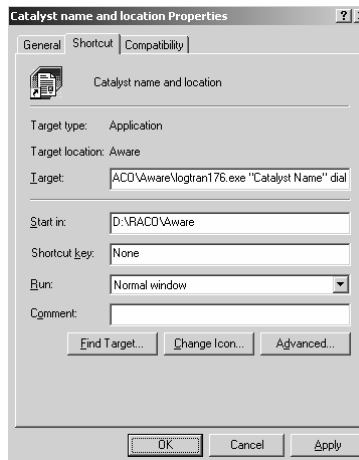


9.  The command line is shown here as the "Target." The syntax "**Catalyst Name**" and **dial** has been added to the command line. Be sure that the "Start in" directory is the same as the directory where Aware and Logtran are located.
10. Click OK.
11. Double-clicking on the icon will now initiate a session to the configured Catalyst.

**Instructions for adding a LOGTRAN task to the Windows Scheduler:**

1.  From the Start menu, select Accessories | System Tools | Scheduled Tasks
2.  When the scheduler window appears, click on the "Add a Scheduled Task" icon. This will launch the "Scheduled Task Wizard.



3.  Click Next.



4.  Click Browse.
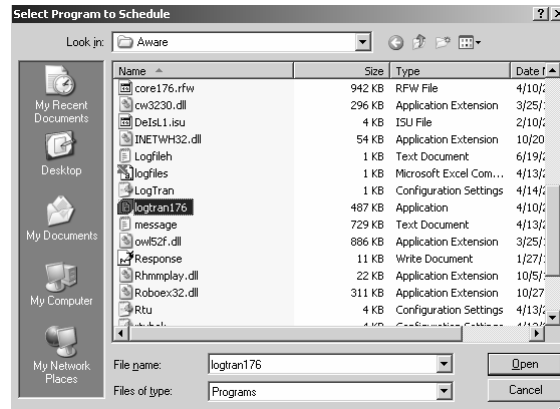
5.   Browse for the Aware directory, then select logtran183.exe. Click Open.
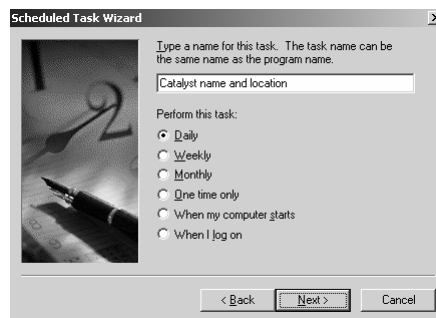


6.   Type in a title for the Catalyst scheduled task. Provide some useful information within the title for later reference.
7.   Select the frequency of this scheduled task. In this example, "Daily" has been selected. Click Next.



8.   Set the time of day you would like the event to start. In this example, the scheduled task will begin at 12:00 noon. The task will be performed every day and will begin April 15, 2003. Click Next.

9.  The task has now been scheduled, but there are still some properties that need to be configured.
10. Select the "Open advanced properties for this task when I click Finish" checkbox. Click Finish.
11. The Catalyst task properties dialog will appear.
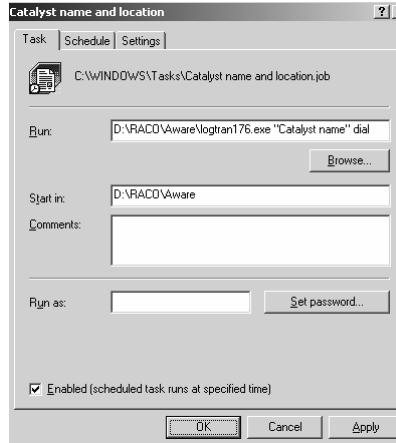


12. On the "Run" line, modify the command line to include the Catalyst Name, followed by the connection type [direct or dial]. Ensure the "Start in" directory is the Aware directory.
13. Click on the "Schedule" tab.
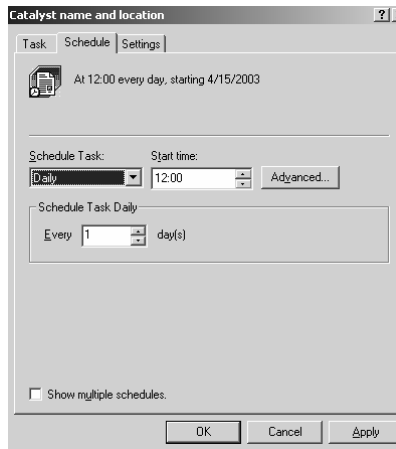


14. Click on the "Advanced" button.
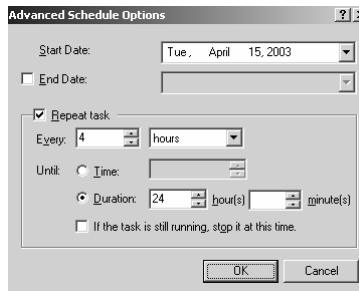


15. In this example, the scheduler will repeat the task every 4 hours, for a 24 hour period. Click OK.
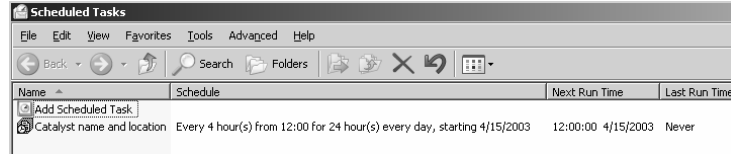
16. Notice the new Catalyst task is now listed among the scheduled tasks.

# 2.0 Catalyst Hardware Installation

## 2.1 Location and Mounting

Choose a mounting location that is not exposed to condensing humidity, or temperatures beyond the limits of +20 to +130F (-7 to +55 C).   If installing outdoors, a sun shield may be necessary to protect against the elevated temperatures that can be produced on exposed objects during a hot day.

This location should ideally be within 5 feet of a standard RJ- 11 phone jack and a grounded 120 VAC power outlet (or other power source as applicable).  Allow at least 3 inches clearance below the lower edge of the enclosure, to allow access to the connection ports that are located there.
Mount the RTU on centers of 6" x 11-3/8", using the external mounting ears on the enclosure.  #10 or 3/16" bolt sizes are best.

Alternatively, the RTU may be mounted in a standard 10" x 12" x 6" NEMA 12, 4 or 4X enclosure.  The RTU alternative internal mounting centers of 8-1/4" x 10-1/4" will match the threaded mounting inserts on most such enclosures.

## 2.2 Physical Dimensions of a RTU

**The RTU external dimensions:**

- 11.9" High
- 9.8" Wide
- 4.7" Deep

**Mounting centers are:**

- 6" x 11-3/8"

## 2.3 Electrical Power Requirements

**The product requires power input of one of the following:**

- 120 VAC (nominal) 60Hz @ 70 mA maximum current
- DC power input of 8-16 VDC (12 VDC Nominal) input @ 900 mA maximum current
- 48 VDC +/- 10% @ 250 mA maximum current using an optional 48/12 VDC converter module
- 125 VDC +/- 10% @ 125 mA maximum using an optional 125/12 VDC converter module

The currents specified do not reflect initial momentary surge current, which can be several times the above figures.

## 2.4 Power Wiring

Refer to the diagram RTU INTERIOR VIEW, which indicates where power input connections are to be made.

- Inspect and remove any foreign materials that might create short circuits.
- Connect the black (negative) battery lead to the negative terminal on the gel-cell battery. This battery lead was disconnected in preparation for product shipment.
- Most often the product is configured to be powered by 120 VAC and will therefore be shipped with an AC power cord already wired into the unit. This power cord may simply be plugged into a standard grounded 15 Amp.120 VAC outlet. If power to the product needs to be wired via conduit the power cord may be disconnected and removed. The Line, Neutral, and Ground wires should be connected to the TS1 terminal strip at the L, N, and GND, respectively.
- If primary power for the product is 48 or 125 VDC, carefully connect the +, - and ground (earth) leads to Terminal Strip TS1 <u>on the DC/DC Power Converter Module</u>. Be sure that the voltage connected matches with the voltage indicated on the Module's label, and that the +/- polarities are correct.
- If primary power for the product is to be a 12 VDC wall adapter or other 12VDC source the product must be ordered from the factory so configured. (The product needs to be assembled with different primary power components.) Connect the 12 VDC positive lead to the TS1 terminal labeled "L" and the negative lead to the TS1 terminal labeled "GND".
- Regardless of the ultimate source of the 12 VDC power, it is imperative to connect the ground terminal on TS1 to a good electrical ground, in order for the product's substantial built-in surge protection to be effective.

*Note: The act of applying primary power will automatically turn the product on. For the time being, turn it off again by pressing the ON/OFF key on the front panel.*

*Important Note: A good ground (earth) connection is important in order for the substantial electrical surge protection built into the product to work effectively. This ground may be associated with the AC or DC power source, or it may instead be a good ground connection to the grounded chassis of nearby electrical equipment, independent of the AC or DC supply source.*

## 2.5 Catalyst RTU Interior View Diagrams

### 2.5.1 Rev CIGB1 board



**CATALYST**
**Interior View**

## 2.5.2 Rev CIGD board



FRONT PANEL CABLE

EXTERNAL SPEAKER JACK

SPEAKER VOLUME ADJUSTMENT

RACO
MANUFACTURING AND ENGINEERING
CIG Rev.D

PRIMARY INPUT POWER PRESENT -YELLOW LED-

REMOTE ACKNOWLEDGEMENT PUSH BUTTON INPUT

CATALYST POWERED ON -RED LED-

RELAY DRIVER OUTPUT

PHYSICAL INPUT CHANNEL CONNECTIONS (OPTIONAL)

SERIAL PORT ACTIVITY LED INDICATORS

MODBUS
Printer
Alarmware

PHYSICAL INPUTS

BATTERY

POWER INPUT CONNECTIONS      MODBUS      SERIAL PRINTER      ALARMWARE      TELEPHONE

## CATALYST
Interior View

## 2.6 RTU Bottom End View and Connectors



WIRING ACCESS FOR
PRIMARY POWER INPUT

WIRING ACCESS FOR
PHYSICAL CHANNELS

MODBUS    SERIAL    ALARMWARE    TELEPHONE
          PRINTER

CATALYST
Bottom View
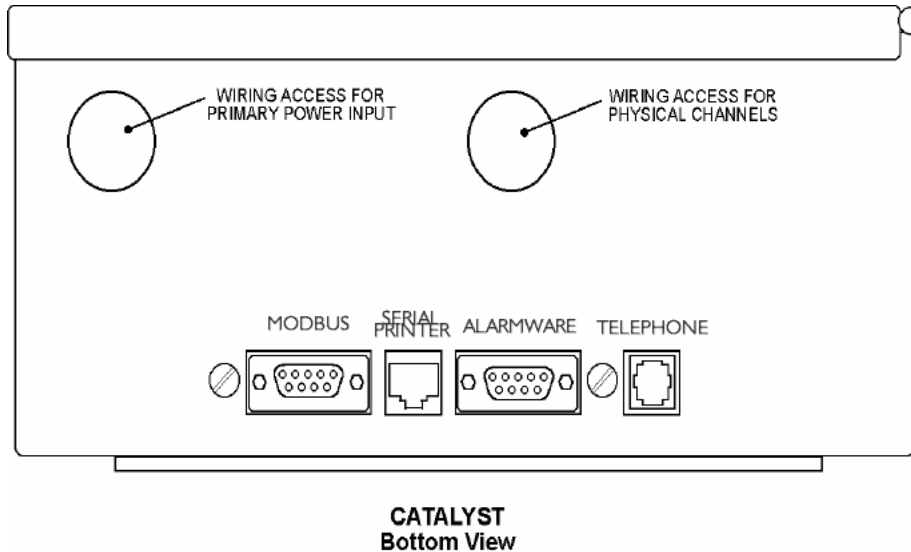
## 2.7 Telephone Line Connections

Plug a standard RJ11 telephone modular cable into the Telephone Jack located at the bottom end on the right hand side of the product.  Plug the opposite end of this cable into an RJ11 telephone line service jack.

Please refer to *the FCC Notice to Users* for details on FCC requirements for use of this product.

## 2.8 Physical Channel Input Connections

Up to four inputs may be connected directly to the unit. Any such signal inputs will be monitored as **Physical Input** channels, as opposed to **Network Input** channels.  These physical input channels are assigned to the first four channel numbers by factory default.  However you can change the channel number of the physical input channels, or not assign them any channel numbers, whenever you are configuring the product and depending upon your needs.

The physical channel inputs may be selected to be either analog or digital on an individual channel basis using the Alarmware™ program.

Physical channel inputs are connected to the product at the 8 point Terminal Strip P6, which is located directly above Port 3 and labeled "PHYSICAL INPUTS".  Refer to the diagram, *RTU INTERIOR VIEW*. Connect each such signal input to the points marked 1, 2, 3 or 4. Connect each channel's corresponding common ground or signal return to the point immediately to the right of the channel input labeled 'C'.

Terminal strip P6 may be unplugged for access convenience. All terminal points are screw-clamp types, eliminating the need for wire termination lugs. The contact input wire should ideally be light (18 to 24 gauge) signal wire rather than heavy power wire. This reduces problems of bulk and stiffness.

*Warning – In all cases, be sure that the contact inputs do not provide power of their own or the product will be damaged!*

*Exception – If your inputs are coming from a logic controller the TTL, CMOS or 5 VDC logic outputs, direct connection may be made as long as the controller has the same electrical ground as the product. See the discussion below.*

## 2.8.1 Connecting Non-Powered ("DRY") Contact Inputs

Connect non-powered contact inputs as shown in the diagram. Each physical channel has two input connection points. The points marked "C" are internally connected together and to common ground.

*Warning – Before making any such connections, verify that there is no electrical power present on the signal wires, otherwise serious damage to the product could result.*

## 2.8.2 Connecting 4-20 mA Analog Signal Inputs

As an alternative to contact inputs or digital logic inputs, you may connect 4-20 mA current loop analog signals to any of the product's four physical inputs. The connections must be made with the correct polarity. For current loop signals this means that the more positive side of the loop must be connected to one of the 'numbered' terminals of P6 (1, 2, 3, or 4) and the return side of the loop must be connected to the input's corresponding 'C' terminal on P6.

### 2.8.2.1 Floating versus Grounded Current Loops

Note that the negative or 'C' connection points for each of the inputs are connected to each other and to the common ground inside the product. Most 4-20 mA signal circuits "float" with respect to ground. Usually the grounding of the negative or return side of loop circuits will cause no problems. However some 4-20 mA signal circuits already have a connection to ground at some other point in the current loop. If your current loop already has a grounded point in the loop that you cannot remove it is best to install an "isolator". (An example of such an isolator is the Model T700-0000 made by Action Instruments 619-279-5726.) Otherwise, signal errors will be introduced, both for the RTU and for any other elements in the same current loop.

*Note that similar devices are available from the above manufacturer (and others) which accept signals in different formats (such as 0-1 VDC, etc.) and translate those signals into standard 4-20 ma signals that the RTU can accept.*

The easiest way to verify that there are no grounding problems is to be sure that the current in the loop does not change when the RTU is added to the loop. For example, if there is a chart recorder or readout device in the current loop, first take a reading with the RTU completely disconnected from the loop. Do this by 1) unplugging P6's connector block and 2) temporarily shorting the current loop at that block. (Short the channel's numbered terminal and its corresponding terminal labeled 'C'.) Observe the reading. Then remove the short and reconnect the connector block to include the RTU in the loop. Turn on the

RTU and verify that this does not change the reading on the readout device or chart recorder. Note that all power and ground connections to the RTU must be in place for this test to be valid. Also, the input channel being tested must be programmed for analog input (described elsewhere in this manual).

One cautionary not if you are troubleshooting by making voltage measurements across the signal input connection points on the RTU. Bear in mind that if the product is turned off or if it has not been programmed for analog input, an internal voltage clamp will result in a fixed voltage drop of about 7 VDC seen at the RTU signal input. If the product is turned on and the input has been programmed for analog input, a loop resistance of about 220 ohms will result in a voltage drop of approximately 0.88 VDC with a signal level of 4 ma, and approximately 4.4 VDC with a signal level of 20 ma.

### 2.8.3 Connecting Digital Logic Signal Inputs

As an alternative to contact inputs you may connect 5-volt logic signals as long as the common electrical ground for the RTU is the same as for the 5 volt logic system. A logic "0" will be interpreted by the RTU as a closed circuit and a logic "1" will be interpreted as an open circuit. If you want to connect higher voltage logic signals (up to 24 VDC) insert a rectifier diode (such as a 1N914, 1N4005, etc.) between the logic signal and the signal input on the RTU. *The diode must be oriented so that the cathode (banded) end is connected to the logic signal.*

## 2.9 PLC Network Serial Connection

Port 1 is used to allow communication between the product and the PLC.  For Modbus PLCs, a standard Modbus serial port cable is needed.

Refer to the *2.13 Cable Diagram* and *2.6 Bottom End Connector View Diagram* included in this section.

## 2.10 Local Serial Printer Connection

If desired, a serial printer may be connected to the middle serial port (Port 2) using an 8-pin shielded modular connector.

**When connected, the serial printer will print activities such as:**

- Calls placed to the product.
- Alarm calls placed by the product.
- Which person (via the PIN) acknowledged each alarm.
- As well as any other activity configured to be output to the LDL printer.

Refer to the *2.13 Cable Diagram* and *2.6 Bottom End Connector View Diagram* included in this section.

## 2.11 Alarmware Serial Port Connection

This is for connection of a computer that is running Alarmware™ configuration software.  The connection would be made in order to allow transfer of configuration programming, including voice messages, between the product and the portable computer.

The cable required for this is a generic standard "PC to PC" "Null Modem" serial cable, (sometimes called a Laplink™ cable). The cable has female 9 pin D-Sub connectors on both ends.  The connection port on the product is Port 3, the 9-pin connector nearest the Telephone Jack port.

## 2.12 Cable Diagrams

### 2.12.1 Catalyst to Alarmware PC Cable
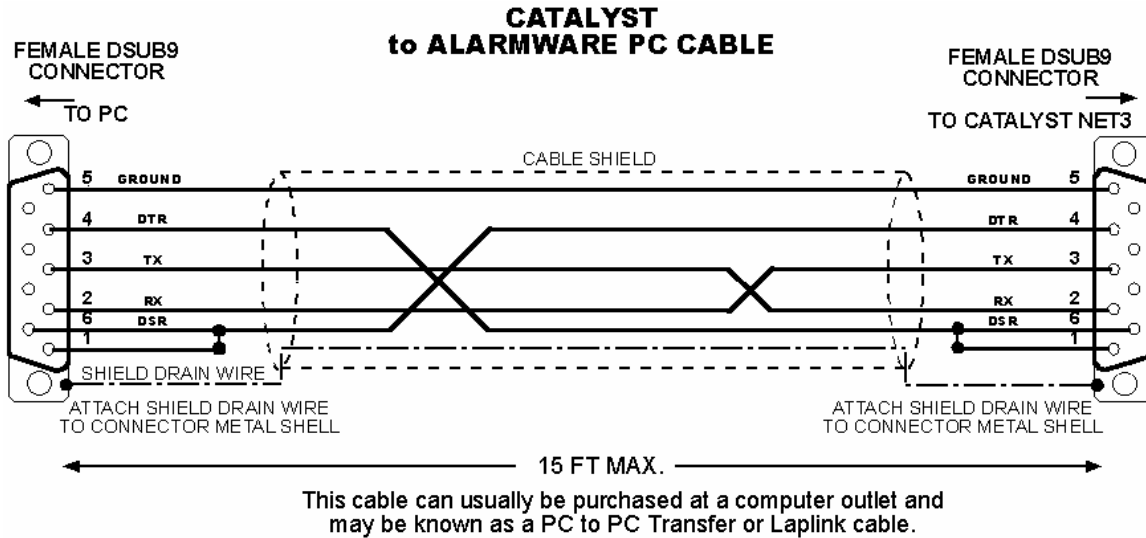


### 2.12.2 Catalyst to Compact 984 PLC Modbus Cable

## 2.12.3 Catalyst Local Data Logger Cable

**FEMALE DSUB 25 CONNECTOR**
← **TO LOCAL PRINTER**

**CATALYST LOCAL DATA LOGGER CABLE**

**SHIELDED MALE RJ45 CONNECTOR**
**TO CATALYST NET2** →

CABLE SHIELD

1
2
3

7
20
8

1
3
5
6
7
8

ATTACH SHIELD DRAIN WIRE
TO CONNECTOR METAL SHELL

SHIELD DRAIN WIRE

ATTACH SHIELD DRAIN WIRE
TO CONNECTOR METAL SHELL

←————— 15 FT MAX. —————→

## 2.12.4 RS-422 Cabling Example – Point to Point



P10 Jumper settings for RS-485 or RS-422 with
Catalyst at one end of network & Termination
Resistor enabled
(Rev. D or higher I/O Board Only)

TERMINATION RESISTOR

150 OHM

SIGNAL_GND

RX-
TX+
RX+
TX-

RX
TX_EN
TX

CHASSIS_GND

D9P-S

To Catalyst
Modbus Port

Typical RS-422 Transceivers or RS-422 to RS-232 converters.
See Black Box, B&B Electronics, and other catalogs.

**NOTES:**

1. Use twisted pair cable - preferably with
seperate conductor for COMMON RETURN and
seperate conductor or drain wire for CHASSIS
GROUND.
2. Termination resistors required at the end of each RS-422
transmitting pair. Enable the Catalyst's s internal
termination resistor at jumper block P10 by placing jumper
shunt on pins 17 & 18.
3. To avoid ground loops and to improve noise
immunity connect CHASSIS GROUND to
earth ground ONLY at a single location.

Raco Manufacturing & Engineering Co. Inc.
1400 62nd Street
Emeryville, CA 94608

| Title | RS-422 CABLING EXAMPLE - POINT-TO-POINT | | |
|---|---|---|---|
| Size A | Document Number | | Rev |
| Date: | Friday, August 09, 2002 | Sheet 1 | of 1 |

## 2.12.5 RS-422 Cabling Example – Master/Slave Network with 5 nodes
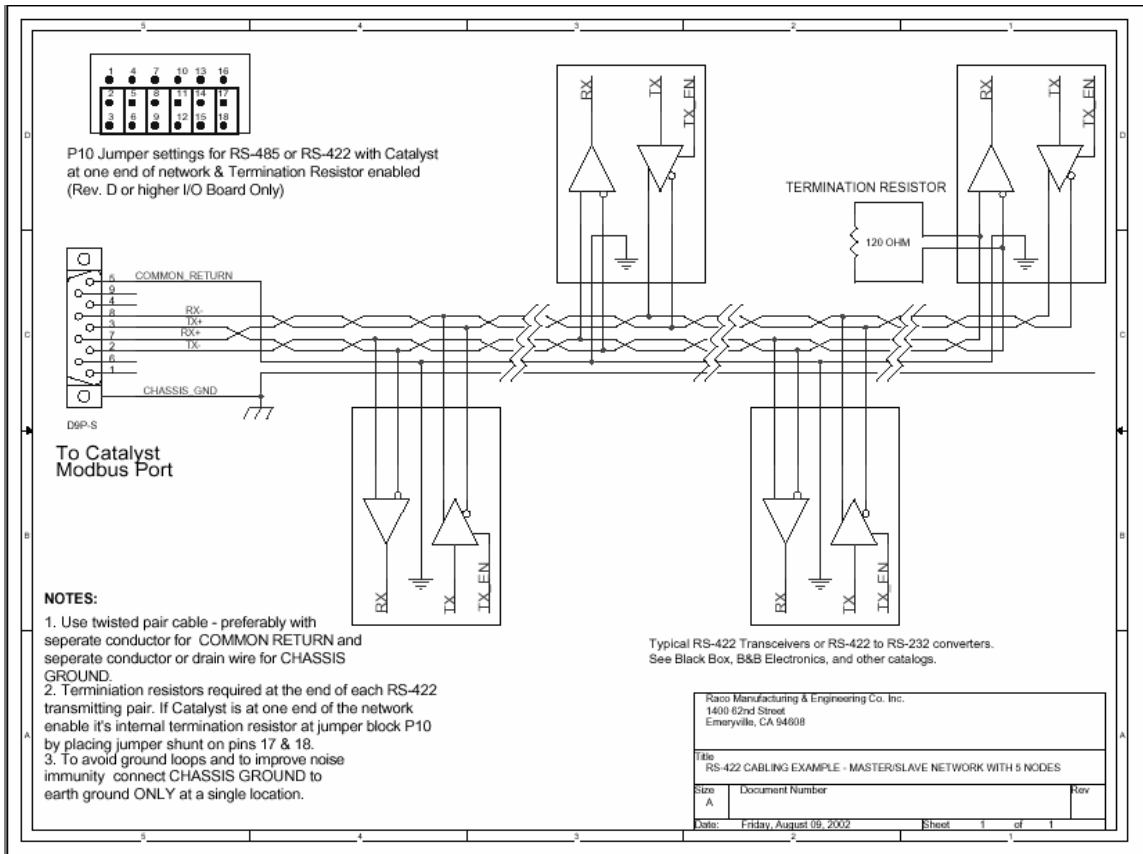
## 2.12.6 RS-485 Cabling Example – Point to Point

## 2.12.7 RS-485 Cabling Example – 5 node network
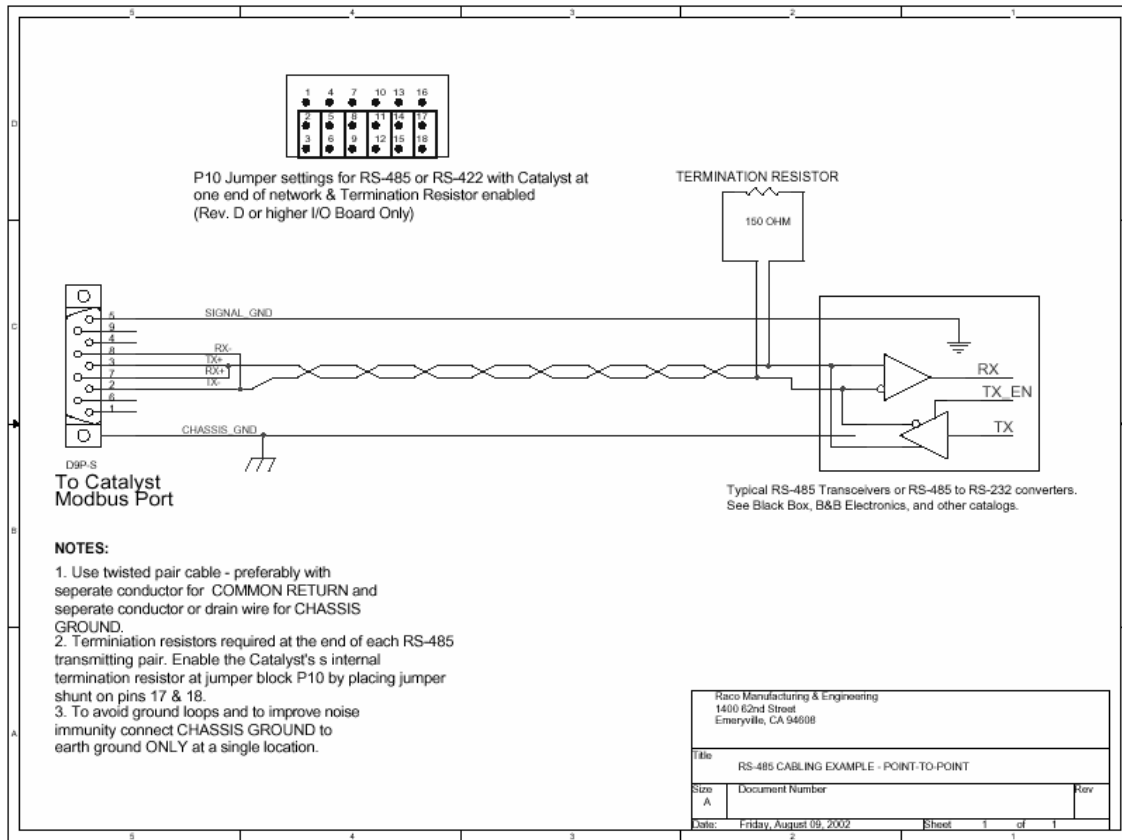
## 2.13 RTU Voltage Converter Module Diagram
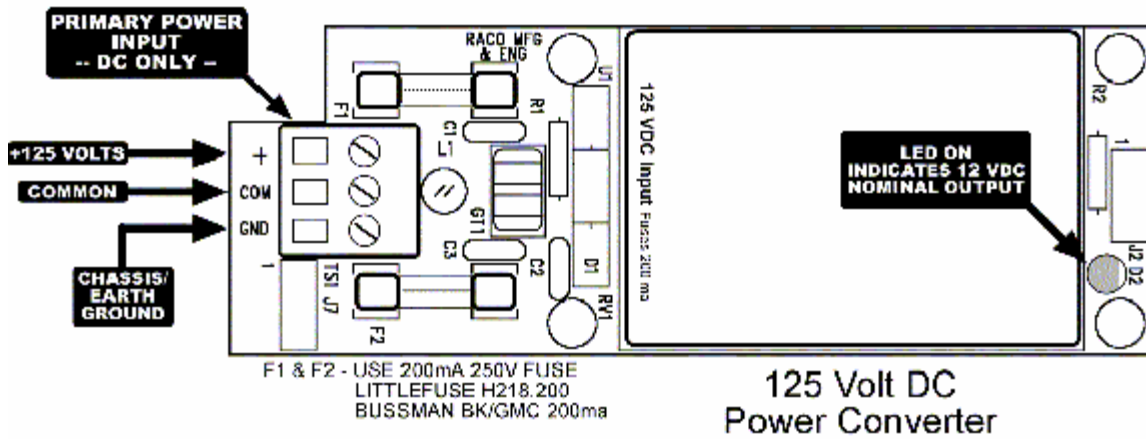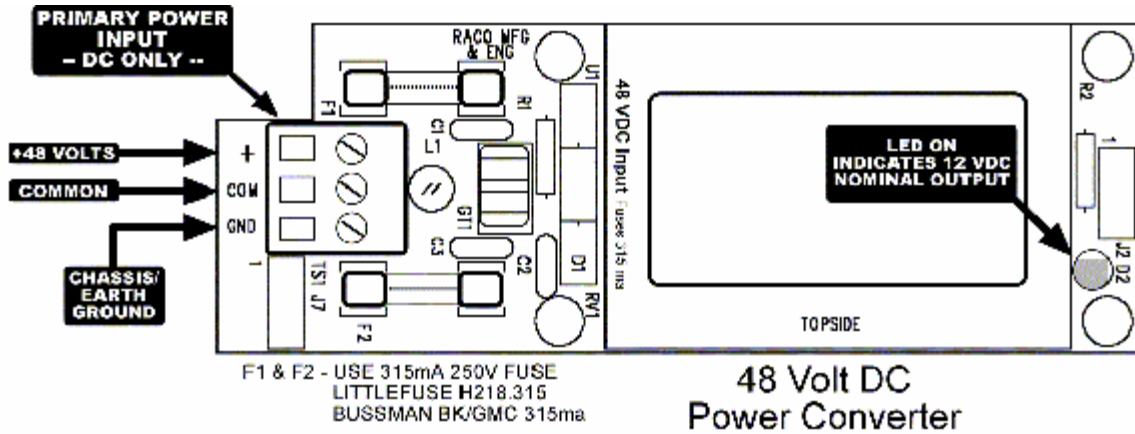


**POWER INPUT CONNECTIONS
48 & 125 VDC VOLTAGE CONVERTER MODULES**

## 2.14 RTU Circuit Board Assembly Diagram
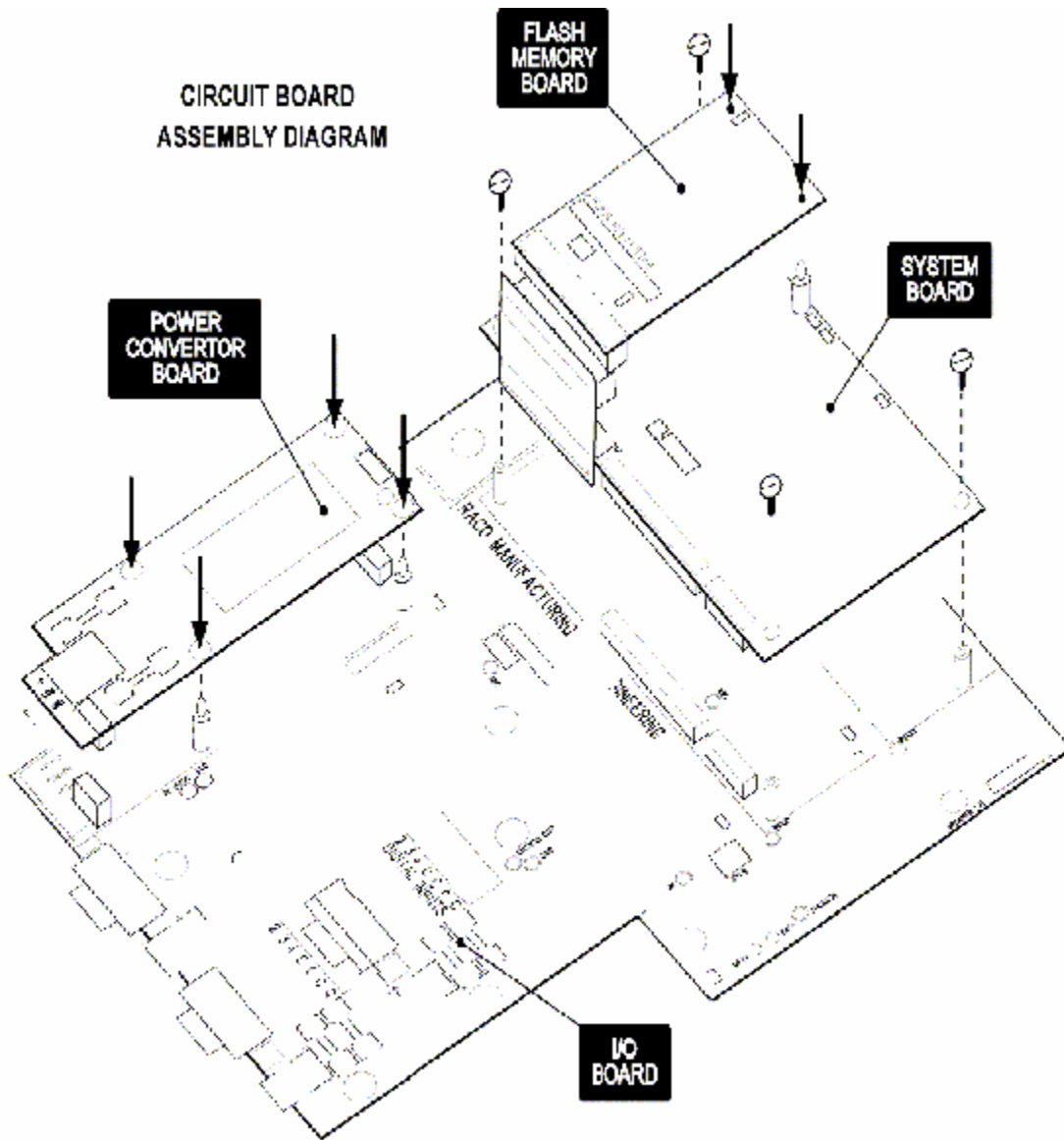
## 2.15 Installing Flash Memory Module

**To install additional NVRAM on the Catalyst, please adhere to the following procedure:**

1. Start by saving your configuration to Alarmware™. Connect Alarmware™ to the proper Catalyst and import the configuration. Quit the session after import completed.

2. Next, press the "Power Off" key on the front panel of the Catalyst.

3. Remove power from the Catalyst by disconnecting the battery, then unplugging the main power cord from it's power source.

4. Open the Catalyst cover.

5. Find the two plastic supports provided and install them on the "System Board" as shown in Step 1 of Diagram 2.15. The collared end of the support should be facing down. Press down on the supports until they snap into place.

6. Next take the flash memory board and line it up with the connector as shown in Step 2 of the diagram. Make certain that all pins are lined up correctly and press down until completely seated.

7. Install the support screws and tighten.

8. Reconnect the battery.

9. Close the Catalyst cover and reconnect the power source.

10. The Catalyst will automatically Power ON and then will reformat the file system.

11. Reconnect with Alarmware™ and export the saved configuration.

FLASH
MEMORY PCB

FLASH MEMORY CONNECTOR

PCB
STANDOFF (2x)

CSU
SYSTEM PCB

FLASH MEMORY
CONNECTOR
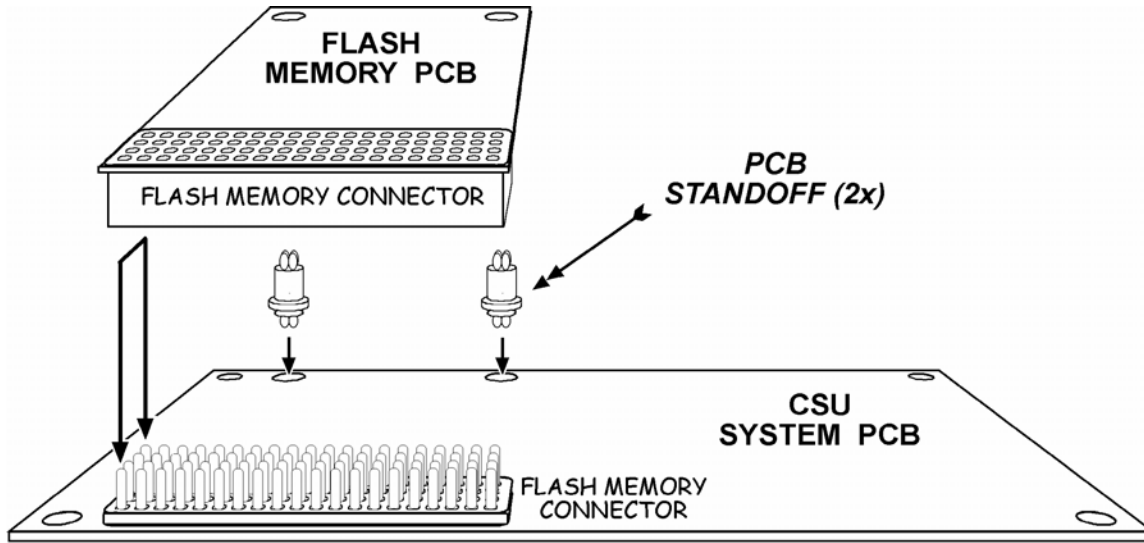
- FLASH MEMORY INSTALLATION -

**Diagram 2.15**

# 3.0 Installation Testing

## 3.1 Channel Operation Testing

**The general channel operations test procedure is as follows:**

- Do whatever is most practical to create violation conditions on each channel
- Verify that the correct calls are made and reports are clear

**The troubleshooting tools available include:**

- Enter key code **3 Z** to verify messages for channel Z are clear and make sense.
- Enter key code **5 * Z** to get configuration report for channel Z.
- Enter key code **916 Z** to read a count of problems for that channel. You may need to clear this count to see if problems are spurious or persistent (use **916 Z\*\***).

*Note: Occasional communication errors are to be expected. Frequent occurrence or conditions that persist through trip delay periods indicate problems.*

**Symptoms of channel operation problems include:**

- A communication alarm occurs.
- Net address configuration reports an error code.
- Any violation condition goes unreported.

**The most common causes of industrial network channel problems are:**

1) A network connection problem exists.
2) Scanning on the network has been disabled.
3) Communication alarm or other trip delays are too long (no alarms), or too short (too many communication alarms).
4) The channel is not configured for violation conditions.
5) Setpoints or other violation conditions are not correct.
6) **Network scan time** (related to latency) is longer than the application assumed. From Alarmware™ with the RTU online, choose menu item Diagnostics, and check only the box "Net Diagnostics Summary Report".  In the resulting report, scroll to read the Net 1 scan time within the section of the report for Net 1.  Or, use key code **902 N 1** to determine the network scan time. Then under Configuration | Devices, select the Net 1 tab and enter an appropriate **Communication Alarm Delay**.  An entry of twice the reported scan time is a good starting value.  Note that network scan time is strongly affected by the number of active channels being scanned.  Therefore you can get the best reading of scan time and make the best determination of an optimum Communication Alarm Delay to set, after the basic configuration of the RTU has been done.
7) Other RTU configuration parameters, such as phone numbers, trip delays, or Destination Channel Groupings, are not correct.

## 3.2 Connecting to an Industrial Network

This section details procedures for establishing the communications link between the Catalyst RTU and an industrial network.

The RTU currently supports the Modbus protocol. There is also a simple ASCII protocol, called Local Data Logging protocol (LDL). This is used only for connections with logging terminals and printers.

### The general steps for connecting the RTU to an industrial network are as follows:

- Determine which network interfaces are needed for the application. Consult the equipment vendors, or contact Customer Support for advice.
- Prepare the external network connection. The Industrial Networks subsection (*see Terminology and Concepts section*) describes usage and configuration for interfacing devices. Follow the vendor's procedures for installation and configuration.
- Connect the correct cable between the RTU and the network. Once connected, it should be safe to power up all equipment.
- Configure your RTU, preferably with Alarmware™.
- Use the procedures in the Testing, Troubleshooting & Diagnostics, particularly Channel Operations Testing and Network Communications Testing.

## 3.3 Network Connection Testing

Procedures in this section should always be conducted after the network connection is established. They may also be useful when symptoms indicate a network connection problem, or after recovering from such a problem.

**The general network connection test procedure is performed from the Front Panel as follows:**

- Verify that Network Status LED is steady ON.
- Enter PROGRAM mode.
- Enter key code **914 N** to get a list of active nodes on the network. If any nodes are missing, trouble-shoot using the common causes listed below.
- Enter key code **902 N 4**. This gets a list of diagnostic codes for the last 10 network problems. To clear out old errors first, use **902 N 4\*\***, wait a while, and then re-issue the **902 N 4** command to get recent status and history.

**Symptoms of a network connection problem are as follows:**

- The Front Panel NET 1 LED configured for industrial network interface is BLINKING, indicating there are communication errors with the PLC. Communications errors indicate time-outs, or no responses to polling requests
- The network "Alert" message is delivered.
- All channels on a particular node are in communication alarm.

**The most common causes of a network connection problems:**

- Incorrect network port or cabling. Verify the correct physical and electrical connections for both the RTU and network side of the connection.
- If problems are isolated to only one of many nodes, suspect a problem local to that node. Examples include cable disconnection, power OFF, or a PLC fault. Other causes may be that the node has been taken out of run mode or commandeered by other activity on the net.
- *Unexpected heavy network usage may trigger time-outs on normally stable configurations. This may happen when one or more users of configuration software become active or increase their loading on the Net. The solution involves adjusting timers and parameters to handle the worst case loading.*
- *Check MEM/DEF switch setting. Will impact required device configuration for the communications link.*

# 4.0 Start-Up Assistant

## 4.1 Open the Shipping Container

Remove the Catalyst and Catalyst CD, as well as any cabling you have ordered from the factory. You may find it necessary to refer to the manual during setup and testing. Just click on "Catalyst Manual" when the CD is running and the menu selections are displayed.

> The Catalyst CD contains;
>
> - Alarmware Configuration Software
> - Catalyst Manual in .PDF format
> - Catalyst Memory Allocation Tool
> - Tutorials
> - Specifications
> - RACO web links

## 4.2 Find a Location for Mounting

This location should be within 5 feet of a standard RJ-11 phone jack and a grounded 120 VAC power outlet.

## 4.3 Connect Wiring

(Refer to the diagram located in section 2.5 Catalyst RTU Interior View Diagrams in the Installation Guide)

1. Inspect and remove any foreign materials which might create short circuits.
2. Connect the red (positive) battery lead to the positive terminal on the battery.
3. Plug the Catalyst power cord into the outlet (or optionally use the terminal power strip TS1).
4. Next, optionally connect physical channel inputs at terminal strip P6. Each physical input point is marked 1 through 4 with common grounds marked with C. Caution: Verify that the circuits you connect are not directly connected to power, as that would damage the unit.
5. Connect PLC industrial network cable if required.
6. Connect the telephone line to the telephone connector on the bottom of the Catalyst so the unit can make out-going calls, as well as being able to answer incoming calls.
7. If a parallel printer is specified, connect the LDL cable from the Catalyst to the printer.
8. If Alarmware connections will be made via the computer's COM port, connect the Serial Port cable from the Catalyst to the appropriate computer serial port.

## 4.4 Powering Up the Unit

1. Press the "Power On" button on the Catalyst keypad.
2. The Catalyst will take a short time to initialize. The front panel LEDs will display the initialization pattern while booting.

3. The unit is ready when the NORMAL LED is ON.
4. Verify the Catalyst time and date is correct.
5. Press the PROGRAM key on the front panel.
6. The Catalyst will respond with "Enter Program Code."
7. Press 42 [ENTER].

If either the time or date should be changed, use the following Keycodes to update the unit:

**To change the time:**

Press 421*HHMMSS (HH=hour, MM=min, SS=sec) [ENTER].

**To change the date:**

Press 422*MMDDYY (MM=month, DD=day, YY=year) [ENTER].

To exit PROGRAM mode, press NORMAL.

## 4.5 Install Alarmware from Catalyst CD

1. Place Catalyst CD in CDROM tray and close. If the CD fails to start, run the "welcome.exe" program located in the top level directory of the Catalyst CD.
2. When the Menu Page appears, click on "Install Alarmware" menu item.
3. Follow the on-screen instructions to install the Alarmware program. Alarmware is the program is designed to allow you to make programming changes to your Catalyst, using your computer.
4. Once the software has been installed, launch Alarmware.

## 4.6 Configure Connections

1. To connect with the Catalyst, you will either:
   a. Connect via the phone line to a computer modem
   b. Connect directly to the Catalyst, using your computer's serial port
2. Click the "Cancel" button on the "Select RTU" dialog.
3. From the "Options" menu, select "Modem" or "COM Port" depending on desired connection type. You may want to configure both connection types at this step.
4. Select the appropriate COM Port number and click OK.

## 4.7 Add RTU

1. Click on the "Select RTU" menu item.
2. Click on the ADD button.
3. When the Add/Edit RTU dialog appears, enter the RTU Name, the number of the phone line connected to the unit, and choose the proper Catalyst model number from the pull-down list.
4. Click the "Set" button. Note: the serial number will appear after the first connection made to the Catalyst added.

## 4.8 Connect to the Catalyst

After adding the RTU, the addition you just made should be highlighted in the list of RTUs.
Click on the proper connection button;

- "Connect Phone" for connections using the phone line and modem
- "Connect COM port" for a direct connection session

A "Database Mismatch" will occur because the Alarmware database and the Catalyst database do not match. At this point, you must determine which database is the one you want to keep.

-- If the Catalyst is **not** being configured for the first time, or, if you don't know whether the unit has been previously configured, the safest course of action is to "Import settings to Alarmware." This will ensure that previous settings will be preserved. Importing to Alarmware will change the RTU name to whatever the Catalyst database has configured. By default, the Catalyst RTU name is CATALYST. If the Catalyst database does not have a configured phone number, then that information will also need to be re-entered.

-- If the Catalyst **is** being configured for the first time, you will probably want to select "Export Settings to RTU." This operation will export the information from Alarmware database to the Catalyst database. All the information in the Catalyst database will be overwritten by the information in the Alarmware database by this action.

When the "Online with RTU" window will appears, the databases are synchronized. The Alarmware front panel is a representation of the LEDs on the Catalyst front panel. Flashing LEDs are an indication that a problem exists with a channel, device, or version. When Channel LEDs are solid ON, the alarm(s) has been acknowledged.

## 4.9 Configure a Destination

1. From the "Configuration" menu, select "Destinations."
2. When the Destination Settings dialog appears you will be given a choice of destination types.
3. For initial setup and testing, let's configure a telephone destination. This is where the Catalyst will call, when an alarm occurs.
4. From the destination types provided, select "Telephone."
5. Fill in the number of the phone to be called when an alarm occurs. For testing purposes, choose a phone that you can readily answer when called by the Catalyst.
6. Fill in the name of the person or organization to be called. Naturally, this name is not important if you are only setting up for a test.
7. Click the "Close" button.

## 4.10 Configure a Channel

1. From the "Configuration" menu, select "Channels."
2. Channels 1 through 4 are configured by default to be discrete physical channels.
3. These channels can be configured to alarm on;

   a. "Open" or "Close",
   b. "1" or "0",
   c. "On" or "Off"

4. By default, these channels are normally closed, meaning they will alarm on an open circuit.

5.  By default, these four channels should be in alarm right now, as indicated by flashing LEDs for channels 1 – 4.
6.  For testing purposes, we can leave these channels in alarm.
7.  When you are ready to start configuring channels for actual monitoring, you will start by entering the source net address (SNA). This is the physical or network address used by the Catalyst to find and retrieve data.
8.  *As you can see for Channel 1, the "SNA" is set by default to "0\*1\*1." (0= physical input, 1= node, 1=input point 1) Note: for more information on SNAs, please refer to the Operator's Manual.*
9.  Click the "Close" button.

## 4.11 Record Messages

1.  From the front panel of the Catalyst, press PROGRAM.
2.  To record a message that will identify the RTU, press 60\* [ENTER].
3.  When prompted, press and hold the RECORD button while you recite a unit ID message, e.g. "North Pointe Hydro-Electric Plant."
4.  Release the RECORD button when you are done reciting the message.
5.  The Catalyst will repeat the message you just recited to verify clarity and appropriateness. For each channel message, you will record a message 1 and message 2 message. Keep the printout from the Memory Allocation Tool handy, so the process of recording messages for all active channels can be accomplished quickly.

6.  The Keycodes for recording channel messages are:

| Analog Channel Messages ||
|---|---|
| Message 1 | 1\*N |
| Message 2 | 2\*N |

| Digital Channel Messages ||
|---|---|
| Normal Message | 1\*N |
| Alarm Message | 2\*N |

*Note: where **N** is the Channel Number.*

7.  Press NORMAL to exit PROGRAM mode.

## 4.12 Test Alarm Condition

1.  With a destination configured for an alarm call, and channels 1 – 4 in alarm, all we need to do is disconnect from the RTU and the Catalyst will initiate an alarm notification call.
2.  Click on the "Disconnect" button.
3.  The Catalyst should start the outgoing call right away.
4.  Answer the call when the phone that the Catalyst called rings.
5.  The Catalyst will prompt you to "enter a 5" to listen to the Alarm report.
6.  Once you have listened to the Alarm Report, press 3 or 9 to acknowledge the alarms. With no further input, the Catalyst will hang up within 10 seconds.
7.  The front panel LEDs for channels 1 – 4 will now be solid ON, indicating the alarms for those channels have been acknowledged.

## 4.13 Run Catalyst Memory Allocation Tool

1. This tool is an Excel file, utilizing Visual Basic for applications. It is located both on your Catalyst CD and can be run by clicking on the "Tools | Catalyst Memory Allocation Tool" menu item or can be found in the directory where Alarmware has been installed.
2. When you launch this tool, you may be asked to enable the macros. In order to use this tool, you will need to select "enable macros."
3. This tool is designed to help you allocate the memory installed with your Catalyst.
4. Non-volatile memory or NVM is available for;

   a. Catalyst configuration changes
   b. Log File Reserve
   c. User-Recorded Speech Messages

5. To help determine how much memory should be reserved for logging, you will be asked to enter information such as;

   a. Installed NVRAM
   b. The number of channels to be sampled
   c. How often the channels will be sampled
   d. How often the data in the reserve is transmitted to a permanent location
   e. The rate at which messages will be recorded

6. The recommended reserve size can then be calculated. This information will yield how much memory is left for user-recorded messages.
7. The next feature of the tool is for developing channel messages for recording.
8. For each channel that will have a user-recorded message, you can enter how the messages will be recited.
9. Once the message is constructed, press the Start Timer button, recite both messages, and press the Stop Timer button.
10. The tool will keep track of how much message time is used, and how much remains;

    a. For analog channels, the message will consist of the combination of message 1 and message 2. Message 1 generally describes the monitoring point, e.g. "Water tank level is." Message 2 normally describes the units of measure, e.g. "feet."
    b. For digital channels, there is both the Normal state message, e.g. "Pump is ON," and the Alarm state message, e.g. "Warning! Pump is OFF."

11. When you are satisfied with the configuration, perform a "Save As" operation to save the file under a new name on your computer hard drive.
12. Finally, print the information for future reference.

## 4.14 Configure a Log File

1. With the information you printed from the Memory Allocation Tool, launch Alarmware and connect again to the Catalyst unit.
2. When you are ONLINE with the RTU, from the "Configuration" menu, select "Devices."
3. Click on the tab labeled "Log File."
4. Enable the Log File.
5. Select the events and information that you would like to be saved in the log.
6. Enter the data sampling information;

     a.    The base time is the starting point for sampling
     b.    The frequency is how often the channels are sampled

7. Click on the "Advanced" button.
8. For the Log File reserve size, enter the recommended size as provided by the Memory Allocation Tool. *Note: this value cannot be changed while "offline."*
9. Close the Advanced dialog, and then close the Devices dialog.
10. The Log File can be delivered to a destination on a scheduled basis when the destination is properly configured. Destinations eligible to receive Log File reports include;

     a.    Fax Machines
     b.    Remote Data Terminals
     c.    Email Recipients

11. Log Files can also be retrieved using Alarmware or a terminal program e.g. "ProComm Plus.'
12. After desired configuration changes have been made, disconnect from the RTU.

# Operator's Manual

## 1.0 Introduction to Product Terminology & Concepts

Before attempting to configure the installed RTU, it is important to become familiar with the terminology and concepts presented in the topics that follow.  Once the user understands these, the configuration process will become fairly straightforward, particularly when using Alarmware™.  Without such understanding, practical obstacles may needlessly arise for the user.

## 1.1 Channels

The following is a simplified depiction of how the operation of a typical channel relates to Source Net Addresses (SNA), optional Destination Net Addresses (DNA), and Destinations.
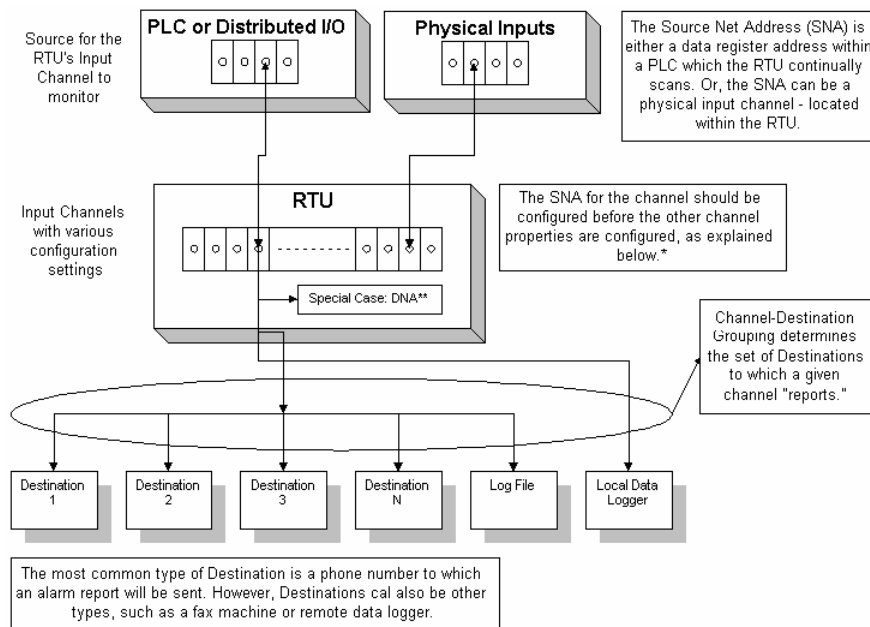


* The data type dictates the channel configuration choices that are offered. Changing the SNA will clear other configuration settings for the channel. Therefore, the SNA should always be configured first.

** A Destination Net Address (DNA) can also be configured for any channel (don't confuse the DNA with the destinations for reports). When so configured, the data monitored by the channel will be continually delivered to the DNA location, at the RTU scan rate.

## 1.1.1 Channel Properties

**Channels have properties that include:**

- **Channel Number** – An ordinal number that identifies the channel.
- **Source Network Address** (SNA, Required) – Specifies a net address location from which the channel obtains (reads) its Raw Value at the scan speed of the RTU.
- **Selected Mode** – Channel mode operations based on the channel type (analog or discrete).
- **Physical Input** – Used to assign the physical channel data type. A physical channel can be set to either Analog or Discrete.
- **Raw Value** – The value as directly read from the SNA, without any transformation.
- **Scaled Value** – The displayed or reported value of the scaled data.
- **Reporting Format or Direct Reading format** – This determines the way in which the "Raw Value" is changed into the "Transformed Value."
- **Alarm Violation Criteria** – Determines what criteria constitute a violation.
- **Alarm Trip Delay** – Determines how long a violating value must persist before an Unacknowledged Alarm is created.
- **Messages** – The method for announcing the channel's status.
- **Destination Channel Grouping** (Optional) – If configured, determines which destinations the channel will report to.  If not configured, a channel reports to all destinations.
- **Destination Network Address** (DNA, Optional) – Specifies a net address location to which the Raw Value of a channel is continuously written, at the scan rate of the RTU.

1.1.2 Net Addresses

1.1.2.1 Source Net Address (SNA)

The Channel Source Net Address (SNA) specifies the location where the data for the channel comes from. Possible sources include local (physical) channels, channels interfaced via industrial networks, and internal data tables.

*Note: The Channel Source Net Address (SNA) must be configured before any other configurations are attempted. All channel data is set to default when the SNA is changed.*

1.1.2.2 Destination Net Address (DNA) (Optional)

The Channel Destination Net Address (DNA) specifies where to direct the transformed channel data. Possibilities here are the same as for the SNA. This capability provides for channel linking. Factory default is no DNA.

*Note: The setting of a Destination Net Address is only possible from Alarmware™.*

1.1.2.3 Net Address Format

The general form for the channel's SNA consists of 3 separate fields, separated by the * character as follows:

# Network * Node * Address

- The **address** field is the only mandatory field in the SNA. It specifies which point within a single piece of equipment is to be accessed. The format depends upon the equipment vendor's conventions. Generally, a standard Modicon name that identifies a 1-, 16-, or 32-bit data object may be used for this field. There is no default.
- The **node** field specifies which piece of equipment on the NET contains the point to be accessed. It usually consists of a single number, in the range supported by the protocol.
- The **net** field specifies which device port on the RTU provides access to the point. If this field is present, then the node field must also be present, delimited by the * character.

1.1.3 Channel Numbers

A *channel number* is an ordinal number that identifies a particular channel.  All channel numbers must be unique.

**Channel numbers are used in:**

- Command key codes
- Alarm reports
- Local and Remote data logs
- Front Panel and Alarmware™ LED displays
- Reporting Priority (lowest numbered channels are reported first)

## 1.1.4 Channel Data Types

**The data type of the channel determines:**

- Which kinds of alarm violation criteria are available
- How the channel values are formatted
- How voice and text messages are used in reports

**Industrial Network channels:**

The determination of an Industrial Network (PLC) channel's data type is simple: the Source Net Address (SNA) determines the point and the data type of that point automatically becomes the data type of the channel. Therefore, changing the SNA of a channel may reset the channel type.

**Physical Input Channels:**

Operators may configure channels to scan physical input points by setting the SNA or DNA appropriately. All physical inputs reside on NET0. The PI channel data type can be set to either Analog or Discrete Inputs. Use Alarmware (Device Settings | Net 0) or keycode 431 to set channel type.

**Default SNAs:**

The default SNA for physical inputs is configured for the lowest four channel numbers, e.g. Channel 1 is configured for physical input 1, etc.

*Note: When you change the channel data type, the Alarm Violation Criteria will automatically be set to "Disabled (Channel Inactive)". To make the channel active again you will need to set an appropriate "Alarm Violation Criteria" and "Reporting Format."*

**The following data types are available:**

## 1.1.4.1 Discrete Channels

If the net address specifies a single bit, then the channel date type is *discrete*.

**Alarm violation criteria available for Discrete channels include:**

- Alarm on 0 Raw Value
- Alarm on 1 Raw Value (default)

**Report messages consist of either:**

- Message 1 (if there is no violation)
- Message 2 (if there is a violation)

## 1.1.4.2 Analog Channels

If the net address specifies 16 or 32-bit data, the channel data type is *analog*.

**Alarm violation criteria available for analog channels include:**

- High Setpoint

- Low Setpoint

**Report messages use:**

- Message 1 as a preamble
- Followed by the channel value
- Followed in turn by Message 2
- Values are as determined by the configured channel reporting format

## 1.1.4.3 Analog Floating Point Channels

If the net address specifies a 32-bit point, then the channel data type is also *analog*. However, values are interpreted as a *floating*-point number formatted according to the IEEE specifications. Values can have up to 7 significant digits as determined by the configured channel-reporting format and can range from 1.18 E-38 to 3.4 E+38.

## 1.1.4.4 System Channels

A System Channel refers to a channel that is not included in the user configurable channel settings. These channels are data points that the Catalyst monitors continually. These data points include:

1. Phone Failures (TFAIL)
2. Power Failures (PFAIL)
3. Battery Charging
4. Time of Day Clock Reset
5. Log File Overflow

# 1.2 Alarm Trip Delay

The Alarm Trip Delay is the length of time a channel's status (value reading) must meet the channel's Alarm Violation Criteria, before the channel goes into *Unacknowledged Alarm State* and begins dialing.

- The default value is 2 seconds for all input channels.
- Between the times from the onset of a violation until the trip delay expires, if a channel's status is read during a report, the extra Tag Word **Alert** will be appended to the channel status message.
- If the channel value ceases meeting the Alarm Violation Criteria before the Alarm Trip Delay expires, no alarm will occur.

*Note: The finite time required completing each scan of the network affect how quickly each channel's status would be updated. Therefore, unless the alarm trip delay is much longer than the scan time, the effective delay will be substantially affected by the scan time.*

For example, suppose the scan time is 100 seconds and the Alarm Trip Delay is set to 50 seconds. If a violation persists for just ten seconds at the address location (SNA) which the channel is monitoring, there is a 90% chance that it will not be detected during scanning. If by chance it is detected, then the channel's value will reflect the violation for the next 100 seconds, and the alarm will be tripped despite the condition having persisted for much less than the Alarm Trip Delay setting.

- In practical terms, this means that it is important to arrange for the PLC to maintain violation values for at least as long as the networks scan time in order to assure detection.

- It also means that the Alarm Trip Delay setting will not be the primary determinant of how long a violation must persist at the SNA before it trips an alarm unless the Alarm Trip Delay setting is substantially longer than the scan time.

For more information on the "granularity" of readings imposed by scan time, *see 1.9.4 Scan Time and Channel Latency in the Operator's Manual*.

There are two ways to change the Alarm Trip Delay for channels:

- **Common Alarm Trip Delay** – Common for all channels (does not include Power Failure or Communications Failure Alarms).
- **Alarm Trip Delay** – Configuration for each individual channel.

*Note: Changing the Common Alarm Trip Delay setting overrides any previously set individual Channel Violation Trip Delays. If you wish to establish a different default trip delay, as well as individual channel trip delays, **configure the common trip delay first**, then configure the differing individual channel trip delays.*

If you are getting a lot of nuisance alarms, with a call saying, "***Alarm now normal***," you may want to consider increasing the trip delay. A good example of this would be the power fail trip delay. In some areas, it is very common to have short periods of power failure.  These may not be of particular concern, so setting the power failure trip delay to a larger value could save unnecessary phone calls.

In addition to "Alarm Trip Delay" and "Power Failure Alarm Trip Delay (PFAIL)," another important alarm delay setting is the "Communications Alarm Delay" which determines how long an interval is allowed between scans of the Network before a Communications Failure Alarm is tripped.

## 1.3 Messages

NOTE: *The following omits mention of the process of recording your own voice messages at the front panel or over the phone. The RTU provides for messages in both voice and text versions, and the following applies equally to both voice and text messages*

The RTU incorporates factory default entries for all messages, both voice and text, which are replaceable by the user as desired. The type of Destination receiving the report determines whether a voice or text version report will be delivered.

There are five different types of messages. The first four messages are used to identify an item for reporting purposes:

| | |
|---|---|
| **RTU Name** | Identifies the RTU |
| **Net Name** | Identifies each network |
| **Destination Name** | Identifies each Destination, typically personnel being called for alarm acknowledgement. |
| **PIN Name** | Identifies the individual who performed some operations such as calling in to the unit and acknowledging an alarm call. ***Note***: *Unlike other message types there are no voice versions of PIN messages.* |
| **Channel Status** | The remainder of this topic is concerned with the channel message type. |

## 1.3.1 Channel Status Messages

All channel types have two distinct text messages available as well as two corresponding distinct voice messages for use in delivering reports to destinations.  A data mode report may include one or both available text messages, while a corresponding voice mode report can also use one or both available voice messages.

For both "text" and "voice" reports, the specific way in which the RTU makes use of these two messages depends upon whether the channel is configured as **Analog** type (having a continuous range of possible values), or **Discrete** type (having just two possible values, 0 and 1).

### Analog Channels
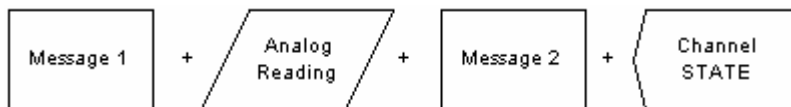


**Analog** channel reports use the two messages (in this case, message segments) to create a **composite message** consisting of:

- A leading **preamble** message (Message 1)
- Followed by the current **analog reading**
- Followed by an **epilogue** message (Message 2)
- Followed by the **current channel state**

The general form of this composite message is illustrated in this example:
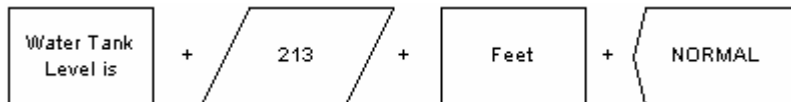


### Discrete Channels

**Discrete** channel reports use the two descriptive messages to reflect the **two different possible** current values:
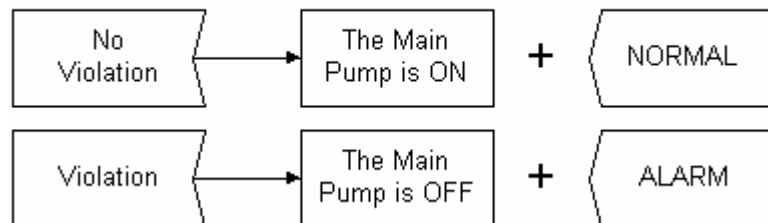


The form of this message is illustrated in this example:
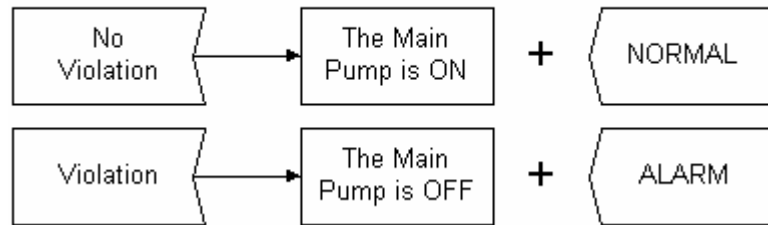
Looking at this distinction another way, for analog channels the immediately current reading value determines the analog value that is inserted between the two messages.  For discrete channels, the immediately current reading value determines the choice of two messages is to be used.

*Important Note: Channel status reports include not only the above described messages which reflect the channel's value, but also Tag Word(s) which reflect the channel's state (ALARM, NORMAL, etc.), and which are automatically appended to the messages to complete the report.  Therefore these messages should be crafted with that fact in mind.*

## 1.3.2 Tag Words and Channel States

In addition to channel status messages, the RTU have available a small set of globally applicable *Tag Words*.

Tag Words are automatically appended to the end of each channel status message, in order to reflect the **state** of the channel, not to be confused with its current **value** reading from the last scan.  The channel status message plus the appended Tag Word(s) constitute the channel status report.

Tag Words appended to Channel Status Messages include the following:

- **ALERT** –– any channel with an input violation which has not been present longer than the Alarm Trip Delay for that channel will have the Tag Word *Alert* appended to the channel status message.
- **ALARM** –– when the input violation has persisted continuously for the Alarm Trip Delay period, the channel goes into Unacknowledged Alarm State, and the Tag Word *Alarm* will be appended to the channel status message.
- **NOW NORMAL** –– if the violation that originally caused the alarm has returned to normal, the Tag Words *Now Normal…* will be appended to the channel status message.
- **ACKNOWLEDGED** –––- any channel that was in an unacknowledged alarm state, and was acknowledged by an operator, will have the Tag Word *Acknowledged* appended to the channel status message.
- **NOW NORMAL, ACKNOWLEDGED** –––- any channel which is both acknowledged and whose input violation has returned to normal, will have the Tag Words *Now Normal, Acknowledged* appended to the channel status message.

For a channel to be able to initiate an alarm report it must be pre-configured with **"Alarm Violation Criteria"** to specifically define what reading value(s) will constitute an alarm violation.

With this in mind, the following describes how the RTU reflects both the current reading **value** and the **state** in reports, as events progress:

| Event or Period Progression | Channel State |
|---|---|
| No Violation | **NORMAL** |
| Violation Occurs | **ALERT** |

| Duration of Alarm Trip Delay | **ALERT** |
|---|---|
| Unacknowledged Alarm | **ALARM** |
| Dials until Acknowledged | **ALARM** |
| Alarm Acknowledged | **ALARM, ACKNOWLEDGED** |
| Channel Violation Returns to Normal | **ALARM, NOW NORMAL, ACKNOWLEDGED** |
| Alarm Reset Times-out | **NORMAL** |

Initially with no violation, the channel's state is NORMAL.  If the channel were queried for a report at this time, the report would consist of the channel status message as described above, followed by the Tag Word "**Normal**".

Whenever the current value reading changes so that it constitutes a violation, the channel first begins timing out its configured **Alarm Trip Delay** period.  During this timeout period, the state is ALERT.  If the channel were queried for a report at this time, the report's message would change to reflect the changed value, and the tag word would change from "**Normal**" to "**Alert**".

If the violation persists continuously long enough to satisfy the Alarm Trip Delay, the state changes from **Alert** to **Alarm**.  This in turn causes the RTU to initiate attempts to deliver alarm reports to the various destinations available to it, typically personnel's phone numbers.  The RTU continues notification efforts until the alarm is acknowledged.  During this time, the report for this channel will be the same, except that the Tag Word is changed from "Alert" to "Alarm".

After having tripped into this Unacknowledged Alarm state, if the current reading value happened to return to a non-violation value, the additional Tag Words "**Now Normal**" would be added to the tag word "Alarm" in the report.

Similarly, after the alarm is acknowledged, the Tag Words "**Alarm, Acknowledged**" would be appended to the message, along with "**Now Normal**" added if there was no immediately current violation.

The fact that Tag Words are automatically added to messages should be considered when determining the exact content of each message element.

1.3.2.1 Tag Words for Analog Channels

The following tables give a visual depiction of the progression of Alarm/Normal states and the corresponding Tag Words incorporated into the full reports.

Analog Message = Preamble (Message 1) + Analog Reading + Epilogue (Message 2) + Tag Word(s)

| CHANNEL STATE | No Current Criteria Violation |
|---|---|
| NORMAL | Message 1 + Analog Reading + Message 2 + "**Normal**" |
| ACKNOWLEDGED ALARM, NOW NORMAL | Message 1 + Analog Reading + Message 2 + "**Alarm, Acknowledged, Now Normal**" |

| CHANNEL STATE | Current Criteria Violation |
|---|---|
| ALERT | Message 1 + Analog Reading + Message 2 + "**Alert**" |
| UNACKNOWLEDGED ALARM | Message 1 + Analog Reading + Message 2 + "**Alarm**" |
| ACKNOWLEDGED ALARM | Message 1 + Analog Reading + Message 2 + "**Alarm, Acknowledged**" |

1.3.2.2 Tag Words for Discrete Channels

**No Violation Message** = (Message 1)
**Violation Message** = (Message 2)

| CHANNEL STATE | No Current Criteria Violation |
|---|---|
| NORMAL | Message 1 + "**Normal**" |
| ACKNOWLEDGED ALARM, NOW NORMAL | Message 1 + "**Alarm, Acknowledged, Now Normal**" |

| CHANNEL STATE | Current Criteria Violation |
|---|---|
| ALERT | Message 2 + "**Alert**" |
| UNACKNOWLEDGED ALARM | Message 2 + "**Alarm**" |
| ACKNOWLEDGED ALARM | Message 2 + "**Alarm, Acknowledged**" |

Finally, for channels that are configured for *Alarm Never* (status report only), the situation is much simpler.   There is no state to differentiate for such channels, and therefore the Tag Words "**Status Only**" are appended.

*Note: The tag words mentioned here are the factory default words; the user can create alternative Tag Words for both text and voice reports.*

**It is important to remember the distinctions between the following three related items:**

1) **The channel status "direct reading"** (generally 0 or 1 if discrete, or a range of values if analog): This consists of both a raw and a translated *reading* value. The direct reading is obtained by clicking on a corresponding channel LED in the Alarmware™ Online LED status window while on line with an RTU. *This special purpose reading must not be confused with messages or reports delivered to destinations.*

2) **The channel status "message"** (which reflects the current channel status reading): This is what appears within voice or text reports to destinations, along with appended Tag Words.

3) **The complete channel status "report"**: This consists of the channel status message plus appended Tag Word(s) reflecting the state, in either voice or text mode.

1.3.2.3 Remaining Tag Words

- **SNA COMMUNICATIONS** -- (Used to indicate an SNA Communications Failure Alarm state)
- **DNA COMMUNICATIONS** – (Used to indicate a DNA Communications Failure Alarm state)
- **LOW SET POINT** – (Used to further delineate an analog alarm as a Low Set Point alarm)
- **HIGH SET POINT** – (Used to further delineate an analog alarm as a High Set Point alarm)
- **STATUS ONLY** – (Used to identify channels set to "Alarm Never." Used when the RTU channels are reporting value and state, but are not configured to initiate an alarm call.)

1.3.3 Messages when PINs are configured

The PIN Name is used to form the phrase "by <PIN Name>" which is appended at the end of every channel status message in an acknowledged state. When no PINS are configured, there is NEVER any "acknowledged by…" phrase.

**Example:**
"Current Fresh Water Tank level is 430 Feet HIGH WATER ALARM, ACKNOWLEDGED by James Bond"

When alarms are acknowledged from either the front panel, over the phone, over by using Alarmware, the composite message will be appended as follows:

| Acknowledged by… | Full Text Message | CSV Format |
|---|---|---|
| Front Panel | "by Front Panel Operator" | 4094 |
| Over the Phone | "by Operator over the Phone" | 4093 |
| Alarmware | "by Alarmware Operator" | 4092 |
| Acknowledgment Switch | "by Remote Acknowledgment Switch/Operator" | 4091 |

1.3.4 Power Failure Alarm Messages

**Power failure alarms cause only one of two possible messages to be given:**

1) When power has been OFF for longer than the Power Failure Trip Delay, "Power is out" is reported.
2) When power has been OFF and is later restored, then in the next report only, "Power has been OFF... Power is now ON" is reported. After this one report, no further mention is made of power until another Power Failure Alarm occurs.

## 1.4 Destinations

A Destination is a location that can receive reports. A Destination is most commonly a telephone number but other possibilities exist.

**Destination types include:**

- **Telephone** – Typically the phone numbers of personnel to call when an alarm occurs.
- **Numeric/Beeping Pager** – Configured when there is a need to call a pager with a phone number when an alarm occurs.
- **Alphanumeric Pager** – Configured when there is a need to deliver a text message alarm report to an alphanumeric pager.
- **Fax Machine** – When there is a need to send various reports at specific times.
- **Remote Data Terminal** - Computer set up to receive Log File downloads from the RTU.
- **PA System** – Announces alarms locally over a public address system or from the Catalyst front panel.
- **Email Reporting** – Provides a way to deliver reports to individual email recipients.

**Destination Parameters:**

- The "Destination Name" for use in text reports.
- How to access the Destination (destination type).
- Which device, protocol and reporting format the Destination should use.
- Which channels should report to a particular Destination
- Which type of report to deliver
- What type of information to include in the report

**Destination Numbers:**

The Destination Number is an ordinal number used to identify specific Destinations in a RTU configuration. The choice of Destination Number can be important. Destination Numbers are related to the priority in which reports are delivered.  If a single channel is in Unacknowledged Alarm, reports will be sent to destinations based upon a priority of lowest Destination number first.

If more than one channel is in Unacknowledged Alarm, then by factory default, reports are delivered on the basis of lowest Destination number first.  However, you may choose instead to have the report delivery priority based primarily upon lowest channel number rather than lowest Destination number. From Alarmware™, this setting appears under the Configuration | Session Parameters menu.

Input channels can be individually assigned to call all destinations, single destinations, or groups of destinations. (*See 1.5 Destination Channel Grouping in the Operator's Manual*)

**Destination use of Devices and Protocols**

Destinations utilize devices and protocols as resources to carry out sessions. Devices usually consist of hardware within the RTU, such as: the date and time clock (TOD), the modem, printer, PLC, and Alarmware ports, the Log File, and the Catalyst's physical inputs. Protocols are similar to languages. Protocols are the agreed upon languages which machines use to talk to each other.

## 1.5 Destination Channel Grouping

Destination Channel Grouping establishes the **linking of channels** with specific **destinations**. The feature is available within Alarmware™ only.

- When a particular channel goes into alarm, only the destinations linked to that channel will receive alarm notification reports.
- By **factory default**, **all channels** are **linked** to **all destinations** until configured otherwise by the user.
- Destination Channel Grouping is typically configured when certain channels are associated with a specific category of personnel, such as electrical, plumbing, security, etc.
- Another use would be to configure selected channels to be linked to a Log File Destination when channel sampling is configured. This will define which channels are to be included in the samples saved to the Log File.

*Note: Power Failure alarms and some kinds of Communications Failure alarms will bypass Destination Channel Grouping and will cause alarm reports to all destinations, beginning with the lowest Destination number first.*

## 1.6 Sessions

Sessions occur between the Catalyst and a Destination. They consist of an exchange of information termed **reports**. An example of a session is what occurs when an RTU calls an operator's phone number to deliver a notification report in voice mode. Another example is when a central computer running Alarmware calls an RTU in order to make configuration changes. They are both considered sessions.

Sessions have a beginning and an end. For example, a phone session with an operator starts when the RTU dials a phone number, and ends when either the operator, or the RTU, terminates the call.

### 1.6.1 Session Types

The *session type* is related to the kinds of information exchanged in the session.

#### 1.6.1.1 Alarm Notification

This type of session deals with current unacknowledged alarm conditions. The report only includes channels in the destination's group. The intent of this report is to obtain operator acknowledgment. These reports are scheduled as the alarm states arise. Details of alarm notification sessions depend on destination type, annunciation sequence, and session parameter configurations.

#### 1.6.1.2 Configuration Changes (Programming)

This type of session is for making changes to the configuration database within the RTU. Configuration change sessions occur over the phone, or with Alarmware™.

1.6.1.3 Data Sampling

Data Sampling is the periodically sampled reading of channel values.  This excludes channels that are disabled (inactive) and channels that have been excluded from the Destination via Destinations Channels Grouping. The intent of this report is to provide "snapshots" of channel readings at periodic intervals. Delivery is scheduled by the data-sampling interval and would typically be directed to a Log File or to a local data logger (LDL or serial printer).

1.6.1.4 Log File Report

This type of session deals with transfer of information previously written to the Log File. This information consists of any desired combination of alarms, data samples, configuration changes, and channel state changes. The purpose is to download the Log File data to a permanent repository. Only the RDT, FAX and EMAIL destination types can receive Log File reports. Alarmware can request a Log File report while online with a Catalyst.

1.6.1.5 Channel State Changes

This type of channel data is the change in the state (Alarm, Normal, etc.) of any channel.  Data would typically be directed to a Log File or to a local data logger (LDL or serial printer).

*Note: The state of a channel is distinct from its current reading or value.*

1.6.1.6 Status Reports

This type of session is a scheduled report delivered at a specific time and frequency. The report consists of the current status of the Catalyst as well as the channel data. The report is similar to the report given when the "Check Status" key is pressed on the front panel. The report can be delivered in voice or text mode, dependant on the type of destination receiving the report.

1.6.1.7 Simultaneous Sessions

It is possible for the RTU to handle some types of sessions at the same time. For instance, a Log File download session may occur at the same time as a local data logging session (one uses the modem, while the other uses a serial port). However, a voice session on the telephone line cannot occur at the same time as a Front Panel session (they both use the modem and voice circuitry).

1.6.1.8 Session Interruption by Operator at Front Panel

When a session is in progress and an operator presses a key on the front panel there will be a short delay while the other session is informed there is a higher priority session pending. There will be an "operator interruption" message delivered to the end of the session's report. The front panel session is then started. When the front panel keypad is pressed more than once, the session is immediately ended. There will be no "operator interruption" message appended to the session's report.

### 1.6.2 Session Modes

Sessions operate in one of two modes:

### 1.6.2.1 Voice mode sessions

These sessions are conducted over the phone (OTP), and uses DTMF signaling. The telephone keypad will allow you to get reports, acknowledge alarms, or make programming changes by entering the appropriate key codes.

### 1.6.2.2 Data mode sessions

The RTU will progress into data mode when a connection is established with Alarmware™, Internet Service Provider, FAX machine, or a remote data terminal.

### 1.6.3 Session Priorities

There is a priority among session types. ***A Front Panel session always has priority over any other session in progress***. For instance, you can always interrupt a phone session in progress by pressing certain front panel keys. Also, there can only be one configuration session at a time, even though it is possible for one to use the modem, and the other to use a local serial port. To prevent problems, the local configuration session will have priority.

### 1.6.4 Alarmware™ Sessions

An Alarmware™ session is a data mode session with Windows-based graphical user interface. Alarmware™ has access to all RTU functions, including downloading RTU firmware upgrades.  Making changes during an Alarmware™ session has the same effect as making changes directly on the front panel of the RTU.

### 1.6.5 Call-Out Precedence

Whenever the Catalyst needs to make an outgoing call, the RTU will need to decide if a call of higher ranking is pending. Some report calls have precedence over other types of report calls. Higher-ranking reports will be made before those of lower ranking.

**The call-out precedence order is as follows:**

- **Test Calls** – These calls will be made before any other type of call. Operators performing installation and troubleshooting normally would use test calls.
- **Alarm Notification Calls and Log File "High-water" Download Calls** – These two types of calls have equal precedence and must be acknowledged or completed before other types of reports can occur.
- **Acknowledgment Report Calls** – These types of calls are a lower priority than Alarms and "High-water."
- **Scheduled Reports** – These calls will be made when there are no other types of reports pending. If an Alarm Notification Report call becomes necessary during a FAX report, the report will be halted when the "maximum number of pages" parameter is satisfied. Once the Alarm is acknowledged, the scheduled report will call the FAX destination once again to deliver the report.

### 1.6.6 Base Time and Frequency Intervals

When the Catalyst is scheduled for an event, it uses a "base time" which is actually the Catalyst "time-of-day." The interval is calculated from this original base time. For example, if the "base time" is 8:00am, and the interval is one (1) hour, then the event will occur every hour, on the hour. Events that use this scheduling method include:

1. Autocalls
2. Report Scheduling
3. Phone Fault Tests
4. Data Sampling

## 1.6.7 Sessions and Alarm Acknowledgment

Each type of session handles alarms differently. Over the phone and front panel sessions will announce "all alarms acknowledged." Alarmware cannot announce these alarms; therefore the specifications are as follows:

- Read-Only Program Mode (OTP, Front Panel, or Alarmware) = All alarms untouched at entry and exit
- Program Mode (OTP and Front Panel) = All alarms acknowledged on entry, action is announced
- Program Mode (Alarmware) = Only acknowledges alarms if set to "acknowledge on PIN," all unacknowledged alarms will be reset on exit from Alarmware session

# 1.7 The Alarm Calling Process

When any input channel value violates that channel's configured alarm violation criteria for a time interval longer than the alarm trip delay for that channel, the channel goes into an unacknowledged alarm state.

*Note: The finite time required completing each scan of the network affect how quickly each channel's value would be updated.*

- Whenever there is an Unacknowledged Alarm the corresponding channel alarm LED on the front panel will begin flashing.
- The unit will then start to call programmed destinations, beginning with the lowest numbered destination that is linked to that channel (*See 1.5 Destination Channel Groups in the Operator's Manual*).
- If call progress monitoring is turned on each calling attempt will be terminated if no answer occurs within a programmable time limit or if a busy signal is detected.
- The report only includes information about channels in the destination's group. As soon as connection is established the notification report begins immediately.

The report of a channel's status will generally include a Channel Status Message reflecting the current value status of the channel, followed by Tag Words, which reflect the state of the channel.

**The impact on Catalyst operations are as follows:**

- Acknowledged channels will re-enter the alarm state whenever a new violation trips.
- The time of alarm transition (used to sort reports) is set only by the initial violation.
- Once a violation is acknowledged, it cannot re-trip until the channel is reset (via reset timer).
- The reset timer is restarted when any violation is acknowledged. (Therefore is may take up to 4 times the alarm reset time to actually reset.

## 1.7.1 Continued Dialing in the Absence of Acknowledgment

The RTU will wait for the configured intersession delay between calls. You may configure the RTU to make from 1 to 5 notification attempts to the same destination before moving on to a new destination. If no acknowledgment is received, and the number of attempts is satisfied, the next destination will be dialed. The process will be repeated indefinitely, going through all the designated destinations in sequence and even looping back if necessary, until acknowledgment is received.

*Note: The FCC requires that consecutive calls to the same destination be subjected to a minimum 10-minute delay. The requirement will be automatically enforced after the configured redial attempts are completed.*

## 1.7.2 Receiving and Acknowledging Alarm Calls

When the unit calls personnel for acknowledgement, the RTU will first dial the proper destination phone number. After dialing each character in the string, the unit will wait a few seconds, then it will begin reciting the RTU Name and then request a tone to be entered to start the session. Press any key on the phone keypad to start session. These two messages will be repeated until operator responds or the "Call-out" timer expires.

If PINs (Personal Identification Numbers) have been established for the RTU, there will be a request for entry of your user PIN (Personal Identification Number).  Enter your PIN at this time.  Regarding entry of PINs, your PIN entry is considered complete upon your issuing either a *, # # #, or by waiting three seconds with no further entries.

Next will follow a preliminary voice report of certain significant global (not pertaining to any one channel) situations. The following is a list of special warning messages that are delivered during an Over the Phone (OTP) session if necessary. They are announced after the Unit ID message, and before the channel status report:

- Unreported Power Failures
- Low Battery is detected and charging
- Unexpected Time of Day (TOD) Clock Reset
- Phone Line Failures
- Unit is Disarmed
- No Destinations are Programmed for Alarm Calls
- Log File Overflow detected
- PLC Network Scan is Disabled
- MODBUS Network with All Channels in Communication Alarm

If no such conditions apply, then this preliminary report will be skipped.
What follows next is an Alarm Report. This report includes the status of any channel(s) that are linked to this Destination (the location where you are receiving this alarm call) and which have an unacknowledged alarms.
If there is a communications failure on the network, this fact will be reported, followed by a report on all channels linked to this destination group.  In this case, the phrase "SNA Alarm" will be added to the channel's report.  Note that the channel reading will reflect the last value read before failure of communications. Subsequent readings will reflect "No Scan Data."

Next you will hear a warble tone and a voice prompt requesting entry of either a touch tone "9" or "3" to acknowledge, or a 1 to enter programming mode in preparation for changing the RTU configuration during this call. For a complete list of menu options available during an over the phone session, see section "*1.7.4 Telephone Keypad Menu Options Table.*"

*Important Note: In order to acknowledge an alarm by pressing 3 or 9, the Catalyst must first recite the alarm. If you press 3 or 9 before all the alarms have been announced, you will only acknowledge those alarms that you have already heard. In the case where there are many alarms to report and you want to acknowledge all alarms without listening to all of them, you have two options:*

1. *Press 7 to mark all alarms as reported without acknowledgment.*
2. *Press 8 to acknowledge all alarms, reported and unreported.*

Entering a "9" will cause the acknowledgement of the unacknowledged alarms you have just heard about, followed by a report of any other channels included in your Destination group which had already been in an acknowledged alarm state prior to this alarm call.

Entering a "3" will do the same, except you will then hear reports of all alarms including any that are not in your Destination group.

In the special case where some new unacknowledged alarm had tripped during this call and you had not yet heard its report, it will also be included at this point and you will be given an opportunity to acknowledge such recent alarms.

The call will automatically terminate when:

- All linked alarms are acknowledged.
- There is no user touch tone entry after the menu has been recited the configured amount of times.
- The session inactivity time period elapses with no user touch-tone entry.

There are additional key entry options.  Some of these are not mentioned in voice prompts in order to maintain simplicity during the call.  Note that any of these entries may be made at any time during the call without waiting for any voice prompts. (*See 1.7.4 Telephone Keypad Menu Options Table in the Operator's Manual*)

1.7.2.1 Alternative Methods of Acknowledging Alarms

- Wait for the alarm call to end then place a return call to unit.  If you just hang up and place a return call without letting the Catalyst alarm call to end, you will probably just get a busy signal representing the fact that the RTU is still trying to complete its report call.
- At the Front Panel, press NORMAL, PROGRAM, DISARM, or DIALOUT.

Upon acknowledgment by whatever means, the corresponding channel LED on the front panel of the product changes from **flashing** to **steady** illumination.  At this time the Alarm Reset Timer for that channel begins counting down as described under *Alarm Reset Time-out After Acknowledgment*.

1.7.2.2 Alarmware™ and Automatic Alarm Acknowledgment

An Alarmware™ session will not, by default, automatically acknowledge alarms. Alarmware™ will only automatically acknowledge alarms when the parameter "incoming calls acknowledge alarms" is set to "ON PIN."

The Alarmware™ session will reset all unacknowledged alarms on exit from the online connection.

1.7.3 Alarm Reset Time-Out after Acknowledgment

As shown in the figure above, when an acknowledgment is received, the RTU begins timing out the Alarm Reset Time (default 1-hour).

Further calling on behalf of that channel is suspended, regardless of further activity at that particular input during this period. If new alarms occur on other channels during this period, the unit will go back into the Unacknowledged Alarm State and dial the first appropriate Destination, with dialing continuing until a new acknowledgment is received.

1.7.4 Telephone Keypad Menu Options Table

| Keypad # | Action |
|---|---|
| 1 | Acknowledge ALL alarms, enter **PROGRAM** mode |
| 2 | Enter **read-only PROGRAM** mode (alarms are not acknowledged) |
| 3 | Acknowledge ALL alarms, then report all **Unreported** and **Non-Normal** Channels **not linked** to Destination |
| 4 | Enter **SEARCH** mode |
| 5 | Repeat the **Menu** Options |
| 6 | Repeat Unit ID message, Preliminary Report, and Complete Status Report |
| 7 | Mark all alarms as reported without acknowledgment. A subsequent 3 or 9 will then acknowledge alarms. |
| 8 | Acknowledge all alarms, reported and unreported, and report an alarm count. |
| 9 | Acknowledge ALL alarms, then report all **Unreported** and **Unacknowledged** Channels **not linked** to Destination |

If PINs have been configured, then hearing the reports and the ability to acknowledge and perform various other actions is dependent upon the authority level of your user PIN.

1.7.5 Search Mode

Search mode is a way for operators to query the status of a channel, without having to know the channel number. Search mode is similar to Program mode in the following ways;

- Enter Search mode by DTMF tone (keypad 4)
- You Exit Search mode by using Enter or Cancel command as the first character  (*###* or *#\*\**)
- The search string is terminated with the Enter command (*###*)
- Search mode also available from the unit's Front Panel

When the menu options are available during an over-the-phone session, press **4** to enter Search mode. The unit will now wait for the operator to enter numeric characters from the touch-tone keypad. The unit will announce the status of all the channels that match the search string. The search sting is compared to **non-default**, channel status text messages (both Message 1 and Message 2) for all channel types. The unit will not include channels with default channel text messages when announcing search results.

**Example:**

You decide that you will construct the channel text messages as in the following table:

| Channel Status Message 1 | |
|---|---|
| **Channel Number** | **Feeder Breakers** |
| 1 | 1*323 Instantaneous Load |
| 2 | 2*323 Maximum Load |
| 3 | 3*323 Current Status |
| 4 | 1*324 Instantaneous Load |
| 5 | 2*324 Maximum Load |

| 6 | 3*324 Current Status |
|---|---|
| 7 | 1*325 Instantaneous Load |
| 8 | 2*325 Maximum Load |
| 9 | 3*325 Current Status |

*Note: In the example above, an asterisk (\*) is used in the message string (Channel Status Message). While in Search Mode, an asterisk or a pound sign can be used in the search string because both characters can be input using your telephone keypad or the unit's Front Panel.*

**To query all the channels that contains the Maximum Load information:**

- Enter Search mode.
- Enter the search string 2* and ### to Enter.
- The unit will respond with:
  **Default voice messages**
  - Channel 2 reading is 125 NORMAL
  - Channel 5 reading is 127 NORMAL
  - Channel 8 reading is 133 NORMAL
  **User-recorded voice messages**
  - Feeder Breaker 323 Maximum Load is 125 volts NORMAL
  - Feeder Breaker 324 Maximum Load is 127 volts NORMAL
  - Feeder Breaker 325 Maximum Load is 133 volts NORMAL

**To query all the Breaker 324 channel information:**

- Enter Search mode.
- Enter the search string 324 and ### to Enter.
- The unit will respond with:
  **Default voice messages**
  - Channel 4 reading is 130 NORMAL
  - Channel 5 reading is 138 NORMAL
  - Channel 6 reading is 133 NORMAL
  **User-recorded voice messages**
  - Feeder Breaker 324 Instantaneous Load is 130 volts NORMAL
  - Feeder Breaker 324 Maximum Load is 138 volts ALARM ACKNOWLEDGED
  - Feeder Breaker 325 Current Status is 133 volts NORMAL

## 1.8 Reports

A report is a sequence of messages intended to communicate complete information about channel states or configurations. In general, reports are delivered to destinations.  Reports may be in voice mode, or in data mode (text), as determined by the configuration of the destination.

## 1.8.1 Report Types

The report type determines what categories of information are included in the content of the report. The report type is configured under the Configurations | Destinations menu in Alarmware ".

**Report types include:**

- **Alarm Notification Reports**: destinations are notified about current alarms
- **Alarm Acknowledgment Reports**: destinations are notified when alarms are acknowledged
- **Status Reports**: destinations are given a report with the current status of all active channels
- **Log File Reports**: the contents of the Log File are delivered as configured

## 1.8.2 Notification (Alarm) Reports

**Notification (Alarm) Reports have two purposes:**

- To report alarm information to personnel
- To prompt for acknowledgment of alarms

From the prospective of the RTU, notification is the process of reporting alarm conditions to eligible destinations. The specifics of what alarms are reported to which destinations depend on many settings within the RTU. These settings include destination types, how channels are linked to destinations, plus various session and annunciator parameters.

The notification report for the destination includes information only for those channels that are in the destination's group. Thus, if there are unacknowledged alarms for channels that are not linked to a given destination (configured using Destination Channel Grouping), the person at the given destination will not hear about them unless they take special steps such as entering Program mode.

In both incoming and outgoing sessions, the notification report is the first thing to occur after establishing a voice mode connection.

**The Notification Report consists of the following elements:**

1. **Unit ID:** Either the default or user-configured ID message; in voice and/or text.
2. **PIN Entry:** If any PINs are configured, the "Please Enter PIN" prompt is given. If PINs are not configured, then a "Please enter tone to start report" prompt is given. If no input is detected within 10 seconds, then the Catalyst will attempt to establish a DATA mode connection. If PINs are configured, the RTU will prompt a maximum of three times for a valid PIN. When a valid PIN is entered, the session proceeds, constrained only by the privileges configured for that PIN. If the RTU is configured to acknowledge alarms on PIN entry, then acknowledgement now occurs. If PIN entry is unsuccessful, a "invalid PIN" entry is logged and the session concludes.
3. **Preliminary Report:** Provides information regarding the RTU state.
4. **Alarm Report:** Provides a channel status message for every channel with an unreported condition that is linked to the reporting destination. Front Panel sessions and Call-in sessions disregard channel/destination links and deliver reports for all channels.
5. **Menu prompt:** Front Panel and Over The Phone (OTP) VOICE mode sessions will give a warble tone and prompt the operator to enter one of the command keys (see table below) by offering the available menu choices. To interact with the RTU over the phone, you will use the **telephone keypad buttons**. These keystrokes act as commands to the RTU.  If the RTU gets no response for 10 seconds, after repeating the menu choices three times, the session will be terminated.
6. **Listening Period:** If so configured, OTP sessions will remain online with the Catalyst microphone enabled for 15 seconds to monitor sounds at the remote site. The RTU will then terminate the session. Note: Key pad tones can interrupt the listening period and return to menu mode.

**Report delivery terminates when:**

- Operator hangs up the phone.
- Three invalid PINs are entered (if PINs are configured).
- Operator enters PROGRAM mode.

- All alarms are acknowledged.
- There is no response from operator within 10 seconds.

*For additional information, refer to the topic Receiving and Acknowledging Alarm Calls.*

## 1.8.3 Status Reports

Status Reports have one purpose, to report the current status of the Catalyst to requesting personnel….

Status reports can be delivered in either voice or text mode as determined by the destination type. You can configure the delivery time and frequency of the status report. The status report contains the same elements as described in the "Notification Report." For voice sessions, it is the same report that you would get pressing the "Check Status" key on the Catalyst. Status reports in text form can be delivered to fax machines, printers, and remote data terminals

## 1.8.4 Log File Reports

The following discussion primarily applies for Log File report operations where regular and frequent downloads are important.  For simple occasional "Manual" downloading of Log Files, when there is no risk of Log File reserve overflows, causing the loss of logged data, you may choose instead to use the Alarmware™ Log File Download function.

**Step One: Configure the Log File:**

- Open the Device Settings dialog box
- Click on the Log File tab.
- Enable the Log File by de-selecting the Disable checkbox
- Next, check the categories of data you want included in the Log File under "**Items to Log**" The Catalyst events to report include; Session History, Configuration Settings, and Data Samples. Data Samples means that data logging (sampling) will be included in the Log File at the specified time and frequency.  If selected, data sampling will include all active input channels. Channel events to report include; Alarms and Channel State Changes.

**Step Two: Configure a Destination for FAX, Email, or Remote Data Terminal:**

- After the **Log File** has been configured, select a Destination (typically one of the last ordinal destinations)
- From the list of destination types select **Remote Data Terminal, Email Recipient, or Fax Machine.**
- Fill in the **phone number** of the computer or fax machine, or the **email address** of the recipient that will receive the Log File data.
- Calls to this destination will be made as scheduled by clicking on the Log File tab and enabling the schedule option. The Log File delivered contains the data that was selected by enabling the proper event checkboxes.
- If the Log File does not save the information it will not be available if requested from the remote data terminal or fax machine.

**Step Three: Configure Log File Parameters: to prevent data loss**

- To customize the Log File configuration, you have the ability to set Log File parameters by opening the Device Settings dialog (select Configure | Devices from the main menu). Click on the Log File tab, and then click on the "Advanced" button. The advanced parameters include:
  1) **Log File Reserve Size**: The amount of memory reserved for the Log File
  2) **Log File Reserve High Water Mark**: The percentage of Log File space that is allowed to be filled before the Catalyst will call the lowest ordinal data destination.
  3) How to handle Log File data when **reserve storage space** is exceeded or is no longer available.

**To determine the amount of memory to allocate for the Log File reserve, you should consider the following:**

1. How **many** channels are to be sampled?
2. How **frequently** are those channels are being sampled (Data samples generally require much more memory then other logging categories)?
3. How **frequently** will the Log File Reserve contents be **transferred** to the Remote Data Terminal?
4. Is there a need for **extra speech** memory (since logging reserve capacity trades off against recorded speech storage capacity)?

*Note: Refer to section "2.10.6.1 Log File Reserve Size Considerations" in the "Operator's Manual." By using the "Catalyst Memory Allocation Tool," you can determine the recommended size of the logfile reserve. Refer to section "1.3 Catalyst Memory Allocation Tool" in the "Installation Guide."*

*Note: Log File Reports will always be preempted by alarm notification calls. When there are no further notification calls pending (all alarms have been acknowledged) the postponed Log File download calls will then be made. If the RTU is in the disarmed state, alarm notification calls will be deferred but calls prompted by a nearly full data reserve will not be deferred.*

**An Alternative Approach for Retrieving Logged Data**

Despite having the RDT Destination configured for receipt of logging calls, another possibility is to have a communications program place calls to the Catalyst at regular intervals to transfer the Log File data. A script for the communications program will need to be configured which calls the RTUs at regular intervals. *Please refer to the section 1.8.4.1 "Example Log File Download Script."*

**Data Communication Program Script Considerations**

The Remote Data Terminal (RDT) is a computer equipped with a modem and a data communications program. Commercial data communications programs, such as Procomm, can be used to automate the process of retrieving logged data from RTUs. No scripts are needed to simply wait for RDT calls from RTUs, capture Log File data into a single reserve or to manually initiate calls to RTUs to retrieve Log Files. However, the scripting capability of data communications programs is required when PINs are configured.

**Uses of scripts can include (but are not limited to):**

- PIN entry by the RDT (when required by the RTU).
- Periodic automated calling of all RTUs for retrieval of data logs.
- Recognition of specific RTU and storing of its logged data into the Catalyst's own capture file.

**Line Length Issues when Using Data Communications Programs and Spreadsheets**

- There are a few precautions when using data communications programs and scripts for downloading Log Files then exporting those files to other programs, such as Excel. Since there is a very good possibility that any line in the downloaded data can be longer than 80 characters the data communications program must be configured properly or problems can arise.
- Turn on "line wrap". Otherwise data will be truncated after either 80 or 132 characters (depending on the number of columns configured).
- If the number of columns is 80 and line wrap is enabled the data beyond 80 characters will be continued on the next line. This can cause alignment problems in spreadsheets.

**Recommendations:**

- Be prepared to set spreadsheet column widths to 132 characters for some data fields.
- Keep channel text messages and PIN messages as short as possible.

1.8.4.1 Example Log File Download Script

- The script shown below can easily be adapted for different purposes.
- You can use the example below by viewing it in the Online Help and either:
    1) Opening the file and copying the contents to the Procomm Aspect script editor
    2) By copying the entire file to the Procomm Aspect script directory, then changing the filename extension from 'wri' to "was".

; Sample Procomm Plus Script for downloading Catalyst RTU Log Files.

| | |
|---|---|
| **Proc main** | ; Starts procedure (required) |
| **string Name = "RTUname.cap"** | ; Choose a name of a capture file to open. |
| **Set capture file Name** | ; Set the name of the capture file. |
| **Dial DATA "Catalyst"** | ; Dial Catalyst. (name of the RTU in the directory) |
| **While $DIALING**<br>**Endwhile** | ; Loop while dialing. |
| **capture on** | ; Open up the capture file. |
| **Waitfor "Enter PIN: "**<br>**transmit "007^M"** | ; Tells Procomm to wait for the RTU to ask for a PIN<br>; Procomm transmits PIN back to Catalyst |
| **while $CARRIER**<br>    **Waitfor "Logfile Download Complete"**<br>    **transmit "Logfile Download Complete^M"**<br>**endwhile** | ; Loop while connected to RTU. |
| **capture off** | ; Close the capture file. |
| **Pwexit** | ; Close Procomm Plus. (optional) |
| **endproc** | ; Ends procedure (required) |

1.8.4.2 Using Hyperterm for LogFile Transfers

This section describes the steps required to use the Microsoft HyperTerminal application for capturing Catalyst Log File transfers

Incoming Calls

Hyperterm may be used to auto-answer incoming calls. Follow the procedure for "waiting for call."

*Note: A limitation of the basic Hyperterm application is that the operator will need to set "waiting for call" manually after each download.*

Catalyst Configuration

Use Alarmware to configure the Log File parameters as desired.

Use Alarmware to configure an RDT destination. Use the Hyperterm modem phone number. Set up Log File filtering and report format options as desired.

HyperTerminal Configuration

1. Define a connection (.ht) file.
2. Specify the Comport and baud rate.
3. Defaults for all other parameters are OK.
4. Using "call" menu, select "waiting for call."
5. Using "transfer" menu, select "capture text."
6. Within the Terminal window, type ATS0=1.
7. Verify OK response

Procedure

1. The Catalyst places an outgoing call to the configured Hyperterm destination.
2. The Hyperterm modem will answer the call and negotiate carrier.
3. After call back is established, the Catalyst will transfer the Log File contents using the configured filtering and formatting parameters.
4. Hyperterm saves the text file in the specified location.

## 1.8.5 Local Data Logger (Local Serial Printer)

The Local Data Logging (LDL or Local Printer) serial port is used by the RTU for delivering selected categories of information to a locally connected logging terminal. Such terminals may be printers or computers using serial interfaces.

To enable the Local Printer, open the Device Settings dialog (select Configure | Devices from the main menu). Click on the Printer tab. Enable the printer by de-selecting the Disable checkbox.

**Examples of printed events may include:**

- Session History
- Configuration Changes
- Data Samples
- Alarms
- Channel States

A time and date stamp will be included with each event. If PINs are configured, the operator PIN Name (not the PIN itself) will be attached to the information being logged. The information is delivered in flat ASCII format.

## 1.8.6 Text Report Formats

Four report formats are available for data mode reports that apply to the Remote Data Terminal. These four, plus an additional two formats are available for email recipients.

## 1.8.6.1 Full Text

Data will be reported as full text in quasi-sentences that are meaningful to humans.

**Full Text Format example:**

Fri Aug 06, 1999 10:40:14 Channel Data Sample:
    Breaker #0965 reading is 220 Amps  HIGH SETPOINT  ALARM, ACKNOWLEDGED by Abe Lincoln

## 1.8.6.2 Comma Delimited Text

Data is broken up into fields. Commas delimit successive fields and all text is surrounded by double quotes. This file format is suitable for importing into database and spreadsheet programs.

**Comma Delimited Text Format example:**

" Fri Aug 06, 1999 10:40:14"," Breaker #0965 reading is 220 Amps "," 220 ","  HIGH SETPOINT ALARM, ACKNOWLEDGED "," by Abe Lincoln"

In this example for an identical channel but with comma delimited format, the direct reading is included again by itself without messages, and commas are used to delimit the fields.

## 1.8.6.3 Comma Delimited Keys

Data is broken up into fields of keys. Commas delimit successive keys, alphabetic keys are surrounded by double quotes and numeric keys are not quoted. This file format is also suitable for importing into database and spreadsheet programs. Spreadsheet macros may be used to re-expand and process the keys for data reports, etc.

**Comma Delimited Keys Format**

"Time/Date Stamp"," Channel Number "," Current Reading "," Channel State "," PIN Number "

**Channel State Keys**

0 = NORMAL
2 = ALARM
3 = ALARM ACKNOWLEDGED
7 = COMMUNICATIONS ALARM

**Example:**

"Fri Aug 06, 1999 10:40:14"," 7 "," 220 "," 3 "," 2 "

**System Channel Keys**

Let "**Nchans**" be the maximum number of user-configurable channels for a given model number. The "Channel Number" field of any channel status message formatted as "comma delimited keys" will be:

| Data Point | System channel | Number of Catalyst Channels | | |
|---|---|---|---|---|
| | | 256 | 96 | 56 |
| Phone Failure | Nchans + 1 | 257 | 97 | 57 |
| Power Failures | Nchans + 2 | 258 | 98 | 58 |
| Battery Charging | Nchans + 3 | 259 | 99 | 59 |
| Time of Day Clock Reset | Nchans + 4 | 260 | 100 | 60 |
| Log File Overflow | Nchans + 5 | 261 | 101 | 61 |

*Note: The channel number replaces any text message. When exported to a spreadsheet, various spreadsheet functions can be used to re-expand the report as desired.*

*Note: Configuration Change reports are always delivered in Full Text format regardless of this setting.*

1.8.6.4 Comma Separated Values (CSV format)

Data is broken up into fields of comma separated values. Commas delimit successive values, alphabetic characters are surrounded by double quotes and numeric values are not quoted. This is identical to Comma Delimited Text, except that the numerical values are not quoted. This file format is also suitable for importing into database and spreadsheet programs. The CSV format is used primarily, and only makes sense, for channel data. Other types of data should be filtered out when creating reports.

**CSV Format**

"Time/Date Stamp"," Channel Number ", Current Reading," Channel State "," PIN Number"

CSV format Notes:

1.  The default CSV format uses the 2-digit year.
2.  When this type of reporting format is chosen, the report cover page is excluded.
3.  "Current reading" for discrete channels is always reported as a raw value 1 or 0.

4.  The file "logfileh.txt" is placed at the beginning of every new Log File created. It contains the text headings for the CSV fields.

**Example:**

"02/13/02 10:40:14","Channel 1 reading is", 220,"ALARM ACKNOWLEDGED","by George Washington"

1.8.6.5 Alphanumeric Paging Format

Alphanumeric Pager Reports are formatted as flat text, with no graphics. Line wrapping is identified within the report by the ASCII character selected (CR/LF). The default CR/LF character is the double bar ("||"). This format is used for alphanumeric paging and email recipients that are using cell phones for text messaging.

1.8.6.6 HTML Format

This format is used specifically for email recipients. HTML formatting allows you to view the data with columns and line-wrapping preserved.

# 1.9 Devices and Protocols

Destinations utilize devices and protocols as resources to carry out sessions.

**Devices usually consist of hardware within the RTU:**

- Phone Connections
- The date and time clock (TOD)
- The RTU modem
- Alarmware port
- Physical Inputs
- Log File
- Printer
- Internet Service Provider

Protocols are similar to languages. Protocols are the agreed upon languages which machines use to talk to each other. Devices can be inputs to, outputs from, or triggers for sessions with destinations.

1.9.1 Industrial Networks

An industrial network is a network using DF1, DH485, Modbus, Modbus Plus, or some other industrial protocol. The RTU uses industrial networks to gather and monitor information about the occurrence of violation conditions.

Your Catalyst RTU has the capability to support industrial networks. Applications arise where the I/O points are connected to some other device, such as a Programmable Logic Controller (PLC). Sometimes the points to monitor exist only in the registers or data table of such devices. It is inconvenient, expensive, or impossible to duplicate these points by wiring them into an RTU. The ideal solution would have an industrial network that allows PLCs and other devices to share their data.

Fortunately, most PLC manufacturers do support and encourage such networking with their products. One of the powerful and unique features of the Catalyst RTU is its extensive support and compatibility with industrial protocols.

The Catalyst and Alarmware™ allow convenient, inexpensive, bi-directional communication with your PLC network via dial-up phone lines.

**This allows you to:**

- Call-in and check the status of any channel
- Modify alarm conditions and set points
- Alter process variables and monitor values
- Be called and receive clear voice message reports of alarm situations

The Catalyst RTU may be easily integrated into an existing process. Points or data in any device anywhere on the network may be monitored. A single serial communications cable connection is all that is required. The Catalyst automatically requests the information it needs from the other nodes. These can be any devices that support the protocol, including PLCs, or intelligent IO modules. No additional equipment or ladder logic reprogramming is necessary.

**The RTU includes three additional features that are specific to networked applications:**

1) The ability to monitor the health of the network itself and trip alarms when communications break down.
2) The ability to support simultaneous and distinct networked connections.
3) The ability to transfer data between any of these networks and automatically providing all necessary protocol conversions.

## 1.9.2 Modbus Issues

Modbus is a simple Master/Slave protocol originally used for connectivity between Modicon products. Now, almost every vendor of industrial equipment supports a Modbus interface. In fact, it has become something of a *de facto* industry standard for open system interconnection.

Specific procedures for physical network connection are impossible to provide for this diverse equipment base. The section below describes the most common devices in some detail. Please refer to the *Modicon Modbus Protocol Reference Guide, PI-MBUS-300*, for further information.

**Important restriction regarding use of Modbus protocol:**

The Modbus protocol is configured on the NET 1 (PLC) port. The serial communication settings of the RTU must match the network or other device exactly. The Catalyst RTU must be the network master.

A slow Modbus device can respond to a poll after the RTU has timed out and moved on to the next transaction. A late response may be matched up with the current pending transaction. The result is a mix-up of channel data. The solution is to increase the Modbus application timer.

### 1.9.2.1 Modicon 984 Programmable Controllers

All devices in the 984 Controller families are Modbus compatible. The communications parameters may be configured using the appropriate *Modsoft* programming tool. Please refer to Modicon Modsoft documentation for details.

The RTU is fully compatible with the default communications parameters for the 984 devices. This makes connection and configuration for this family extremely simple. If changes are desired, be sure the DEF/MEM switch is in the MEM position. If the switch is set to DEF, it will be impossible to change the PLC's network communications parameters. PLCs running with configuration MEM/DEF switch in DEF position seem to have their node addresses equal to the MBPLUS node address. Attempts to poll registers using any other node address give error 602. When switch is in MEM position the configured MBSLAVE port address is active. When writing a '1' to a discrete PLC output (0x refs), firmware is reporting the value as 255.

### 1.9.2.2 Generic Modbus Interface

Many different vendors of industrial equipment and software provide Modbus compatibility. The RTU may interface to any such devices. Examples include DCS and SCADA systems, as well as equipment whose native protocols are not supported.

**The steps generally necessary for connecting such systems with the RTU are:**

1) Establish a serial connection with the Catalyst RTU. A cable will need to be purchased or fabricated for connection to the Catalyst's NET 1 (PLC) port.
2) Configure a Modbus driver on the equipment. It must allow the RTU to be master and implement Modbus RTU mode.
3) Implement a mapping scheme between the equipment's registers and the standard Modbus-style references. The Modbus commands received from the RTU are then interpreted to read and write the correct locations.
4) Configure the Catalyst's communication parameters to match the capabilities of the equipment. This often involves increasing the scan delay and link delay timers.

Each of the steps above will need to be performed according to the equipment vendor's instructions. To date, this approach has successfully interfaced to TI/Siemens, Bristol Babcock, Westinghouse, and General Electric controllers, as well as several SCADA systems.

### 1.9.2.3 Modbus Addresses

For Modbus protocol, the RTU port and the node number of the targeted equipment determine the net and node fields:

- The Catalyst's Serial Port 1 is reserved for Modbus protocol, and is given the designation of NET 1 (PLC) port.
- Modbus allows nodes in the range of 1 to 256.
- The address component is fully compatible with the standard Modbus register reference scheme. This has been extended to include floating point and global data. The table below presents this scheme. In the table, x represents a digit in the range of 0 to 9. Except where noted, the RTU will accept any values for xxxx.

| Register Address | Description | Size / Limitation | Catalyst SNA |
|---|---|---|---|
| 0xxxx | Coil number xxxx | 1-bit | 1*node*0xxxx |
| 1xxxx | Input number xxxx | 1-bit | 1*node*1xxxx |
| 3xxxx | Input register number xxxx | 16-bit | 1*node*3xxxx |
| 4xxxx | Output register number xxxx | 16-bit | 1*node*4xxxx |
| 5xxxx | Floating Point register | 32-bit | 1*node*5xxxx |
| *Note: The 5x and 4x references share the same data space. That is, an address of the form 5nnnn takes the 32 bits beginning at location 4nnnn and extending through 4nnnn+1. These 32 bits are then interpreted as an IEEE floating point number.* | | | |

**The following list identifies special issues with regard to this addressing scheme:**

- When any address is out of range for a particular processor the processor will issue an error diagnostic that will be passed on to the user.
- 1x and 3x references may not be written by the RTU.
- The 5x reference is non-standard, *See Note in above table*.
- The controller's memory protect switch may prevent writing to a 0x or 4x reference.
- A controller not in run mode may prevent writing or report unexpected values.
- The Modsoft reference data screen can enable and disable specific points. Those operations may impact RTU operations.

## 1.9.3 The Network Polling Process

The points associated with each channel, by way of its SNA, are continuously monitored for alarm situations.

**The Channel Polling Process consists of the following Steps:**

1) A request for the current value of the point is transmitted across the network to the appropriate node.
2) That node then responds with the desired data. This transaction is referred to as **polling** the channel.
3) The current value of that point is then compared against the configured alarm violation criteria for that channel.
4) This process is endlessly repeated while the scan for that network is ON.

This entire process is referred to as the **Channel Scan**. The scan continues in an infinite loop. When a violation condition is detected, the RTU begins its alarming sequence, as described in Notification. The scan loop continues so those new alarm situations may be registered as they subsequently arise.

Because the scan depends upon transactions across the industrial network, alarm detection and reporting may be affected by various network failures. For example, a node may become disconnected or otherwise disabled. Other traffic on the network may cause arbitrary delays in the exchange of information packets. Ambient electrical disturbances can corrupt the information being transferred.

The Catalyst RTU has been carefully engineered to reliably detect and deal with the following situations:

- The protocol drivers all have state of the art error detection and correction algorithms, so data is guaranteed to be reliable.
- There are many timers and protocol-specific parameters to control traffic flow and adapt to specific networking environments.
- Polling delays for one channel will not delay the polling of other channels.

- Failed communications for an extended period will trip an alarm.

### 1.9.4 Scan Time and Channel Latency

Network applications must always be concerned with bandwidth and latency:

- The bandwidth available to the RTU will determine how fast the scan loop can be completed. In practice, the scan time will be effected by such things as baud rate, protocol overhead, network loading, and contention for specific nodes.  The number of channels being scanned is also a major factor.
- The latency for a channel is a measure of how long it has been since the value for that point was updated. It is a function of the channel scan time, the response time of the remote node, and the occurrence of communications glitches. *This latency has important ramifications upon the RTU's ability to detect transient alarm violation conditions.*

To determine the actual time it will take to complete a scan:

- Use Alarmware™ to connect to the RTU.
- When online with the RTU, select the Diagnostics menu item.
- Select "Net Diagnostics – Summary Reports."
- Move the cursor to the "Messages for RTU" window.
- Scroll to the area of t he report on Net 1, and read the scan time.

<u>Or Alternatively Use:</u>

- From the Front Panel or Over the Phone, use code **9 0 2 N 1**

## 1.10 Disarm/Re-Arm Setting

When your RTU is operating normally, the RTU is considered "armed." There will be times when you will need to take the unit out of service. You may want to temporarily prevent the unit from calling personnel. This is accomplished by "disarming" the RTU. The DISARM/RE-ARM button on the RTU front panel is used to toggle the RTU between ARMED and DISARMED states.  You can also toggle states with Alarmware™ and from Over the Phone (OTP) programming.

The following summarizes ARMED AND DISARMED states:

**Armed State**
1. Channel values are scanned
2. Alarm states may transition
3. Notifications will occur
4. Data sampling will occur.  If the configured high water mark percentage of reserve fullness is exceeded, the required call will be made to the designated Remote Data Terminal Destination, to download logged data.

**Disarmed State**
1. Channel values are scanned
2. Unacknowledged alarms – both old and new  - are automatically acknowledged
3. Notifications will immediately cease
4. Data sampling will occur
5. High-water mark Log File download calls will not be made as needed
6. Scheduled reports will not be delivered

1.11.3 Re-Arming the Unit

If the RTU is already DISARMED – indicated by the flashing DISARMED LED – pressing the DISARM/RE-ARM button will cause the RTU to become ARMED. This will immediately clear the alarm states of all channels. If the RTU is already ARMED, pressing the DISARM/RE-ARM button will cause the RTU to become DISARMED, and all the unacknowledged alarms will become acknowledged.

The DISARM/RE-ARM button may also be used to clear channel alarm states. If the RTU is ARMED and there are acknowledged alarms – indicated by some channel LEDs on solid (not flashing) – pressing DISARM/RE-ARM twice will cause all channel states to be cleared back to normal. If, at that time, there are no channel alarm violations, then all channel LEDs will remain off. If any channel alarm violations still exist, new unacknowledged alarms will occur after the appropriate trip delays have expired.

*Note: Since the Acknowledged Alarm state of a channel is associated with a corresponding alarm reset timer, the above operation also forces an immediate timeout, and therefore the timer will be reset.*

If you are connected online to a given RTU, the online window will display the current state of the LED's on the Catalyst's front panel, allowing you to continuously view the Armed and Disarmed state of the RTU.

# 1.11 Call Progress Monitoring (CPM)

Call Progress Monitoring (CPM) is the method by which a unit such as the Catalyst RTU can interpret tones on the phone line to determine the progression of a phone call. Dialing and delivering notifications and data logs without regard to CPM is sometimes referred to as **blind dialing**.

In the Catalyst, RTU Call Progress Monitoring (CPM) is used to make decisions about whether to commence voice notification reports, or whether to consider a call attempt failed, due to no answer or the phone line being busy. The RTU will operate quite differently, depending on whether CPM is ON or OFF.

**The differences are as follows:**

### CPM OFF (Blind Dialing)
- After the end of the dialing string the voice prompt begins. (The delay character can be inserted into phone number strings to extend this delay.)
- There is no such thing as a failed voice call attempt.
- If a phone number string includes tone detection characters, then the CPM dial tone detection capability will be automatically activated only for the tone detection and not for the whole call.

*Important Note: The RTU will NOT make repeated attempts to the same number. The Redial Attempts feature is effectively disabled when CPM if OFF.*

### CPM ON (default)
- Notification and Log File download calls are considered "FAILED" when there is no answer, or busy tones are detected.
- When CPM determines that a call has "FAILED," an appropriate report is sent to the Log File, and/or the local printer (if selected).

## 1.11.1 Telephone System Call-Progress Tone Elements

Call progress tones originate from the Phone Company's central office switching equipment. There are many possible call progress tones. Only a few tones are of interest to the RTU. These are shown below.

### 1.11.1.1 Dial tone

When telephone or telecom equipment (the RTU is telecom equipment) goes off-hook in order to make an outgoing call, the central office asserts the dial tone to inform the telecom equipment that the central office is ready to receive tones or dial pulses. The dial tone is usually a continuous tone and is discontinued after the first digit of the phone number is dialed.

### 1.11.1.2 Ringback tone

After the telecom equipment has dialed the phone number (if the phone number is valid and not busy or blocked) the central office asserts an audible ringback tone. The ringback tone has a specific ON/OFF and repetition cadence – which in North America is 2 seconds on, 4 seconds off, 2 seconds on, 4 seconds off, and so on.  Please note that the term "ringback" in this context is distinct from the same term that is sometimes used in describing sequences in annunciator systems.

### 1.11.1.3 Busy tone

The central office asserts the busy tone after the number has been dialed, and if it is impossible to connect to the desired phone number. There can be several reasons one may receive a busy tone. The most common reasons are; the phone is already in use or there is congestion in the phone network. The standard busy signal in North America consists of a tone, or combination of tones, turned on and off at a 50% duty rate – ½ second on, ½ second off. Other busy tone cadences may be used for different situations that cause the dialed number to become unreachable.

### 1.11.1.4 Blind Dialing

Ignoring the call progress monitoring tones is called *blind dialing*. One reason to use blind dialing (CPM OFF) would be when there are non-standard CPM tones on the phone system. Non-standard CPM tones may defeat the Catalyst's CPM detection, which would prevent calls from reaching the intended destination.

## 1.12 Call-In Sequence

When an operator calls the RTU, there are sequences of steps that must occur. The following flowchart will demonstrate how the timers work and how the RTU determines which type of session to start.
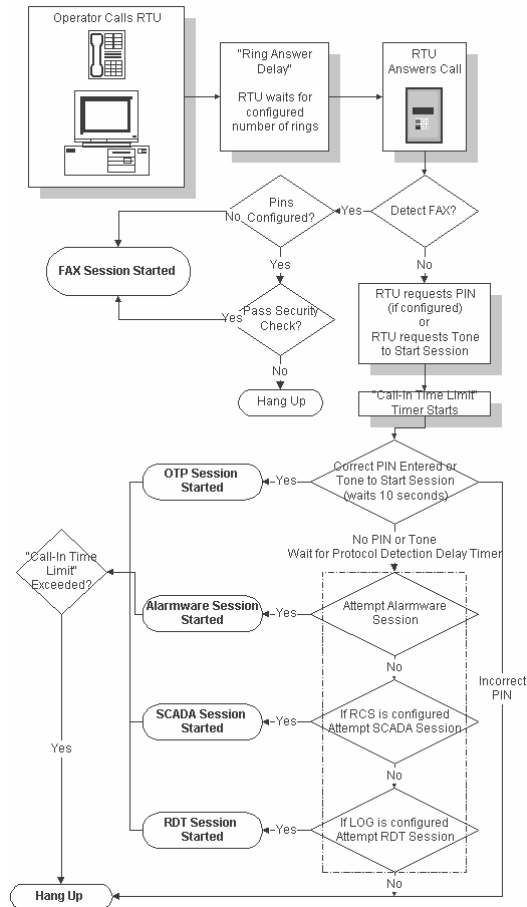
## 1.13 Phone Line Failure Indicator (TFAIL)

When the Catalyst finds there is a phone line failure, the TFAIL indicator on the front panel will blink. This is an indication that the Catalyst either attempted an outgoing call, or the phone line failure test, failed to detect a dial tone. The TFAIL alarm is treated the same as any other alarm, except that the LED will never be a steady ON. If the phone line is working, the LED is OFF. If the phone line is not working, the LED will blink, regardless or whether or not the TFAIL alarm has been acknowledged. The TFAIL LED is cleared when:

1.  Phone line failure test passes

2.  A manual dial-out with dial tone is detected before digits are entered.

3.  Modem carrier is detected during any session

4.  DTMF tone is detected during any session

5.  Catalyst detects an incoming call

## 1.14 Scheduled Events and Activities

Scheduling timers support the configuration of certain Catalyst activities to start at a particular calendar date and time and repeat at a particular periodicity.  Table 2.6A lists all Catalyst features that support scheduling.

There are 2 main components in any schedule:

**Base Time**:   Specifies the precise calendar date and time at which the activity should commence for the first time in the current year.

**Frequency**:   Specifies the periodicity at which the activity should recur.  Value must be in range of 10 seconds to 12 months.

In general, each of these two components consists of 5 sub-fields allowing configuration of months, days, hours, minutes and seconds.  Some features do not require the full range of resolution and so do not provide control over certain sub-fields.  Table 2.6A details all this.

| Event or Activity | M O | D D | H H | M M | S S | Notes* |
|---|---|---|---|---|---|---|
| Phone Line Test | | | x | x | | |
| Scheduled Test Sessions | | x | x | x | | **HH** range is 0-23 |
| Scheduled Log File Report Sessions | x | x | x | x | | **HH** range is 0-23 |
| Scheduled Status Report Sessions | | | x | x | | |
| Data Sampling Interval – Log File | | | x | x | x | **SS** available only for **FREQ** |
| Data Sampling Interval – Printer | | | x | x | x | **SS** available only for **FREQ** |
| Scheduled Channel Value Reset | x | x | x | | | **HH** range is 0-23 |

**\*** Unchecked **MO:DD:HH:MM:SS** field means value is hidden, not configurable and always 0

**\*** Settings that would cause **FREQ** value to become less than 10 seconds are illegal for all items except the *Measurement Intervals* (there, 0 interpreted as the infinite interval).

## Examples (components specified as MO:DD:HH:MM)
- *Monthly, at midnight on the 15th:*
  - **BASE**=**01:15:00:00** and **FREQ**=**01:00:00:00**
- *Every 30 days, at 9:00AM., starting on January 5th:*
  - **BASE**=**01:05:09:00** and **FREQ**=**00:30:00:00**
- *Weekly, 2:00PM on Thursdays:*
  - **BASE**=**00:04:14:00** and **FREQ**=**00:07:00:00**
- *Every other Monday at 10:00AM:*
  - **BASE**=**00:01:10:00** and **FREQ**=**00:14:00:00**
- *Daily at Midnight:*
  - **BASE**=**00:00:00:00** and **FREQ**=**00:01:00:00**.  (**BASE**=**01:01:00:00** will also work).

## Sorts of Things That One Can Do, But Would Probably Never Want:
- *Weekly at 9:00AM, starting only on June 17:*
  - Nothing will happen Jan-June this year, next year and each year thereafter.
- *Every 13 days, 17 hours, 41 minutes and 56 seconds:*
  - The "schedule" will appear quite random.
- *Jan 5, every 30 days:*
  - First expiration in any year occurs on Jan 5.  Last expiration would be Dec 31 or 30 (leap years). First expiration next year is still Jan5.  Note that interval between these last two periods is only 5 (or 6) days.
- *Anything where the **FREQ** component is not commensurate with the **BASE**:*
  - The last examples above are special cases of this general situation.  They all will cause the events to happen at shifting dates and times, and/or the periodicity to change abruptly sometime near the end of the year.  Incommensurate configurations are not prevented but may give unexpected (although predictable) results.

## Sorts of Things We Can Not Do:
- *First Wed of every month:*
  - You can specify day of week or date in month, but not both.
- *Every 90 days:*
  - months are not always 90 days, and the maximum value for **DD** field is 30.

- *Monthly, on the 31st:*
  When a month does not have the specified date, the next expiration happens on the date that would give the expected number of days.  Thereafter, expires monthly on that new date (until a new year starts).
- *Mother's Day, Labor Day, Election Day, etc:*
  There is no facility to get "first Tuesday after first Monday" sorts of definitions, and no way to specify an interval greater than 1 year.
- *Easter, Ramadan, Passover, Chinese New Year, etc:*
  There is no facility to synchronize schedules with the phases of the moon or other geo-astronomical phenomena.
- *Weekdays only, Weekends Only:*
  Workaround for destinations would be to configure multiple objects with the single days of week that would accumulate to the desired groups of days.

## 1.15 Incomplete Reports

There are many circumstances that can cause an incomplete report to be delivered.  For examples; busy signal detected (no report at all), a premature connection loss, or exceeding the configured report length limits.

This section provides the specification for what happens whenever a report is incomplete for any reason.  These specifications apply uniformly to all destination types.

The term **contacted** is used to indicate that a connection was actually established with the destination.

The precise definition here depends on the destination type as follows:

| Destination Type | Considered "*Contacted*" When: |
|---|---|
| Voice | Receive DTMF response to initial greeting prompt. |
| RDT | Begin report delivery after modem carrier established. |
| Alarmware | Host acknowledges the session request. |
| Fax | Begin report delivery after all modem negotiations completed. |
| RCS | Session completed successfully. |
| Numeric Pager | Receive tone prompt from service provider. |
| Alpha Pager | Service provider acknowledges the session request. |
| PBX | After all dialing string characters are processed, if any exists. |
| Email | When carrier signal is received from the ISP. |

The term **confirmation** is used to indicate that a given report item was delivered and received by the destination.  Again, specifics here depend on destination type as follows:

| Destination Type | Items Considered "*Confirmed*" When: |
|---|---|
| Voice | Any DTMF tone entered after item reported. |
| RDT | Carrier was up when data transmitted. |
| Alarmware | The report packet is acknowledged. |
| Fax | The report page containing the item is confirmed received. |
| RCS | The packet containing the item is acknowledged. |
| Numeric Pager | Contacted.   **NOTE**: S*ervice providers do not provide end-to-end confirmation. Impossible to know that pager receives the message*. |
| Alpha Pager | Transaction containing item is acknowledged by the service provider.  **NOTE**: *Paging service providers do not provide end-to-end confirmation.  Can not know that pager receives the message*. |
| PBX | Contacted. |
| Email | The ISP confirms reception of the entire report. |

The term **session attempt** indicates that the RTU is trying to contact some destination.  The **session rotation** refers to the series of session attempts caused by the need to get operator acknowledgment for alarms or to deliver some other report(s).

Please see the *Catalyst Operator's Manual, section 1.6,* for all the details, rules and specifics about the prioritization of session attempts, session rotation, and call-out precedence.  Suffice to say here that anytime a session is re-attempted (*in the current rotation*), logic will retain the cumulative number of pages/blocks/whatever sent in all prior attempts and never exceed the configured limit.  This cumulative count is reset when a new rotation begins.

The term *reported* is used to indicate that a specific channel state or Log File segment has been delivered to a given destination.  In general, reports only contain unreported data, and sessions occur if and only if there are unreported states.

## 1.16 Report Delivery Rules

The term *delivery rule* refers to the option that governs when items are considered reported.  The delivery rules are set using Alarmware's configuration->destination->notification report tab dialog.

There are 3 options for delivery rules as listed below:

- *Continually Until Acknowledged*: Unacknowledged channel states are **never** considered as reported. Other channel states and Log File items are considered reported as described under *Until Reported* option below.  Hence, as long as there are any unacknowledged alarms, notification sessions are attempted and each report starts from the beginning.

  **ALWAYS USE THIS RULE** for destinations relied upon to provide alarm acknowledgment.  This is the default rule for any destination type that has the ability to provide operator acknowledgment during the session (see table below).

- *Only Once*: All channel states as of the moment are considered reported at the moment the destination is **contacted**.  Thus, no report will resume after initial contact and subsequent sessions happen only as new state changes or schedule events occur.  Log file items are considered reported as described under *Until Reported* option below.

  **NEVER USE THIS RULE** if relying on the destination to archive data or to provide alarm acknowledgment.  Rather, use only when partial reports are acceptable and session resumption is not desired.  For examples:
  1. Avoid exhausting a fax machine's paper supply (at the risk of loosing report data) by setting the page limit to a small number and selecting this delivery rule.  Reports will stop at that limit and not be resumed later on.
  2. Allow factory floor personnel to stop a PBX report without complete delivery and without requiring acknowledgment of all alarms.

- *Until Reported*: All channel states and Log File segments are considered reported if and only if they are confirmed received by the destination.  New sessions will take place, in rotation, only so long as there are unreported items.  Reports will resume as required, and omit any data already reported. This rule guarantees that every event and channel state is reported and that those reports are not repeated.

  **DO NOT USE THIS RULE** when report repetition is desired.  Any destinations fully relied upon to notify or correct alarm conditions should use the *continually until acknowledged* delivery rule.  For example, there is no end-to-end confirmation of paging reports.  This exposes any given report to loss (if the pager is turned off, for example).  Hence, repetition is desirable for pager destination types.

The table below summarizes how the configured rule applies to each session/report type.

| Session Type | Delivery Rule Used During Report |
|---:|---|
| **Alarm Notification** | As configured on notification tab of destination dialog. |
| **Acknowledgment Notification** | As configured, except that *continually until acknowledged* is treated as *until reported*.  (Because there is no way to acknowledge the acknowledgment |

| | |
|---|---|
| | report). |
| **Test Callbacks** | Always one attempt only, whether contact made or not. |
| **Scheduled Test Calls** | Always *continually until acknowledged*. |
| **Status Reports** | As configured on notification tab of destination dialog, except that "*continually until acknowledged*" will be treated as "*until reported*" (there is no way to acknowledge the status report). |
| **Log File Reports** | Always *until reported*.  The Log File segmentation granularity suffices to prevent a lot of duplication when reports resume. |

The table below summarizes the default delivery rule for destination type.

| Destination Type | Default Delivery Rule (for alarm notifications) |
|---|---|
| **Voice** | continually until acknowledged |
| **RDT** | until reported |
| **Alarmware** | continually until acknowledged |
| **Fax** | until reported |
| **RCS** | continually until acknowledged |
| **Numeric Pager** | until reported |
| **Alpha Pager** | until reported |
| **PBX** | until reported |
| **Email** | until reported |

## 1.17 Report Resumption

In general, any incomplete report will be resumed in a subsequent session.  There are some idiosyncrasies and limitations as listed below:

- At any given time, it is possible that multiple distinct report types could be incomplete to the same destination.  In this case, resumption will happen according to current session priorities and rotation rules.

- Program mode will only reset those session schedules that were modified. The resumption status is cleared only if a schedule change made the session no longer pending.

- The only procedures that globally impact the session resumption states are:
    1. Disarm/Arm.
    2. Exporting the Alarmware data base to RTU.

- Cycling power: any session in progress when power goes off will be resumed only if that attempt was already resumption.  Any other sessions should have their resumption state survive the power cycle.  However, all the history of what was reported is lost.  The report will "resume" from the beginning.

- The "*until reported"* rule resumes any session that fails to report all required items.

- The "*only once*" delivery rule will only resume Log File reports after contact established.

- The "*continually until acknowledged"* rule will resume acknowledgment, status, and Log File sessions.  Alarm reports always restart from the beginning.

- Callback sessions are never resumed.

- Cover page for report will indicate if current session is a "resumption of prior report…"

- Resumption may occur even if prior session not officially "contacted".

- Fax sessions are limited (and hence might need resumption) only if some other session is waiting. Alpha pagers are always limited, even if no other session is waiting.

# 2.0 Configuring your RTU with Alarmware™

## 2.1 Select RTU

When you launch Alarmware™, the **Select RTU** dialog box will appear:
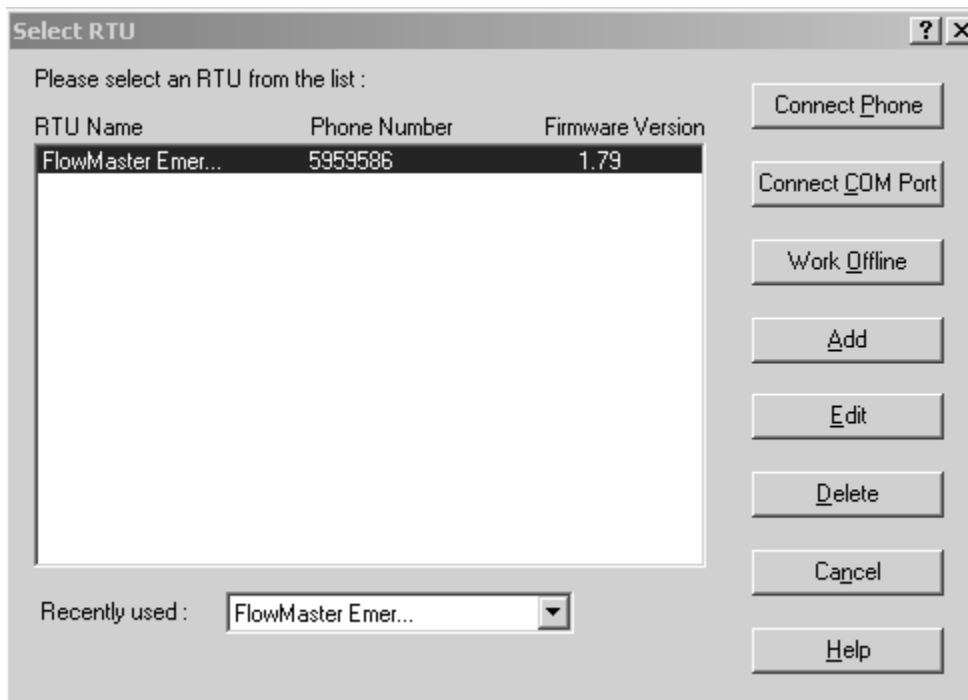


Highlight the RTU you want to connect with on line and/or configure off line, by clicking once on an existing RTU name.

**At this point, the Select RTU dialog box will allow you to perform a variety of operations, such as:**

- Connecting to an RTU via the phone line by clicking the Connect Phone button.
- Connecting to an RTU via a serial port by clicking the Connect Com Port button.
- Configuring an RTU offline before connecting to the unit directly by clicking on the Work Off-line button.
- Using the Add or Edit button to add an RTU to the list, or edit basic RTU information.
- Using the Delete button to remove an RTU from the list, as well as its existing configuration data and Log Files.

There is a convenient "Recently Used" list at the bottom of the dialog box for RTUs most recently selected.

To select another RTU, close the online or offline session with the currently selected RTU, then click on *Select RTU* on the top menu.

*NOTE:  If you need to add RTUs, be sure that the model number is correctly selected from the dialog box that requests it.  If the model number is incorrectly selected, you will not be able to make connection with the RTU.*

## 2.1.1 Add/Edit RTU

To Add a Remote Terminal Unit (RTU):



If you have not done so already, start Alarmware™. This will launch the Select RTU dialog box. You may *add an RTU* to the list by simply clicking on the Add button, and entering basic information.

**The information required includes:**

- **RTU Name** -- Choose a name that will uniquely identify the remote terminal unit (RTU).
- **Phone Number** -- Enter the phone number of the phone line to which the RTU is connected, exactly as it will need to be dialed from the computer running Alarmware™.  Be sure to include any necessary prefixes or delays.  Enter a comma for each one second of dialing delay desired.
- **Serial Number** -- The serial number will automatically be downloaded from the RTU the first time you connect to the RTU.
- **Model Number** – Choose the proper model number from the popup list.

Enter the required information, and click the OK button. The RTU you just added is now displayed in the Select RTU list. To *edit existing RTU* information, simply double-click on the RTU you wish to edit, or select the RTU and click the Edit button. Modify the RTU information as required, keeping in mind that the model number must be correct for Alarmware™ to work properly.

*Note: Alarmware™ will use the model number to determine the number of channels configured for the RTU, so correctly selecting the model number is critical to proceeding with other configuration work.*

## 2.1.2 Connect to RTU using Phone Line and Modem

**To connect to an RTU via a phone line, follow the steps as described below:**

1.   If you have not already, start the Alarmware™ application.

---

2. You will be presented with a *Select RTU* dialog box.
3. Choose an existing RTU from the list or add a new RTU via the Add button.
4. With the proper RTU highlighted, click on the Connect Phone button.
5. Alarmware™ will attempt to connect to the RTU. If the unit is ready to accept incoming calls you should be able to make the connection rather quickly.
6. Upon establishing connection with the RTU, if PINs have been configured for this RTU, you will be prompted to enter a valid PIN of at least "Program" privilege level.  *Exception:  If you have previously entered a PIN in the special Retained Alarmware™ PIN dialog box and the "Save PIN for future use" box has been checked, the entry of that PIN will be done automatically by Alarmware™..*
7. Alarmware™ then checks for agreement between the configuration in its database and the configuration of the RTU.
8. If there is any mismatch, you will be presented with a choice of either importing the RTU's current configuration into Alarmware™ or exporting the Alarmware™ configuration to the RTU. You must do one or the other before you will be able to proceed with the session.

**Troubleshooting:  If the unit does not make connection:**

- Verify that the basic RTU information is correct, especially the phone number with any necessary prefixes or delays (delays are invoked with a comma for every one second of delay desired).
- Verify that your Modem settings are correct.
- Verify that the unit is not in use from the Front Panel, and is ready to accept incoming calls.

## 2.1.3 Connect to RTU using COM Port and Serial Cable

**To connect to an RTU locally via your computer's communications port, follow the steps as described below:**

1. If you have not done so already, start Alarmware™.
2. Choose an existing RTU from the list, or add a new RTU via the Add button.
3. Make a physical cable connection between your computer's Com Port and the Alarmware™ connection port on the RTU.  (*see 2.10.5 Alarmware™ Serial Port Connection in the Operator's Manual*)
4. Click on the Connect Com Port button.
5. Alarmware™ will attempt to connect to the RTU. If the unit is ready to accept Com Port access, you should be able to make the connection rather quickly.
6. Upon establishing connection with the RTU, if PINs have been configured for this RTU, you will be prompted to enter a valid PIN of at least "Program" privilege level.  *Exception:  If you have previously entered a PIN in the special Retained Alarmware™ PIN dialog box and the "Save PIN for future use" box has been checked, the entry of that PIN will be done automatically by Alarmware™.*
7. Alarmware™ then checks for agreement between the configuration in its database and the configuration of the RTU.
8. If there is any mismatch, you will be presented with a choice of either importing the RTU's current configuration into Alarmware™, or exporting the Alarmware™ configuration to the RTU. You must do one or the other before you will be able to proceed with the session.

*Note: While Alarmware™ is connected to an RTU via the com port, all outgoing calls that the RTU might normally make will be held off until the end of the com port session.*

**Troubleshooting -- If the unit does not make connection** (normally indicated by a box that says, "Session concluded, transaction failure")

1) Verify that the basic information is correct.
2) Verify that your Com Port settings are correct.

3)   Verify that the RTU is not in use from the Front Panel.

*Recorded speech data is a special case*, because as a practical matter, recorded speech data comprises a much larger block of data than other configuration data. If there is a discrepancy only with respect to recorded speech data, you will get a dialog box that allows you to import or export for reconciliation as described above.  However, due to the very large amount of data and transfer time involved, you will be given a third choice, to do nothing and proceed with the session.

The speech message import process can take up to 2 hours via modem or preferably about ½ hour via serial port connection to the RTU at 57,600-baud speed.  While you may choose to defer this step initially, *it is good defensive practice to have recorded speech data saved*, to avoid need to re-record messages if some unusual event requires restoration of the recorded speech data.

When adding or removing flash memory to the Catalyst, there will be a file size mismatch when attempting to connect Alarmware™ with the Catalyst. When adding flash memory, Alarmware™ will detect this situation and handle it automatically. In situations where Alarmware™ has a bigger file size than the Catalyst, a message will appear, instructing you to reduce the file system size by the calculated number of bytes. File size can be reduced by clearing user-recorded messages and Log File data.

**Note**: *At the end of any Alarmware™ online session, if there are any unacknowledged alarms, they will be automatically reset to NORMAL (corresponding to what otherwise happens when the respective Alarm Reset Timers time out).  Then, if there are any alarm criteria violations existing, after the respective Alarm Trip Delays elapses, new unacknowledged alarms will be created.*

## 2.1.4 Working Offline with an RTU

Use the Offline mode to prepare a configuration profile for an RTU before connecting to it.

**To work off-line with an RTU, follow the steps as described below:**

1.   If you have not done so already, start Alarmware™.
2.   Choose an existing RTU from the list, or add a new RTU via the Add button, making sure for newly added Catalysts that the model number is correctly selected.
3.   Click on the Work Offline button.

Alarmware™ will not attempt to connect to the RTU. This will enable you to create or edit the configuration information for a particular RTU. Working off-line allows you to make and save configuration changes, while the RTU is allowed to perform without disruption.

When you are satisfied with the profile you have created, or the changes you have made, simply quit the session and the configuration will be saved to the local disk. This configuration will then be available for export the next time you connect to the RTU.

The Offline window is designed to represent the LED display on the Front Panel of an RTU. Each box within the Offline window has a corresponding LED on the Front Panel. The numbers represent channel numbers or ranges of channel numbers. The Offline window is different from the Online window in a number of different ways. For example, when working Offline, upon clicking on a channel number or channel number range the Channel Settings dialog box will be launched, instead of the Channel Status dialog box. When clicking on a net number, the Device Settings dialog box for that net will be launched instead of the Net Status dialog box.

**Note**: *When you later connect with the RTU online, you will need to decide whether to export the RTU's Alarmware™ configuration file to the RTU, or import the RTUs existing configuration into the corresponding*

*Alarmware™ configuration file. This action will overwrite the existing file for that RTU in the computer. When online, the two configurations must continuously match, with the single exception of recorded speech message data.*

## 2.2 Import RTU

To access the dialog box for this setting cancel the "Select RTU" dialog and select Import RTU from the top menu.
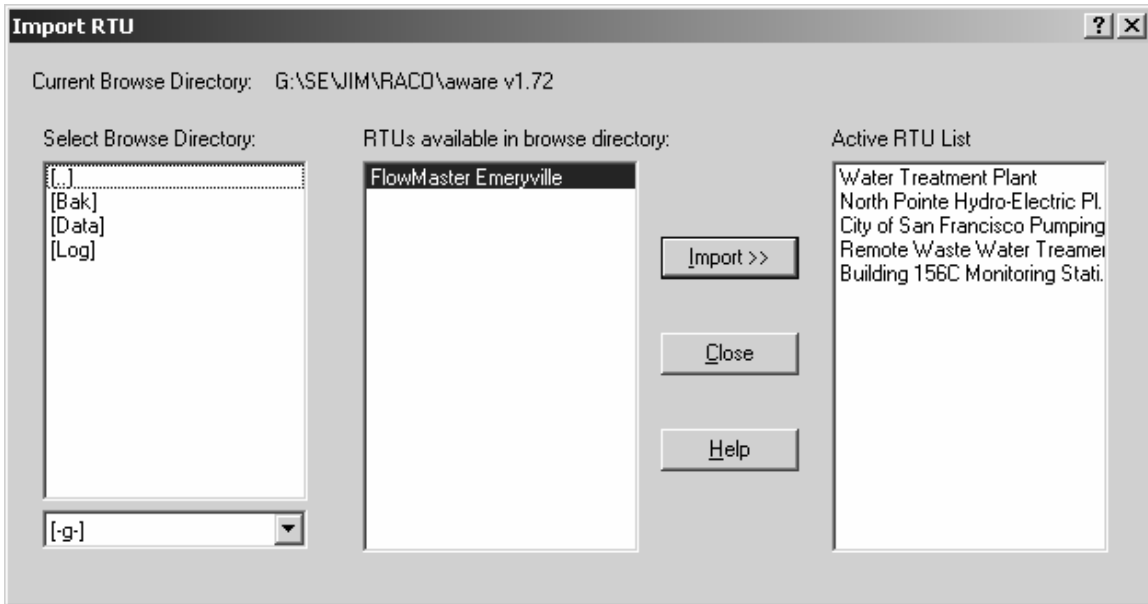


When the "Import RTU" dialog appears, use the browse window in the far left to find the Alarmware directory you would like to import the RTU from. When the directory is found, the middle window will display the available Catalyst configurations from the selected directory. Highlight the desired RTU(s) and click on the "Import" button. The configuration you selected should now appear in the far-right window or "Active RTU list." When you close this dialog, the added RTU will appear in the "Select RTU" dialog.

## 2.3 Alarmware™ Setup Options

### 2.3.1 COM Port Settings

To access the dialog box for this setting have no RTU selected and select Options from the top menu.

From there select COM Port:
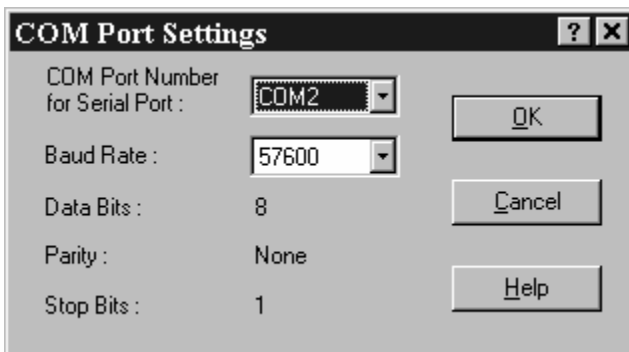
*In order to make a local serial communications port connection to an RTU you will need to properly set the COM Port Number for Alarmware™ on your computer. This is the port where you will connect the serial interface cable. If you are not sure what COM Port setting to use connect the serial cable to the RTU and an open communications port. Since it only takes a short time to check each setting available start with COM 1. Next select the Connect COM Port button on the Select RTU dialog box. If Alarmware™ fails to connect, try COM 2, and so on, until connection is successful.*

### 2.3.2 Modem Settings

To access the dialog box for this setting, close the "Select RTU" dialog and select Options from the top menu.  Then select Modem:
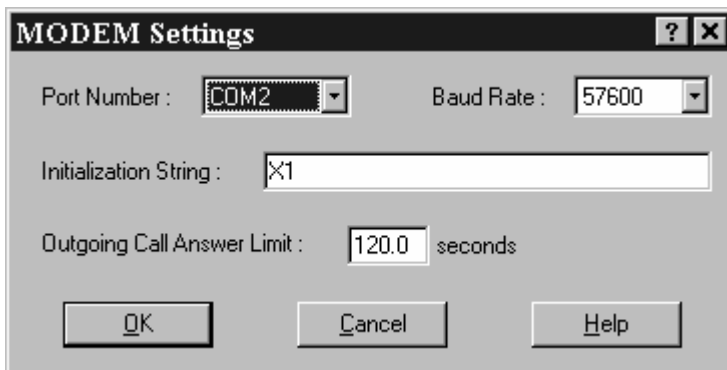


In order to make a remote connection between Alarmware™ and a RTU via your computer modem, you will need to properly set the COM Port Number that your computer's modem uses. If you do not know which communication port your modem uses, go to the Windows Control Panel and select Modems. For Win95 users, click on the Diagnostics tab of the Modems Properties dialog box. Note to which port your modem is installed. Set your Port Number to match this setting.

### 2.3.3 Alarmware™ PIN Settings

To access the dialog box for this setting, close the "Select RTU" dialog and select Options from the top menu.  Then select Alarmware PIN.
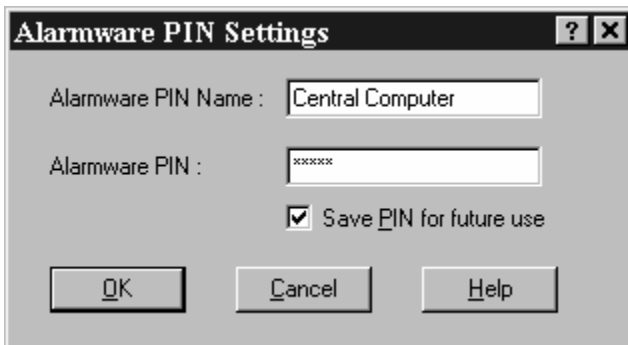


If PIN protection for a given RTU is made active by configuration of one or more PINs (in the dialog box under Configuration | PINs) the RTU will require entry of a valid PIN (with at least "Program" privilege level) before allowing connection to the RTU via Alarmware™.

Once such PINs are configured, you may then enter into the Alarmware™ PIN dialog box any one of the pre-configured PINs that have been configured with a privilege level of "Program" or "Administration".  If you have checked the box marked "save PIN for future use", then Alarmware™ will cause this PIN to be issued automatically upon connection with the RTU in subsequent sessions, relieving the Alarmware™ operator the step of entering their PIN.

- **Alarmware™ PIN Name**: This optional entry is used to better describe the location or name of the Alarmware™ destination site that will be initiating a session, or receiving alarm notifications.  For example this might be "Main Central Alarmware™ Computer".  This name will then be reflected in any log reports, as having established connection with the RTU.  However, if any alarms are acknowledged during the Alarmware™ session, the report will show the acknowledgements as having been performed by the individual's name previously assigned for that PIN in the dialog box under Configuration | PINs.
- **Alarmware™ PIN**: Enter a valid PIN of at least Program access level, from among the valid PINs which have previously been configured for this selected RTU under Configuration | PINs.
- **Save PIN for future use**: When selected, the user PIN entered will be saved for automatic use in future sessions with this Alarmware™ station.

*Note: If you want to assure that specific individuals are always uniquely identified in log reports for connections and configurations, you should not establish a retained Alarmware™ PIN. (For additional information on PINs including individual personnel PINs, see 2.15 PINs: Alarmware™ in the Operator's Manual)*

## 2.3.4 Other Settings

To access the dialog box for this setting, have no RTU selected and select Options from the top menu.  From the Options menu select Misc. Options:
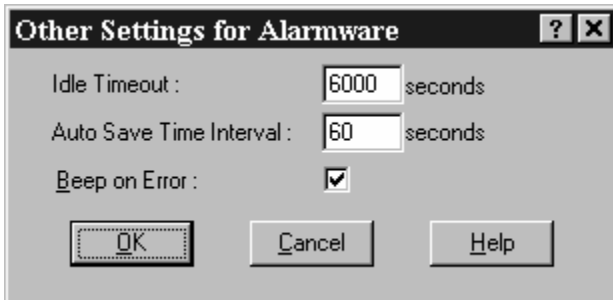


**Idle Timeout**: When working with a given RTU, if there is no user interaction with Alarmware™ for this duration of time, the RTU will be deselected.  *This is distinct from the session timeout setting under Configuration | Sessions*, which determines how long the RTU will continue a dormant session when reporting or being configured online or if left dormant in Program mode at the Front Panel. To turn the Alarmware Idle Timeout OFF, set this value to zero (0).

**Auto Save Time Interval**: This setting determines how often the Alarmware™ settings are automatically saved to disk.  This only applies when working offline.  When online, all changes in settings are saved immediately as entered and also sent to the RTU immediately as entered, to maintain consistency.  *A setting of 0.0 results in no automatic interval saving of configuration settings to disk.  Default is 5 minutes.*

**Beep on Error**: When enabled, will force a computer beep when an error is encountered.

## 2.3.5 Log File Options

A Log File is a record of RTU activity that is accumulated within the RTU.

Alarmware™ can access any configured RTU and download its Log Files. Log Files can then be saved to disk or opened for viewing with Alarmware™. You can open saved Log Files by selecting Log File from Alarmware™ main menu.

**When the Log File window is active, a special Log File menu is displayed, enabling the following functions:**

- **Open Log** -- Launches Open dialog box. Select appropriate Log File for viewing or editing.
- **Save Log** -- Saves any changes made to open Log File.
- **Print Log** -- Prints the Log File in the active window.
- **Delete Log** -- Deletes the Log File in the active window.
- **Find/Find next** -- Searches for text in active window.

## 2.3.6 Find (Log File Search for String)



The Find feature is included to assist you in searching for specific text within an open Log File or the "Messages for RTU" window. When you are viewing a Log File, the Find feature is available from the Search menu. You can search for any string of text by just typing the text in the Find what textbox. You may narrow your search by selecting the appropriate checkboxes and then search in desired direction.

## 2.3.7 Alarmware™ Toolbar

The Alarmware™ Toolbar is a collection of buttons that can be used as shortcuts to Alarmware™ functionality. These buttons are equivalent to their respective menu selections. Hold the cursor over the toolbar button momentarily and text will appear, describing the type of function associated with the button.

## 2.4 Offline and Online Windows

The Offline window presents a depiction of the LED's of the RTU Front Panel.  The only items in this depiction that are active are Net 1, Net 2, Net 3, and the channel areas. Clicking on one of the Nets brings up the Device Settings dialog box, allowing this Net's settings to be reviewed or altered in the Alarmware™ configuration file.

Clicking on one of the channel areas brings up the Channel Settings Dialog box for the selected channel.  If you clicked on a range of channels, an intermediate dialog box allows you to further select the specific channel you want.

## 2.4.1 Online Window/Channel Status

When connected online with a Remote Terminal Unit (RTU), the Online Status window is displayed. This window is a "live" representation of the Front Panel LEDs as they are actually appearing on the Catalyst's Front Panel. The Online window is different from the Offline window in a number of different ways. For example, when working Offline, upon clicking on a channel number or channel number range the Channel Settings dialog box will be launched, instead of the Channel Status dialog box. When clicking on a network LED, the Device Configuration dialog box for that device will be launched instead of the Net Status dialog box.
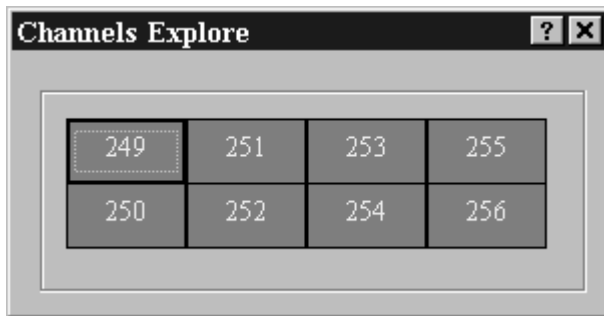
*Note: if you observe all of the LEDs flashing; PLC, Printer, Aware, and Program, this is an indication that there is a version mismatch. Alarmware and the firmware versions are not synchronized. To update the firmware, see section "2.19 Firmware Update" of the Operators Manual.*



To view an individual channel status click on the channel number or range of channel numbers that includes the channel you are interested in viewing. When selecting a range of numbers, a Status Explore window will pop up that will allow you to select the individual channel you want to view.

Click on a specific channel LED and a Channel Status dialog box will appear that displays the following information:



**Channel Number** -- Current channel being viewed

**Channel State** -- States include Normal, Alarm, Acknowledged Alarm, Now Normal, or Now Normal, Acknowledged, Communications Failure, and High or Low Setpoint violations.

**Channel Reported Value** -- The value that represents the current transformed value in the reporting format configured for the channel in Configuration | Channel Settings.

**Channel Raw Value** -- The value that represents the current raw (not transformed) data associated with the channel.

**Error Count** -- The number of errors counted since last reset.

**Last Error** -- Description of the last error encountered.

**Data/Time** -- The date and time of the last error encountered.

**Channel Latency** -- This is the time elapsed between the last 2 consecutive scans.

**Configuration Button** – If you need to make any channel configuration changes, click on this button and the channel settings dialog box will appear.

**Write New Value Button** – If you want to write a value back to the channel, click on this button and the Write New Value dialog box will appear. Enter value and click OK.

**Force New Scan Button** – If you want to get the most current value at the channel input, click this button and the channel value will be immediately updated.

**Reset Channel Value** -- This action causes the channel mode value to be reset, without writing any data back to the SNA (*Channel Modes are a planned future product enhancement*).

**The Online window also contains 4 button controls:**



**Arm/Disarm** -- Click on this button to either Arm or Disarm the connected RTU. This button acts like a toggle switch to change the state of the RTU.

**Acknowledge Alarms** -- Click on this button to acknowledge all active alarms.
**Disconnect RTU**-- Click on this button to disconnect from the currently connected RTU.
**External Net Address** -- Click on this button to launch the External Net Address dialog box.

## 2.4.2 External Net Address

The External Net Address dialog box is accessed from the Online window (accessible when Alarmware™ is connected with an RTU via phone or via ComPort). From the Online window, click on the External Net Address button:
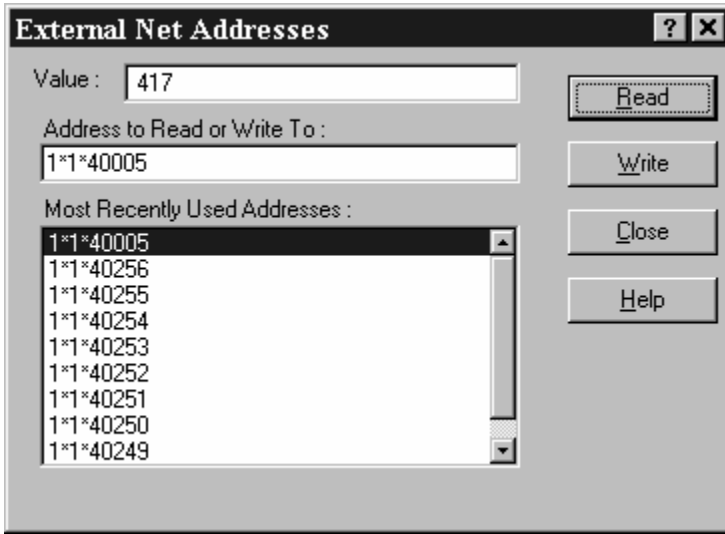


This function allows you to either write a value to a net address that you enter, or to read the value of an address that you enter. To write, enter the value to write and the address and click on the Write button. To read, enter only the address and click on the Read button.

### 2.4.3 Network Status

The Network Status dialog box can only be accessed when you are connected to an RTU. From the Online window you can view the Status of Network devices. or 4 (Log File). On the far left of the Online window, there are three boxes labeled PLC, Printer, and Aware. These represent the corresponding LEDs on the Front Panel of the RTU. On the far right of the Online Status window there is a LED marked Log File. Click on this LED and the Log File device settings will appear.

**To view the Net Status for the NET 1 PLC, click once on the PLC box.**
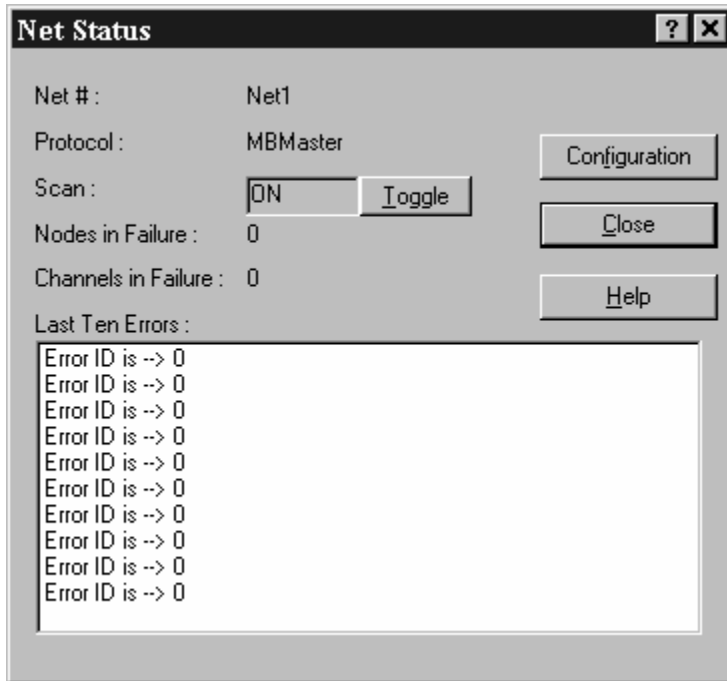


**The Net Status dialog box for Net 1 will appear with the following indications and controls:**

> **Net #** -- This label will reflect which numbered network status is displayed.
> **Protocol** -- This label will describe the protocol used for the current Network.
> **Scan** -- This label indicates whether the network scan is active or inactive.
> **Toggle** -- This button enables or disables the network scan.
> **Nodes in Failure** -- This label display how many nodes have currently failed.
> **Channels in Failure** -- This label display how many channels have currently failed.
> **Last Ten Errors** -- This list box will contain a list of the last ten network errors encountered.
> **Configuration** -- Click on the Configuration button to launch device configuration dialog box.

## 2.5 Transfer Configuration

### 2.5.1 Save Configuration to Disk

This function saves current configuration data to disk. When the configuration data is properly entered, select Save to Disk from the Transfer menu. The configuration data is then saved to disk.

*Note*: *When working online, most Alarmware™ operations automatically save changes so this feature will only be used in special situations when configuring an RTU.*

## 2.5.2 Firmware Update

The Firmware Update selection under the Transfer menu is used in the event it is necessary to update the operating firmware version of the RTU.  (see *2.18 Firmware Update in the Operator's Manual*)

## 2.6 Copy RTU Configuration

When working offline with an RTU selected, select Copy from the menu bar. The Copy Configuration File dialog box is launched:
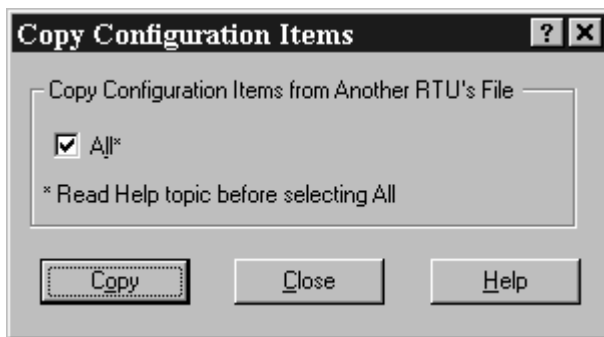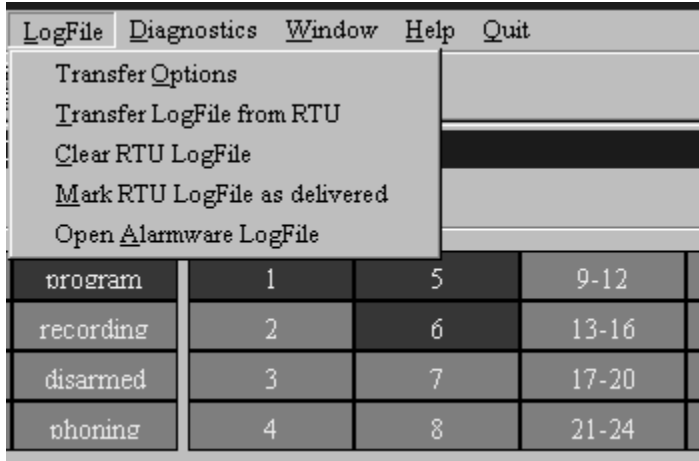


Copy allows you to take another Catalyst's configuration, including voice and text messages, and copy it to the current RTU configuration file in Alarmware™.  Be sure that the file you want to have the new configuration copied **to** be the current one.

*Note: Copy RTU configuration command is not available when working online.*

## 2.7 Log File Menu

These options allow you to retrieve, view, and manage the Catalyst's Log File:

## 2.7.1 Transfer Options



By selecting this menu item, a transfer options dialog will appear. These options allow you to include or exclude any particular segment of data contained in the Log File. The data is filtered in terms of channel state transitions and RTU events. This data can be selected from the range of data taken from the log.

When the data is transferred, you can also determine how the data will be sorted and how it will be formatted when delivered.

*Note: These options also apply to Remote Data Terminals that call the Catalyst in order to retrieve the Log File.*

## 2.7.2 Transfer Log File from RTU

This procedure initiates the Log File download from the RTU to Alarmware. The data will be saved on the local hard disk. The data that is transferred is determined by the "Transfer Options."

## 2.7.3 Clear RTU Log File

This procedure will completely erase the contents of the current RTU Log File. No transfer is performed prior to clearing.

### 2.7.4 Mark RTU Log File as Delivered

This feature will clear all the delivery flags that have been set for the Log File. The RTU will cease from calling out and will no longer attempt a log download session until a new delivery flag is set.

### 2.7.5 Open Alarmware Log File

This feature will open the Log File for the RTU currently connected to Alarmware. This feature does not retrieve the Log File from the RTU.

## 2.8 RTU Diagnostics

When attempting to troubleshoot a particular problem with an RTU, there are a variety of functions available from RTU Diagnostics. To access these features with Alarmware, you must be connected to the RTU you would like to test. Select Diagnostics from the menu bar.

```
Factory Settings
Statistics & Counts
File System Diagnostics
Channel Diagnostics
Device Diagnostics        ▶
Net Diagnostics           ▶
Destination Diagnostics
Active Channel Config
Clear Out Diagnostics     ▶
```

## 2.8.1 Factory Settings

The "Factory Settings Report" is comprised of information you will find very important when it comes to setting up your Catalyst, upgrading the firmware, or reporting problems to RACO. You can refer to this report when you need to determine your serial and model numbers. You can see that the number of channels, destinations, and PINS are also included. When configuring your Catalyst, it will be important to also know how much NVRAM has been installed so you can properly reserve enough space for the Log File and determine how much user-recorded speech time is available. Additional NVRAM is available from the factory.

**Sample "Factory Settings Report":**

```
CATALYST Summary Report:
 Boot Version: 1.74
 Code Version: 1.74
 Manufactured: May 15 2002 22:20:08
 For Customer: Any Company, Inc.
 Country:     USA
 Serial#:     1001-99-15xx
 Model#:      C10-2-020-1450
 System Board Info:
   RAM Size:            512 Kbytes
   Number of Channels:     256
   Number of Destinations:  96
   Number of PINs:        96
   Number of Networks:     3
   Modem Chipset:        R144ACFW
 Physical IO Module Info:
   Multi-Function Inputs:  4
 NVM Module Info:
   Slot #4    Base: 0x00800000  Size:  2 Mbytes
   CODE       Base: 0x00800000  Size: 448 Kbytes
   NVROM      Base: 0x00870000  Size: 576 Kbytes
   NVRAM                Size:  1 Mbytes
```

## 2.8.2 Statistics and Counts

These statistics can be useful in troubleshooting and analyzing the frequency of alarms, log overflows, power failures, etc.

```
Diagnostic Summary Report:
    Acknowledged alarm count is 0.
    Alarm count is 0.
    Communications alarm count is 0.
    Reset count is 1.
    Call-in count is 0.
    Log overflow count is 0.
    Call-out count is 426.
    Reset history is:  114
    Power Failure Alarm count is 0.

PLC Communications Report for NET 1:
    Scan time is 4 second(s).
    Communication with all node(s) is normal.
    The total error count is 6.
    Last 10 errors are:  410, 0, 0, 0, 0, 0, 0, 0, 0, 0
    Alert count is 0.
```

## 2.8.3 File System Diagnostics

This feature allows you to perform File System diagnostics. This report includes information on Log File usage as well as user-recorded speech.

```
File System Report:
  NVM Error Events:    total=0
  Block Erasure Differentials:
  BLK 0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
  20  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  30  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  40  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  50  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  90  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01
  Oldest Block has been erased 1 times
  Record usage:
    dirty=510 free=13433 logs=34 speech=6120 database=48 system=0
  Total of 67 Files using 1550Kbytes in 93 segments.
  Log files:    256Kbytes reserved,    8K in use,    0K undelivered.
  Other files:  4780Kbytes reserved,  1542K in use.

  Speech File Detailed Summary Report

  Kbytes Seconds Language        Description
  ------ ------- --------  ----------------------------------
  14     4       English   Channel #5 MSG2
  17     5       English   Channel #1 MSG2
  25     7       English   Channel #5 MSG1
  20     5       English   Channel #1 MSG1
```

**Channel Diagnostics** -- This function reports channel configuration information, network communication status, with the count of channel communication errors, for all channels.

**Device Diagnostics | Reports** -- This function reports all available device information, including overruns, parity errors, etc.

**Device Diagnostics | Self-Tests** -- This function performs a diagnostic self-test on all devices. All available diagnostic counters and information will be reset. Self-test either returns test result as normal or it reports the error code(s).

**Network Diagnostics | Summary Reports** -- This function reports all network statistics for all networks.

**Network Diagnostics | Self-Tests** -- This function performs a diagnostic self-test on all networks. All available network diagnostic counters and information will be reset. Self-test either returns test result as normal or it reports the error code(s).

**Network Diagnostics | List Active Nodes** -- This command will query the Modbus network for Active PLC nodes.

**Destination Diagnostics** -- This function reports diagnostic information for all destinations, including date/time of last session and total number of sessions.

**Active Channel Config** -- This function reports diagnostic information for all destinations, including date/time of last session and total number of sessions.

## 2.9 Channel Settings

The Channel Settings dialog box is accessed from the Configuration menu. The Configuration menu is available when connected to the RTU or when working off-line. Select Channels from the menu items listed.

A Channel Settings dialog box will appear with access to the following information:



### 2.9.1 Channel Number

The ordinal number associated with the channel you are currently configuring. The Channel with the lowest ordinal number is reported first, until all channels are reported.

### 2.9.2 Source Network Address (SNA)

This channel will monitor (receive data from) this address from either the physical channel or on the industrial communications network to which it is connected, updating at the channel scan rate. The net address format is net/node/address (for example, 1*1*00001).  The SNA determines what available choices are relevant for other items in this dialog box*, so the SNA should be established before configuring other channel configuration items*.  If the SNA is changed, it will cause existing settings for the channel to be returned to factory default.

## 2.9.3 Alarm Trip Delay

Amount of time, in seconds, that an alarm violation is allowed to continue before an alarm is tripped.

NOTE REGARDING SCAN TIME: The scan time (the finite time required to complete each scan of the network) affects how quickly each channel's status will be updated.  This in turn has important implications as to the ability to detect transient alarm conditions, as well as the effective overall trip delay.

NOTE REGARDING COMMON ALARM TRIP DELAY: The dialog box for Annunciation (under the Configuration menu selection) includes a Common Alarm Trip Delay entry field.  If you enter a new value in that field, it will immediately overwrite that value for all channels regardless of what may have been previously set for individual channels.  Therefore if you want to use that feature but want a different Alarm Trip Delay for selected channels, you must enter any such individual delays after having changed that common value setting.  Note also that there is a separate entry field for the Power Failure Alarm Trip Delay in the Annunciation Settings dialog box.  Default value is 2.0 seconds.

## 2.9.4 Alarm Violation Criteria

The only way for a channel to cause an alarm is to set the Alarm Violation Criteria to define what constitutes an Alarm Violation. When these criteria are met continuously for the entire trip delay period (as reflected in the channel's current status), the channel transitions into an Unacknowledged Alarm state. The channel Alarm Violation Criteria available depends on the channel type, which in turn is dictated by the Physical Input configuration and the SNA address.

**Discrete** Channels:

- Alarm on 0 Raw value
- Alarm on 1 Raw value

**Analog** Channels:

- Alarm on High Set Point
- Alarm on Low Set Point
- Alarm on High & Low Set Point

Both **Discrete** and **Analog** channel types can also be set to the following:

- Disabled - channel is completely inactive
- Alarm Never (status report only) - channel will give reports when queried but never cause an alarm
- Alarm on Com Failure Only - like Alarm Never but will cause an alarm if there is a failure of communications for that channel

## 2.9.5 Reporting Formats

**Discrete** reporting formats include:

- 0 Reported as "0" (default)
- 0 Reported as "Off"
- 0 Reported as "On"
- 0 Reported as "Open Circuit"

- 0 Reported as "Closed Circuit"

**Analog** Reporting Format**:**

- Signed
- Unsigned (default)
- Hex
- Octal
- Binary
- 24Hr Time - causes the report to be given in terms of military hours and minutes of the day. In order to get this kind of time report, the corresponding 16-bit register in the PLC must contain a value obtained by multiplying the hours (0-23) by 100 and then adding the minutes. Example: if the time is 13:45, the register must contain the value $13 \times 100 + 45 = 1,345$. Then with this channel configured for 24 Hr Time format, the reading will be "Thirteen hundred hours 45 minutes".
- Spell - causes digits to be reported as individual numerals in sequence (e.g. "6 4 5 4 3" rather than "Sixty-four thousand five hundred forty-three")

*Note: These last two settings are useful for example when reporting maximum and minimum values and the corresponding time of day that they occurred, as stored in PLC register locations.*

**Floating Point** Reporting Format**:**

- Significant Digits

## 2.9.6 Advanced Channel Settings

To access the Advanced Channel Settings, click on the "Advanced" or "Change Mode" button on the Channel Settings dialog:

**Advanced Channel Settings**  ? ✕

Selected Mode :  [Analog Mode ▼]

Mode Specific Parameters

There are no parameters for the selected mode.

Clear Item

Accept

Close

Help

Value Scaling
Scaling Option :  [No Scaling ▼]

Data Export (Optional)
Destination Net Address (DNA) :  [                    ]
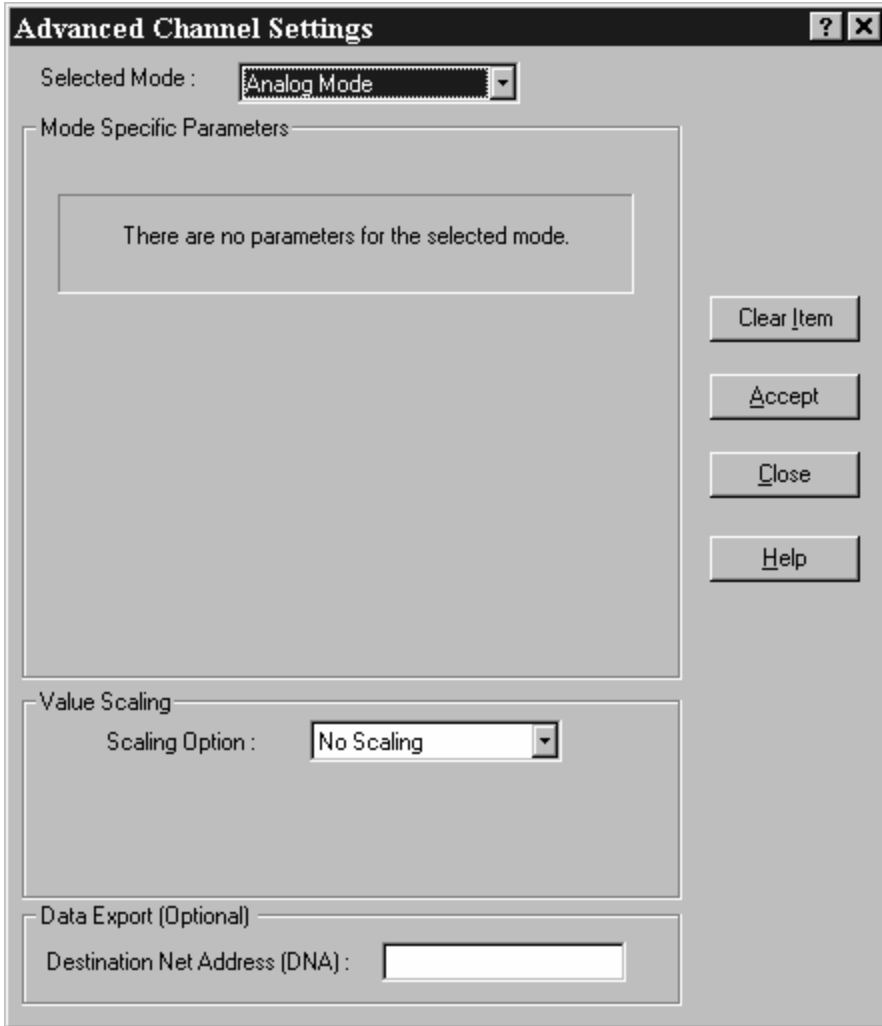
## 2.9.7 Channel Modes

Channel Modes involve various ways in which the Catalyst can process a channel's raw data to derive new data useful for monitoring and alarming applications. Each mode may also have additional, mode-specific, configuration options. The default messages for both text and speech depend on channel mode. The allowable modes depend only on the raw input data type.

*Note: Successful operations of certain modes depend on the channel scan time and latencies.*

### 2.9.7.1 Discrete Mode

In this mode, discrete raw value channels current reading is unchanged.

### 2.9.7.2 Analog Mode

This mode is allowed for analog (16-bit, 32-bit, ieee32) raw type SNAs only. This is simply the mode in which non-discrete raw value channels operate.

## 2.9.8 Value Scaling

The Scaling Options allow you to change how the raw channel value is interpreted. By leaving the value scaling setting at "Default (raw)" the channel's current reading will be unchanged. The Physical Input type and the SNA determine the channel's *raw value type* as either DISCRETE, INTEGER or IEEE32.

Table 1.1 details the logic here. Raw channel values are always numeric. The range of values for physical analogs will depend on the resolution of the ADAC hardware.

| SNA | Description | Data Type | Raw Type |
|---|---|---|---|
| 0*module*point | Physical Input point<br><br>Catalyst only supports module=1 and point=1--4 | Boolean or uint16 per point's configuration | DISCRETE<br><br>or<br><br>INTEGER |
| 1*…*0xxxx | Remote discrete output | Boolean | DISCRETE |
| 1*…*1xxxx | Remote discrete input | Boolean | DISCRETE |
| 1*…*3xxxx | Remote analog input | uint16 | INTEGER |
| 1*…*4xxxx | Remote analog output | uint16 | INTEGER |
| 1*…*5xxxx | Remote analog output | float | IEEE32 |

Table 1.1

Operators have several options in transforming the raw value into the value used by the alarm criteria and reports. These options are listed in table 2.1 below. The result of this scaling determines the *channel type*.

Remember that raw values are reported **only** when using the *"direct channel reading"* or *"read external net address"* screens in Alarmware or via the FP code **03Z.** All other reports and commands use the value resulting after the scaling has been applied.

| Raw Type | Option | Description | Channel Type |
|---|---|---|---|
| DISCRETE | Default | No scaling, raw value. | DISCRETE |
| INTEGER or IEEE32 | Default | No scaling, raw values and types. | INTEGER or IEEE32 |
| | Scaled Gain / Offset | Conversion to engineering units using slope-intercept concept. | IEEE32 |
| | Scaled 2-point | Conversion to engineering units using 2 sample point concept. | IEEE32 |

Table 2.1

Also, certain scaling options require rapid sampling of the underlying data. They can only apply to channels using physical IO points. The default transformation for all channel types is "raw". Alarmware must be used to select any other option. There are no Front Panel codes for configuring these options.
For the scaled options, any data that would result in an infinite or zero gain is rejected with an error message. The same applies for data resulting in an infinite offset.

## 2.9.8.1 Scaling Voltage Inputs

Scaling to engineering units will depend on the application (water tank level, etc.). Use Alarmware™ to configure your channel settings by first connecting with the Catalyst unit. From the "Configuration" menu, select "Channels." To read a voltage input directly in volts, do the following:



Step #1. First enter the SNA for the Analog Input:

1*1*30001

Step #2. Next click on the "Advanced" button.

The "Advanced Channel Settings" dialog will appear:

**Advanced Channel Settings** [?][X]

Selected Mode :   [Analog Mode ▼]

Mode Specific Parameters

    There are no parameters for the selected mode.

[Clear Item]

[Accept]

[Close]

[Help]

Step #3. Select the "2 Point Scaling" Option.

Value Scaling

Scaling Option :   [2 Point Scaling ▼]

Input1 (X1) : [0]          Reported1 (Y1) : [0]

Input2 (X2) [8191]        Reported2 (Y2) : [10]

Data Export (Optional)

Destination Net Address (DNA) : [          ]

Step #4. Enter the following scaling data:
X1=0          Y1=0
X2=8191        Y2=10

## 2.9.8.2 Scaling Current Inputs

To read a current input directly in mA, verify the SNA is an "Analog Input." Then click on the "Advanced" button:

**Advanced Channel Settings**    ? X

Selected Mode :    Analog Mode

Mode Specific Parameters

There are no parameters for the selected mode.

Clear Item

Accept

Close

Help

Step #1. Select the "2 Point Scaling" Option.

Value Scaling

Scaling Option :    2 Point Scaling

Input1 (X1) : 0    Reported1 (Y1) : 0

Input2 (X2) 8191    Reported2 (Y2) : 20

Step #2. Enter the following scaling data:
X1=0    Y1=0
X2=8191    Y2=20

Data Export (Optional)

Destination Net Address (DNA) :

## 2.9.8.3 Gain / Offset Scaling

When the value transformation is set to gain / offset, the value of the raw data will be transformed by the gain and offset values. The raw data will be multiplied by a factor of the gain. The offset is then added to that value.

**Report Value = (Gain * Raw Value) + Offset**

## 2.9.8.4 Analog 2-point Scaling

It may be useful in comprehending the process of establishing the scaling factors, to visualize a graph that relates the water level in a tank to the input from a 4-20ma transducer. To establish the relationship on such a graph, it is necessary to define two separate points, or coordinate pairs ideally at two widely separated points on the graph. For such a linear relationship any point on the "reading" may be calculated from the formula:

$$Y = Mx + b$$

Where **M** is the gain and **b** is the zero crossing point or Input (ma -> offset). The gain may be calculated from:

$$M = (y2-y1)/(x2-x1)$$

Where x1, y1 is one coordinate pair on the graph and x2, y2 is the other.

**Example:**



Feet

50

X2,Y2
16,50

Gain = (y2 - y1)/(x2-x1)

Gain = (50-10)/(16-8)

Gain = 5

X1,Y1
8,10

Offset = y - Gain * x

Offset = 10 - (5 * 8)

Offset = -30

mA

20
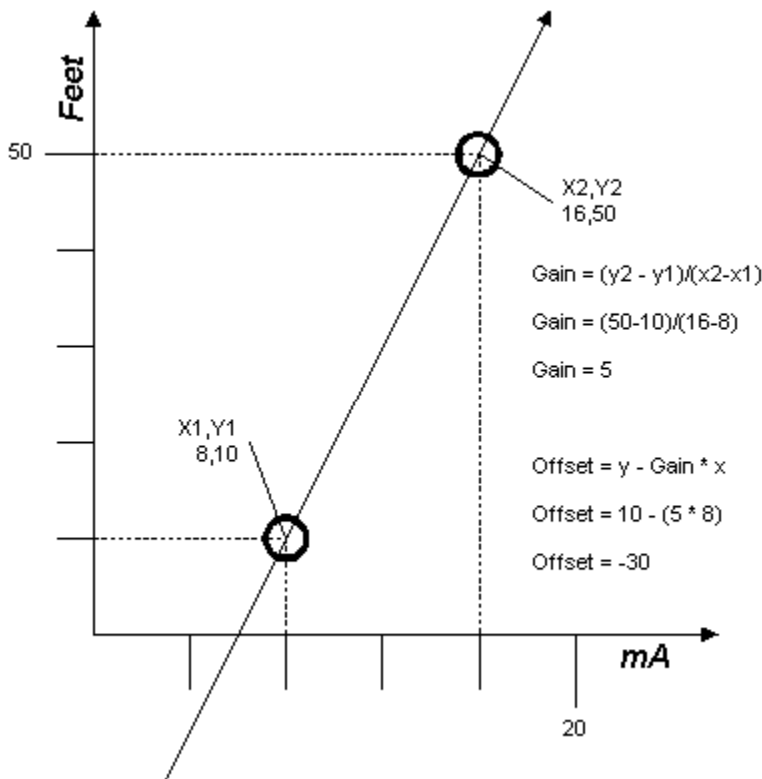
## 2.9.8.5 4-20ma Scaling

When the value transformation is set to 4-20mA Scaling, the value of the raw data will be transformed by the 2 Point Formula. The 4-20mA Scaling selection is much like 2-Point Scaling, but assumes a 4-20mA transducer is installed.

The X1 and X2 values are set to 4mA and 20mA by default for the transducer. The Y1 and Y2 values must be configured properly to get correct reading. Take a reading when the output of the transducer is 4mA. That will be the value for Y1. Now take a reading when the output of the transducer is 20mA. That will be the value of Y2.

The values of X1 and Y1 may be modified. Just confirm Y1 and Y2 correspond to the "real world" readings for those transducer values.

### 2.9.9 Destination Network Address (DNA)

This channel will deliver data to this network address on a <u>continuous</u> basis, updating at the channel scan rate.  The DNA should not be confused with destinations (such as telephone numbers of personnel) to which alarm reports are to be delivered only under specific conditions.

| Advanced Channel Settings | ? ☒ |
|---|---|

Selected Mode :  Analog Mode ▾

Mode Specific Parameters

There are no parameters for the selected mode.

Clear Item

Accept

Close

Help

Value Scaling

Scaling Option :  No Scaling ▾

Destination Net Address (DNA)

Data Export (Optional)

Destination Net Address (DNA) :

### 2.9.10 Other Channel Settings Features

**Copy To** -- Copies current channel settings (excluding voice and text messages) to another channel or group of channels.

**Copy From** -- Copies channel settings (excluding voice and text messages) from any other configured channel to the currently selected channel.

**New Window** -- Enables you to configure or refer to the channel settings for multiple channels simultaneously.  This provides one additional means of copying settings from one channel to another via the Windows Clipboard.

**Clear Item** -- Restores the currently selected field to its factory default setting.

**Clear All** -- Restores all channel settings for this channel to their factory default settings, except Messages.

**Groups** -- Launches the Destination / Channel Groups dialog box.  This function allows channels or groups of channels to be grouped or linked with various destinations or groups of destinations, defining which destinations are to receive reports based upon alarms from which channels.

**Messages for this channel -**-- Launches the Messages dialog box and displays the text messages for the selected channel.

**PIO Configuration -**-- Launches the Physical Input Points configuration dialog. This button only appears when the channel SNA is configured for NET 0. The Physical Input configuration dialog is used to set the Physical Channel Data Type to either Analog or Discrete type inputs.

## 2.10 Copy To/Copy From

Alarmware™ has the capability of copying certain information from one group of settings to another group of settings. The copy to/from is available for channel settings and destination settings.  This is distinct from the separate "Copy" top menu selection item, which allows you to copy a wider set of RTU configurations.

*Note: Copy To/From is not available on S-model units.*

## 2.10.1 Copy To

This feature enables you to copy configuration data (*with the exception of message and text entries*) from the currently selected channel, destination, or group, to another channel, destination, or group.  You can also copy the current configuration to a range of channels, destinations, or groups.

In the following example, the configuration of Channel 1 is copied to Channels 2, 3, 5, 7, 8, 9, 10, 11, and 15.

**Copy to channels**                    `? X`

Copy Channel settings from
Channel:1 to Channel(s)

`2,3,5,7-11,15`

[ Copy ]    [ Cancel ]    [ Help ]
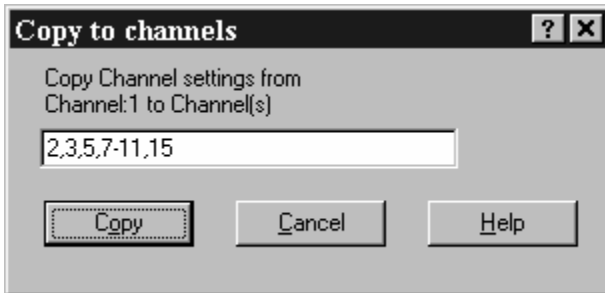
## 2.10.2 Copy From

This feature enables you to copy configuration data from any channel or destination, to the current channel or destination, *with the exception of messages and text entries*.

In this example, the configuration from Channel 55 is copied to Channel 1.

**Copy from channel**                    `? X`

Copy Channel settings to
Channel:1 from Channel

`55`

[ Copy ]    [ Cancel ]    [ Help ]
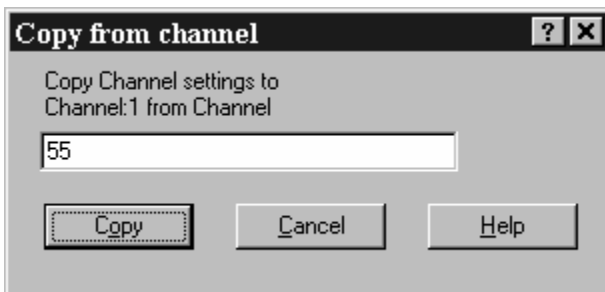
## 2.11 RTU Device Settings

### 2.11.1 Phone Configuration

To make changes to your Phone Configuration, either connect to or work off-line with the desired RTU. From the Configuration menu, select Devices. When the Device Settings dialog box appears, select the Phone Configuration tab (which should already be displayed by default):

```
Device Settings                                              ? X

    RTU Modem          |       Printer       |        Log File
  Phone Config  |  Physical Inputs  |  Modbus Port  |  Alarmware Port  |  Time/Date

  RTU Phone Number :      1-510-594-4236

   Call Progress Monitoring Enable :    ☑
                                                          Clear All
   Outgoing Call Answer Limit :      45      seconds

                                                          Clear Item
   Speaker Enable :     ☑

                                                          Help

  Country :       USA

  Dialing Mode :    Tone

  Ring Answer Delay :    1      rings

  After answering, wait a maximum of  60   seconds for the session to start

                                                          Close
```

### 2.11.1.1 Call Progress Monitoring

In the Catalyst RTU, Call Progress Monitoring (CPM) is used to make decisions about when to commence voice notification reports, or whether a call attempt has failed due to no answer, or the phone being busy. When enabled, the RTU will listen on the phone line for call progress tones from the phone company central office. These call progress tones include; dial tone, ringback, and busy signal. They inform the RTU of the progress of calls made to telephone destination. When set to OFF, the RTU will ignore those tones and deliver the report while waiting for operator actions.

### 2.11.1.2 Outgoing Call Answer Limit

If Call Progress Monitoring is enabled, this parameter will enable you to set the maximum number of seconds (not rings) the RTU will wait for any Destination to answer before abandoning that call attempt, and moving on to place the next appropriate call. In determining an appropriate setting for this parameter, it may be helpful to relate the Outgoing Call Answer Limit time to the number of rings that occur during that time. In North America, for example, phone systems use a ring cadence of 2 seconds ON (ring signal

asserted), followed by 2 seconds OFF (silence). Therefore, the duration for one ring cycle is 6 seconds. Thus, if the Outgoing Call Answer Limit is set to 30 seconds, 5 rings can occur during that time. If you want to allow the called party 5 rings in which to answer the call then a 30 second setting would be generally good.

Note, however, that you can never rely on the audible ringing signals commencing precisely when the phone system connects to the called line. (This is true for both the "ringing" phone being called and for the audible ringback signal heard at the calling phone.) Thus, dividing the Outgoing Call Answer Limit time by the ring cycle time (6 seconds in the above example) is only an approximate indication of the number of rings that will occur at the called phone.

### 2.11.1.3 Ring Answer Delay

This parameter represents the number of rings required, when calling the RTU, before the RTU will answer. A long ring delay may be configured if you wish to have the opportunity to answer a regular telephone on the same line, before the RTU would answer.

### 2.11.1.4 Speaker Enable

This function controls the state of the RTU's local speaker during remote voice sessions. If selected ON, both sides of a voice session between the RTU and a remote user will be heard through the speaker. If selected OFF, the RTU will be silent during remote voice session. The speaker is always ON when a Front Panel session is in progress, regardless of this parameter.  The default is ON

### 2.11.1.5 Dialing Mode

This parameter sets the dialing mode for the RTU. Most modern phone systems support DTMF (Dual Tone Multi-frequency) tones or touch-tones. However, on some systems pulse dialing mode may be required.

Options are — **Pulse, Tone.** Tone is the default mode.

*Note*: *Timing and encoding of both Pulse and Tone dialing are determined by the country specification.*

### 2.11.2 Physical Input Point Settings

Operators may configure channels to scan Physical Input points by setting the SNA or DNA appropriately. All physical IO resides on NET0. The default SNAs will always place physical IO at the lowest channel numbers.

By default, Physical Input Channels are configured as follows:

| Channel | SNA | Data Type | Raw Type |
|---------|------|-----------|----------|
| 1 | 0*1*1 | Boolean | DISCRETE |
| 2 | 0*1*2 | Boolean | DISCRETE |
| 3 | 0*1*3 | Boolean | DISCRETE |
| 4 | 0*1*4 | Boolean | DISCRETE |

To change the channel type, go to Device Settings dialog, Physical Inputs tab. You can then change the channel type from Discrete to Analog.
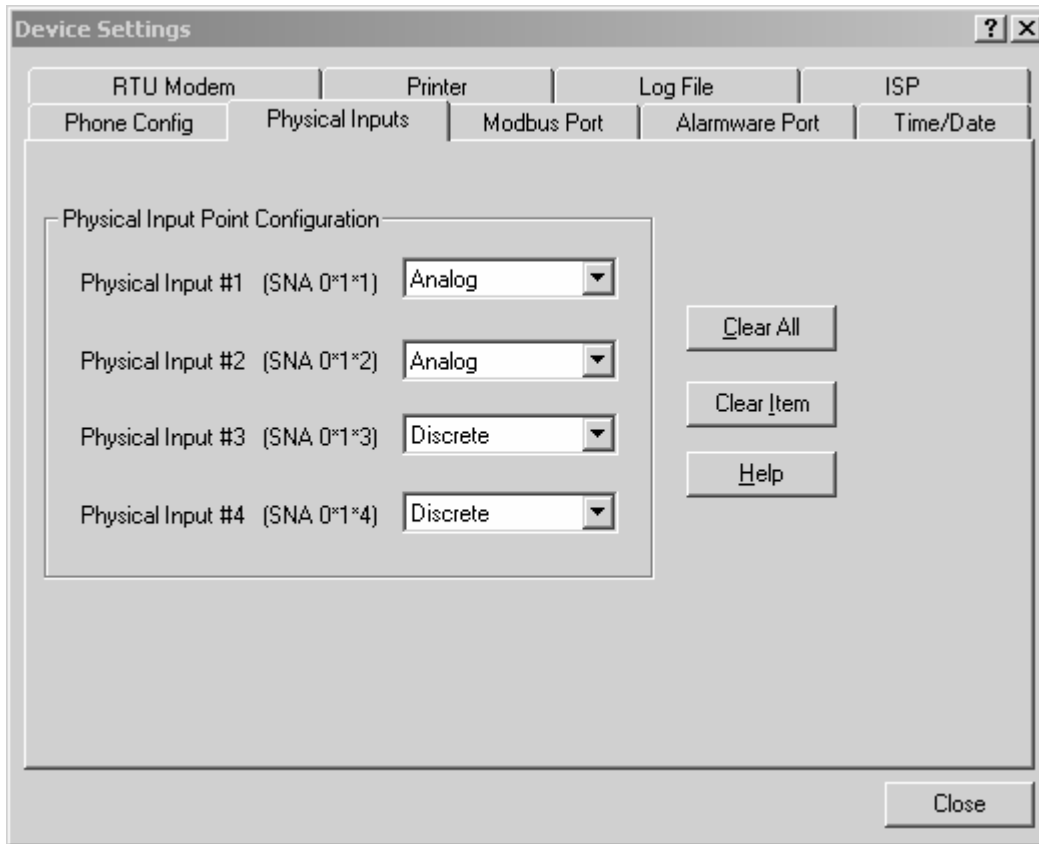


The physical inputs can be either Analog or Discrete. Changing the data type will reset all the channel settings of channels previously configured to monitor this particular physical input. A warning message will be given and logged whenever a change to the physical input point will impact channel configuration.

*Note: All configuration data for the changed channel type will be reset to default.*

*S-Model Notes: The S-model constraints regarding channel type groupings imply that the first physical analog IO point will appear at channel 33.In the tabbed dialog box labeled "Device Settings" select the Physical Inputs tab:*

## 2.11.3 MODBUS Port Settings

To make changes to your Industrial Network configuration, either connect to or work off-line with the desired RTU. Select Devices from the Configuration menu.

In the tabbed dialog box labeled "Device Settings" select the MODBUS Port tab:

**Baud Rate** – The default is 9600.

**Parity** – The default for Net 1 is Even. It is possible to configure the Modbus Port **Stop Bits** independently of the parity.

**Node Address** -- The default Node Address used by the RTU for Modbus protocol is 1.

**Communications Alarm Delay** – The Communication Alarm Trip Delay Timer determines the length of time a network channel must continuously detect a communications failure before tripping a communication failure alarm. Default is 200.0 seconds.  A suitable value is generally about twice the network scan time.  Scan time is strongly dependent upon the total number of active channels being scanned.  You can read this network scan time while online with the RTU by selecting the Diagnostics menu item and checking only the box "Net Diagnostics Summary Report".  Scroll to the area of the report on Net 1, and read the scan time.

**Application Timer** – This is the length of time the RTU will wait for another node to respond to any command. Default is 0.2 seconds.

**Transmit Delay** -- Polls for each channel on the network will be spaced at least this many seconds apart. This is useful for preventing the RTU from causing network congestion. The transmit delay parameter specifies the possible delay which can be interposed between the end of one transaction and the start of the next transaction (by the RTU). Default is 0.0 seconds.

**CTS always ON** – When checked, the RS232 CTS signal is continuously asserted whenever the Modbus scan is active. This setting is required for PLCs that us the CTS line parasitically. If the checkbox is not checked, then CTS is asserted only when the Catalyst is actually transmitting the packet. This is required for RS485 handshaking and is the default setting. Most RS232 connection s to most PLCs don't care about this setting.

Note: The Modbus port now drives CTS and RTS signals, per the RS485 handshaking specification. The comport type is still RS232, but the port can also interface to external RS485 line drivers.

## 2.11.4 Printer Settings

To make changes to Printer network configuration, connect or work off-line with the desired RTU. Select Devices from the Configuration menu.
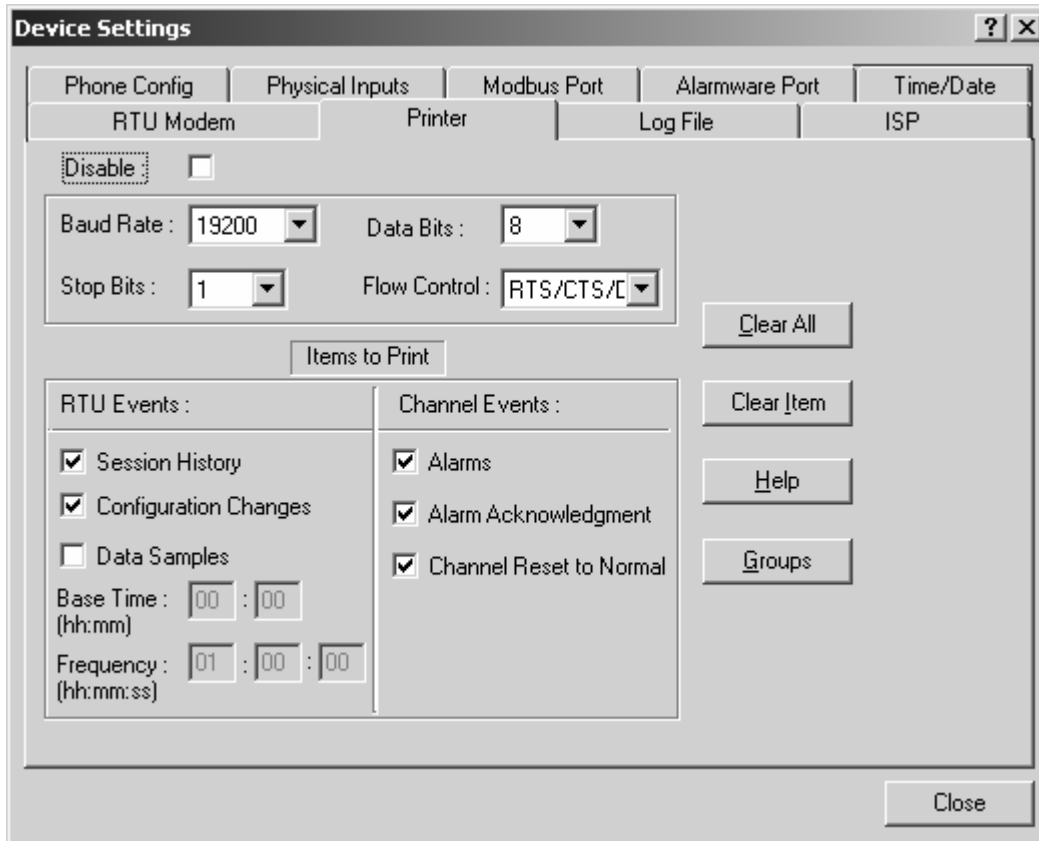


In the tabbed dialog box labeled "Device Settings" select the Printer tab:

To enable the printer, deselect the disable checkbox.

- **Baud Rate** -- Default is 19200 baud.
- **Data Bits** -- Default is 8.
- **Stop Bits** -- Default is 1.

### Items to Print

**RTU Events:**
- **Session History**: prints all session related messages e.g. call-in or call-out sessions
- **Configuration Changes**: prints all changes made to the Catalyst configuration
- **Data Samples**: prints a snapshot of all active channels at the specified frequency. The minimum data-sampling interval is 10 seconds.

**Channel Events:**
- **Alarms**: prints messages of channels in alarm state
- **Alarm Acknowledgment**: prints messages of channels when alarms are acknowledged
- **Channel Reset to Normal**: prints the messages of channels that transition from acknowledged state back to Normal state.

## 2.11.4.1 Printer Flow Control

This function controls the Printer Flow Control for the specified network. This item applies only when the serial device has a flat ASCII protocol (TTY or Printer) configured. This parameter is only configurable from within Alarmware™.

- Sufficiently long flow control will eventually cause data loss when the internal queues fill up with unprocessed requests. This occurrence is not logged.
- RTS/CTS/DTR is the default and recommended method.
- Trouble-shooting: If you fail to see any printer output:
    1. Set method to NONE
    2. Press Normal key. If you see output, you have a cabling problem

### XON/XOFF
- XON character has hex value 0x11, "control-Q," ASCII DC1 character
- XOFF character has hex value 0x13, "control-S," ASCII DC3 character
- It is not possible to reconfigure the XON/XOFF characters
- If an XON is not received within 5 minutes after receiving the XOFF, the port will automatically resume transmission. This prevents permanent freezing of the port should the XON byte be corrupted. It also implies data will be lost if the printer is offline for more than 5 minutes. The RTS/CTS/DTR control method avoids these problems.

### RTS/CTS/DTR
- RACO's VSER-01 cable will work with the KX-P1180 printer.
- Printer is considered DTE and the RTU are considered DCE.
- The cable used must have the following properties and the connected printer must be configured consistently (as shown below)
    - RJ45 pin 8 -- RXD (from printer to RTU)
    - RJ45 pin 7 -- DTR/CTS (from printer to RTU).  +12v enables TXD, -12v disables TXD.
    - RJ45 pin 6 -- TXD (from RTU to printer)
    - RJ45 pin 5 -- RTS (from RTU to printer)  +12v when RTU's printer port is enabled
    - RJ45 pin 1 -- signal ground

**NONE**

- Unit does no flow control and the receiving device (printer) is responsible for being able to accept the continuous flow of characters at the serial device's data rate.

## 2.11.4.2 Panasonic KX-P1180 Printer

This is RACO's standard offering for an off-the-shelf data-logging printer. The default settings for the printer port, the jumper settings for the KX-PS13 card, and VSER-01 cable are all required for "out-of-the-box" operations.

**The jumper settings for the KX-PS13 interface card:**

| Switch | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|
| SW1 | Off | off | off | off | off | off | on | On |
| SW2 | off | on | off | on | off | off | on | Off |

The KX-P11D card does not support DTR flow control and has a small buffer (but switch settings are identical).

## 2.11.5 Alarmware Port

To make changes to the Alarmware™ Port settings (the network used to establish serial port connection with a computer running Alarmware™ locally at the RTU) either connect or work off-line with desired RTU. Select Devices from the Configuration menu. In the tabbed dialog box labeled "Device Settings" select the Alarmware Port tab:
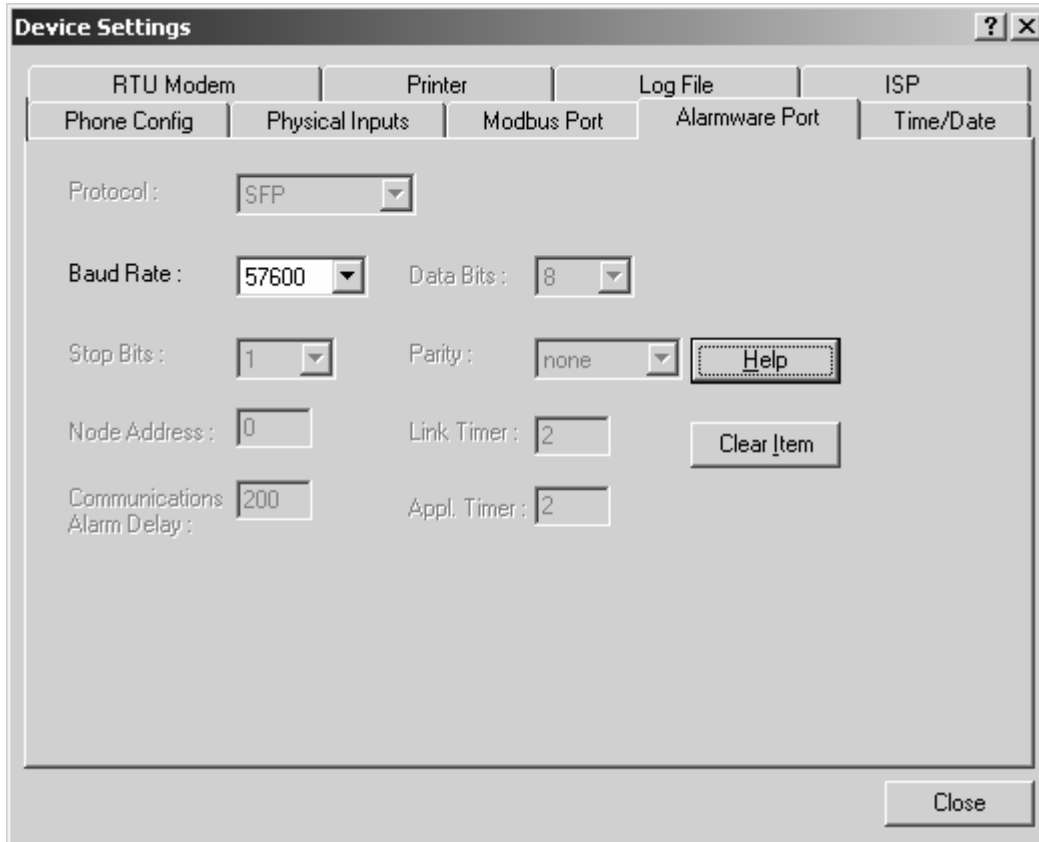


**Baud Rate** -- Select desired Baud Rate from list. The Baud Rate value must match the Baud Rate configured for the COM port used by the Alarmware Host computer.
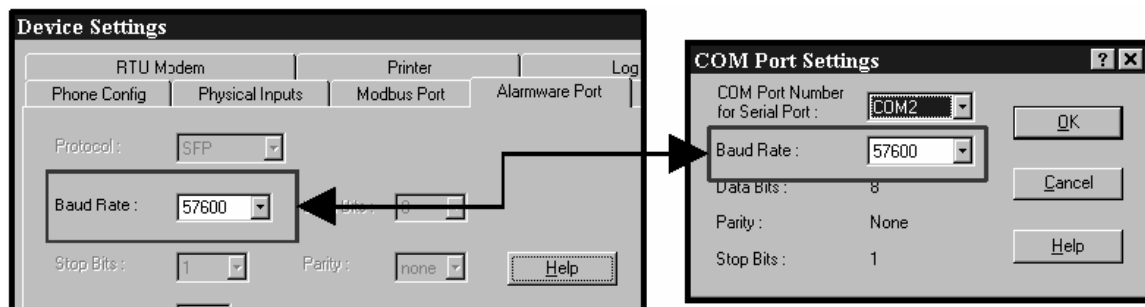


## 2.11.6 Log File

To set up the Catalyst Log File, select Devices from the Configuration menu. This will launch the Device Settings dialog box.

Select the Log File tab:
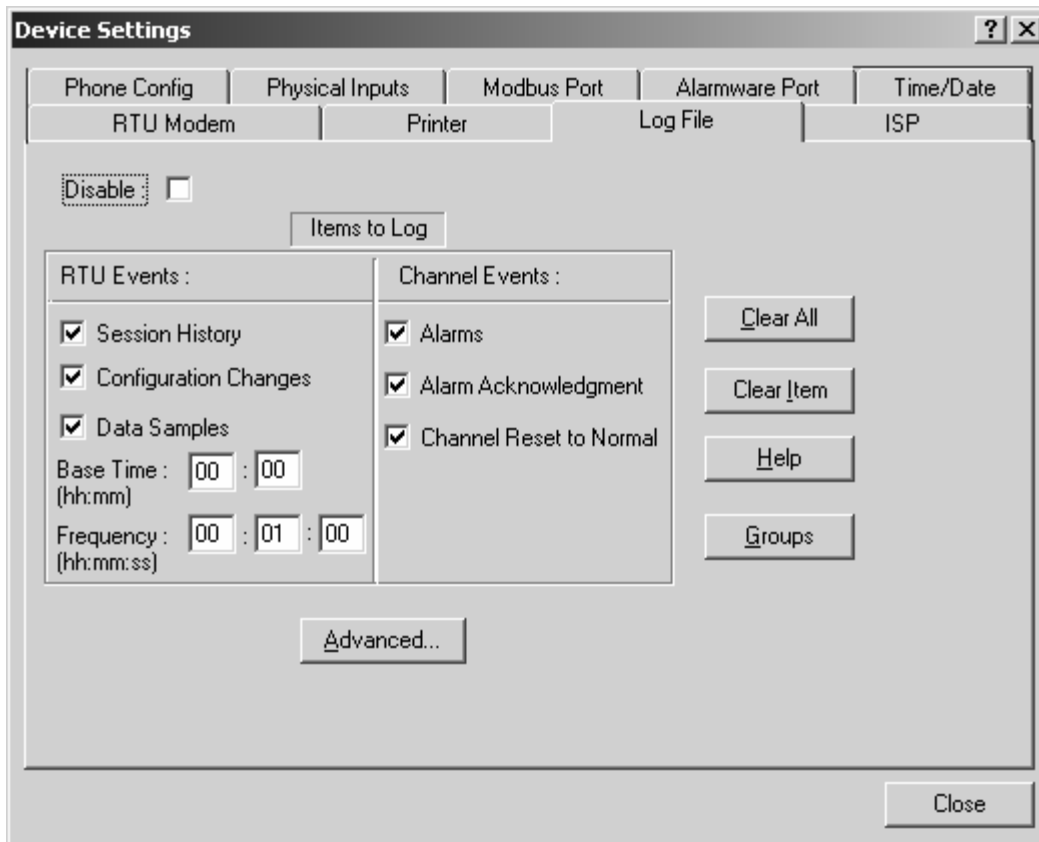


When the device Log File is enabled, memory space is reserved to store RTU events and Channel State transitions. The amount of space reserved is determined by the Log File Size parameter. With the Log File device, you can select any combination of the following "items to be included" in the Log File:

**Items to Log**

**RTU Events:**

- Session History: logs all session-related messages, incoming and outgoing calls, etc.
- Configuration Changes: logs all changes made to the Catalyst configuration.
- Data Samples: logs a snapshot of all active channels at the specified base time and frequency. The minimum data sampling frequency is 10 seconds.

**Channel Events:**

- Alarms: logs messages of channels in alarm state.
- Alarm Acknowledgment: logs messages of channels when alarms are acknowledged.
- Channel Reset to Normal: logs the messages of the channels that transition from an acknowledged state back to a normal.

## 2.11.6.1 Log File Advanced Settings

The Log File advanced settings are available to operators to allow greater flexibility in handling the Catalyst's Log File. You can control how much storage space (memory) is available for the Log File. You can also control what to do with the Log File data when the allocated space becomes filled.
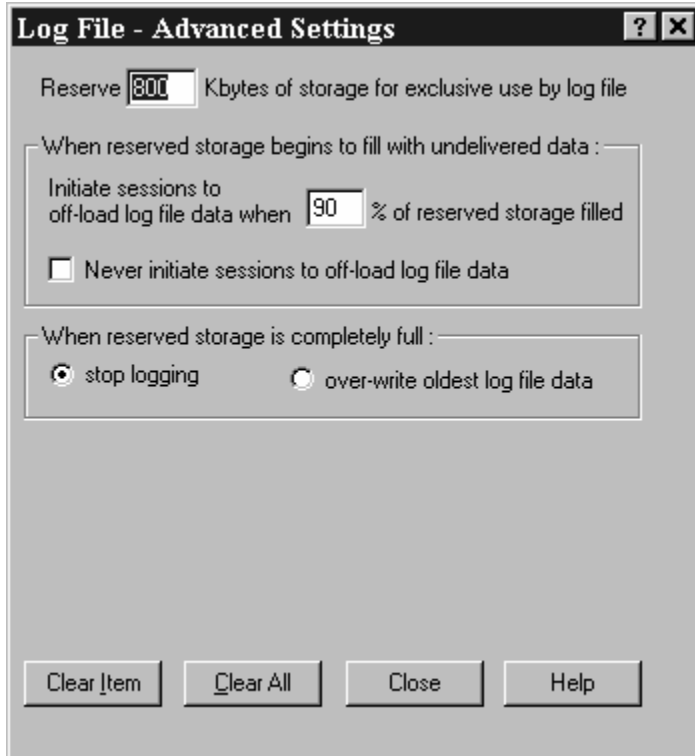


**Log File Reserve Size**: This parameter determines how much NVRAM is reserved for the Log File. By default, the amount of storage space reserved is 256 Kbytes. This parameter can be set to zero if a Log File is not needed. Note: The memory configuration for Alarmware and the Catalyst must always be synchronized. Therefore this value cannot be altered while working offline.

**Log File Reserve Size Considerations:** This setting determines how much flash memory is to be reserved for storage of Log File data.  This allocation is then subtracted from the memory otherwise available for user recorded voice messages.

**Factors to consider in setting this parameter are:**

1)   The number and type of channels being sampled (if any)
2)   The corresponding Data Sampling Interval
3)   How frequently the sampled data is delivered to another location
4)   How much concern there is regarding available speech recording time

Typically, Data Sampling (if configured by selection in the Log File or Printer device dialog box in Alarmware) will require far more File storage than will other selectable categories of data logging such as Alarms, or Configuration Changes.

The Catalyst can automatically call destinations when the file fills to the configured "high water" mark percentage of fullness.  RACO recommends that Log File delivery be scheduled in each appropriate

destination configuration. Use the high-water delivery capability only as a fail-safe against unexpected increases in the Log File size.

Any **fully delivered** Log File segment can be automatically deleted at any time. These Log File segments are preserved as long as possible. The treatment of <u>undelivered segments</u> is determined by the "when reserved storage is completely full" parameter. When no destinations exist for Log File downloads, or when overwrites of undelivered data are enabled, every segment is considered as fully delivered.

It is illegal to set the Log File reserve to a value that will leave less than 1K of memory available for speech and database files. Operator must manually free up memory space.

The maximum size for Log File reserve depends on NVRAM usage at the time.

"**High-water" mark**: This parameter is a percentage of the Log File Size. As the storage space becomes filled with Log File data, the Catalyst will monitor how much memory is being used. When the set percentage threshold is reached, the Catalyst will attempt to off-load the data to destinations configured for Log File reports. There must be at least one RDT or FAX destination configured for this parameter to be in effect.

The default percentage is 90%. If it is decided that you never want the Catalyst to "off-load" the Log File data, check the "never initiate session to off-load Log File data" checkbox.

## IMPORTANT NOTE:

High-Water sessions are always "undelivered data only," regardless of the configured range setting.

The destination selected for the first High-Water download will be the destination with the most undelivered data. High-Water downloads will continue until the combined total of all undelivered data to all eligible destinations fall below the High-Water mark.

**When storage is completely full**: This option allows you to control how Log File data is treated when all reserved space is in use. You can choose to either stop logging any data, or to over-write the oldest data. Before determining how to use this setting, you should consider what data would be the most important in keeping for future reference. If you stop logging, the old data is preserved and the new data is lost. Otherwise old data is lost and new data is captured.

**Storage capacity can become filled when:**

1) RTU is unable to deliver data to some destination configured for Log File reports.
2) The Log File reserve is too small for the configured data sampling rate and grouping.

## 2.11.6.2 Log File Advanced Concepts

**Below are a few advanced concepts that will help you understand how the Log File is managed:**

❖ Disabling the Log File will not delete its contents.
❖ Log Files are confined to the Log File reserve space.
❖ Any fully delivered Log File segment can be automatically deleted at any time. These segments are preserved as long as possible.
❖ The treatment of undelivered Log File segments is determined by the "when reserved storage is completely full" parameter.

❖ When no destinations exist for Log File downloads, or when overwrites of undelivered data are enabled, every segment is considered as fully delivered.

❖ You can not set the Log File reserve space to a value that will leave less than 1K bytes of memory available for speech-database files. Operator must manually free up some extra memory space.

❖ You cannot set the Log File reserve to a value smaller than that currently occupied by the existing Log File data. The "when reserved storage is completely full" parameter controls what happens to the existing data. The operator may need to clear out the Log Files to regain space for speech and/or database.

❖ The maximum size for Log File reserve depends on NVRAM usage at the time.

❖ The Log File reserve parameter is read-only while working OFFLINE.

❖ Any Log File segment skipped (because of filtering parameters) during any successful reporting session will be marked as delivered to that destination. For example, suppose you have Log File segments going back to yesterday and now deliver a report containing only data from the last hour. All segments from yesterday will be marked as delivered to that destination, even though they actually were skipped.

❖ Altering channels or destination messages will cause Log File data from before the change to appear incorrect-- messages only, data values not impacted.

❖ Newly disabled channels will not get rendered, even if not disabled at the time the data sampling occurred.

## 2.11.6.3 Log File LED

The LED on the lower right hand corner or the front panel display is labeled LogFile. The LED is ON when the Log File has been enabled and OFF when the Log File is disabled. The LED will blink slowly when the Log File reserve is completely full and log data is being lost. The LED will stop blinking when space becomes available.



Log File LED
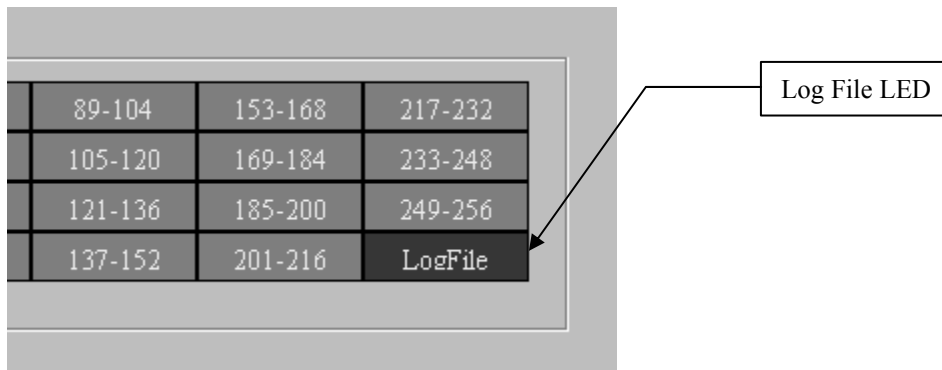
## 2.11.6.4 Example of Calculating Log File Reserve Size Requirements

▪ With 256 channels being sampled every fifteen minutes, and with downloads every 24 hours.

▪ Each channel sample requires 12 bytes regardless of its data type.

▪ 256 active channels x (24 hrs x 4 samples/hr) x 12 bytes/sample = 294,912 bytes required for 24 hours of logging.

▪ Assuming the high water level percentage is set at 95%, a comfortable allowance might be to let the above amount of data represent 90% of the reserve size. Therefore the reserve size should be 245,760 divided by 0.9 = 327,680 bytes.

The above calculation disregards the amount of "overhead" storage required for each sample interval (typically 32 bytes) as well as the possible logging of alarms, configuration changes, and channel state changes, which occur and can be excluded.

*Note: Use the Catalyst Memory Allocation tool provided with your Catalyst software package in order to determine the recommended reserve size.*

If data sampling is not being used, or if it is being used with substantially fewer channels or longer sampling intervals, then the contributions of the other event categories may no longer be negligible, and in general will be unpredictable.  However in that case, one can still allocate substantially more storage space than calculations indicate, since even 256 Kbytes does not have a major impact upon the much larger amount of storage still available for user recorded speech.

**The specific impact of Log File reserve size upon available speech recording time is to decrease recording time by the following amounts:**

- At 1800 bytes/second recording rate:  0.0092 x reserve size in Kbytes
- At 3600 bytes/second recording rate: 0.0046 x reserve size in Kbytes

**Example:**

For a recording rate setting of 1800 and a Log File Reserve size of 256 Kbytes, the reduction is 256 x .0092, or 2.36 minutes.

## 2.11.7 Time/Date Clock Settings

To make changes to your Time/Date Clock configuration, select Devices from the Configuration menu. This will launch the Device Settings dialog box.

Select the Time/Date Clock tab:



**Date** – Reflects the date properties of your Windows operating system (read-only).
**Time** – Reflects the time properties of your Windows operating system (read-only).
**Daylight Savings** – Automatically turns the Catalyst's Daylight Savings Time On of Off on the proper date.
**Synchronize with Local Time** – If enabled, the RTU will be updated with the computer's current local time when connecting with Alarmware™. This option can only be set with Alarmware™.
**Time/Date Report Format** -- Determines the desired time and date format that will be included in all reports:

- Wed Feb 20, 2002 10:28:52
- 20-Feb-02 10:28:52
- 02/20/2002 10:28:52
- 20/02/2002 10:28:52
- 02/20/02 10:28:52 (used for all comma-delimited formats)
- 20/02/02 10:28:52

## 2.11.8 RTU Modem Settings

To change settings for the Catalyst's Modem (*not* the modem for the computer running Alarmware™), either connect to, or work offline with, the desired RTU. Select Devices from the Configuration menu.

In the tabbed "Device Settings" dialog box select the "RTU Modem" tab:
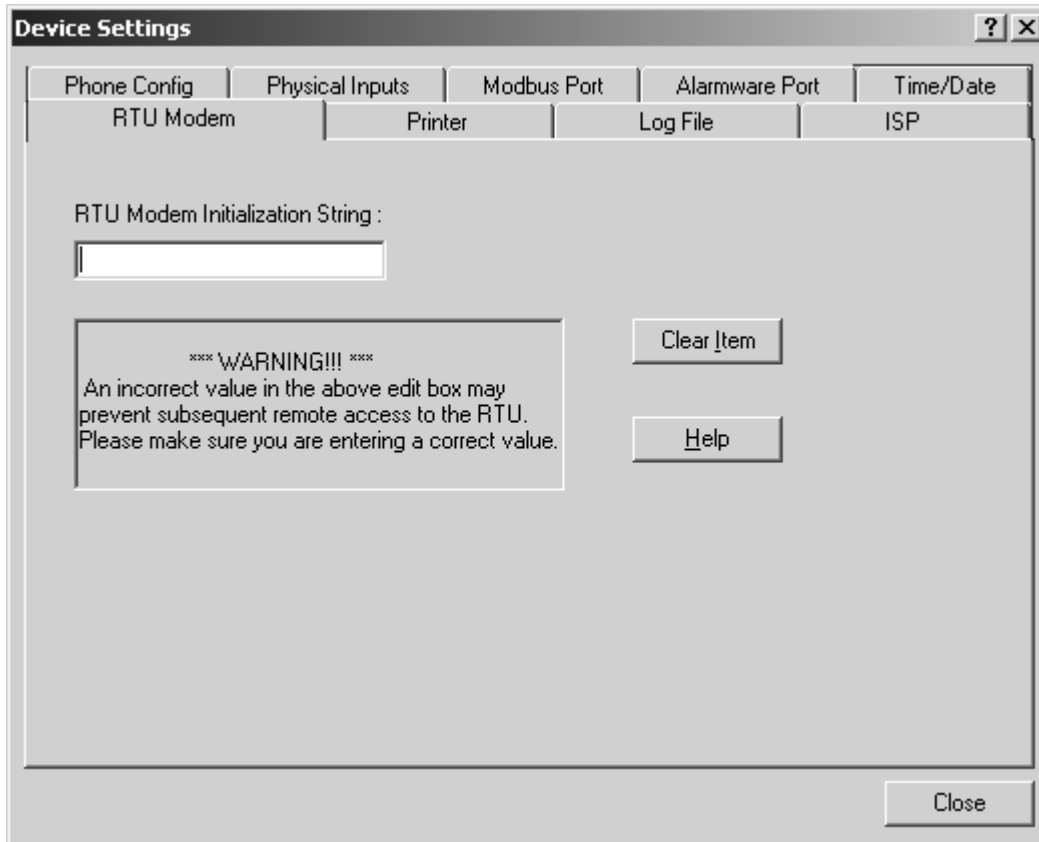


**WARNING - An incorrect value entered for the RTU Modem Initialization String may disrupt access to the RTU. Please make certain you are entering a valid RTU Modem Initialization String.**

The RTU Modem Initialization String field is used to tailor the performance of the RTU modem for special data communication situations. AT command set values may be entered into the initialization string. However, it is advised that you do not enter AT commands unless you thoroughly understand the impact of AT commands, or you have consulted with the RACO Customer Service Department.

The RTU re-initializes its internal modem at various times, such as whenever it needs to make outgoing calls or when it begins making voice reports. It is during re-initialization that the RTU Modem Initialization String is sent to the RTU modem.

## 2.11.8.1 Useful Modem AT Commands

AT commands are used to configure some of the modem's operating parameters and to initiate and terminate communication. These instructions can be issued from the modem initialization string.
*   M0 is used to turn off the modem speaker, M1 to turn it back on

- X0 may be used to disable busy tone detection.
- S0=r is used to set the modem to auto-answer in "r" number of rings
- Ln sets the speaker volume

*Note*: *Changes made to modem settings will not take effect until the next RTU or Alarmware™ session.*

## 2.11.9 Internet Service Provider Settings

To configure settings for your internet service provider (ISP), either connect to, or work offline with, the desired RTU. Select Devices from the Configuration menu.

In the tabbed "Device Settings" dialog box select the "ISP" tab:



**Phone Number** – This is the local access number for your internet service provider. This is the phone number the Catalyst will call when sending a report to an email recipient.

**Account Name** – This is the name that is provided by your ISP as your account name. Enter the information exactly as specified by your ISP.

**Account Password** – Click on the "Change Password" button to enter or change your ISP password. The "ISP Password" dialog will appear.

**ISP Password**                                    ? X

Enter new password* :     [                    ]

                 *Password is case-sensitive
                 (i.e) A-Z, a-z are not same.

    [ OK ]            [ Cancel ]            [ Help ]
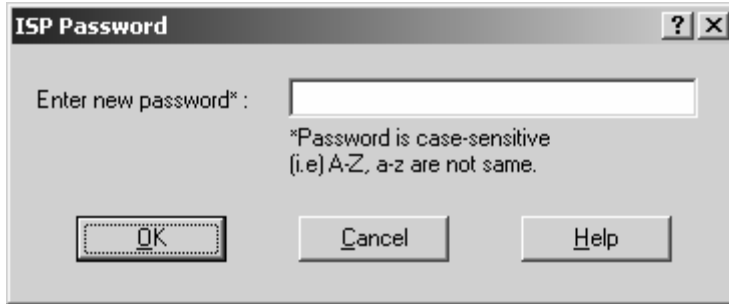
Enter the password required by your Internet Service Provider and click OK. *Note: most all passwords are "case-sensitive."*

**Outbound Mail Server** – This information will be provided by your ISP. This is the location of the mail server for your ISP and is where the Catalyst's outgoing mail will be directed.

## 2.12 Destination Settings -- General

The Destination Settings dialog box is accessed from the Configuration menu. The Configuration menu is available when connected to the RTU or when working off-line. The destination type determines the tabs and parameters available to the operator. To configure a destination, you must first select a destination type. To remove a destination from service, select "not in use."



### 2.12.1 Destination Number

Each Destination is assigned an ordinal number by which it is known. Enter the number of the Destination you wish to configure in the designated field. Your choices for destination number have a functional importance, in that when a single channel goes into Unacknowledged Alarm state, it will issue reports to the available destinations to which it is linked, in priority based upon lowest ordinal Destination number first. Exception: *power failure alarms will result in calling all voice mode (personnel) phone number destinations, with priority based upon lowest Destination number first.* In the special situation where there are two or more channels in Unacknowledged Alarms state simultaneously, alarm reports will be issued in

priority either according to lowest ordinal Destination number, or else according to lowest ordinal channel number, depending upon which mode is selected in the Session Parameters dialog box.

## 2.12.2 Destination Types

From the list of connection types, select the type of connection the RTU will make when calling the specified Destination.  *Note: changing destination types will re-enable all channel links.*

### 2.12.2.1 Telephone

The RTU will call this **telephone** number to deliver a voice alarm report.

### 2.12.2.2 Numeric/Beeping Pagers

It has become fairly common to have the RTU call a numeric pager system with an alarm call. The RTU is well equipped to handle many of the current numeric pager protocols.  Notification and Status Reports may be delivered to numeric paging destinations.

A report consists of a callback phone number, followed by *N, where N is the current number of unacknowledged alarms in the destination's group. *Exception: when the callback string is Null, *N will be skipped.* The callback phone number string may be set using Alarmware. The total number of characters allowed in a report is 30 characters. This is the display limit of most popular devices. If the pager cannot display 30 characters, a shorter callback phone number string may be configured.. Otherwise, the service provider or pager will truncate the report.

The RTU phone number provides the default data for the pager callback string. Changing the RTU phone number will therefore immediately change the callback string for all destinations using the default.

There are a few cases where there are potential conflicts with no warning given:
- The RTU phone number string may have incompatible characters. These characters are removed in the callback control and upon report delivery.
- The RTU phone number string may be greater than 26 digits. No warning is given. The string is truncated at 26 digits.
- The RTU phone number string may be null. No warning given. Callback control is also blank. The *N portion of the report is omitted.

Beeping Pagers can not display any sort of report.

### 2.12.2.3 Alphanumeric Pagers

Catalyst will operate with any pager terminal having:
- Service provider offering a dial-up access number supporting TAP protocol.
- Display area of at least 120 characters

*Note: RACO recommends that you configure other non-pager phone numbers at the appropriate place in the dialing list. This is to insure that if for some reason the pager system cannot be activated, you will still get a timely warning from your RTU.*

Notification and Status Reports may be delivered to alphanumeric paging destinations.  The destination is considered *contacted* when the first transaction is confirmed by TAP protocol. A given channel is considered *reported* when the block containing its status message is confirmed.

Report length is an important consideration. Features are specified that control the length of reports, their fragmentation, and truncation:

**Report Formatting** -- alphanumeric pager reports are formatted as flat text, with no graphics, and no terminal-specific format control characters. The only non-printing ASCII control characters used within the report are "carriage-return" and "line feed." No attempt is made to control or optimize line wrapping or layout based upon terminal display dimensions.

**Report Contents** -- alphanumeric pager reports consist of a header followed by individual status messages describing the RTU state. The order and content of these messages is identical with that used in other voice and text reports. Exception: the preliminary report items, consisting of PFAIL, TFAIL, etc. are contained only in the report header.

**Status Messages** -- alphanumeric pager status messages use text identical to those messages used by the printer, logfile, and fax reports.

**Report Blocks** -- an alphanumeric pager report is split up into blocks, the size of each block is limited by the "*message length limit*" that applies to the particular destination terminal. The parameter is referred to as the "*pager terminal message block size*" or "*block size*" for short. A "block" is a single TAP transaction and same as "message" in most pager documentation. Block sizes available: 80, 120, 160, 240, 500, 1000, 32000.

**Report Structure** -- The pagers shown below demonstrate the structure of the alphanumeric pager report blocks:

**Block 1: Report Begins:**
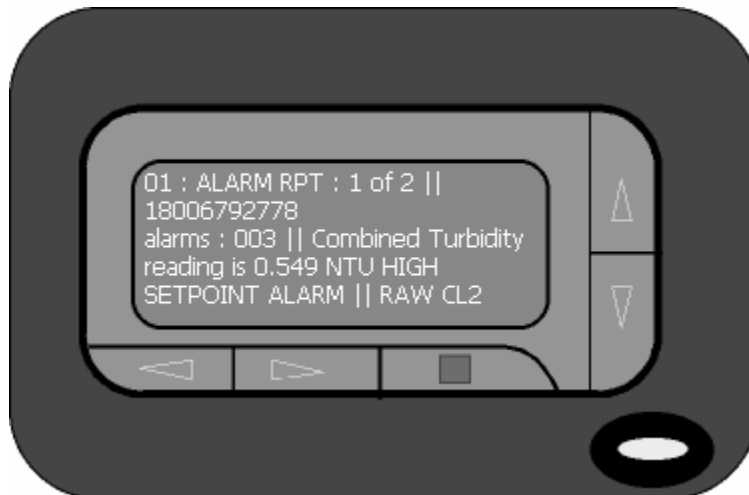
**Continuation Block 2: Report is completed:**



**Block Header** -- Each block begins with a single line of text describing the report type, sequence number of the current block and total number of blocks within the report. The report type is one of the following words: AUTOTEST, CALLBACK, STATUS, ALARM, and ACKNOWLEGMENT. The size of the block header is always less than 20 bytes.

*Note: The actual report length can change due to new alarms that trip or other state changes after the report begins. If that happens, a "+" is appended to the block header.*

**Example:**
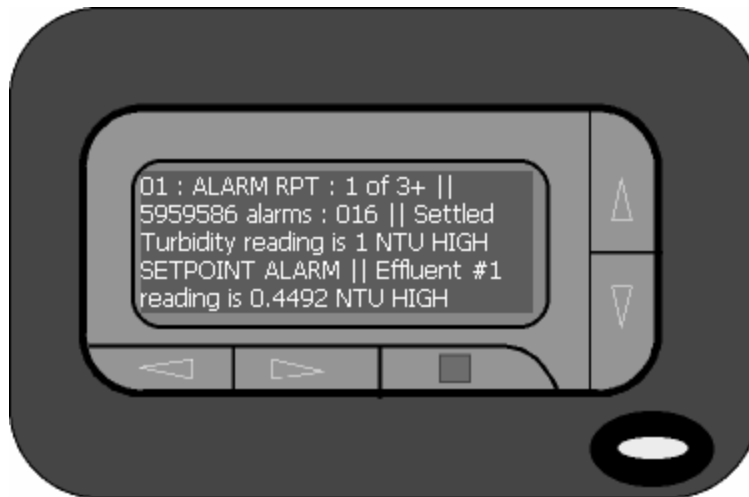
**Report Header** -- The first block of every report contains the *report header*. This header is presented after the "block header" but before any *status messages*. Minimum length is 8 bytes, maximum length is 70 bytes and typical length is ~45 bytes. It contains the fields below, in the listed order, arranged on 2 lines:

| Field | Description |
|---|---|
| Call Back String | **Line 1:**<br>Configured callback string for this destination.<br>▪ Can be null<br>▪ May contain text<br>▪ 30 characters maximum<br>▪ Default is the RTU Phone Number |
| Alarms:### | **Line 2:**<br>The Number of unacknowledged alarms in destination group. |
| PFAIL | Included only if AC power is OFF at the time of the report. |
| LOBAT | Included only if battery is charging at the time of the report. |
| TFAIL | Included only if phone failure is unacknowledged at report time. |

**Text Messages** -- All status messages use text identical with that employed by the printer, Log File, and fax reports, In other words, this specification avoids the need for operators to configure channel, tag, destination, or device messages specifically for use only by alpha paging destinations.

Alarmware prevents the insertion of any non-printing ASCII character within any text message string.

**Message Truncation and Report Fragmentation** -- Some applications may have long text messages configured. In these cases, truncation is inevitable when delivered to alphanumeric pager terminals. To reduce the possibility of truncation, the block size and block limit is configurable for each destination.. The *block size* allows the Catalyst to partition the report into truncation-free blocks. The *block limit* allows a report to fit within the pager memory and therefore avoid overflow.

As the report is being generated, the software will check to determine that an entire channel *status message* will fit within the current block. If it will not, then the block will end and a new block begins with that status message. If the status message started at the beginning of a block but still won't fit, it is truncated. The next block begins with the next status message.

When a report must be ended prematurely because the blocks size limit has been reached, an ellipsis (…) will be displayed as the last 3 characters of text.

**Example**:

When truncation occurs, you can choose to:
- Reduce the length of the offending text message for all destination types
- Accept the truncation
- Purchase a pager terminal with a larger block size
- Configure duplicate channels that use abbreviated messages, then link only those duplicates to the pager terminal destinations

**Pager Sessions --** A pager session consists of the Catalyst dialing the pager service provider access number and delivering as many blocks as required or limited using TAP protocol transactions. It is assumed that any transaction confirmed by the TAP provider will get delivered to the terminal destination. The session result and any error diagnostics provided by the service provider will be logged.

Alphanumeric pagers work exactly the same as any other destination regarding the notification sequence and the configuration options that apply. Alphanumeric pagers are considered contacted whenever TAP accepts a transaction. A particular channel is considered reported when TAP confirms the transaction containing that status message.

If the session only succeeds in delivering a portion of the report, the block headers will provide the evidence that the report was incomplete. Based on the options configured, the next session may generate a new report whose contents may either include or exclude channels already reported.

**Alphanumeric Pager Settings**

From the Destination Settings dialog, select the "General" tab. Select "Alphanumeric Pager" from the group of destination types:

**Alphanumeric Pager Advanced Settings**

When an Alphanumeric Pager is selected as the destination type, there are additional features available under the Advanced Tab:

```
┌─────────────────────────────────────────────────────────────┐
│ Destination Settings                                ? │ X │ │
├─────────────────────────────────────────────────────────────┤
│ ┌General┐ Notification Reports │ Status Reports │ Log File    │
│          Reports │ Advanced                                   │
│                                                               │
│  Destination :    16  ▲▼                                      │
│                                                               │
│  ┌─────────────────────────────────┐   ┌─────────────┐       │
│  │ Protocol :        Device :      │   │  Request    │       │
│  │ [TAP        ▼]    [Modem    ▼]  │   │  Test Report│       │
│  │ Language :        Report Format:│   │  Call Back  │       │
│  │ [English  ▼]      [Alpha Paging▼]│  └─────────────┘       │
│  └─────────────────────────────────┘   ┌─────────────┐       │
│                                         │  Clear Item │       │
│  ┌─────────────────────────────────┐   └─────────────┘       │
│  │ Call Back String : 5959586      │                         │
│  │  ┌──────────────────────────┐   │   ┌─────────────┐       │
│  │  │ Use RTU Phone Number     │   │   │  Clear All  │       │
│  │  └──────────────────────────┘   │   └─────────────┘       │
│  └─────────────────────────────────┘                         │
│                                         ┌─────────────┐       │
│  ┌─────────────────────────────────┐   │    Help     │       │
│  │ Pager Terminal Block Size: [120▼]│  └─────────────┘       │
│  │                     max chars     │                       │
│  │                     per block     │                       │
│  │ Max blocks per report : [3 ▼] blocks│                     │
│  │ CR/LF Translation :     [‖    ]   │                       │
│  │ Pager Password :    [          ]  │                       │
│  └─────────────────────────────────┘                         │
│                                                               │
│  ☐ Exclude tagwords in any channel status message to this     │
│    destination                                                │
│                                                               │
│                                        ┌─────────┐            │
│                                        │  Close  │            │
│                                        └─────────┘            │
└─────────────────────────────────────────────────────────────┘
```

**Request Test Report Callback** -- When button pressed, the RTU will conduct a call back session (sending status report) to the pager using all parameters as currently configured.  That session will begin as soon as the needed device is available and the RTU is not in program mode.

**Call Back String** -- This is the string that will be included in the report indicating the phone number of the RTU. Alpha pagers have a 30 char limit and any printable ASCII is allowed.

**Pager Terminal Block Size** -- Controls the fragmentation of reports into blocks.  Block Range is 120-32000, and the default is 120. Lowering this block value can introduce message truncation.  To determine if there is any truncation of messages, spin through the channel status dialog to verify no warnings are triggered. This value should never be larger than the terminals "message size."

**Report Block Limit** -- Controls the total length of any report.

**Pager Identification Number** -- This number is used during a TAP session to indicate the target terminal with the service provider.

**Pager Password** -- Used during TAP session as required.

**CR/LF Translation** -- Provides way to control line layout for a specific terminal.  Specify up to 5 characters to be substituted for all CR/LF character in any reports (Up to 5 ASCII bytes, printable or non-printable characters.  Certain service providers may have problems with non-printable characters). Null string will preserve CR/LF in TAP session.

**Exclude tagwords in any channel status message to this destination** -- Provides way to prevent all tagwords from appearing in any channel status message reported to this destination.  Helps reduce overall report byte count. The PIN name will also be excluded.

## Alpha Pager Compatibility

The Catalyst RTU supports the following alpha pager terminals:
- Motorola FLEX
- Motorola Advisor Elite
- Motorola Advisor FLX
- Motorola Advisor Pro
- Motorola Talkabout

And the following Service Providers:
- Arch
- Metrocall
- Verizon
- Skytel

It is likely that most other terminals and service providers are fully compatible.  Currently the only known compatibility problems are:
1. Service providers that can not connect at 1200 baud.
2. Cell-phone paging terminals that don't have a TAP access service number.

## 2.12.2.4 Fax Machine

One of the destination types available is the Fax Machine. When fax machine is selected, the Catalyst can deliver notification, status, and Log File reports to whatever phone number has been entered. Status and Log File reports are generally scheduled events, while notification reports occur when an alarm condition exists.

**Fax Machine Advanced Settings**

When a Fax Machine is selected as the destination type, there are additional features available under the Advanced Tab:



**Preferred Report Image Resolution**: Alarmware allows you to determine the printed resolution of fax reports. The Fine setting will produce better quality on the printed page, but will also require twice a long to transmit the information. You may find it more economical and timesaving to leave the setting at the Standard resolution.

**Include Cover Page**: When selected, the fax report will include a cover page that includes; Channel Status Summary Counts, Cumulative Statistics, and Power Status.

**Maximum number of pages per report**: This feature is designed to allow the Catalyst a chance to interrupt a long fax transmission when another session is pending. The fax transmission will proceed until the maximum page parameter is reached. When the maximum page parameter is reached, the transmission will be interrupted and the next session will initiate. If there is no other session pending, the fax transmission will continue, regardless of this setting.

**Maximum transmission time per page**: This parameter is in place to prevent long sessions over noisy phone lines. If communication between the Catalyst and the Fax machine is lost, this feature allows the Catalyst to end the session and ultimately reset and re-connect for re-transmission.

**Fax Report suspension and resumption**: Long fax reports need suspension when there is an unacknowledged alarm wanting to use the phone line for other notifications. Fax reports will suspend when the total page or per-page limits are exceeded. The suspended report will indicate the reason for report suspension.

**Cover Page:** When selected, a cover page will be included with each FAX and RDT session. To enable the cover page, go to Advanced Settings for a FAX destination. An ASCII text version of the cover page is included with each download to a remote data terminal.

*Important Note: Fax machines can also be programmed to retrieve status reports by calling ("polling") the Catalyst. This feature however, is not available when using a Phonecell GSM.*

**The FAX cover page is shown below:**

North Bay Treatment Plant      15105959686      Thu Aug 02, 2001 13:21:46

# Log File Report

TO:      Central Dispatch Fax Machine
FROM:      North Bay Treatment Plant
REPORT TIME:      Thu Aug 02, 2001 13:21:50

**This Report Includes Data Collected Between**
     Start Time      Wed Aug 01, 2001 13:00:00
     Stop Time      Thu Aug 02, 2001 13:21:52

**Log File Contents Filtered as Follows:**
     Data Already Delivered:    **last 24 hours only**
     Channel Group:      **1-4, 256.**
     Channel Transitions:      **ALL**
     Data Samples:      **included (chronological order)**
     Other Events:      **configuration changes and session history**

| Channel Status Summary Counts | Total | Linked to this Destination |
|---|---|---|
| Unacknowledged Alarms | 0 | 0 |
| Acknowledged Alarms | 0 | 0 |
| Alarms Now Normal | 0 | 0 |
| Acknowledged Alarms Now Normal | 0 | 0 |
| Total Currently Not Normal | 0 | 0 |

| Cumulative Statistics | Total | Last 24 Hours |
|---|---|---|
| AC Power Failures | 1 | 1 |
| Phone Line Failures | 0 | 0 |
| Modbus Network Failures | 0 | 0 |
| Log File Events Lost | 129 | 129 |
| Incoming Calls | 2 | 2 |
| Outgoing Calls | 16 | 16 |
| Alarms | 6 | 6 |
| Operator Acknowledgments | 4 | 4 |

AC power is currently ON.
The battery is currently CHARGED.

**Catalyst**
*INTERACTIVE COMMUNICATIONS SYSTEM*

**RACO** *SINCE 1948*
WWW.RACOMAN.COM

**Incoming Polling Calls:** If no Fax destinations are configured, then incoming calls from remote fax machines are disconnected. If a Fax destination is configured, a status report including all channels is delivered.

If PINs are configured, then the list of fax destination phone numbers acts as a security list. Permission to receive the status report is granted only to those fax machines whose phone number (CIG/CSI) matches the number for some configured fax destination. The status report is then delivered using all the configuration options for the matching destination.

## 2.12.2.5 Remote Data Terminal

The Remote Data Terminal (RDT) destination type is most commonly used in conjunction with a Log File. This is the destination that is called on a specific schedule, or when the Log File exceeds the memory percentage threshold of the high-water mark.

**The data that is delivered to the RDT is determined by:**

- The content of the Log File. All information downloaded to the Remote Data Terminal must already be stored in the Log File to be retrieved.
- The individual portions of data selected to be included in the download. These include logged channel state transitions, and logged Catalyst events.
- The range of data selected. This can include all data available, only undelivered data, or a specific range of dates or times.
- All reports have a cover page, similar to the specification for FAX destinations.
- Outgoing calls from the Catalyst can be scheduled, including log, status, and notification reports, using all the destination configuration options.
- Incoming calls to the Catalyst can only get a Log File report. The Alarmware "Transfer Options" are used for the parameters of an incoming call.
- Incoming calls to the Catalyst are refused unless the Log File scan is enabled.
- Incoming calls to the Catalyst require a PIN only if PINs are configured.
- Incoming calls to the Catalyst will not delete any Log File segment.

Note: The RDT has two strengths; it is fast and all it needs is a modem. However RDT has one weakness; it is not a reliable transfer server. There is no error detection, correction, or way to pinpoint when or where a lost connection occurs. Some data may be lost during a lost connection. The solution is to use a more reliable transfer server protocol: FAX, Alarmware, or Email.

## 2.12.2.6 Public Address System

The PA System destination type is used to announce reports over external speakers and PBX announcement systems. A remote switch may be wired to the Catalyst so that personnel throughout the broadcast zone can acknowledge alarms.

The information below will detail how the phone number is used, as well as other operational details specific to the PA System destination type.

The primary difference between PA System destinations and standard telephone destinations is that PA System destination alarm reports are intended primarily to provide important operations and safety information for local personnel only. Therefore, PA System alarm reports are substantially more succinct than reports to telephone destinations.

PA alarm reports eliminate greetings, prompts for mode changes and good-bye messages. In addition, there will only be a single report recitation from this type of destination. At completion of the annunciation, there is a single "warble" prompt, followed by a 10-second delay during which the report may be acknowledged. See Acknowledgement Switch section below.

When configuring a PA System destination, entering a phone number into the phone number field of the destination dialog box is optional. When a PA System destination is configured with a destination phone number it is assumed that alarm annunciations will be made through a private phone system such as a PBX or PABX.

When a "PA System" destination is configured without a destination phone number it is assumed that the user wants alarm annunciations to be "broadcast" over an in-plant audio (PA) system. This mode of operation requires neither a telephone line interface nor the dialing of any phone number digits. Direct connection can be made between the Catalyst's line level audio output and the in-plant audio systems.

There is no problem inter-mixing the "PA System" destination type with other destination types. By properly configuring the Catalyst's Destination – Channel Grouping, concise messages may be directed to PA destinations only, while standard voice reports may be directed to telephone destinations. Intermixed PA and non-PA System destinations will function just fine regardless of whether the Catalyst is connected to dedicated phone lines or to PBX phone systems. Furthermore, use of the direct connection from the Catalyst audio output for PA system announcements does not preclude the use of the phone line for all other destination types.

### Audio Connection

An audio connection from the Catalyst to the PA system can be made at RCA jack, J1 on the I/O board (main board) within the Catalyst enclosure. (See the Interior View Diagram (CIG Rev D). This jack provides a line level signal output for direct connection to a PA system.

It's important to note that with the Catalyst audio output connected to the PA system in this manner, the PA System will amplify all audio from the Catalyst. Thus, calls to other types of phone destinations plus any operator activity, like unit configuration, will be heard over the PA system. If it is undesirable to hear all Catalyst voice activity through your PA system then the multi-use Catalyst relay driver output may be utilized.

### Multi-use Catalyst Relay Driver

When there is at least one destination configured as PA the Catalyst relay driver output operates very much like a "press-to-talk" type switch. This switch is activated only for the short duration of PBX/Local Paging System alarm annunciation. The relay driver output is intended to source current for a 5 VDC reed relay and should only be used for that purpose.

Caution: Uses of the relay driver output that draw more than 20 milliamps will compromise the Catalyst system operation.

Connection of the reed relay is made on the Catalyst I/O board (main board) at the header pins, P4 (see diagram CIG Rev D). P4 – Pin 1 is the output of a PNP transistor and P4 – Pin 2 is ground. There is a diode between the P4 pins to short out the inductive kick of a relay coil.

### Acknowledgement Switch

The acknowledgement switch input is available specifically for PA destination types. It is possible to install a momentary switch for the purpose of remotely acknowledging alarms reported over a PA system or patched-through a PBX. This is important since, for local paging applications, there is no way to acknowledge the alarm in the usual way by entering a touch-tone digit. The pushbutton switch is operable at any time during the report to the PA system, and inoperable at all other times. Note: There are several other ways to silence and/or acknowledge the Catalyst at the front panel during the progress of a PA annunciation.

The Acknowledgement Switch must be a momentary, normally open (NO) pushbutton type switch. It connects to the Catalyst on the I/O board at jumper JP4 (see diagram CIG Rev D). The polarity of the switch is irrelevant.

When the switch is operated, it acts similarly to pressing the PROGRAM key from the Catalyst front panel. Pressing the acknowledgment switch will acknowledge ALL channels, not just the ones reported (The unit will NOT go into PROGRAM MODE).

*Important Note: The connection of an Acknowledgement Switch is only possible on the Catalyst I/O boards CIG Rev. D and higher.*

**PBX Support**

Interfacing the RTU to a PBX or PABX phone systems can occasionally present problems. Some PBXs have a non-standard dial tone. Additionally, in many PBXs, you must first press a special key, like a '9' to get an outside line. After pressing the '9' there may be a short delay followed by the dial tone for the outside line. Entering a comma for each one-second delay desired may configure the necessary dialing delays.

*Note: By turning OFF CPM you can avoid problems with non-standard dial tones from your PBX system.*

*Caution: Must be using an Analog Phone Line*

Some PBX systems are either partially or entirely digital data. That is, voice and signaling information is converted to a digital representation. Voice information arriving at the PBX from the outside is converted from analog to digital. Voice information leaving the PBX to the outside is converted from digital to analog. Phone sets within a digital system may be interfaced by digital signals only. In such systems it may be difficult, but usually not impossible, to obtain a standard analog phone line to use in interfacing devices such as the Catalyst RTU. It may be necessary to contact the vendor of your PBX system for information on the addition of analog lines.

*Warning: Digital Phone Lines Can Cause Damage*
Caution is advised. Some telephone lines within digital PBXs present voltages that can be dangerous to RACO's equipment. If you are attempting to interface a Catalyst inside of a PBX , it would be a good practice to have the phone line you intend to use, checked for "unusual" voltages and signals.

With few exceptions, if you can get a standard telephone set to work on a PBX line, then you will be able to make the Catalyst work as well.

**In-Plant Paging Mode**

The RTU provides an RCA-type phono jack (Jack J1, located near the upper right hand area of the main circuit board) for optional connection to an in-plant paging system or external loudspeaker. The RTU broadcasts all alarm messages through this output and the telephone line simultaneously.

## 2.12.2.7 Email Reporting

The newest destination type available is Email Reporting. When Email Recipient is selected, the Catalyst can deliver notification, status, and Log File reports to an email address via an Internet Service Provider (ISP).

*Important Note*: *An Internet Service Provider must be configured with a phone number and password before an email destination is eligible for reporting. These parameters can be edited under the Configuration menu item >>Devices|ISP.*

**Email Reporting Sessions**

An email session consists of establishing a link between the Catalyst and the Internet Service Provider, by dialing the ISP, logging into the user account, and then transferring a single report addressed to the intended recipient using SMTP. It is assumed that any report confirmed as received by the ISP will actually be delivered to the email address. Any session errors or diagnostics provided by the ISP will be logged.

No sessions are possible unless the ISP and the recipient's address are fully configured. Multiple email addressed may be included in the recipient field, separated by semi-colons. Identical reports will be sent to all recipients in a single session.

Alarmware will warn you when you select an email destination before the ISP account has been configured. An incorrect configuration will result in session attempts that fail. Failure explanations received from the ISP will be logged.

**Email Recipient Advanced Settings**

When an Email Recipient is selected as the destination type, there are additional features available under the Advanced Tab:



**Email Report Formats**

The comma separated values, comma delimited text, and comma delimited keys format options apply only to Log File reports. All other reports are sent in plain text format. Also, CSV, CDT, and CDK settings send the Log File report as plain text, just with commas and quotes inserted as specified.

**Plain Text Format**

- All text appears in a single fixed pitch font and plain typeface.
- No graphics are included in the cover page.
- The left margin is omitted.
- There are no page length or line length limitations.
- Columns and spacing may be imperfect.

**Attachment Format (MIME)**

You may configure any email destination so that the report is sent as an attachment. The Catalyst report can be attached in any of the available formats. The cover page is never a part of the attachment.  The attachment file suffixes are assigned as follows;

- Full Text = .html
- CDT, CDK, and CSV = .csv

**HTML Format**

With this option, the report is sent in a HTML document. Cover page is optional and may be sent as part of the attachment if required. HTML documents allow you to view the data with columns and line wrapping preserved. *Note: In most cases, you can import this HTML document directly into a spreadsheet application.*

**Paging Format**

This format generates reports as specified for alpha pagers. This option is useful when the email recipient is actually a cell phone, or alpha pager, and the report will be viewed on a very small screen.

**Email Header Fields**

**From**: -- This header specifies the address used for responses and error reporting by SMTP servers and routers.  So, must include the ISP account.
**To**: -- Includes the destination name in addition to the actual email address. Includes all the recipient email addresses.
**Subject**: Includes the type of report, and the callback phone number.
**Cc**: This field will be used if the TO: field cannot hold all recipients.

**Maximum Size of Any EMAIL Report is**

To ensure that an email message is within particular ISPs maximum email size limitation, this parameter allows each individual destination to be configured with the maximum email message size allowed (in Mbytes).

**Maximum Transmission Time to each EMAIL Recipient is**

To avoid allowing the Catalyst to be busy delivering a Log File report for long periods of time, this parameter sets how much time the Catalyst should continue the current report before interrupting for a higher priority session, such as an Alarm Report call.

## 2.12.3 Destination Name

Enter a name that will identify this destination. This is a text only message that will appear in local data logger or Log File text as well as data mode alarm reports.  Typically this will be the name of a person or location.

## 2.12.4 Phone Number

This is the phone number the RTU will use to call the Destination if its type setting is Telephone, Telephone Pager, Fax Machine, Remote Data Terminal, or PA System.  The number must be entered with all necessary prefixes.  Delays are invoked by entering a comma or by using an @ character in the dialing string.

## 2.12.5 Reports

There are three types of reports available for delivering information to destinations:

1. Notification Reports
2. Status Reports
3. Log File Reports

## 2.12.5.1 Notification Reports

The Notification Report destination settings are available for all destination types.



**Alarm Checkbox** -- Check this box when you want to deliver a notification report to this destination when an alarm occurs. Telephone and PA destinations are the only destination types capable of acknowledging a notification report.

**Alarm Acknowledgment Checkbox** -- Check this box when you want to deliver an alarm acknowledged report to this destination when an alarm has been acknowledged.

**Sort Report Contents By** -- You have three ways to sort the notification report:
1.  Time the state tripped, first in, first out: Allows you to sort based on the time the alarm was tripped. This option will configure the Catalyst to report the alarms tripped first, then report each alarm until the last alarm tripped is reported.
2.  Time the state tripped, last in, first out: Allows you to sort based on the time the alarm was tripped. This option will configure the Catalyst to report the alarms tripped last, the report each alarm until the first alarm tripped is reported.
3.  Channel Number: Catalyst will sort the notification report so that lowest ordinal channel alarms are reported first.

**Deliver Notifications** -- You have three delivery options for each destination:
1.  Continually until Acknowledged: Allows the Catalyst to continuously attempt to notify this destination until the alarm has been acknowledged.
2.  Notify Once: When selected, the Catalyst will only contact this destination once.
3.  Until Reported: All channel states and Log File segments are considered reported if they are confirmed received by the destination.

*See "Operator's Manual section 1.16" for more information on delivery notifications.*

## 2.12.5.2 Status Reports

A Status Report consists of a preliminary report and a channel report. The type of status report delivered depends on the destination type:

*   **Telephone** -- Consists of a preliminary report if there are any problems for the Catalyst to report. The Catalyst will then report any channels that are not NORMAL. If all channels are NORMAL, then the Catalyst will report "All Channels are NORMAL." You will be prompted to press 3 or 9 to acknowledge the test Autocall. For channels that are in ALARM but are ACKNOWLEDGED, the Catalyst will report how many of these channels have been acknowledged.
*   **FAX** -- Consists of a "cover sheet" if selected and a report of the current channel readings and states. Includes linked channels, any state (including normal). Also includes status only channels.
*   **Remote Data Terminal** -- Consists of an ASCII text report containing information on the current statistics and counts (similar to the FAX cover page). The report will also contain information on all channels that are not NORMAL. If all channels are NORMAL, then the Catalyst will report that "All Channels are NORMAL."
*   **Alpha Pager** -- Includes linked channels, with non-normal states. Includes all status only channels.
*   The "system channels" are always linked, always subject to report, and always excluded from the "all channels normal" logic.

**Include the destination in the "Autocall" roster --** Check this box if you want this destination to be included in the group of destinations that may be called when the Catalyst performs an Autocall. An Autocall is a test call made at scheduled intervals. (*See "2.14.6 Conducting Test Autocalls" in the Operator's Manual*)

**Deliver Status Reports on the following schedule --** Check this box if you want the Catalyst to call this destination at scheduled intervals to deliver a Status Report.
- **Base Time:** Sets the time of day that the Catalyst will reference when determining when to deliver a report.
- **Frequency:** Determines how often the Status Report will be delivered to this destination.

**Example:** A base time of 00:00 and a frequency of 02:00 will result in scheduled reports sent to this destination at 00:00, 02:00, 04:00, 06:00, and so on, around the clock.

## 2.12.5.3 Log File Reports

*The Log File Report destination settings are available for both Fax and Remote Data Terminal Destinations.*

**Deliver Log File Reports Checkbox** -- Check this box when you want to deliver a Log File to this destination on a given schedule.

**Deliver Log File Reports Schedule** -- Log File reports will be delivered per the schedule configured:
- Base Time (mo:dd:hh:mm)-- Sets the month, day, and time of day that the Catalyst will reference when determining when to deliver a report.
- Frequency (mo:dd:hh:mm)-- Determines how often the Log File report will be delivered to this destination.

**Log File Report Schedule Examples**:

You would like to get a Log File report the first of every month, at 8am. The configuration would look like this:

Deliver log file reports on the following schedule : ☑

Base time (mo:dd:hh:mm)    01 : 01 : 08 : 00

Frequency (mo:dd:hh:mm)    01 : 00 : 00 : 00

Base time Month (mo) is set to January, day (dd) is the 1st and hour is 08:00 am

Once Per Month, based on one calendar month

You would like to get a Log File report weekly, at 2pm on Thursdays. The configuration would look like this:

Deliver log file reports on the following schedule : ☑

Base time (mo:dd:hh:mm)    00 : 04 : 14 : 00

Frequency (mo:dd:hh:mm)    00 : 07 : 00 : 00

Since the Base Time month (mo) is zero, the day (dd) is interpreted as the "day of the week." Day 4 is Thursday. 1400 (hh:mm) is 2 pm.

Frequency is set to every 7 days (dd) or "once per week."

**Include the following Log File contents** -- Use these checkboxes to filter the type of data to be included in the report. Note: The data must be saved in the Log File or it cannot be retrieved by a destination. The Data includes logged alarm events, data sampling, configuration changes, and session history.

**Range of Data** -- This parameter will allow you to the range of data to be delivered to this destination. You can choose to include "all data" in the Log File, only "undelivered data," or data in the range selected.

**Sort Report** -- This feature allows you to determine in what sort order the data will be delivered. Setting refers specifically to data sampling data.

## 2.12.5.4 Report Formats

**Full Text**

Log records will be reported as full text in quasi-sentences that are meaningful to humans.

## Comma Delimited Text

Log records are broken up into fields. Commas delimit successive fields and all text is surrounded by double quotes. This file format is suitable for import into database and spreadsheet programs.

## Comma Delimited Keys

Log records are broken up into fields of keys. Commas delimit successive keys, alphabetic keys are surrounded by double quotes and numeric keys are not quoted. This file format is also suitable for import into database and spreadsheet programs. Spreadsheet macros may be used to re-expand and process the keys for data reports, etc

## Comma Separated Values

Data is broken up into fields of comma separated values. Commas delimit successive values, alphabetic characters are surrounded by double quotes and numeric values are not quoted. This is identical to Comma Delimited Text, except that the numerical values are not quoted. This file format is also suitable for importing into database and spreadsheet programs.

✓  When this type of reporting format is chosen, the report cover page is excluded.
✓  Discrete raw values are reported (no text formatting, e.g. OPEN, CLOSED, etc)

## Items to Log Selections:



**RTU Events**:

- **Data Samples** - includes snapshots of channel values and states
- **Session History** – includes all session-related messages
- **Configuration Changes** - includes all RTU configuration changes

## Channel State Transitions:

- **Alarms** - includes all channel alarm data

- **Alarm Acknowledgment** - includes messages pertaining to when an alarm is acknowledged
- **Reset** – includes messages logged when channels are reset to normal

**Include Log File Data in the following range:**

- **All Data** - includes all channel alarm data and notification reports
- **Undelivered Data Only** - include only data that has not been delivered to this destination
- **Data Collected in the Previous DD:HH** – include only data logged during the previous day:hour

## 2.12.6 Other Destination Settings Features

**Copy To** -- Copies the current Destination configuration (excluding Destination Name) to a selected Destination or group of destinations.

**Copy From** -- Copies a selected Destination configuration (excluding Destination Name) to the current Destination.

**Groups** -- Launches the Destination / Channel Groups dialog box.  This is used to link this Destination or a group of destinations, to receive alarm reports when a given channel or group of channels has an alarm.

**Clear All** -- The Clear All button returns all parameters to their factory default settings.

**Clear Item** -- The Clear Item button restores the current field to its factory default setting.

## 2.12.7 Destination / Channels Grouping

The Destination/Channels Grouping dialog box is accessed from various dialogs. From the Configuration menu, select Channels, Devices (Log File or Printer), or Destinations. Hit the button labeled "Groups" in the resulting dialog box:
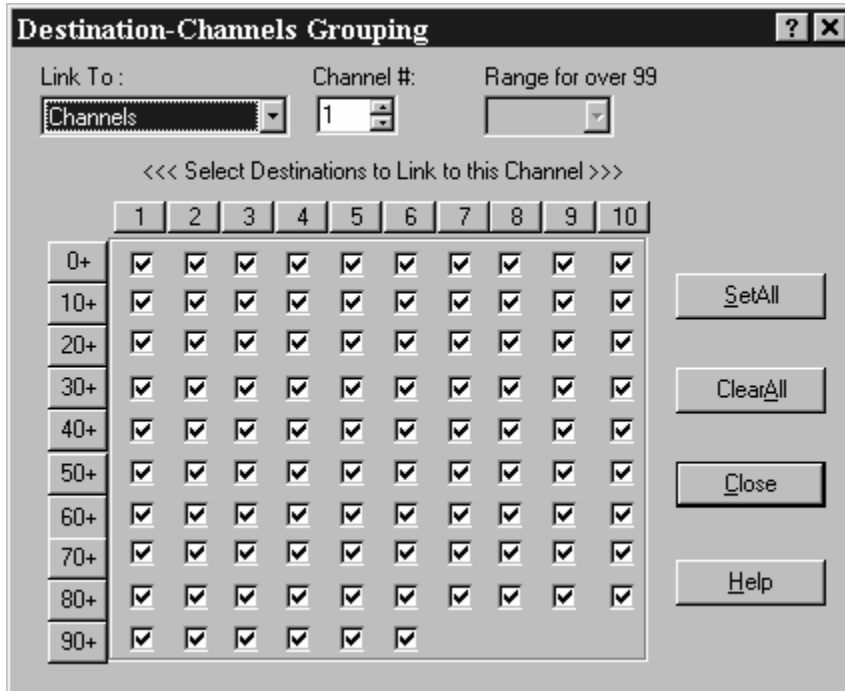


Destination-Channel Grouping allows you to establish a link between specific channels and specific destinations or devices. Once configured, a channel that goes into Alarm State will only notify destinations or devices linked to that particular channel. By default, all channels are linked to all destination types and devices.

**Channels are linked to:**

- Destinations
- Log File Device
- Printer Device
- Alarmware (*see 2.6.1 Transfer Options in the Operator's Manual*)

**Link to** – Choose Channels if you want to link selected destinations to a given channel, or choose destinations if you want to link selected channels to a given Destination.  See examples below.

(**Destination)(Channel) Number** -- Enter either the corresponding channel number or Destination number that you wish to establish links for.

**Range** – This is used when there are more channels or more destinations to link, than can be shown on the selection grid.  In such cases, use the Range parameter to select the range shown on the grid: 0-100, 101-200, or 201-256.

**Example of Linking selected destinations to a given channel:**

1.  In the "Link to" field, select "Channels".
2.  Enter the desired Channel number (1--256) to be linked to one or more destinations.
3.  To select the destinations that will receive notification from the selected channel, click the checkboxes that represent the Destination Number (1 -- 96).

**Example of Linking selected channels to a given Destination:**

1.  In the "Link to" field, select "destinations".
2.  Enter the desired Destination Number (1--96) to be linked to one or more channels.
3.  To select the Channels that will notify the selected Destination, click the checkboxes that represent the intended channel number(s). The Range field determines which groups of channels are displayed (1--100, 101--200, or 201--256) in the selection grid.

*NOTE: By default, until a given channel is linked to selected destinations, it is automatically linked to report to all destinations (as are indicated on the selection grid).  Likewise, until a given Destination is linked to selected channels, it is automatically linked to all channels.*

*NOTE: Power Failure Alarms will bypass Channel Destination Grouping and report to all available destinations.*

For each channel which is capable of having any kind of alarm, even if only a communications alarm, it is imperative that you leave at least one destination linked which can receive and acknowledge a possible alarm from that channel.

**Other available features:**

**Set All** --The "Set All" button selects all the checkboxes shown in currently displayed range in the selection grid. This feature applies to either channel or destination types, depending on the type selected under the "Link to" field.

**Clear All** -- The "Clear All" button deselects (removes checkmarks for) all the checkboxes shown in currently displayed range in the selection grid. This feature applies to either channel or destination types, depending on the type selected under the "Link to" field.

**Row and Column Buttons** -- There are buttons located along the top and left side of the checkbox matrix. These buttons are labeled: 0+, 10+, 20+, etc. on the left, and 1, 2, 3, 4, etc. along the top. Click on these buttons to select the entire row or column of checkboxes. This feature speeds up the checkbox selection process.

*NOTE: Don't overlook the convenient COPY TO and COPY FROM buttons in either the Channels or the Destinations dialog boxes, to facilitate rapid copying of channel and Destination configurations (excluding Messages), including Grouping.*

2.12.8 When is the Grouping Cleared?

- "**Copy To**" a destination or channel will overwrite the groups.
- "**Clear All**" for any channel or destination will clear groups
- Changing any single channel item will not clear groups.
- Changing the destination type back to "not used" then back to the same destination type will not clear grouping.
- Changing the destination to any other type will clear the grouping.
- "**Clear All**" within the Destination-Channels grouping dialog will only clear those items displayed in the current screen To clear others, it may be necessary to alter the "Range for over 99" control.

## 2.13 Messages

The Message Settings dialog box is accessed from the Configuration menu. The Configuration menu is available when connected to the RTU or when working off-line.

Select Messages from the menu items listed:

## 2.13.1 Message Types

Identifies the type of <u>text</u> name (or in the case of Channel Status, status messages) to be configured. This applies to the text that will appear in data reports (as opposed to voice reports).

**<u>Type choices are:</u>**

- RTU Name
- Net Name
- Destination Name
- PIN Name
- Channel Status

**Name or Messages** – This is the entry field for the actual text content to appear in data reports for the selected item.  *The appearance of this field item depends upon the selection of Type, above.  Further, if you have selected Channel Status as the message type, then the entry fields provide further guidance as to how the channel's two text messages will be used in reports.*

**Example of Analog Channel Status Message:**

**Example of Discrete Channel Status Messages:**



Note that in the case of channel messages, in addition to whatever messages are in place, Tag Words such as NORMAL or ALARM will be automatically appended to the message in the report for the channel. Thus, for some messages, what appears in the field may not look like a complete message. *Also note for channel messages, the SNA (or at least the discrete/analog data type for the channel must have been previously established*, otherwise the entry field for the corresponding messages will be incorrect.

## 2.13.2 Clearing Messages

**Clear All Text Messages** – This button clears all text messages, for the message type selected, to factory defaults.

**Clear Current Text Message** – This button clears the text message(s) for the currently selected message to factory default.

**Clear All Speech Messages** – This button clears all speech messages for the message type selected to factory defaults.

**Clear Current Speech Message** – This button clears the speech message(s) for the currently selected message to factory default.

## 2.13.3 Tag Words

Click on the Tag Words button to launch the Tag Words dialog box. This dialog box will allow you to change the text version "state" tag words (which otherwise are default words such as "Alarm", "Normal", etc.) to customize them for your application.  Tag word settings in Alarmware™ apply only to text reports. Corresponding speech tag words can be recorded on the RTU in a similar manner as for other recorded speech messages.

## 2.13.4 Practical Considerations

**Some practical considerations regarding text message composition:**

- **You may save time** by using the Windows clipboard to copy and transfer the text representations of messages that you have entered in the Message Planning Page of the Excel Catalyst II RTU Configuration Work File.  This file is primarily used to plan voice messages prior to recording them.  However there is probably a lot of commonality between what you plan for the voice messages, and what you wish to appear in corresponding text reports for those same channels.
- **If you plan to use data sampling**, you may wish to edit the text messages to facilitate the subsequent sorting and processing of the logged data in a spreadsheet or database.  For example, you may wish to strategically include certain leading letters or short text strings which personnel would disregard when directly reading a text report, but which a spreadsheet macro would use as an initial basis for sorting or other data manipulation.

The lower portion of this dialog box is concerned with the speech messages corresponding to the message type selected at the top of the dialog box. Although it is not possible to record or playback speech messages from Alarmware™ it **is** possible to perform some speech message management functions.

## 2.13.5 Speech Message Management Functions

- **Clear All Speech Messages**-- This button erases all user-recorded messages and restores messages to their factory defaults.  This should not be done casually since it takes time to re-record voice messages.
- **Clear Current Speech Message** -- This button restores the current selected type (and perhaps channel) message to its factory default message.
- **Message Time** -- Displays the amount of speech time that is available for recording voice messages.  This depends upon the selected Recording Rate, the allocated size of the data logging reserve (if any), and the messages already recorded by the user. *Note: there may be a small percentage of error when calculating message time if the file system has become fragmented.*
- **Recording Rate** – Determines the recording rate for speech messages. The recording rate is specified in terms of the rate of speech memory consumption – in bytes per second (Bps) of speech. 3600 bps gives the best sound quality but increases the rate of memory use, resulting in half as much recording time capacity. The default recording rate is 1800 Bps. See below.
- **Default** – Sets the recording rate to the factory default (1800 bps).

**Important note regarding the saving of user recorded speech data:** While user recorded messages can only be recorded at the front panel or via voice telephone, the resulting data can be imported into Alarmware™ by selecting this option when connecting to the RTU.  Due to the large amount of data involved with recorded speech, this import process can take up to 2 hours via modem, or preferably about ½ hour via serial port connection to the RTU at 57,600 baud speed.  *It is good defensive practice to have recorded speech data so saved* to avoid need to re-record messages if some unusual event requires the restoration of the recorded speech data.

## 2.13.6 Recording Rate

This function controls the dialer's speech message recording rate. Recording rate is directly proportional to speech sampling rate. The 3600 bps setting provides for very intelligible speech recording. If a large number of long speech messages are needed the 1800 bps setting should be used. The 1800 bps setting provides for adequately intelligible speech recording but consumes only half the speech message memory as the 3600 bps setting.

- For higher quality messages a higher sampling rate must be used.
- The lower sampling rate will provide more recording time for messages.
- This parameter can be configured from the Dialer's Front Panel, Over the Phone, or Alarmware™.

**The Options are:**

- 3600 bps (Default)
- 1800 bps

*Note: BPS = bytes per second*

## 2.13.7 Customizing Text Tag Words

To customize (change) the text version message tags for a given RTU, either connect to, or work offline with the desired RTU. Select Messages from the Configuration menu. Click on the Tag Words button. The Tag Words dialog box will appear:

**Tag Words**

Default Tag Word(s) :

NORMAL

Tag Word(s) to use for Text Reports :

NORMAL

Clear Item          Clear All

Help                OK
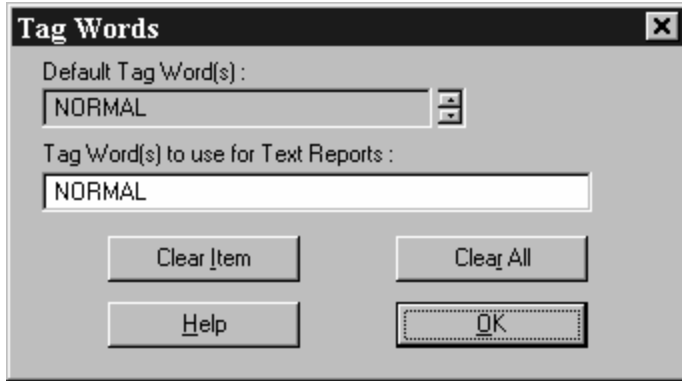
**Important**: *See 1.3.2 Tag Words and States in the Operator's Manual.* This section will explain how Tag Words are automatically appended to channel status messages to form a complete channel status report and to reflect the Alarm/Normal state of a channel. The state is distinct from its current reading value.

From Alarmware™, you may make changes to the standard text version tag words (applicable to text reports, not speech reports) in order to better describe to operators exactly what the Alarm states represent in your particular application. Use the up and down arrows to view each Tag Word available for

**Tag Words**

Default Tag Word(s) :

HIGH SETPOINT

Tag Word(s) to use for Text Reports :

HIGH TEMPERATURE

Clear Item          Clear All

Help                OK
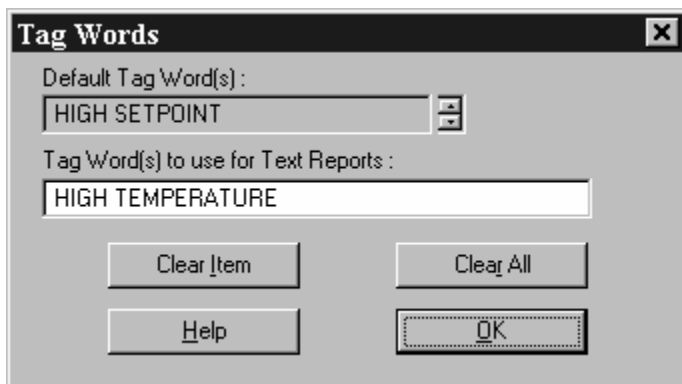
change.

**Example for monitoring temperature:**

- Change the default Tag Words LOW SETPOINT to LOW TEMPERATURE.
- Change the default Tag Words HIGH SETPOINT to HIGH TEMPERATURE.
- Click OK.

All channels that are in an Unacknowledged Alarm State have the Tag Word "ALARM" automatically appended in channel status reports. In addition, all analog channels which have such an alarm tripped by violation of a high or low set point will have the added Tag Words "HIGH SETPOINT" or "LOW SETPOINT" inserted before ALARM in their channel status reports.
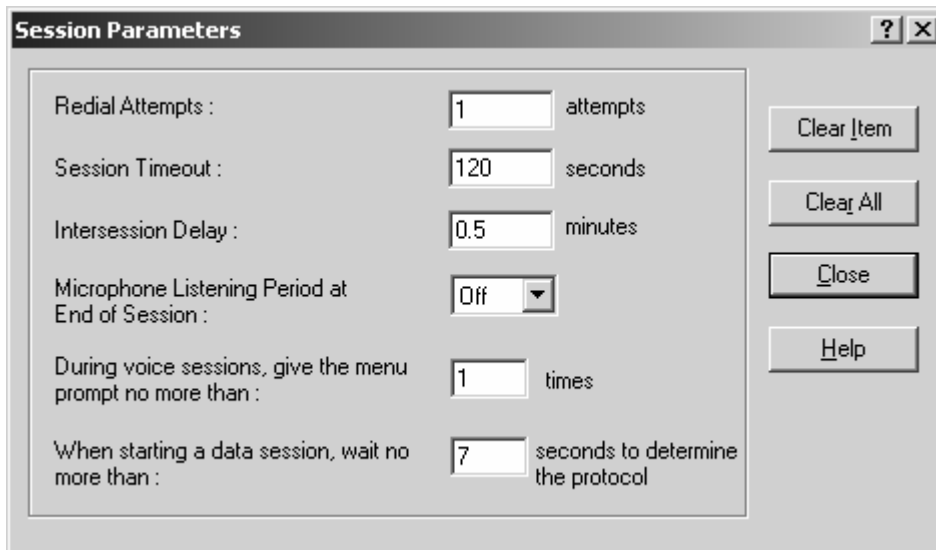
With the above changes, the Tag Words HIGH TEMPERATURE ALARM will appear in text version channel status reports for all analog channels.

At the Catalyst front panel or over the phone using touch-tone commands, you may also record corresponding alternative *voice tag words*, which will then be used in voice reports.

## 2.14 Session Parameters

The Session Parameters dialog box is accessed from the Configuration menu. The Configuration menu is available only when connected to the RTU or when working off-line.

**Select Session Parameters from the menu items listed:**



**A Session Parameters dialog box will appear with access to the following information:**

## 2.14.1 Redial Attempts

Determines the total number of times each Destination will be dialed, without an answer, before going on to the next eligible Destination.  For example, a setting of 3 would result in 3 total redial attempts to a linked destination.

Note: The FCC 10-minute limit does not apply for this inner-sequence of redial attempts.

## 2.14.2 Session Time-out

Certain protocols and types of sessions require timely responses from the Destination, or else the session is taken down. If the protocol does not specify a time-out, this parameter will. This parameter is only relevant for OTP (Over the Phone programming) and FP (Front Panel programming) sessions.  The purpose is to assure that the RTU will not be inadvertently be left in programming mode, since calls to destinations will not occur while the RTU is in this mode.

## 2.14.3 Intersession Delay

Once a notification sequence begins, this parameter specifies how long the RTU will wait after calling one Destination (if acknowledgement has not been received), before placing a call to the next Destination. This applies to any sequence of reports using the same RTU device. The Catalyst will not wait for the intersession delay if a new alarm occurs.

## 2.14.4 Microphone Listening Period at End of Session

When set to ON, the Catalyst's built-in microphone is activated for 15 seconds, upon entry of DTMF 0, 3 or 9.  After the 15 second listening period, the call is terminated without need to enter additional DTMF tones. This option allows operators to listen to the ambient noise surrounding the unit. When set to OFF, there will be no listening period and the call is terminated immediately.

Note: When the microphone is ON, ambient noise surrounding the unit can effect the entry of DTMF tones. Modem tone and event detection is decreased when the remote microphone is ON. If you are having trouble connecting with Alarmware,  turn the microphone OFF.

## 2.14.5 Menu Options Prompt

The menu options prompt parameter determines whether or not the menu options are to be repeated during an over the phone session with a Catalyst. Administrators may decide that the menu options should not be repeated at all for security reasons. Others may deem that the unit should repeat the menu more than once for novice operators. This feature provides the administrators some flexibility and added security.

## 2.14.6 Protocol Detection Timer

This parameter impacts the treatment of incoming data calls as follows:
1. All incoming calls are answered first in voice mode with a prompt requesting DTMF tone or PIN (if configured) entry.
2. If the tone is not entered within 5 seconds (not configurable), the RTU will then attempt a data mode connection.
3. The session will then wait the configured maximum time (see keycode 406) for carrier to be established.
4. If no carrier signal is detected, the call is terminated.
5. If the carrier signal is established the RTU will attempt to identify the protocol used by the calling party for the period of time defined by this parameter.
6. During this time period, an appropriate session (Alarmware™, RCS, or MBSLAVE) will begin as soon as the protocol is identified.
7. When this time limit expires, one of two things will happen:
   - If no incoming data was received, the RTU will assume Log File download.
   - If there is incoming data then the RTU assumes a non-RACO SCADA system is calling and a pass-thru modem session will begin.

Subsequent timeouts are controlled by the session timeout limit which will trip if no data is received for that period of time.

# 2.15 Annunciation Options

The Annunciation Options dialog box is accessed from the Configuration menu.

Select Annunciation from the menu items listed:

## 2.15.1 Common Alarm Trip Delay

This allows the user to establish a Common Alarm Trip Delay value other than RACO's default value. When set the Alarm Trip Delay for all channels is overwritten with this value. *Caution*: If you want any channels to a separate Alarm Trip Delay, you must go to the Channels Setting dialog box and enter, or re-enter, the desired individual value <u>after</u> changing this common value.

*Be sure to review the topic* Alarm Trip Delay *for important information on the effects of network scan time upon effective trip delay. Note that this Alarm Trip Delay does not apply to power failure alarm; there is a separate setting for power failure alarms.*

## 2.15.2 Alarm Reset Time

This is the length of time, after acknowledgment, before a given channel or power failure detection is automatically reset to a clear condition, ready to act on a new (or still existing) violation condition. If the condition remains when this reset to NORMAL occurs, a new set of alarm calls will be placed, requiring a new acknowledgement.

## 2.15.3 Power Failure Alarm Trip Delay

After a failure of primary power to the RTU, this is the length of time before the power failure alarm (PFAIL) is tripped**.**

Power failure alarms result in the calling of all destinations that are voice mode phone numbers, with a priority basis of lowest Destination numbers first.

## 2.15.4 Calling RTU Acknowledges Alarm?

This setting determines whether the entry of a PIN can automatically acknowledge all linked alarms.

**If PINs have been configured:**
1.  If set to **No**, the caller will have to enter a valid PIN and then press the proper tone on the touch tone menu, to acknowledge all alarms.
2.  If set to **Require PINs**, then once a valid PIN has been entered, all alarms are automatically acknowledged without need to further enter a tone from the touch tone menu.

**If PINs have not been configured:**
1.  If set to **No**, the caller would have to press the proper tone on the touch tone menu, to acknowledge all alarms.
2.  If set to **Require PINs** without PINs configured, the Catalyst behaves as if No was selected.

**Notes:**
✓   "Calling RTU" refers to Com Port connections as well as Phone line connections.
✓   A PIN privilege level of "Acknowledge" or higher is required to enable this feature to work.

## 2.15.5 Interval for Checking Phone Line

This value controls how often the unit tests the phone line. A phone fault alarm (TFAIL) is tripped whenever this test fails. To enable the phone line test, select the parameter's checkbox. The test will be performed according to the base time and frequency you set.

## 2.15.6 Interval for Conducting Test Autocalls

This value controls how often the Catalyst makes test "Autocalls." Autocalls are made to prove that destinations are physically able to receive incoming calls from the RTU.

Selecting the checkbox enables this feature. The base time and frequency parameters work together, setting the time of the test call, and how often the test call is initiated. The Catalyst firmware will look at the base time, and then calculate out from that point when the calls should occur.

**For example:**

Base Time (dd:hh:mm) = 00:09:00 (Sunday, 9am)
Frequency (dd:hh:mm) = 01:00:00 (Test Once per Day)

The firmware will calculate the intervals it needs to make test calls. In the example above, test calls will be made every day, starting at the first eligible interval the Catalyst encounters. The firmware will not wait until Sunday to make the first test call. Eligible destinations begin at the lowest numbered destination enabled for test Autocalls. A destination is considered eligible if the "include in Autocall roster" parameter is enabled. (*See "2.11.5.1 Destination Settings -- Status Reports" in the Operator's Manual*)

## 2.15.7 When RTU is disarmed, automatically rearm

The RTU, when disarmed, will automatically rearm itself if this parameter is enabled. The intent of this feature is to prevent a unit from being left in disarmed state by accident. When the unit is disarmed, and this parameter is enabled, the RTU will time how long the unit has been disarmed and then rearm the unit when the timer expires.

## 2.16 PINs (Personal Identification Numbers)

The PIN dialog box is accessed from the Configuration menu. The Configuration menu is available when connected to the RTU or when working off-line. Select PINs from the menu items listed.

A PIN dialog box will appear:
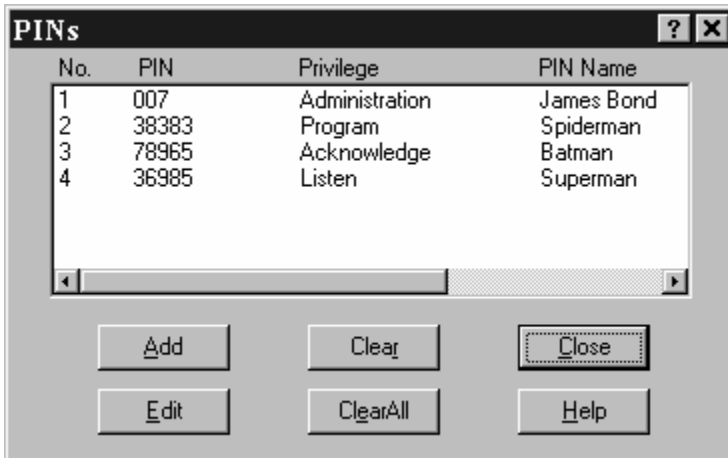


The PIN list box contains a list of all configured PIN numbers, along with the privilege level and PIN Name associated with each PIN:

**Add** -- To add a PIN, click the Add button. This will launch the Add PIN Information dialog box.
**Clear Item** -- This function will clear a selected PIN from the list.
**Clear All** -- This function will clear all PINs from the list. Effectively turns OFF Password Protection, allowing unrestricted access to all RTUs.
**Edit** – Allows you to edit the previously configured PIN.



**The PIN Information Dialog contains the following information:**

1. The first field is for a *PIN Number (ordinal)* associated with the PIN.
2. In the second field enter a unique *PIN Code*, which can be a maximum of 5 digits.
3. Select a *privilege level* that is appropriate for the individual: "*Listen*", "*Acknowledge*", "*Program*", *or* "*Administration*".

4.  Enter a *PIN Name* that will identify the operator in any text reports or any other related text message. *This PIN Name entry is required.*
5.  Click OK when done.

*Note: A privilege level of "Administration" is required to make subsequent changes in PIN settings. Therefore if you configure PINs at all, it is important to have one or more individuals be assigned a Privilege Level of "Administration".*

## 2.16.1 PIN Number

Each PIN created has a unique ordinal number. This number is used primarily as a reference when PIN codes are created or edited with Keycodes. When using Alarmware, the PIN Number is assigned when the PIN code is accepted.

## 2.16.2 PIN Code

This is the PIN code that is assigned to PIN Number N. A maximum of 5 digits is allowed. PIN code 00000 is reserved for Front Panel operation.

## 2.16.3 PIN Privileges

- Listen: Allowed to LISTEN to Alarms in assigned Group.
- Acknowledge: Allowed to ACKNOWLEDGE to Alarms in assigned Group.
- Program: Allowed to enter PROGRAM mode. Allowed to Acknowledge ALL Alarms.
- Administration: Allowed to EDIT PINs, enter Program mode, and Acknowledge ALL Alarms.

## 2.16.4 PIN Name

Enter the name of the PIN holder. A brief note or description can also be added. This is the information that will appear in the Log Files and Local Data Logging when alarms are acknowledged.

The PIN Name is used to form the phrase that is appended at the end of every channel status message in an acknowledged state.

> "Wed Jun 19, 2002 14:58:24 Current Fresh Water Tank level is 430 Feet HIGH WATER ALARM, ACKNOWLEDGED **by James Bond**"

## 2.16.5 Important Notes about PINs

- PIN Names are also accessible and editable from the Messages dialog box. PIN Names are in the same category as text and voice messages. Operations that affect Messages also affect PIN Names.
- Editing a particular PIN may change subsequent "acknowledged by PIN" messages in Log Files and printed at the local printer.
- Regarding the entry of PINs, the entry is considered complete upon issuing * or by waiting three seconds with no more digits entered.
- After three incorrect PIN entries, or if more than ten seconds elapses between entry attempts, the session will be ended.
- You may also enter one of these PINs, of at least "Program" privilege level, in the special Retained Alarmware™ PIN dialog box and check the box "Save PIN for future use". This will cause the PIN

to be automatically issued whenever connecting to an RTU via this Alarmware™ station; saving the operator from having to manually enter it each time connection is established.  This item is accessible when no RTU is selected under Options | Alarmware PIN.  Additional information on this can be found in the topic Retained Alarmware PIN--Alarmware.

### 2.16.6 Limitations of PINs

- Even if PINs have been programmed, access to the front panel operations on the RTU does not require PIN entry.  Log reports will assign a PIN Name of "0" for operations done at the front panel.
- Access to Alarmware™ configuration offline does not require a PIN.
- Configuration files for each Catalyst (.nvm) are not encrypted.

## 2.17 Cleardowns

The Cleardowns dialog box is accessed from the Configuration menu. The Configuration menu is available when connected to the RTU or when working off-line.
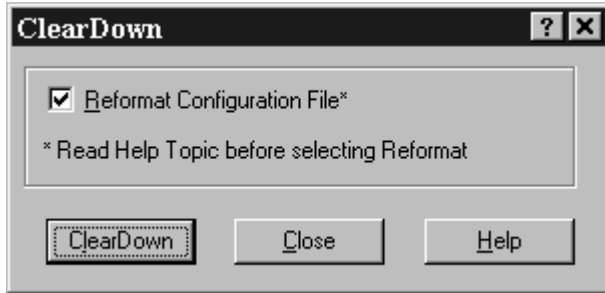


The Cleardown function has one available checkbox: Reformat Configuration File.  This function, if selected and executed causes complete cleardown of the Catalyst's configuration file within Alarmware™ and also at the RTU to factory default settings.

*NOTE:  Carefully consider the implications of a File System Reformat, because recorded speech messages represent a lot of data to upload or download or a considerable amount of time to re-record messages.*

## 2.18 Backing Up your Data

When your Catalyst is delivered from the factory, it will have a default configuration database already created within the file system. Any changes made to the configuration database from the front panel or over the phone will create a database mismatch when attempting to connect with Alarmware. When Alarmware detects there is a database mismatch, you will be given the option to import the data into Alarmware or to export the database from Alarmware to the Catalyst. When you choose to import from the Catalyst, you will have a backup copy of your configuration data.

Similarly, when you record messages, you will be given three options when connecting:

1) Import the user-recorded messages into Alarmware
2) Export messages to the Catalyst
3) Do Nothing (do not import or export, mismatch is OK)

When you choose to import into Alarmware, you will have a backup of the messages stored on your computer.

***Important Note: If you choose to export messages from Alarmware, you will be replacing all messages on the Catalyst, even if the messages being exported are default messages.***

As an added level of safety, you may choose to make a copy of the .NVM files located in your Aware/Data directory. This will allow you to recover from any accidental erasing of the configuration or speech databases.

## 2.19 Firmware Update (Download)

*Before beginning any firmware download process, be sure to read the supplemental instructions provided by the factory, and found on our website.*

If at all practical, RACO recommends that firmware downloads be performed using the Com Port connection. Perform the firmware update at the RTU site with a notebook computer and using Alarmware™. For an extra measure of safety, RACO also recommends that you keep backup copies of all the .NVM files located in the Aware\Data directory.

**The time required to perform the download process** over the phone, for the firmware only, is approximately 20 minutes at a 36K-baud rate. If you use the Com Port, the download time will be about 5 minutes, with the Alarmware port baud rate set to 57,600 baud (*see 2.10.5 Alarmware Port Net 3 Device Configuration in the Operator's Manual*).  While the user configuration data represents a relatively small amount of additional time, *user recorded message data can also take a significant amount of time.* The amount of time depends upon what fraction of total recorded message capacity has been used to record voice messages.

If user-recorded voice messages are programmed in the RTU, but have not previously been transferred from the RTU to Alarmware™, a message box will pop up when Firmware Download is selected from the Transfer menu. Since user configurations, including user-recorded messages, will be lost during the firmware download process, you should transfer the Catalyst's configuration settings, and recorded speech message data, to Alarmware™ before proceeding.

Select the proper RACO firmware file from the file menu. Firmware files have the file extension of ".rfw". After selecting the file, click OK to proceed. The firmware download process will start at that time.

**Please select firmware file for export to RTU**

File name:
`*.rfw`

core155.rfw

Folders:
c:\program files\raco\aware

- c:\
- Program Files
- RACO
- Aware
- Bak
- Data

List files of type:
RFW files

Drives:
c: NAE10-97

OK | Cancel | Help | Network...
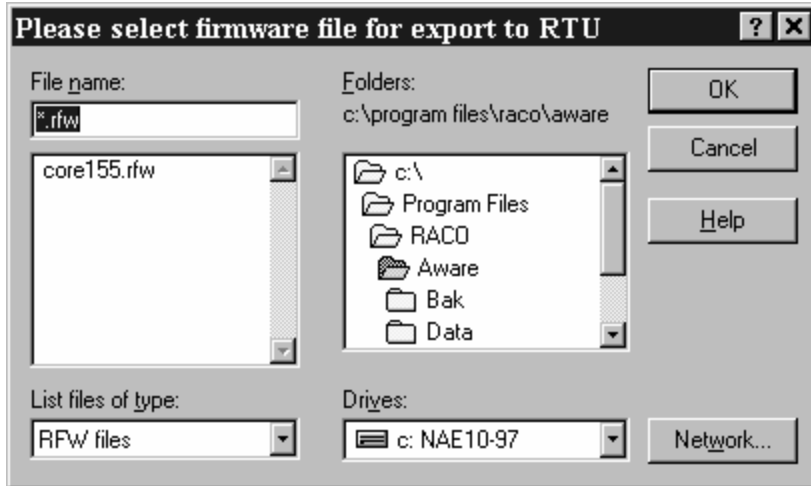
A status box will show the progress of the download. After the download is complete, the RTU will disconnect from Alarmware™ and complete the update procedure. After a few minutes, connect to the RTU once again in order to transfer (export) configuration and message files to the RTU.

To verify that the upgrade and export operations were performed properly, select "Verify Configuration File" from the Transfer menu. When you can run this feature without getting any database mismatches, you can feel secure that the speech and data files were transferred properly.

**A Cautionary Note**

There is a small, but finite risk that some malfunction during the firmware download procedure will cause the RTU to become completely inoperable. Every effort has been made to minimize that risk. If a malfunction should occur, the only remedy is to physically replace the RTU's Flash memory module with a new module from the factory. The highest vulnerability to this condition is during the time the RTU is copying the new firmware to Flash memory. If during this copy operation there is an interruption of primary power when the RTU back-up battery is completely discharged or disconnected, the copy operation will fail, and the RTU firmware will be in an inoperable state. (The copy operation occurs as the final step of the update process, after Alarmware has disconnected) Appropriate steps taken to ensure proper primary and back-up power to the RTU during the download process will minimize the likelihood of this happening**.**

**Never initiate a download if LOBAT LED is ON or blinking!**

At other points along the way, malfunctions such as loss of communication with the RTU can be recovered. Simply restart the firmware download procedure.

**Warning** - The Catalyst's Flash memory does not have enough capacity to perform the firmware download without first erasing all user configurations and messages. The firmware download procedure in Alarmware™ will provide a warning when user data has not been transferred to the Alarmware™ computer. But remember that after the RTU has downloaded the updated firmware and rebooted, it will be completely void of user configurations and messages.

**In performing the complete firmware download procedure, the RTU progresses through the following steps:**

- The RTU suspends operating as an RTU. At this point there will be no channel scanning or response to alarm violations.
- The new firmware is transferred from the Alarmware™ computer (either via the computer's com port, or via the modem) to the RTU.
- The RTU copies the new firmware image to Flash memory.
- The RTU does a complete reboot.
- At this point, the RTU will resume operating as an RTU. However, all configuration settings will be at their factory default settings. There will be no user-recorded speech or text messages.

## 2.19.1 Compatibility problems with v1.39

Problems noted with upgrading from firmware and Alarmware™ version 1.39:

- The Log File / Printer groups are not preserved and the groupings are not cleared out in the old Log File / Printer destination slot.
- The v1.39 notification and log filters have changed and are mapped as reasonable.
- Flow control is changed from XON/XOFF to NONE.

To be certain that the configuration was converted properly, operator should verify the following:

- Grouping for all destinations
- Filtering for all destinations
- Filtering for Log File and Printer devices
- Set Printer Flow control to desired setting.

# 3.0 Recording your own Voice Messages

## 3.1 Recording Voice Mode Messages: Preparations

### 3.1.1 Recording Voice Messages is an Optional Step

Your RTU comes with default voice messages for all channels. The specific default messages for a given channel depend upon the configured channel type.  Recording voice messages can be postponed until you have become more familiar with your RTU. You may choose to record or re-record your own message from a remote telephone or the front panel at any time.

*Note: Before recording speech messages, be sure you have resolved which channels are analog type and which are discrete type.*  If there is any concern about total available recording time, you should also have determined the amount of memory to allocate to a **Log File**, if you plan to create one*.  Please refer to Log File Reserve Size Considerations. Also, be sure to review the topic "1.3 Messages" in the Operator's Manual.*

### 3.1.2 Planning for Voice Messages

*The ideal way to proceed is to first complete the Catalyst Memory Allocation Tool Excel Work File,* which is included with your Alarmware™ package.  Instructions for using the worksheet are included within the Excel tool file.  This worksheet provides a simple way to plan your messages. It includes intelligent utilities to determine if there is adequate recording time capacity available to record all your messages and to help you determine whether you should use the slower or faster recording speed, etc.

The resulting Work File (opened with Excel or as a printed hard copy) can then be used to record your voice messages via phone or at the RTU Front Panel. You can also enter the corresponding text messages via Alarmware™ if that has not already been done.  Working with both Excel and Alarmware™ open, you can even use the Windows clipboard to easily copy and paste the text messages from the Message Planning Work File into the corresponding Alarmware™ dialog boxes.

When planning messages, be conservative.  This will not only reduce recording time, but also to make voice and text reports easy to understand.  When there are a number of channels to report simultaneously, long speech and text messages can become quite cumbersome to deal with.

*In addition to determining in advance which channels are analog and which are discrete data types, you should progress to enter all the configuration items for each channel, especially the text messages, prior to making final determination of the amount of recording time available*.  This step is important because some RTU's need to have many channels configured. If the configuration data (especially the text messages) occupies a lot of space, there can be secondary impact upon the amount of recording time that is available.

### 3.1.3 Helpful Hint If Using Log Files

Considering that you may wish to export retrieved log data to a spreadsheet or database for sorting and processing of large amounts of data, it may be strategically helpful to include brief leading characters in the text messages that will assist with initial sorting operations.  You can include such brief leading strings in the message planning worksheets, and then disregard the leading characters when using them as the guide for recording of voice messages. However, include them in the actual text messages that are entered in the Messages dialog box under Alarmware™.

## 3.1.4 Important Note Regarding the Saving of User-Recorded Speech Data

While user recorded messages can only be recorded at the front panel or via voice telephone, the resulting large amount of data can be imported into Alarmware™ by selecting this option when connecting to the RTU. Due to the large amount of data involved with recorded speech, this import process can take up to 2 hours via modem, or preferably about ½ hour via serial port connection to the RTU at 57,600 baud speed. *It is good defensive practice to have recorded speech data saved on the central computer*. This will help avoid the need to re-record messages if some unusual event requires restoration of the recorded speech data.

## 3.2 Verifying that there is Adequate Recording Time Available

**The total available recording time is determined by four factors:**

1.  The amount of on-board RAM as well as any additional Memory Modules installed at the factory. Check the "Factory Settings" report to determine amount of memory available
2.  The amount of memory you allocate for an optional **Log File**, which reduces the memory available for recording
3.  The amount of configuration data stored
4.  The selected speech recording rate, either 1800 or 3600 bytes per second

**There are two ways to determine the amount of available speech recording time:**

1.  By formula (approximate value)
2.  By querying the RTU (more accurate value)

The formula for the approximate number of minutes available for speech recording at the **3600 bps rate** is:

**Minutes = T - (.0044) \* (Log File reserve in Kbytes)**

'T' is the approximate time available when the log reserve is set at zero.

If your RTU has a 4Mbyte expansion module installed, use T = 23. Otherwise, use T = 4.6.

**Double** the formula to get minutes available at **1800 bps rate**.

For example, an RTU with no expansion module and log reserve of 256 Kbytes can record 4.6 - (.0044)\*256 = 3.4 minutes at 3600 bps or 6.8 minutes at the slower rate.

*Important Note: These figures are approximate in part because there is a small amount of additional memory capacity lost to file overhead factors which are difficult to calculate.*

**To get a more accurate measure of the amount of recording time:**

You can query the amount of recording time available via the Messages configuration dialog box in Alarmware or by using keycode **690** from the front panel or over the phone. If you have configured the size of the Log File reserve then you can disregard the above formulas in favor of the actual displayed value.

Channel status messages will typically occupy the great bulk of your total recorded messages.  By comparison, RTU Name, as well as the other messages, will represent only a small fraction of available recording time, if you decide to record them at all.  *Managing recording time requirements is mostly a matter of managing time requirements for channel message recording.*

Even if you need to use the slower recording rate to accommodate all your channel messages, you might consider recording the RTU Name at the faster rate in order to maximize its quality.  The RTU Name will tend to be heard much more frequently than a given channel status message. The small size of such a message means that recording them at a faster rate will have little impact on overall recording time capacity.

The Catalyst Memory Allocation Tool includes a **timer utility** to estimate the recording time required for each message entered. The resulting accumulation of total estimated recording time is presented in comparison with the total time available.  In particular, the tool presents the **estimated accumulated time** and corresponding **estimated total time remaining**.  At any given point through the process of the recording of the channel messages, you can compare this figure with the RTU's own statement of its **actual remaining recording time** to verify that you are "on pace" with respect to use of overall recording time available.

*To check the amount of recording time remaining at any point, use Key Code **690**.*

## To make more recording time available you may elect to:

- Shorten some of your existing recorded messages
- Decide to rely more upon the default messages
- Change the recording rate for some or all messages. *Note: This will require re-recording those messages.*

## For Basic guidelines on use of Keycodes refer to:

- *4.2 Configuring your RTU from the Front Panel*
- *4.3 Configuring your RTU Over The Phone*

## 3.3 Default Voice Mode Channel Status Messages

**If you wish to clear a Voice Mode message to default:**

Enter the appropriate message code followed by * *.



Example:

2 197 ** To reset Message #2 for Channel 197 back to default.

Message Number
Channel Number
Reset Characters
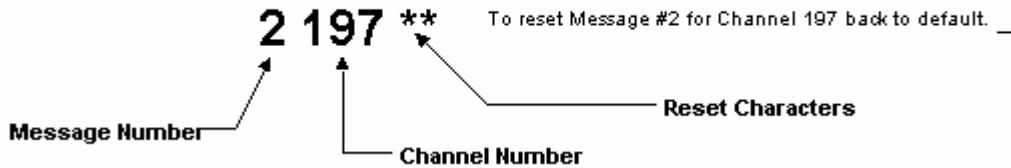


| CHANNEL TYPE | DEFAULT MESSAGE #1 | DEFAULT MESSAGE #2 |
| Analog Channel | "Channel N reading is" _____ | (none) _____ |
| Discrete Channel | "Channel N" _____ | "Channel N" _____ |

| Channel Data Type | Default Message 1 | Default Message 2 |
|---|---|---|
| **ANALOG** | Channel N reading is | (none) |
| **DISCRETE** | Channel N no violation | Channel N violation |

## 3.4 The Actual Voice Message Recording Process

**The following recommendations apply to all message recording:**

- Minimize any background sounds.
- Have your completed Message Planning Work File (or a hard copy) in front of you.
- Be prepared to recite the message in a fairly loud, clear voice
- If recording from the RTU's Front Panel, speak from within approximately 6 to 12 inches of the built-in microphone (located at the top of the Front Panel).
- Always stop the recording promptly to avoid wasting recording time.

**Verify that you have the correct recording rate set:**

| From the Front Panel (FP) | From Over The Phone (OTP) |
|---|---|
| <ul><li>Enter PROGRAM mode</li><li>Enter Keycode 693 to check the rate.</li><li>To change the rate, enter 693*1800 or 693*3600</li></ul> | <ul><li>Press 1 to get into Program Mode</li><li>Enter Keycode 693### to check the rate.</li><li>To change the rate, enter 693*1800 ### or 693*3600###</li></ul> |

**Now you are ready to proceed with recording!**

**Follow the example below for channel status Message 1 and Message 2:**

| 3.4.1 Recording from the Front Panel (FP) | |
|---|---|
| **Message 1:** | <ul><li>Enter PROGRAM mode by pressing the PROGRAM key.</li><li>Enter Keycode: **1 Z \*** (where **Z** is the channel number, such as 1 for channel 1, or 256 for channel 256. Leading zeros are not required.)</li><li>*The RTU's voice specifically identifies the message you are about to record, then prompts you to press the RECORD key.*</li><li>Hold RECORD key down for the duration of your spoken message. Note: There is a short delay after pressing RECORD before the RECORD light turns ON.</li><li>***Do not start speaking your message until the* RECORD *light turns ON*.** If you do not wait, the first portion of your message will be clipped off.</li><li>Since you will immediately hear your message played back upon releasing the RECORD key you will quickly become proficient at working with this short time delay.</li></ul> |
| **Message 2:** | <ul><li>Enter Keycode: **2 Z \*** then follow the example shown above.</li></ul> |

| 3.4.2 Recording from Over The Phone (OTP) | |
|---|---|
| **Message 1:** | <ul><li>Press **1** to get into Program Mode</li><li>Enter Keycode: **1 Z \* # # #**  (where **Z** is the channel number)</li><li>The RTU's voice specifically identifies the message you are about to record, then prompts you to press ZERO to begin recording, then press ZERO again to stop recording</li><li>Note that there is a delay of approximately ¼ second after pressing the ZERO key before the recording actually begins.  Therefore **you will need to wait** this brief time before beginning to recite your message</li><li>Since you will immediately hear the resulting message played back you will quickly become proficient at working with this short time delay</li><li>Note that when programming Over The Phone, # # # is used in lieu of pressing ENTER on the Front Panel Keypad</li></ul> |
| **Message 2:** | <ul><li>Enter Keycode: **2 Z \* # # #** then follow either the FP or OTP example shown above.</li></ul> |

**In Either Case:**

The RTU will automatically play back the message you just recorded, allowing you to determine if you need to re-record the message to make it louder, softer, or clearer:

- Experiment with different volume levels to get the best message clarity.
- Try recording some messages over the phone and from the front panel to determine preferred method of recording.
- Try recording some messages at different recording rates to determine preferred quality.

**If you run out of recording time**, you will hear the message, "**No more message time.**" In this case, refer to *3.2 Verifying that there is Adequate Recording Time Available*.

## 3.5 Voice Mode Name (ID) Messages

In addition to Voice Mode channel status messages, the RTU uses three types of Voice Mode Name (ID) "messages" in various voice reports.  These three message types correspond to the text name messages used in the corresponding data mode text reports.  Note that there is a fourth category of names, PIN names, for which there are no Voice Mode counterparts.

### 3.5.1 Voice Mode RTU Name Messages

The Voice Mode RTU Name Message is used to identify the site where the RTU is located.  An example for this message might be, "This is the South Main Pumping Station."  This message will be the first message heard when calling the RTU or receiving alarm reports in voice mode.  Using the leading words "This is…" will usually be helpful in making the nature of the call more clear to the recipient. The factory default Voice Mode RTU Name Message is "RTU."

*Important Note: If the RTU Name message is very long, the timing of data connections can be affected. The amount of time it takes to connect with Alarmware™ and other devices is increased by the length of time it takes to recite the message. **It may become necessary to either extend the call-in delay timer or to shorten the RTU Name message**.*

| Keycode | Action |
| --- | --- |
| 60 | Listen to the VOICE mode RTU Name message |
| 60 * | Record the VOICE mode RTU Name message |
| 60 ** | Reset the VOICE mode RTU Name to default message |

### 3.5.2 Voice Mode Network ID Name Messages

The Voice Mode Network ID Name Message identifies the corresponding Industrial Network that is the source of most of the information in the report.  In practical terms, this amounts to naming the PLC that the RTU is monitoring. The factory default Voice Mode Network ID Name Message for Net 1 is "Net 1".

| Keycode | Action |
| --- | --- |
| 61 | Listen to all the VOICE mode Network Name messages |
| 61 N | Listen to the VOICE mode Network **N** message |
| 61 N * | Record the VOICE mode Network **N** message |
| 61 N ** | Reset the VOICE mode Network **N** message to default |

### 3.5.3 Voice Mode Destination ID Name Messages

Voice Mode Destination ID Messages are most commonly used in text reports or logs, to identify personnel at the telephone numbers where they will be receiving alarm calls.  Typically, user recorded Voice Mode Destination ID messages are the names of the corresponding individuals. If more than one person might be reached at a given telephone number configuring PINs provides a way to more reliably identify the exact individual who receives an alarm call in text logs and reports. Regardless, Voice Mode Destination ID voice messages will be encountered much less frequently than their text counterparts. The factory default Voice Mode Destination ID Name message for Destination N is "Destination N".

| Keycode | Action |
|---|---|
| **62 N** | Listen to the VOICE mode Destination **N** Name message |
| **62 N \*** | Record the VOICE mode Destination **N** Name message |
| **62 N \*\*** | Reset the VOICE mode Destination **N** Name to default message |

## 3.6 Voice Mode Tag Words

You may record your own voice mode Tag Words to replace the factory default ones. To have an adequate understanding of Tag Words, please refer to *1.3.2 Tag Words and States*.

The Keycodes for *reading* the Tag Words based upon the factory defaults are:

| | |
|---:|---|
| **6 4 1** | NORMAL |
| **6 4 2** | ALARM |
| **6 4 3** | ALARM ACKNOWLEDGED |
| **6 4 4** | NOW NORMAL |
| **6 4 5** | NOW NORMAL ACKNOWLEDGED |
| **6 4 6** | FIRST OUT |
| **6 4 7** | ALERT |
| **6 4 8** | HIGH SET POINT |
| **6 4 9** | LOW SET POINT |
| **6 4 10** | DNA COMMUNICATIONS |
| **6 4 11** | SNA COMMUNICATIONS |
| **6 4 12** | STATUS ONLY |
| To *record* your own replacement tags, add * after the above digits. To *restore* tags to default, add * * after the above digits. | |

# 4.0 Configuring your RTU with Keycodes

## 4.1 Factory Defaults

When all programming is cleared out at initial start-up, all configurations are set to factory defaults. Some of these default values are suitable for users, and some selected items will need to be configured for different settings.

## 4.2 Configuring your RTU from the Front Panel

At the Front Panel, enter PROGRAM mode by pressing the PROGRAM key (*please refer to drawing 1.4 The RTU Front Panel*). The RTU will respond with, "Enter program code."

**For most configuration items you will have the choice of:**

- Determining an existing setting
- Clearing the setting to factory default value
- Establishing a new setting.

**To determine the existing configuration values:**

- Enter a code at the keypad
- Followed by the ENTER key
- A voice will annunciate the existing setting or value without changing it

**To clear, erase, or reset a value or setting:**

- Enter the code
- Followed by the reset delimiter **
- Then the ENTER key

**To change a value or setting:**

- Enter the code
- Followed by the command delimiter *
- Then add the new value or setting
- Then signal the end of the command string with the ENTER key

*Notes:*
1. *Certain commands may take several seconds to process before responding*
2. *Keystrokes entered while a previous command is reporting will stop that report, silence the unit, and begin a new command.*
3. *Most front panel operations, including configuration, will automatically acknowledge any existing Unacknowledged Alarms.*
4. *Even if PINs have been configured, front panel operations may be done without entry of a PIN.  Any text mode reports will automatically list a PIN of 00000 for actions performed at the front panel.*

## 4.2.1 Keycode Entry Flowchart
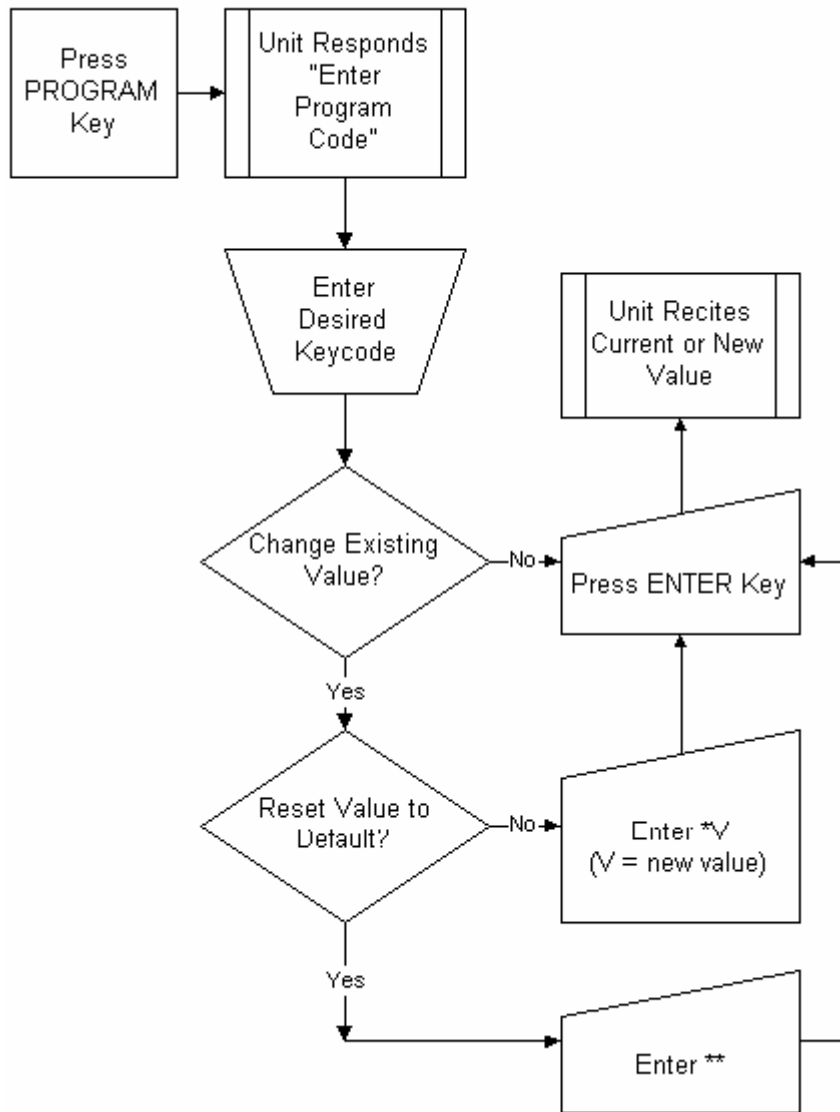


## 4.3 Configuring your RTU Over the Phone

*Note: refer to the topic 4.5.3 Keycodes: Complete Listing for specific Keycodes to use.*

To read or alter configuration settings by phone place a call to the RTU from a touch tone telephone. When the RTU answers the call, press the 1 key on the telephone keypad. The RTU will respond with, "Enter program code."

**As with programming at the front panel, for most configuration items, you will have the choice between:**

- determining an existing setting

- clearing the setting to factory default value
- establishing a new setting

*Note: You may instead enter a "2" which will get you into read-only Program Mode, which as a safety feature only allows you to review, not change, program settings.*

**To read existing configuration values:**

- Enter a code at your touch-tone keypad
- Followed by the # # # key sequence (# # # is the code equating to the ENTER key, when programming over the phone)
- A voice will annunciate the existing setting or value without changing it.

**To clear, erase, or reset a value or setting:**

- Enter the code
- Followed by the reset delimiter **
- Then the # # # keys

**To change a value or setting:**

- enter the code
- followed by the command delimiter *
- add the new value or setting
- signal the end of the command string with # # # (the ENTER code).

*Note: When you enter a leading #, the RTU does not yet know whether the intention is to enter # # # to indicate an ENTER or a single # as a prelude to something else.  Therefore it will respond to the first # with the word "pound" recited back.*

**Since some of the Front Panel keys are not found on a touch tone keypad, some special conventions apply for OTP (Over the Phone) keystroke interpretation:**

| Front Panel Key | Equivalent |
|-----------------|------------|
| CANCEL | *# * ** |
| ENTER | *# # #* |
| POINT | *# ** |
| MINUS | *# #* |

*Special case: Over the phone,* **you may not configure more than one consecutive dialing delay** *because two ## in a row is interpreted as MINUS when configuring.*

*Note: Not all programming items can be performed over the phone and are only available within Alarmware™.*

*Note: The action of entering Program Mode automatically acknowledges all unacknowledged alarms, regardless of destination group.*

## 4.4 Utilizing Keycodes → Important Configuration Notes

1. When referring to the RTU, **Z** = 0.
2. For any channels you have configured as Status-Only, used code **1 Z** for Message 1, and use code **2 Z** for Message 2.
3. **DN** is the Phone Number associated with a particular Destination.
4. Actual power failure trip delay may be a fraction of a second longer than configured value, due to power supply discharge time which varies with the number of option boards.
5. The speaker always operates during Front Panel programming, even if it is configured OFF.
6. For large channel units, especially with logging and Printer activated, there may be some long periods of silence while the unit is performing the requested task. To avoid confusion, any period of silence greater than 3 seconds during processing of any command will cause a beeping tone. Every third tone is replaced with "over in X seconds" progress report.

## 4.5 Keycode Programming Reference

### 4.5.1 OTP Session Menu Items Table

| FEATURE (AS PIN ALLOWS) | TELEPHONE KEYPAD NUMBER |
|---|---|
| Acknowledge ALL alarms, enter PROGRAM mode | 1 |
| Acknowledge ALL alarms, enter PROGRAM mode \| Read Only | 2 |
| Acknowledge ALL alarms, then report all **Unreported** and **Non-Normal** Channels **not linked** to Destination | 3 |
| Enter SEARCH mode | 4 |
| Repeat the Menu Options | 5 |
| Repeat Unit ID message, Preliminary Report, and Alarm Report | 6 |
| Mark ALL alarms as reported without acknowledgement | 7 |
| Acknowledge all alarms, reported or unreported and give a count of the number of alarms | 8 |
| Acknowledge ALL alarms, then report all **Unreported** and **Unacknowledged** Channels **not linked** to Destination | 9 |
| End Session or Report | 0 |
| Quit current Report or Mode | #** |

| The following are available when in **PROGRAM or SEARCH** mode. | |
|---|---|
| Insert Command digits | 0-9 |
| Signal end of Command string | ### |
| Erase current command | #** |
| Toggle recording state (prior command required to enable) | 0 |
| Delimits command from set value (used to separate command fields) | * |
| Command value reset delimiter | ** |
| Sub-Sub-Field delimiter (e.g. routing nodes) | *** |
| Shift the meaning of the following keystroke | # |
| Minus sign | ## |
| Decimal point | #* |

4.5.1.1 Special Phone Number String Characters

The table below describes the special characters used in phone number dialing strings. They may be typed directly using Alarmware. Keycode users will need to use the multi-key forms shown in the right hand column.

| Special Phone Number String Characters | | |
|---|---|---|
| **Character** | **Interpretation** | **Keycodes used to enter from the Front Panel or Over the Phone** |
| 1 | DTMF 1 | 1 |
| 2 | DTMF 2 | 2 |
| 3 | DTMF 3 | 3 |
| 4 | DTMF 4 | 4 |
| 5 | DTMF 5 | 5 |
| 6 | DTMF 6 | 6 |
| 7 | DTMF 7 | 7 |
| 8 | DTMF 8 | 8 |
| 9 | DTMF 9 | 9 |
| 0 | DTMF 0 | 0 |
| * | DTMF * | #* |
| # | DTMF # | ## |
| A | DTMF A | #1 |
| B | DTMF B | #2 |
| C | DTMF C | #3 |
| D | DTMF D | #4 |
| - | Delimiter, ignored while dialing | N/A |
| . | Delimiter, ignored while dialing | N/A |
| , | Pause 1 second | #5 |
| P | Enter PULSE dialing mode | N/A |
| T | Enter TONE dialing mode | #7 |
| @ | Wait for Silence | #9 |
| & | Wait for Credit Card Tone | N/A |
| W | Wait for Dial Tone | #6 |

4.5.2 Special Designators Used in Programming

| Special Designators | |
|---|---|
| **Value** | **Definition** |
| V | A value of one or more digits which may include a decimal point or minus sign. |
| N | One or more digits representing a whole number. No decimal point allowed |
| DN or A | Phone Number string (can be any length). |
| 1/0 | Used to turn a function ON or OFF. |
| Z | A channel number of one or more digits. Limited only by the number of channels available. Leading zeros are not required. |
| ❶ | Depends on SNA |
| ❷ | Depends on Model |
| *Note: You will notice that the Keycodes are displayed with spaces. These spaces are for readability only. Spaces should be ignored when entering Keycodes from the Front Panel or Over The Phone.* | |

### 4.5.3 Keycodes: Complete Listing

| 4.5.3.1 Unit Control | |
|---|---|
| **Keycode** | **Specification** |
| #** | **Silence Unit** |
| * | **Toggle remote listening mode ON and OFF** |
| *1 | **Arm/Disarm Unit** |
| *69 | **Repeat Last Command.** *Note: cannot be used with message recording keycodes.* |
| *9 | **Acknowledge Alarms** |

| 4.5.3.2 Channel Status, Value, and State Reports | |
|---|---|
| **Keycode** | **Specification** |

| **Status Reports** | |
|---|---|
| 0 | **Channel status summary report** |
| 00 | **Review full status report** |
| 00Z | **Read status of channel Z** |

| **Channel Value Reports** | |
|---|---|
| 01 | **Current value of all channels** |
| 01*SNA | **Read current value at net address** |
| 01*SNA*V | **Write value to net address** |
| 01Z | **Read current value of channel Z** |
| 01Z*V | **Write value to channel Z** |
| 01ZZ** | **Channel value reset without write-back.** |

| **Communications Status Reports** | |
|---|---|
| 02 | **Review full communications status report** |
| 02Z | **Report communications status for channel Z** |
| 02Z** | **Reset channel Z communication errors** |

| **Channel Raw Value Reports** | |
|---|---|
| 03Z | **Report default (raw) value for channel Z** |

| **Channel State Summary Reports** | |
|---|---|
| 05 | **Channel state summary report** |

| 4.5.3.3 Channel Messages | |
|---|---|
| **Keycode** | **Specification** |

| **Channel Status (analog = message 1, digital = normal message)** | |
|---|---|
| 1Z | **Listen to channel Z message 1/normal message** |
| 1Z* | **Record channel Z  message 1/normal message** |
| 1Z** | **Erase channel Z message 1/normal message** |

### Channel Status (analog = message 2, digital = alarm message)

| | |
|---|---|
| 2Z | Listen to channel Z message 2/alarm message |
| 2Z* | Record channel Z message 2/alarm message |
| 2Z** | Erase channel Z message 2/alarm message |

### Channel Status Message Reports

| | |
|---|---|
| 3 | Listen to all channel messages |
| 3Z | Listen to channel Z Message 1 and 2 (or normal and alarm) |

### 4.5.3.4 Phone Configuration

| Keycode | Specification |
|---|---|

### Device Report

| | |
|---|---|
| 4 | Review complete device configuration report |
| 4*N | Report complete device configuration report for N |
| 4*N** | Resets all parameters for device N to factory default |
| 4*N*0 | Enable scan for device N |
| 4*N*1 | Disable scan for device N |

### Telephone Device Report

| | |
|---|---|
| 40 | Review all telephone configuration items |
| 40** | Reset all telephone configuration items to default |

### Call Progress Monitoring

This feature enables or disables CPM. When CPM is off, the unit will disregard ringing, and consider the phone answered. After 5 seconds the notification report will begin.

| | |
|---|---|
| 401 | Read status of Call Progress Monitoring (CPM) |
| 401** | Reset CPM to default |
| 401*0 | Set CPM to ON |
| 401*1 | Set CPM to OFF |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| N/A | 0 | 0 | 1 | 0=ON,1=OFF |

### Country Code

| | |
|---|---|
| 402 | Read country code setting |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| N/A | N/A | 15 | 22 | 15=KSA, 22=USA |

### Outgoing Call Timer

This is the amount of time that the unit will wait between a destination answering the call, and the start of the session. Associated with Alarmware™, Log File downloading, and Central Station contact.

| | |
|---|---|
| 403 | Read outgoing call time limit |
| 403** | Reset outgoing call time limit to default |
| 403*V | Set outgoing call answer limit |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| SECONDS | 45 | 30 | 120 | N/A |

## Ring Answer Delay

This parameter determines how many rings will be allowed before the unit answers an incoming call.

| 404 | Read ring answer delay (ring count) |
|-----|-------------------------------------|
| 404** | Reset ring answer delay to default |
| 404*V | Set ring answer delay to V |

| Units | Default | Min | Max | Options/Comments |
|-------|---------|-----|-----|------------------|
| RINGS | 1 | 1 | 20 | N/A |

## Speaker State

Determines whether or not the speaker is audible during incoming and outgoing over the phone sessions.

| 405 | Reads speaker state |
|-----|---------------------|
| 405** | Reset speaker state to default |
| 405*0 | Set speaker state to ON |
| 405*1 | Set speaker state to OFF |

| Units | Default | Min | Max | Options/Comments |
|-------|---------|-----|-----|------------------|
| N/A | 0 | 0 | 1 | 0=ON, 1=OFF |

## Call-In Timer

This is the amount of time that the unit will wait between answering the call, and the start of a session. Associated with Alarmware™, Log File downloading, and Central Station contact.

| 406 | Read Call-in Time Limit |
|-----|-------------------------|
| 406** | Reset Call-in Time Limit to default |
| 406*V | Set Call-in Time Limit to <V> |

| Units | Default | Min | Max | Options/Comments |
|-------|---------|-----|-----|------------------|
| SECONDS | 60 | 15 | 120 | N/A |

## Dialing Mode

| 407 | Read dialing mode |
|-----|-------------------|
| 407** | Reset dialing mode to default |
| 407*0 | Set dialing mode to PULSE |
| 407*1 | Set dialing mode to TONE |

| Units | Default | Min | Max | Options/Comments |
|-------|---------|-----|-----|------------------|
| N/A | 1 | 0 | 1 | 0=PULSE, 1=TONE |

## RTU Phone Number

This is the phone number that is physically connected to the Catalyst.
*Note: FCC requirements prevent any outgoing FAX sessions unless this phone number has been entered.*

| 408 | Read RTU Phone Number |
|-----|----------------------|
| 408*DN | Set RTU Phone Number to DN |
| 408** | Reset RTU Phone Number to NONE |

| GSM Digital Cell Phone Support | |
|---|---|
| This support is enabled when a Phonecell SX5e GSM 850/1900 is used with the Catalyst. This support includes; altered timing on certain session types and altered DTMF tone duration. | |
| 409 | Read status of GSM support |
| 409*0 | Set GSM support to ON |
| 409*1 | Set GSM support to OFF |
| 408** | Reset GSM support to OFF (default) |

| 4.5.3.5 Network & Device Configuration | |
|---|---|
| Keycode | Specification |

| Device Configuration Report | |
|---|---|
| 41 | Read current settings of all serial parameters for all networks. |

| Device Configuration Parameters | |
|---|---|
| 411 | Read all configuration settings for MODBUS network |
| 411** | Reset all configuration settings for MODBUS network |
| 412 | Read all configuration settings for Printer |
| 412** | Reset all configuration settings for Printer |
| 413 | Read all configuration settings for Alarmware Port |
| 413** | Reset all configuration settings for Alarmware Port |
| 414 | Read all configuration settings for Log File |
| 414** | Reset all configuration settings for Log File |
| 415 | Read all configuration settings for ISP |
| 415** | Reset all configuration settings for ISP |
| 41N** | Reset all parameters for device N |

| Device Enable/Disable (MODBUS, Printer, and Log File) | | | | |
|---|---|---|---|---|
| 4*N*0 | Enable Device N | | | |
| 4*N*1 | Disable Device N | | | |
| Units | Default | Min | Max | Options/Comments |
| N/A | N/A | 1 | 4 | 1 = MODBUS PLC<br>2 = PRINTER PORT<br>4 = LOG FILE RESERVE |

| 4.5.3.6 Time and Date Settings | |
|---|---|
| Keycode | Specification |

| Time and Date Report | |
|---|---|
| 42 | Review TOD configuration report |

| Time of Day | |
|---|---|
| 421 | Read the time-of-day |
| 421*HHMMSS | Sets time-of-day |

| Date | |
|---|---|
| 422 | Read the date |
| 422*MMDDYYD | Sets the date |

| Daylight Savings Time | | | | |
|---|---|---|---|---|
| 423 | Read Daylight Savings Time (DST) status | | | |
| 423** | Reset DST to default | | | |
| 423*0 | Set DST to ON | | | |
| 423*1 | Set DST OFF | | | |
| 423*2 | Set DST to Automatic | | | |
| Units | Default | Min | Max | Options/Comments |
| N/A | 2 | 0 | 2 | 0=ON, 1=OFF, 2=AUTO |

| TOD Report Format | |
|---|---|
| Determines how the time and date are formatted for reporting purposes. | |
| 424 | Reads the TOD report format option |
| 424** | Reset the TOD report format option |
| 424*0 | Set the TOD report format option 0 [WED JUL 24, 2002 15:52:34] |
| 424*1 | Set the TOD report format option 1 [24-JUL-02 15:54:32] |
| 424*2 | Set the TOD report format option 2 [07/24/2002 15:55:04] |
| 424*3 | Set the TOD report format option 3 [24/07/2002 15:55:20] |
| 424*4 | Set the TOD report format option 4 [07/24/02 15:55:40] |
| 424*5 | Set the TOD report format option 5 [24/07/02 15:55:58] |

| 4.5.3.7 Channel Configuration |
|---|

| Keycode | Specification |
|---|---|

| Physical Input Configuration | | | | |
|---|---|---|---|---|
| Determines how the physical channels are configured. Physical Input and Physical Output channels can be set as either an ANALOG or DISCRETE data type. Analog channel types have a range of values, while discrete channel values are either 1 or 0. | | | | |
| 431 | Report the Physical Input configuration for all points on the IO board. | | | |
| 431** | Reset all Physical Input configurations on the IO board to DISCRETE | | | |
| 431*P | Report the Physical Input configuration for point P on the IO board. | | | |
| 431*P** | Reset the Physical Input configuration for point P on the IO board back to DISCRETE | | | |
| 431*P*0 | Set the Physical Input configuration for point P on IO board to DISCRETE | | | |
| 431*P*1 | Set the Physical Input configuration for point P on IO board to ANALOG | | | |
| Units | Default | Min | Max | Options/Comments |
| N/A | 0 | 0 | 1 | 0=DISCRETE<br>1=ANALOG |

| Channel Configuration Report | |
|---|---|
| 5 | Review configuration report for all channels |
| 5** | Reset configuration report for all channels |
| 5*Z | Review all configuration data for Channel Z |
| 5*Z** | Reset Channel configuration data. |

### Channel SNA Configuration

| | |
|---|---|
| **51Z** | **Read channel Z source net address** |
| **51Z\*\*** | **Reset channel Z source net address** |
| **51Z\*SNA** | **Set channel Z source net address** |

### Channel Violation Conditions

| | |
|---|---|
| **52** | **Report violation conditions for all channels** |
| **52\*\*** | **Reset violation conditions for all channels** |
| **52Z** | **Review violation conditions for channel Z** |
| **52Z\*\*** | **Reset violation conditions for channel Z** |
| **52Z\*0** | **Disable channel Z** |
| **52Z\*1** | **Set channel Z to Alarm on 1 raw value** |
| **52Z\*2** | **Set channel Z to Alarm on 0 raw value** |
| **52Z\*3** | **Set channel Z to Alarm Never** |
| **52Z\*4** | **Set channel Z Alarm on Com Failure only** |
| **52Z\*5** | **Read low setpoint for channel Z** |
| **52Z\*5\*\*** | **Reset low setpoint for channel Z** |
| **52Z\*5\*V** | **Set low setpoint for channel Z to V** |
| **52Z\*6** | **Read high setpoint for channel Z** |
| **52Z\*6\*\*** | **Reset high setpoint for channel Z to default.** |
| **52Z\*6\*V** | **Set high setpoint for channel Z to V** |

### Transformation Options

| | | | | |
|---|---|---|---|---|
| **53Z** | **Read transformation option for channel Z** | | | |
| Units | Default | Min | Max | Options/Comments |
| N/A | RAW | 0 | N/A | 0=RAW |

### Destination / Channel Groups

**Provides operators with the opportunity to determine which channels are linked to which destinations.**

| | | | | |
|---|---|---|---|---|
| **55** | **Read destination channel groups** | | | |
| **55\*\*** | **Reset all destination channel groups to default** | | | |
| Units | Default | Min | Max | Options/Comments |
| LINKS | ALL | ONE | ALL | N/A |
| **55Z** | **Read destination channel groups for Channel Z.** | | | |
| **55Z\*\*** | **Reset destination channel groups for channel Z to default.** | | | |
| Units | Default | Min | Max | Options/Comments |
| LINKS | ALL | ONE | ALL | N/A |

### Channel Violation Trip Delay

**Determines the amount of time an individual channel can be in a violation condition, before channel goes into an alarm state.**

| | | | | |
|---|---|---|---|---|
| **56Z** | **Read channel Z violation trip delay** | | | |
| **56Z\*\*** | **Reset channel Z violation trip delay** | | | |
| **56Z\*V** | **Set channel Z violation trip delay to V seconds** | | | |
| Units | Default | Min | Max | Options/Comments |
| SECONDS | 2.0 | 0.0 | 9999 | N/A |

| 4.5.3.8 Messages and Tag Words | |
|---|---|
| **Keycode** | **Specification** |

| **Unit Name (ID) Message** | |
|---|---|
| **60** | **Listen to Unit ID message** |
| **60\*** | **Record Unit ID message** |
| **60\*\*** | **Erase Unit ID message to default (both voice and text)** |

| **Network Name (ID) Messages** | |
|---|---|
| **61** | **Listen to all active network ID messages** |
| **61\*\*** | **Reset Network ID messages to default.** |
| **61N** | **Listen to network N ID message** |
| **61N\*** | **Record network N ID message** |
| **61N\*\*** | **Erase network N ID message (both voice and text)** |

| **Destination Name (ID) Messages** | |
|---|---|
| **62\*\*** | **Reset all destination messages to default.** |
| **62N** | **Listen to destination N ID message** |
| **62N\*** | **Record destination N ID message** |
| **62N\*\*** | **Erase destination N ID message (both voice and text)** |

| **Tag Words** | | | | |
|---|---|---|---|---|
| **These words define different channel states. Operators have the flexibility to change the factory words to user-recorded tag words.** | | | | |
| **64\*\*** | **Reset All Tag Words to default** | | | |
| **641** | **Listen to alarm state tag "Normal"** | | | |
| **642** | **Listen to alarm state tag "Alarm"** | | | |
| **643** | **Listen to alarm state tag "Alarm Acknowledged"** | | | |
| **644** | **Listen to alarm state tag "Now Normal"** | | | |
| **645** | **Listen to alarm state tag "Now Normal, Acknowledged"** | | | |
| **647** | **Listen to alarm state tag "Alert"** | | | |
| **648** | **Listen to alarm state tag "High Setpoint"** | | | |
| **649** | **Listen to alarm state tag "Low Setpoint"** | | | |
| **6410** | **Listen to alarm state tag "DNA"** | | | |
| **6411** | **Listen to alarm state tag "SNA"** | | | |
| **6412** | **Listen to alarm state tag "Status Only"** | | | |
| **64N\*** | **Record alarm state tag N** | | | |
| **64N\*\*** | **Erase alarm state tag N and restore default (both voice and text).** | | | |
| **Units** | **Default** | **Min** | **Max** | **Options/Comments** |
| N/A | N/A | 1 | 12 | TAG WORD N |

| **Autocall Message** | |
|---|---|
| **This feature allows you to record a special message to be played during a "Scheduled Test Call."** | |
| **65** | **Review Autocall Message** |
| **65\*** | **Record Autocall Message** |
| **65\*\*** | **Erase Autocall Message (Voice Only)** |

### Message Time

This is the amount of time available for recording speech messages at the current recording rate.

| | |
|---|---|
| 690 | Report message time available (in seconds). |

### Message Length Limit

This parameter sets the maximum length of any individual speech message recording.

| | |
|---|---|
| 691 | Report message length (in minutes). |
| 691*V | Set message length limit to V |
| 691** | Reset message length limit to default |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| SECONDS | 30 | 10 | --- | MAXIMUM DEPENDS ON AMOUNT OF NVRAM INSTALLED |

### Recording Rate

| | |
|---|---|
| 693 | Read recording rate |
| 693** | Reset recording rate to default. |
| 693*1800 | Set recording quality to 1800 BPS |
| 693*3600 | Set recording rate to 3600 |

### 4.5.3.9 Destination Configuration

| Keycode | Specification |
|---|---|

### Destination Configuration Reports

| | |
|---|---|
| 7 | Review destination configuration report |
| 7*N | Read Destination N configuration information. |
| 7*N** | Reset all configuration information for Destination N to default. |

### Phone Numbers

| | |
|---|---|
| 70 | List all phone numbers for all destinations |
| 70** | Clears all phone numbers for all destinations |
| 70N | Read phone number for destination N |
| 70N*DN | Set phone number for destination N to DN |

### Destination Types

| | |
|---|---|
| 71N | Read destination type of destination <N>. |
| 71N** | Reset device N configuration information to default |
| 71N*0 | Set destination N to NOT USED |
| 71N*1 | Set destination N to Voice Telephone Number (OTP) |
| 71N*2 | Set destination N to Group 3 Fax Terminal |
| 71N*3 | Set destination N to Numeric/Beeping Pager |
| 71N*4 | Set destination N to Alphanumeric Pager |
| 71N*5 | Set destination N to RACO SCADA Central Station |
| 71N*6 | Set destination N to Remote Data Terminal |
| 71N*7 | Set destination N to Email Reporting |
| 71N*8 | Set destination N to PA System |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| N/A | 0 | 0 | 8 | |

| Destination Reporting Formats | |
|---|---|
| This parameter determines how text reports are displayed and downloaded. | |
| 73N | Read reporting format for destination N |
| 73N** | Reset reporting format for destination N |
| 73N*0 | Set reporting format for destination N to 0 [Full Text] |
| 73N*1 | Set reporting format for destination N to 1 [Comma Delimited Text] |
| 73N*2 | Set reporting format for destination N to 2 [Comma Delimited Keys] |
| 73N*3 | Set reporting format for destination N to 3 [Comma Separated Values] |

| Callback Settings -- Status Report | |
|---|---|
| These settings determine what type of test callback is made. | |
| 791 | Read Callback Settings |
| 791*A | Status Report to phone number A in voice mode |
| 791** | Clear Status Report Callback |
| 792D | Send Status Report to Destination D in proper mode (if Destination D is a FAX then the report is sent in FAX mode. If Destination D is a RDT, then the report is sent in RDT mode. Etc.) |
| 792*A | Status Report to A in FAX mode |

| Callback Settings -- Log File Report | |
|---|---|
| 793 | Read Callback Settings |
| 793*A | Send Log File Report for the last 24 hours to phone number A in FAX Mode |
| 793** | Clear Log File Report Callback |
| 793D | Send Log File Report for the last 24 hours to destination D (FAX, Email, or RDT) |

| Autocall Report | |
|---|---|
| 794** | Toggle Autocall Report (enable/disable) |

| Log File Dump to Printer | |
|---|---|
| 799D | Dumps the Log File report, using parameters for destination 'D', to the Printer port. |

| 4.5.3.10 Session and Annunciation Parameters | |
|---|---|
| Keycode | Specification |

| Common Trip Delay | | | | |
|---|---|---|---|---|
| This is the amount of time that a channel violation is allow to exist without the unit changing the channel state to alarm. This setting is common to all channels. Individual channel trip delays should be set after this parameter because changing this parameter changes all channel trip delays to the common trip delay. | | | | |
| 801 | Read common trip delay | | | |
| 801** | Reset common trip delay | | | |
| 801*V | Set common trip delay to V seconds | | | |
| Units | Default | Min | Max | Options/Comments |
| SECONDS | 2.0 | 0.1 | 9999 | N/A |

### Alarm Reset Time

This setting is the amount of time between alarm acknowledgement, and the unit returning the channel state back to normal.

| 802 | Read alarm reset time |
|---|---|
| 802** | Reset alarm reset time |
| 802*V | Set alarm reset time to V hours |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| HOUR(S) | 1 | 0.1 | 99.9 | N/A |

### Power Failure Alarm Trip Delay

This is the amount of time that the unit will wait before tripping a PFAIL alarm and subsequent notification sequence.

| 803 | Read power failure alarm trip delay. |
|---|---|
| 803** | Reset power failure alarm trip delay |
| 803*V | Set power failure alarm trip delay to V minutes |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| MINUTE(S) | 1 | 1 | 9999 | 0.0 DISABLES POWER FAILURE ALARM |

### Phone Fault Test

When enabled, the unit will test the phone line for dial tone at the interval set by the operator.

| 804 | Read current TFAIL settings |
|---|---|
| 804*0 | Enable phone line failure tests |
| 804*1 | Disable phone line failure tests |
| 804** | Resets all phone line failure testing parameters to factory default |

### Automatic Re-Arm Enable

This parameter will enable the "Automatic Re-Arm" feature.

| 805 | Reports status of the automatic re-arm feature |
|---|---|
| 805*0 | Disable automatic re-arm feature |
| 805*1 | Enable automatic re-arm feature |
| 805** | Resets automatic re-arm feature to factory default (disabled) |

### Automatic Re-Arm

When enabled, this parameter will automatically re-arm the unit after the configured amount of time. This feature is designed to prevent the unit from accidentally being left in a DISARMED state, unable to make outgoing phone calls. Caution is advised however, because this could have unwanted side effects, such as arming the unit when it was intentionally left DISARMED.

| 806 | Report current automatic re-arm setting |
|---|---|
| 806*V | Set automatic re-arm time to V minutes |
| 806** | Resets automatic re-arm time to factory default |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| MINUTES | 60 | 2 | 9999.9 | |

## Alarm Acknowledgement Options

This setting determines how incoming calls to the unit are handled when an alarm condition exists. Alarms can be automatically acknowledged simply on call-in, or when a **PIN** is entered.

| 813 | Read acknowledgement option |
|---|---|
| 813** | Reset acknowledgement option to default |
| 813*1 | Set acknowledgement option to OFF |
| 813*2 | Set acknowledgement option to PIN required |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| N/A | 1 | 0 | 2 | 0=ON,1=OFF,2=REQUIRE PIN |

## Intersession Delay

This is the period of time between outgoing phone calls. Intent is to provide an opportunity for operators to call the unit.

| 820 | Read intersession delay value |
|---|---|
| 820** | Reset intersession delay value to default |
| 820*V | Set intersession delay to V minute |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| MINUTES | 1.0 | 0.0 | 60.0 | N/A |

## Redial Attempts to Same Destination

This parameter determines how many times a particular destination will be consecutively contacted. Destination my be called again if no destination has acknowledged the alarms and the unit is forced to loop back to the first eligible destination.

| 823 | Read redial attempts |
|---|---|
| 823** | Reset redial attempts to default |
| 823*V | Set redial attempts to V |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| ATTEMPTS | 1 | 1 | 5 | N/A |

## Session Time-Out

This parameter defines how long the RTU can be inactive, before a session is terminated. Purpose is to ensure the unit is not left in program mode for extended periods of time.

| 824 | Read session time-out value |
|---|---|
| 824** | Reset session time-out to default |
| 824*V | Set session time-out to V seconds |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| SECONDS | 120 | 0.1 | 3600 | N/A |

## Listening Period Options

Listening period when enabled will add 15 seconds to the end of an over the phone session, to allow operators to listen to the ambient noise surrounding the unit. Menu options are available during the listening period.

| 825 | Read end of session listening period option |
|---|---|
| 825** | Reset end of session listening period option to default |
| 825*0 | Set end of session listening period option to ON |
| 825*1 | Set end of session listening period option to OFF |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| N/A | 1 | 0 | 1 | 0=ON,1=OFF |

| Menu Options Repeat | | | | |
|---|---|---|---|---|
| The Menu Options Repeat parameter determines whether or not the menu options are to be repeated during an over the phone session with a RTU. Administrators may decide that the menu options should not be repeated at all for security reasons. Others may deem that the unit should repeat the menu more than once for novice operators. This feature provides administrators a greater flexibility. | | | | |
| 826 | Read current Option Menu Prompt Repeat value | | | |
| 826** | Reset Option Menu Prompt Repeat to default | | | |
| 826*V | Set Option Menu Prompt Repeat to value | | | |
| Units | Default | Min | Max | Options/Comments |
| REPEATS | 0 | 0 | 3 | N/A |

| Protocol Detection for Incoming Calls | | | | |
|---|---|---|---|---|
| This parameter impacts the treatment of incoming data calls as follows:<br>▪ All incoming calls are answered first in voice mode with a prompt requesting DTMF tone or PIN (if configured) entry.<br>▪ If the tone is not entered within 5 seconds(not configurable), the RTU will then attempt a data mode connection.<br>▪ The session will then wait the configured maximum time (see keycode 406) for carrier to be established.<br>▪ If no carrier signal is detected, the call is terminated.<br>▪ If the carrier signal is established the RTU will attempt to identify the protocol used by the calling party for the period of time defined by this parameter.<br>▪ During this time period, an appropriate session (Alarmware™, RCS, or MBSLAVE) will begin as soon as the protocol is identified.<br>▪ When this time limit expires, one of two things will happen:<br>If no incoming data was received, the RTU will assume Log File download.<br>   ♦ If there is incoming data then the RTU assumes a non-**RACO SCADA** system is calling and a pass-thru modem session will begin.<br>   ♦ Subsequent timeouts are controlled by the session timeout limit which will trip if no data is received for that period of time. | | | | |
| 827 | Reports current protocol detection time limit | | | |
| 827** | Resets current protocol detection time limit to default | | | |
| 827*V | Set current protocol detection time limit to V seconds | | | |
| Units | Default | Min | Max | Options/Comments |
| SECONDS | 7 | 3 | 60 | N/A |

## 4.5.3.11 Statistics and Counts

| Keycode | Specification |
|---|---|
| 900 | Review factory settings report |
| 9001 | Modem Chipset Identification |
| 901 | Review all dialer unit statistics and counts |
| 901** | Reset all dialer unit statistics and counts |
| 9011 | Read incoming call count |
| 9011** | Reset incoming call count to default |
| 90110 | Read janitor reset count |
| 90110** | Reset janitor reset count |
| 9012 | Read outgoing call count |
| 9012** | Reset outgoing call count to default |
| 9013 | Read acknowledgement count |

| | |
|---|---|
| 9013** | Reset acknowledgement count |
| 9014 | Read power failure alarm count |
| 9014** | Reset power failure alarm count |
| 9015 | Read alarm count |
| 9015** | Reset alarm count |
| 9016 | Read communication alarm count |
| 9016** | Reset communication alarm count |
| 9018 | Read log overflow count |
| 9018** | Reset log overflow count |

| Network Diagnostics | |
|---|---|
| 902 | Report all diagnostics for Modbus Network and Modem hardware |
| 902** | Reset all network diagnostic statistics for Modbus Network and Modem hardware |
| 90211 | Read time to complete a scan for the channels on Modbus Network |
| 90212 | Lists each node on the Modbus Network, all of whose channels are in communication alarm |
| 90213 | Read Modbus Network alert count |
| 90213** | Reset Modbus Network alert count to 0. |
| 90214 | Read diagnostic codes for last 10 Modbus Network problems |
| 90214** | Reset diagnostic codes for last 10 Modbus Network problems to 0 |
| 902N | Read device diagnostic report:<br>        1= MODBUS<br>        2 = Printer Port<br>        3= Alarmware<br>        4= Log File Reserve<br>        5= Internet Service Provider |
| 902N** | Reset device diagnostics:<br>        1= MODBUS<br>        2 = Printer Port<br>        3= Alarmware<br>        4= Log File Reserve<br>        5= Internet Service Provider |
| 9121 | List all the nodes whose **CHANNELS** are currently experiencing failure on the Modbus Network |
| 9131 | Reports number of **NODES**, all of whose channels are in communication alarm on the Modbus Network |
| 9141 | Read list of all active nodes on Modbus Network |
| 9141*V | Read list of all active nodes on Modbus Network greater than V |
| 9141 | Who command that will query the Modbus network for PLC nodes |
| 9141*V | Who command that will query the Modbus network for PLC nodes starting at Node V. |
| 915Z | Read instantaneous communications error code for channel Z |
| 916Z | Read count of communication errors for channel Z |
| 916Z** | Reset channel communication error count. |

## 4.5.3.12 Diagnostics and Cleardowns

| Keycode | Specification |
|---|---|

| File System Report | |
|---|---|
| Contains file system information. Displays the number of records used by the unit database, logs, and speech files. | |
| 918 | File system report |

| Destination History Report | |
|---|---|
| Contains information regarding the number of attempts to contact a each destination and the time of the last session. | |
| 919 | Reports session history for all destinations |
| 919** | Clears session history for all destinations |
| 919D | Reports session history for destination <D> |
| 919D** | Clears session history for destination <D> |

| Cleardowns | |
|---|---|
| 931 | Remove all undelivered Log Files |
| 932 | Mark all Log File segments as delivered. This resets the "high-water" and will stop all high-water Log File delivery sessions. |
| 933 | Erase all messages |
| 934 | Clear all channel configuration data (except for messages) |
| 935 | Total unit cleardown |
| 936 | Reset all channel values |
| 93911 | Total unit cleardown and reboot |

| Channel Report | |
|---|---|
| 95 | Reports Channel configuration information for active channels. |

| 4.5.3.13 PINs and Privileges |
|---|

| Keycode | Specification |
|---|---|

| PINs | |
|---|---|
| 98 | Full report on all pins (requires admin privileges) |
| 98** | Cleardown of all pins |
| 98P | Report code for PIN number P. |
| 98P** | Remove PIN number <P>. |
| 98P*PIN | Set PIN number <P> to <CODE>. |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| PINs | N/A | 1 | ❷ | 5 DIGITS MAXIMUM FOR PIN |

| PIN Privileges | |
|---|---|
| 99P | Report privilege for PIN number <P>.PIN number <P> |
| 99P** | Set PIN number <P> to default privilege. PIN number <P> |
| 99P*V | Set privilege for PIN number <P> to <V>. PIN number <P> |

| Units | Default | Min | Max | Options/Comments |
|---|---|---|---|---|
| PRIVILEGE | 3 | 0 | 3 | 0=LISTEN<br>1=ACKNOWLEDGE<br>2=PROGRAM<br>3=ADMINISTRATOR |

# The Rest of the Story

## 1.0  Glossary

## A

| | |
|---|---|
| **ACKNOWLEDGMENT** | The act of advising the Catalyst  (RTU) that the alarms message has been heard. Acknowledgement is accomplished by either pressing a designated touch-tone digit, or by calling the RTU back after the alarm call has ended. The ability to do this is dependent upon PIN configurations.  Once acknowledged, further activity on that particular channel will not cause further dialing until the expiration of the Alarm Reset Time. |
| **ALARM REPORT** | A channel status report that is delivered to eligible destinations whenever an Unacknowledged Alarm condition exists. The Alarm report is a component of the Notification report. The alarm report includes alarm status information for linked channels when a violation condition persists for the entire trip delay period. Upon initiating an alarm report, the RTU will report only those linked channels that are currently in alarm status. |
| **ALARM RESET TIME** | The period of time, beginning at the moment an alarm is acknowledged, during which alarm dialing on behalf of that specific channel is suspended, regardless of further activity of its input circuit. At the end of the period, the Acknowledged Alarm status is cleared for that channel.  Thus, if an alarm criteria violation still exists at that time, a new Unacknowledged Alarm will be created and a new series of alarm calls will be placed. |
| **ALARM TRIP DELAY** | The time required for an input violation to remain continuously in violation, before the channel trips into the Unacknowledged Alarm state. |

**ALARM VIOLATION CRITERIA**
This is the configuration setting for a given channel that establishes what value, or condition, constitutes an alarm violation. The available choices depend upon channel data type (analog, discrete, physical, etc.) For example, if a channel with discrete data type is configured with an alarm violation criteria of "Alarm on 0", then whenever the channel's value is 0, a violation is considered to exist. If the violation remains in place for the duration of the configured alarm trip delay, an Unacknowledged Alarm state will be created for that channel. For any given channel, the alarm violation criteria can also be set to give an alarm only when there is a communications failure for that channel, or never to give an alarm (status only), or even to turn off (disable) the channel entirely so that it effectively does not exist.

**ALARMWARE™**
Windows-hosted software used to configure the RTU. May also be used to receive alarm, event, and data logging information from the RTU. Provision is made for ALARMWARE™ to be used on a portable computer, temporarily connected directly to a serial configuration port on the RTU, or remotely via modem.

**ANALOG**
Analog signals have variable values of current or voltage, with the specific value generally representing some physical parameter such as water level or pressure. The most common type of analog signal is 4-20 ma current loop, with a transmitter (transducer and associated power supply) governing the current in a loop. This current is detected by one or more receiving devices in the loop, such as a PLC.

**ALIASING**
In pulse generation, aliasing is the generation of a false (alias) frequency along with the correct one when doing frequency sampling.

**APS**
Allen-Bradley's Advanced Programming Software.

**AUTOCALL**
A special test calling function. When Autocall is turned on, the RTU places test calls at regular intervals to provide ongoing assurance of RTU and phone line operation.

**AUTODIALER**
A device that constantly monitors a set of inputs from various external sensors, and places outgoing alarm calls when there is an alarm condition. It also allow inquiry calls. Also referred to as an RTU (Remote Telemetry Unit) or Dialer.

# B

# C

**CALL OUT**
The action of the RTU placing calls to outside personnel or facilities.

**CALL IN**
The action of calling a RTU from a telephone line. Includes OTP, Alarmware™, and Log File download sessions.

**CHANNEL**
A channel consists of:

1.  A channel number.
2.  A data value.
3.  A SNA (Source Network Address) from which to obtain the value reading.
4.  Parameters about what sorts of values to treat as alarms ( *alarm violation criteria*).
5.  Information about how to process alarms (*Annunciator sequence parameters*).
6.  How to announce the channel's status (*messages*).

**CHANNEL NUMBER**   The channel number is an ordinal number used to identify a particular channel. You can assign data points to channels in any way desired. *Channels with the lowest numbers are reported first. Exception: the RTU can be configured to report based upon lowest Destination number first.* Any channel can get data from any source.

**CHANNEL SOURCE NET ADDRESS**   The Channel Source Net Address (SNA) specifies from where the channel data comes. Every active channel must have a SNA. Possible sources include;
▪ Local Hardware (Physical I/O channels)
▪ Industrial Networks (PLCs)
▪ Internal Data Tables
▪ Other Channels

**CHANNEL DESTINATION NET ADDRESS**   The optional Channel Destination Net Address (DNA) specifies a location to which to direct the transformed channel data. Unlike the SNA, channels do not need to have DNA's established. Possibilities here are the same as for the SNA. This capability provides for channel linking. Factory default is no DNA.

DNA's should not be confused with destinations. Destinations receive reports only upon occurrence of certain conditions, while DNA's are continuously updated with the value of the channel configured with the DNA, at the RTU's scan rate.

**CLOSED CIRCUIT CONDITION**   One of two possible states of a contact closure input circuit. This would most commonly apply to the Physical input channels, rather than channels which get their data from a network address. **Closed Circuit** is the condition in which the contacts complete the electrical circuit connection. **Open Circuit** is the opposite condition, in which the contacts do not complete the electrical circuit connection. The Open Circuit condition is electrically equivalent to having no connection to the input circuit. A closed circuit on a physical input channel will measure zero volts DC from the input connection to the common connection point. An Open Circuit input channel will measure 5 volts DC.

**COMALARM**   Communications alarm. Network Communications failed for the duration of the communications alarm trip delay.

**COMMON**   This is the combined electrical return connection point for all contact closure inputs, for physical channels. One side of all contact inputs are connected to Common. Physically, this Common connection point is any of the 4 terminals marked C on terminal strip P7. The circuit board internally connects Common to the enclosure ground.

**CONTACTED**   In the area of notification sequencing, the term "contacted" refers to a destination answering the phone. No acknowledgement is needed to satisfy the RTU, just the act of answering the phone.

# D

**DATA TRANSFORMATION**   The optional data transformation parameters define how the default channel data converts to the value used for reports, and alarm condition comparisons. These parameters support:
- Analog Scaling
- Gain and Offset

**DCS**   Distributed Control System.

**DEFAULT**   Configuration values which are built into the RTU, and remain in effect until an operator alters them. Also includes, permanently available speech messages, which are utilized when an operator has not recorded any messages.

**DEFAULT VALUE**   The initial factory setting of a configurable parameter.

**DESTINATION**   A Destination is a location that can receive reports. A Destination is generally a phone number, but other possibilities exist. They include:
- Pagers (numeric, beeping, and alphanumeric)
- Local Printer (LDL)
- Remote Data Terminals (RDT)
- Log file
- Central Station SCADA (available with S models only)

**DESTINATION CHANNEL GROUPING**   Special programming established to cause specific input channels to notify only selected destinations. Typically used to provide separate alarm functions, according to category of personnel, such as maintenance, security, plumbing, etc.

**DESTINATION NUMBER**   The Destination Number is used to determine which destination is notified about an alarm condition. *When there is an alarm on a given channel, report delivery attempts are made to destinations which are eligible for that channel (based upon any Destination Channel Grouping), with the lowest Destination numbers first.* Therefore, you have complete control over annunciation priorities.

**DIALER**   *See Autodialer or RTU.*

**DNA**   *See Channel Destination Net Address.*

**DRY**   Description of a sensor contact circuit that is not connected to any power source.

**DUTY CYCLE**   Duty cycle is the proportion of time during which a component, device, or system is operated. The duty cycle can be expressed as a ratio or as a percentage. Suppose a pump operates for 1 second, then is shut off for 99 seconds, then is run for 1 second again, and so on. The pump runs for one

out of 100 seconds, or 1/100 of the time, and its duty cycle is therefore 1/100, or 1 percent.

# E

# F

**FIRMWARE**   Firmware is the operating code (similar to software in a computer) which controls the operation of the microprocessor system in the RTU.  It is stored in part of the Flash memory system in the RTU.  It remains fixed except for special occasions when an update of the firmware is done in order to incorporate improvements, or include new features. Firmware updates are made using Alarmware™ and the .rfw file provided.

**FLOOBYDUST**   Miscellaneous. A contemporary term derived from the archaic Latin *miscellaneous*, whose disputed history probably springs from Greek origins (influenced, of course, by Egyptian linguists) -- meaning here "a mixed bag."

**FRONT PANEL (FP)**   Includes Front Panel keys, microphone , speaker, and LEDs.

**FULL DUPLEX DF1**   A particular variant of the DF1 protocol.

# G

**GLOBAL**   Essentially "over all" or "universal." Configurations that simultaneously sets the same value for all channels, or all destinations, etc.

**GROUPING**   *See Destination Channel Grouping*.

# H

# I

**ID MESSAGE**   A name that identifies the associated device. ID messages are configurable for:
- Destinations
- RTUs
- Networks
- PINs

**INDUSTRIAL NETWORK**   A network using:
- DF1
- DH485
- Modbus

- Modbus Plus
- Other Industrial Protocol

**INQUIRY CALL**   A call placed by personnel to the RTU. Also known as a "Call-in."

**INTERSESSION DELAY**   The waiting time from the end of one attempt to reach a given phone Destination, until the start of the next attempt. Note that there may be multiple attempts to the same destination – according to configuration settings. During this interval, personnel may call the RTU back, which may acknowledge the alarm and suspend further calling.

**I/O**   Input / Output. A point, or channel, that senses or controls real-world devices.

# J

# K

# L

**LED**   Light Emitting Diode. A lighted legend indicator on the front panel.

**LATENCY**   The measure of how long it has been since the value for a channel was last updated. Latency is affected by:
- Scan time (which in turn is strongly influenced by the number of active channels being scanned).
- Response time of the remote node.
- The occurrence of communications glitches.

# M

**MESSAGE**   A voice or text phrase which conveys the status, of a channel or of the RTU. RTUs, Destinations, Networks, and PINs may be given names, and in that context the term "message" and "name" is used somewhat interchangeably.

Channel messages refer to the status of a channel. Note that the RTU appends Tag Words to channel status messages, so the messages should be planned with this in mind.

**MIME**   The name for the mail protocol used to handle attachments.

**MMI**   Man-Machine Interface

**MODBUS**   Non-proprietary industrial protocol allowing programmable controllers and other devices to communicate with each other over an RS-232C or Modbus

Plus network. See also the *Modicon Modbus Protocol Reference Guide,* **pi-mbus-300 rev.D**, AEG, Inc.

**MODEM**    Modulator/Demodulator: A device which allows digital data (as opposed to voice data) to be transmitted between two sites, usually via public telephone lines. In the case of a RTU, a modem is built-in so that no external modem is required.

**MODSOFT**    Modicon's controller programming software package.

# N

**NETWORK**    A collection of devices, called nodes, connected in a way that allows information to be exchanged between the nodes. Includes the physical and higher level protocols for a specific vendor's PLC data communications. The RTU can support a maximum of 3 networks simultaneously. The actual number of networks and types of protocols are hardware options, and software configurable.

**NET ADDRESS**    The concatenation of the network number, node, and PLC data table address. It is sometimes symbolized by '/net/node/address' where:
- Net is the network number
- Node is the node address
- Address is the PLC address

The network address uniquely identifies any data object that the RTU can access.  For the RTU's purposes, network addresses are generally Source Network Addresses (SNAs) or Destination Network Addresses (DNA's).

**NET NAME (ID) MESSAGE**    A message (text or speech) identifying a specific network. By default, the message is "Net N," where 'N' is a number from 1 to 3. Custom speech messages may be recorded and custom text may be entered using Alarmware™.

**NET 1**    Refers to devices connected to the "NET1' port on the RTU. ***Protocol is Modbus***.

**NET 2**    Refers to devices connected to the 'NET2' port on the RTU. ***Protocol is Printer***.

**NET 3**    Refers to devices connected to the "NET3" port on the RTU. ***Protocol is Aware***.

**NODE**    The address of a specific PLC node on the network. Each PLC is already configured with a unique integer as its node address. The RTU must also be given a unique number as its node address on each network to which it interfaces. The network number and node together suffice to uniquely identify any PLC.

**NORMAL CONDITION**    For contact closure inputs, the Normal Condition is that condition (open or closed circuit) which normally exists. The opposite condition would create an alarm.

**NON-VOLATILE**    All configurations and all user recorded messages are kept in flash memory

**MEMORY** which is completely non-volatile. Unit is not affected by power interruptions.

**NOTIFICATION** The primary goal of the product is to notify operators of abnormal conditions, within specific operating parameters.

# O

**OPEN CIRCUIT CONDITION** *See Closed Circuit Condition.*

**ORDINAL** Ordinal numbers are used to indicate the "numerical order" of items such as input channels or destinations.  From that standpoint, a channel number is really a channel ordinal number.  Channel and Destination numbers determine the priority basis upon which alarm reports are delivered.

**OTP (OVER THE PHONE)** One of the ways to configure the RTU is by placing a phone call to it from a remote telephone.  Once in PROGRAM mode over the Phone (OTP), configuration can then be performed via DTMF keys on the calling telephone.

# P

**PAGING SYSTEM TERMINAL** An automated system to receive numeric and alphanumeric text messages that will then be transmitted over the pager network to a specific pager device.

**PCRASH** The term PCRASH is short for "Power Crash." A power crash is when there is an AC power failure and the battery backup has exhausted it's power supply. The RTU will try to protect the following data by saving it just prior to the unit completely loosing power;
- RTU State (arm/disarm)
- Internal System Clock
- Channel States
- Channel Values
- Statistics and Counts

**PHYSICAL CHANNELS (PIO)** Input channels that are associated with physical, point-by-point wiring connections. Physical channels are assigned to Net 0.  By factory default until altered by the user, the first four channel numbers are the first four physical channels.  These four physical channels are available for connection to dry (non-powered) contact closure inputs, or 5-volt logic levels, at terminal strip P7 on the main circuit board.

**PIN** Personal Identification Number. Once configured, a PIN will be required to access the Dialer from OTP or ALARMWARE™™.  PINs can be up to five digits long. Privilege level must also be assigned:
- Listen
- Acknowledge
- Program
- Administrator

**PLC**    Programmable Logic Controller.

**PLC ADDRESS**    The data table location of an object within a specific PLC's internal memory. The format of the PLC address is vendor dependent. For Net 0, the "PLC address" is the physical channel number.

**POINT**    A source of data. Includes PLC registers, data table locations, IO, or channels.

**POWER FAILURE**    The disappearance of primary power to the RTU. The Dialer will continue to operate under power failure until its internal sealed lead-acid battery is discharged.  A power failure alarm will be created if the failure endures for the configured power failure alarm trip delay.

# Q

# R

**RACO**    RACO Manufacturing and Engineering Company
1400 62$^{nd}$ Avenue
Emeryville, CA 94608
510.658.6713 (main)
800.449.4539 (customer support)
510.658.3153 (fax)
customerservice@racoman.com (email)
http://www.racoman.com/ (web site)

**RECORDING RATE**    n the process of digitally recording the User's voice messages into speech memory, the message is recorded into memory at one of two possible rates. The faster the rate of memory usage, the higher the recording quality, but the total available recording time is reduced correspondingly. 3600 bps is the factory default setting.  1800 bps is the other available rate, allowing more recording time.

**REMOTE DATA TERMINAL**    A kind of Destination consisting of a modem and computer which is running communication software, e.g. Procomm Plus. Used to download Log Files for permanent storage and data processing.

**REPORT**    A report is a sequence of messages intended to communicate complete information about a RTU state or configuration. The message sequence conveys the nature and extent of the report information.

**RING ANSWER DELAY**    The nominal number of rings required before the RTU  will answer an inquiry call.  Depending upon timing factors, any given inquiry call may be answered in one more or one less ring than the configured value.

**RTU (REMOTE TELEMETRY UNIT)**    A monitoring device, interfaced to a communication medium, whose mission is to communicate conditions from a remote or inaccessible site. A central computer on some schedule, or interval, usually polls RTUs. Additionally, RTUs may request polling to report any exceptions such as alarms or other

events that require the attention of the central computer or its operators. The Catalyst RTU is capable of receiving polling calls from a computer running Alarmware™ configuration software, a fax machine, or other type of communications software programs such as Procomm.

**RTU ID MESSAGE**  A message that is always included in all calls made to or from the RTU, intended to identify the RTU, or its physical location.

# S

**SCADA**  Supervisory Control and Data Acquisition System.

**SCALE FACTOR**  Scale and offset factors can be configured for analog input channels, to transform the raw reading into the desired end units.

**SESSION**  Sessions occur between the RTU and a Destination. They consist of an exchange of information that is termed a report. An example of a session is what occurs when an RTU calls an operator's phone number to deliver a voice report. Another example is when central computer calls an RTU for a Log File download. They are both sessions. Sessions have a beginning and an end. For example, a phone session with an operator starts when the RTU dials a phone number, and ends when either the operator or the RTU terminates the call.

**SNA**  *See Channel Source Net Address.*

**SPEECH MEMORY RATE**  *See Recording Rate.*

**STATE**  The state of an input channel reflects additional information beyond its current reading status or value.  From a conceptual standpoint only, the primary set of states for a channel are Normal, Alert, Alarm, Acknowledged Alarm, and Acknowledged Alarm, Now Normal.  These primary states reflect the progress of an alarm condition:
- From the moment the violation is detected (Alert)
- To the moment the Alarm Trip Delay elapses (Alarm)
- To the moment the alarm is acknowledged (Acknowledged Alarm)
- Until the alarm reset time elapses and clears the alarm (Normal)

States are manifested in reports via the appending of Tag Words to the channel status messages.

# T

**TAG WORDS**  Supplemental words or phrases which are automatically appended to a report, that indicate the state of the channel or of the RTU. Tag words include:
- Normal
- Alarm
- Alarm, Acknowledged
- Now Normal
- Now Normal, Acknowledged

- Alert
- High Setpoint
- Low Setpoint
- DNA
- SNA
- Status Only

The factory default tag words can be reconfigured to whatever text and voice words that are appropriate for the RTU.

For additional information on Tag Words, please refer to the Operator's Manual section on Terminology and Concepts: Tag Word and States.

**TAP**  An abbreviation for Telocator Alphanumeric protocol. A communications protocol used to transmit simple text-only messages to a paging system terminal.

**TRANSITIONS**  The channel's current data value; the channel alarm conditions, operator actions, and the Annunciator all drive transitions between state sequence parameters. These parameters include; trip delay, acknowledgment, reset, lock-in, ringback, and first-out designations.

**TOD**  Time of Day

# U

# V

# W

**WATCHDOG**  The Watchdog is integrated into the firmware of the RTU watching over all RTU activities. When the Watchdog detects that a process is not running as intended, it will initiate a firmware reboot. This will prevent any of the unit processes from being offline for more than 90 seconds.

# X

# Y

# Z

# 2.0 Testing, Troubleshooting, & Diagnostics

## 2.1 Troubleshooting RTU Problems

### 2.1.1 RTU is dead: no lights or voice

**If the RTU will not respond to the Power ON/OFF key:**

*Note: Refer to section 2.5 RTU Interior View Diagram within the Installation Guide*

- Verify that the battery is connected.
- Verify that the main power fuse, F1, is not blown.
- Verify that there is primary power to the RTU. Verify that the yellow LED marked DC INPUT on the main circuit board is illuminated. *On the RTU Interior View Diagram, find the call-out labeled "PRIMARY POWER PRESENT LED."*
- If the RTU is powered via a plug-in voltage converter module, verify that the green LED on the module is lit. This would verify that voltage is being delivered to the output connector of the voltage converter module.
- If the product's voltage regulator circuit is "turned on" the red LED labeled 'VCC' will be lit, indicating that even though the RTU seems dead, the product is turned on as far as the power supply circuit is concerned. *On the RTU Interior View Diagram, find the call-out labeled "PRODUCT TURNED ON LED."* (Do not confuse this single red LED with the array of six red serial port LED's.)
- Verify that the front panel ribbon cable is properly seated on both the main circuit board and the front panel circuit board. Refer to the Interior View Diagram for a detailed view of the proper orientation of the front panel circuit board. This cable when properly plugged onto the front panel circuit board has the index color stripe arriving at the front panel circuit board with the index color stripe on the right hand side when the door is open.

### 2.1.2 RTU appears either dead or "locked up"

When the unit is behaving properly, there is a system watchdog that will automatically reboot the unit when it is dead for 90 seconds. If this feature is not performing, it may become necessary to cleardown the unit to its factory defaults. Under certain unusual circumstances, data in certain register locations within the RTU's flash memory module may become corrupted. If this occurs, the RTU may lock up or behave erratically.

- If the RTU will not respond to any front panel keys, e.g. Power ON/OFF, then the unit is considered "locked up."
- To regain control of the unit, first temporarily disconnect the battery by disconnecting the positive battery terminal.
- Next remove primary power by unplugging the unit.
- Next restore primary power to the RTU.
- The unit should boot automatically. If the unit performs as expected, then it may have only needed to be rebooted.
- Reconnect the battery terminal.

- If the unit continues to act strangely, then a good practice would be to reformat the file system.
- To reformat the unit, enter PROGRAM mode. For OTP and FP use keycode 93911 to reformat and reboot. For Alarmware™, use the Cleardown menu item.
- The process can take several minutes. When done, the RTU should respond normally to pressing front panel keys.
- If the unit continues to perform improperly, please contact your RACO representative.

**After reformatting is complete:**

- Restore your user configurations for this RTU, including recorded speech messages, by connecting to the RTU with Alarmware™ (via modem or preferably by local serial port connection).
- Alarmware™ will report a database mismatch.
- Select "Export Alarmware™ configuration to RTU".
- Using local serial port connection at 57,600 baud, the length of time the configuration restoration process will take will depend upon how much speech data has been recorded and saved in the corresponding Alarmware™ configuration file.
- Any user configurations or recorded speech memory data, which was not previously saved in the Alarmware™ configuration file, will need to be re-entered as needed.

## 2.1.3 RTU turns itself ON, a few seconds after having been turned OFF

Check to see if a battery installed.  If the battery is missing or completely dead, this behavior can occur. Also check to see that the front panel ribbon connector is properly seated onto its connectors on the main circuit board and the front panel circuit board.

## 2.1.4 RTU seems OK, but will neither answer, nor dial out on phone line

- This assumes that you hear a voice report at the Front Panel when you press CHECK STATUS.
- With the normal light lit, test the phone line by pressing DIAL-OUT. The PHONING light should light and you should hear a dial tone.
- If you do not hear a dial tone, open the door of the RTU and verify that fuses F1 and F2 (800 milliamperes) are not blown.
- Check the phone line and its connection with a DC voltmeter and/or a separate telephone handset.
- A live phone line should deliver approximately 50 VDC when the product is on hook.  This voltage will drop to just a few volts when the product or other connected phone device goes off hook.  Failure of this voltage to so drop when the RTU goes off hook indicates a likely blown fuse F1 or F2.  The replacement is Bussman BK/GMC 800 ma or equivalent.
- If you do hear the dial tone after pressing DIALOUT, press the digits of a valid phone number. You should hear the clicks of relay (for pulse dialing) or else the tones of tone dialing, as you press each digit. The dial tone should cease after you enter the first digit. Continue until you have dialed the complete phone number. You should now hear the sound of ringing and someone answering at the other end.
- End the call by pressing NORMAL.

## 2.1.5 RTU answers incoming calls, but does not reach dialed number

RTU answers incoming calls, and also goes into alarm when it should, and attempts to dial out, but does not reach dialed number. First, verify whether the RTU is actually attempting to dial out, as evidenced by pulsed dialing clicks or tone dialing sounds, followed by message recital. If not, then see the separate problem below: Unit does not go into alarm when it should.

- Enter PROGRAM mode by pressing the PROGRAM key.
- Read the present mode by pressing keycode **40 7** and the ENTER key.
- Then set the operating mode by entering **40 7 *1** for TONE or **40 7 *0** for PULSE.
- Then press NORMAL and repeat the manual DIALOUT procedure.
- Verify that you have configured complete phone numbers including any area codes, or prefixes that might be required to complete the call.
- Consider whether your phone system requires a prefix such as 9 to be dialed, followed by a delay period (to access an outside phone line) before dialing out. One second delays can be added to phone strings by entering commas. Commas can be easily added to the dialing string with Alarmware™, or with a #5 when using keycodes.
- You can also try temporarily connecting a regular telephone to the line normally connected to the RTU, and see if you can successfully dial out to the same telephone number with that telephone.  This would reveal whether there is a problem with the phone line, and whether the number the RTU is trying to dial is valid.

## 2.1.6 RTU dials out, but will not answer incoming calls

- Check configured ring delay by pressing PROGRAM **40 4** ENTER.
- If it is set for a number larger than one (1), the RTU is not supposed to answer until the corresponding number of rings has been received.
- Try setting it back to one (1) by using code **40 4 **** ENTER.
- If the RTU still will not answer incoming calls but is able to dial out, try plugging a regular telephone into the same phone jack in place of the RTU and see if it rings.

## 2.1.7 RTU will not go into alarm when it should

**For the RTU to Transition into an Unacknowledged Alarm and Dial Out:**

- A violation condition must be continuously present for the *Alarm Trip Delay* period.
- At least *one destination must be configured* and eligible to receive notification calls.
- For a destination to be configured there must be a place for the RTU to get acknowledgment, a telephone number for example.
- For a destination to be eligible, it *must be linked* to the alarming channel.
- Destinations are always linked to all channels with the default settings from the factory, until the user establishes other linking.
- The RTU *must not be* in the *DISARMED* state.
- Also, the channel that has the violation *must not already be in an acknowledged alarm state*, since acknowledged alarm status for a given channel (including power failure) precludes further activity on that channel until that status is cleared.

**To clear the acknowledged alarm status of all channels including power failure:**

- Starting with the NORMAL light lit, press DISARM/REARM to get the flashing DISARMED indication.
- Then press it again to re-arm the RTU with all acknowledged alarm status cleared.
- Now any violations lasting longer than the Alarm Trip Delay will cause unacknowledged alarms and dialing.
- The corresponding channel number flashing indicates unacknowledged alarm status.
- The same light remaining ON continuously without flashing indicates acknowledged alarm status.

**If you do not observe this:**

- Press PROGRAM.
- Then press **70 1** ENTER to check the **phone number** of destination 1.
- Press **80 1** to check the **Common Trip Delay**.
- If there is a specific channel that you are attempting to create an alarm on, also press **56 <Z>** to check for any long single-channel **Alarm Trip Delay** setting.
- Check the **Alarm Violation Criteria** configuration for this channel by pressing **52 Z**. Make sure it is not set to **disabled or status-only,** since these settings would not allow an alarm.

   **Example:**

- If the channel Alarm Violation Criteria is configured for **Alarm on 1 raw value**, you will want to temporarily provide a logic 0 (or a closed circuit if using a physical channel) at its input to trip the alarm.
- You can directly **read** and verify the Open/Closed status you are applying to physical channels by using the Alarmware™' **Check Status**, or by using keycode **01 Z**.
- Note that the physical channels are by factory default, the first four channel numbers. However, you may have changed these assignments in the course of configuring the RTU.
- You may also use a DC **voltmeter** to trace your physical input circuit connections. With the RTU turned ON, an **Open** Circuit to a physical input **reads 5 volts DC** with respect to the C terminals, or electrical ground. A **Closed** Circuit **reads 0 volts**.

## 2.1.8 RTU does not go into Communications Alarm when it should

- The Communication Alarm Trip Delay may be set too high.
- Refer to the topic 2.2.2 *Channel Operations Testing within the Rest of the Story*.

## 2.1.9 RTU keeps calling when it should not

- Be sure that the initial alarm call is in fact being acknowledged. The RTU will specifically state "Alarms are acknowledged..." at the moment you successfully acknowledge the call.  Press the Check Status key at the front panel or call the unit over the phone, to determine if all alarms are acknowledged.
- Also, be sure that the alarm violation has been corrected. Otherwise, even if the alarm is acknowledged, when the *Alarm Reset* Time period times out, dialing will begin again.
- Write down exactly what the RTU recites when it gives the unwanted call. This provides valuable guidance as to the cause and correction of the problem.
- You may need to lengthen the *Alarm Trip Delay* in order to minimize nuisance alarms, particularly the *Power Failure Alarm Trip Delay* (PFAIL).
- If you hear an alarm message with the phrase "Now Normal..." added at the end, it means that the violation occurred long enough to trip the alarm but has returned to normal by the time you are hearing the report.
- In the case of power failure lasting longer than *the Power Failure Alarm Trip Delay*, power will continue to be mentioned in any phone call or Front Panel Status Check, until the Alarm Reset time expires.
- Environmental factors such as lightning or power surges may have caused a program lock-up. If this is the case, then to return the RTU to normal operation, you will need to restore your configuration and speech data from Alarmware. If your data was not saved to Alarmware (*see 2.17 Backing Up Your Data in the Operator's Manual*), it may become necessary to cleardown all parameters to its factory defaults. This is accomplished by entering key code 93911 when in PROGRAM mode.

## 2.1.10 Cannot Establish Com Port (serial port) Connection

- Verify that the com port settings are correct on each device.  This includes the data speed setting.
- Verify that the cables are the correct type (*see topic 2.12 Cable Diagrams in the Installation Guide*) and that they are properly seated in the proper connectors (*see topic 2.6 RTU Bottom View and Connectors Diagram in the Installation Guide*).  If available, try swapping with another cable.
- There are six LED's on the main circuit board.  For each of the three ports there is an RX LED indicating receive activity and a TX LED indicating transmit activity (*see topic 2.5 Interior View Diagram in the Installation Guide*).

## 2.1.11 Communications Alarms occur repeatedly

- Verify that cable connections are correct and secure.

- If basic serial communications seem to be occurring on the industrial network, then the problem may be too low a setting for the communications alarm trip delay.
- The amount of time communications with a specific channel may lapse is dependent on many factors. One of the main factors is how many channels are active. An RTU scanning 256 channels may require a com alarm trip delay of 200 seconds or more to avoid nuisance alarms.
- One practical approach to determining a suitable initial setting for the com alarm trip delay is to query the RTU for the channel scan time with Keycode **9 0 2 N 1**, where N is the Net number (usually 1). It is suggested that you configure twice that value for the **communication alarm trip delay**, which can be accessed using the Net 1 tab under Configuration | Devices in Alarmware™.

### See also Topics:

- *3.1 Channel Operations Testing in the Installation Guide*
- *2.1.12 Failed Network Communications in the Rest of the Story*
- *2.10.3 Modbus Port Settings (Net 1) in Operator's Manual*
- *1.9.4 Scan Time and Channel Latency in the Operator's Manual*

## 2.1.12 Failed Network Communications

Whenever a channel poll fails, for whatever reason, it becomes impossible to determine if that channel is, in reality, violating its alarm violation criteria. Since most network problems are spurious and random, the next poll is likely to succeed. Persistent failures require some sort of notification. The term communications alarm is used to distinguish this situation from alarms based upon alarm violation criteria.

### A channel will register a communications alarm violation whenever the following two conditions are met:

| | |
|---|---|
| **1** | The channel is configured with an alarm violation criteria (e.g. cannot be set to "status only or disabled"). |
| **2** | The channel's latency exceeds the Network Communications Alarm Trip Delay Timer. |

Once in violation, the communications alarm condition must then persist for the trip delay period before the alarm call sequence begins. The occurrence of a communications alarm tells personnel that there is a persistent network problem preventing access to channel data. It gives absolutely no indication of whether the point is violating the conditions or not. Still, for status reports, alarm calls, LED indicators and acknowledgments, a communications alarm is treated just the same as regular alarms.

*Note: The communications alarm trip delay period is not combined with the violation criteria alarm trip delay period. The channel(s) will go into SNA alarm as soon as the communications alarm trip delay period times out.*

If any channel configured on a given node is in the communications alarm state, the message depends upon the channel's analog/discrete data type:

| CHANNEL TYPE | COMMUNICATION ALARM MESSAGES |
|---|---|
| **Discrete** | "Channel <**Z**> violation SNA Alarm" |
| **Analog / Floating Point** | "Channel <**Z**> reading is NO SCAN DATA SNA Alarm" |

### To determine the Communications Failure Code:

| KEYCODE | COMMUNICATION REPORT MESSAGE |
|---|---|

| | |
|---|---|
| **915 Z** | "Channel <**Z**.> The present communication status is Error Code **xxx**"<br><br>Where **Z** is the channel number, and **xxx** is one of the codes in the Diagnostic Codes List. |
| If all channels configured on a given node are in the communications alarm state the message is simplified to: | "Communication Failure at Node **N**"<br><br>Where **N** is the given node number |

*Note: If all channels on a Net are in communications alarm, then in addition to the corresponding channel LEDs being activated, the LED for the Net which it is on will also be activated.*

**To determine the Communications Failure Code with Alarmware:**

Connect with Alarmware. The PLC LED should be blinking if there is a detected problem. Click on the blinking LED and the error codes are be listed.

## 2.1.13 Corrective Action to Resolve File System Full Condition

If the file system becomes completely full, it will become impossible to modify the RTU configuration.  This condition will be reported via error codes, alarm messages or diagnostic reports.

**Operator intervention is required to resolve the condition as follows:**

- If configuring the unit, exit the current session.  The automatic database cleaning function may free sufficient space to allow the next session to continue.
- Erase any single speech message.  This should free up sufficient space to make a large number of configuration changes.  Be sure to keep a full backup copy of all speech data used by the RTU.
- After the desired configuration changes are completed, attempt to restore the erased speech message.  In rare cases it will be necessary to re-record a shorter version of the speech message.
- Reduce the amount of file system space reserved for the data Log Files.  If this reserved space is currently utilized, it may also be necessary to download or otherwise erase the existing Log File data.
- If file system fills while recording speech messages and additional messages still need to be recorded, then:
  - Select a slower recording rate if possible.
  - Re-record messages speaking faster or using shorter phrases.

*Note: It is recommended that the unit be fully configured BEFORE the speech messages are recorded.*

## 2.1.14 PLC Related Errors

The remaining portion lists the values and interpretations for the most common network error situations. Note that some codes are derived directly from standard error codes supported by specific protocols. The documentation for those products is then necessary for interpretation.

| Code | Description |
|---|---|
| 0 | No error condition detected |
| 350 | Net address entered incorrectly |
| 351 | Rc flag not recognized, attempt to write a read only address |
| 352 | Specified net is invalid |
| 353 | Packet did not fit in buffer |
| 354 | Protocol does not support the net address format |
| 355 | Protocol does not fit this data type |
| 356 | Request timed out with no feedback |
| 357 | Node address is invalid for selected protocol |
| 358 | Driver got into an unknown state |
| 359 | Node/driver incompatible with address mode |
| 360 | Miscellaneous error parsing address string |
| 361 | Some field was duplicated in address string |
| 362 | File type specified in address string no supported |
| 363 | Couldn't parse file number field in address string |
| 364 | Couldn't map the I/O slot specified in address string |
| 365 | Couldn't parse element field in address string |
| 366 | Couldn't parse sub-element field in address string |
| 367 | Couldn't parse bit field in address string |
| 368 | Too many routing nodes specified in address string |
| 369 | Some routing node has illegal syntax |
| 370 | Transaction aborted at user request |
| 371 | Hardware does not support the protocol |
| 372 | Alarm criteria flag not recognized |
| 373 | Error function called with no config error |
| 374 | Created/transmitted a null packet |
| 390 | Source channel data not available for channel link |
| **MODBUS-SPECIFIC ERRORS:** | |
| 410 | No traffic received from the net |
| 420 | UART serialization error |
| 430 | Time-out with no recognizable response |
| 431 | Time-out with no response at all |
| 440 | CRC error |
| 450 | Valid framing, unknown command or response |
| 500 | Enqueued transaction not transmitted |
| 501 | Transaction took too long to transmit |
| 502 | Attempt to transmit a null packet |

| | |
|---|---|
| **MODBUS EXCEPTION RESPONSES**: *The last 2 digits come directly from the MODBUS protocol exception responses. The occurrence of these codes is sufficient to conclude that the remote node received the command but could not execute it.* | |
| 600 | Offset for Modbus exception responses |
| 601 | Modbus exception: Illegal function |
| 602 | Modbus exception: Illegal data address |
| 603 | Modbus exception: Illegal data value |
| 604 | Modbus exception: Failure in associated device |
| 605 | Modbus exception: Acknowledge |
| 606 | Modbus exception: Slave device busy |
| 607 | Modbus exception: Negative acknowledge |
| 608 | Modbus exception: Memory parity error |
| 609 | Could not convert data to correct type |
| **DEVICE SELF-TEST CODES:** | |
| 700 | Device has not been opened |
| 705 | DUART not present |
| 710 | Net not configured with PLC-type protocol |
| 715 | Bad serial IO configuration parameter |
| 725 | Background noise on network substrate |
| 730 | Another Modbus master already active |
| 731 | MBPLUS peer in monitor-on-line state |
| 732 | MBPLUS peer never getting token |
| 733 | MBPLUS peer in unknown state |
| 734 | MBPLUS driver not responding |
| 735 | Diagnostic loop-back test failed |
| 750 | A remote node has same node address |
| 755 | Could not find any nodes on network |
| | *Note: See Modicon documentation for further details.* |

## 2.1.15 Self-Test on Network

Response to the self-test on a network will either be with ***Normal...*** or with the Error Code. All available network diagnostic counters and information will be reset. If a Printer device is configured, additional information will be printed.

*Modbus Note: During self-test, communication alarms may trip, but these alarms will be reset after exiting program mode.*

### Keycode Examples:

- To do a Self-Test on Network N, press: **911 N** ENTER.

### Alarmware™ Example:

- To do a Self-Test on a Network, connect to the desired RTU and click Diagnostics on the main menu.
- Click the Network Diagnostics Self-Test[⊥] checkbox from within the RTU Diagnostics dialog box.
- Click OK.

## 2.2 Network Diagnostics via Keycodes

### 2.2.1 Report All Network Diagnostic Statistics for All Networks

This function will report all the diagnostic information for all networks.

Diagnostic information includes:

- Network Status
- Network Alert Count
- Diagnostic Codes for the Last Ten Network Problems
- Active Nodes
- Scan Time

To list all active nodes on Network N, press: 914 N  ENTER.

**Alarmware™ Example:**

To receive a Summary Report for All Network Diagnostic Statistics for a particular network, first connect to the desired RTU.
Click Diagnostics on the menu bar.
The RTU Diagnostics dialog is launched.
Select the Net Diagnostics -- Summary Report checkbox, and click OK.
Alarmware™ will upload the Net Summary Report to the RTU messages window.

## 2.2.6 Instantaneous Communications Status for Channel

This function enables you to query the RTU for the current communication status for a specified channel. Function either reports normal status or the status error code.

**Keycode Example:**

To read the instantaneous communications status for Channel Z, press: 915 Z ENTER.

Alternately, you can use Alarmware to retrieve the information from its direct channel reading dialog.

## 2.2.7 Channel Communication Errors

This function enables you to query the RTU for the count of communication errors for a specified channel.

**Keycode Example:**

To read the count of communication errors for channel Z, press: 916 Z ENTER.

Alternately, you can use Alarmware to retrieve the information from its direct channel reading dialog.

## 2.2.8 Network Diagnostic Capabilities

The Catalyst RTU offers many features to help with the inevitable complexities of a networked environment.

**The following list gives a brief sketch of these capabilities:**

- Ability to perform end-to-end network-connectivity self-test (*see 2.2.12 Network Diagnostic Self-Test in the Rest of the Story*)
- May obtain a list of all nodes currently active on any net (*see 2.2.6 Active Nodes in the Rest of the Story*).
- Status reports and the Front Panel LED indicators announce the overall health of each network.
- May easily suspend and later resume all scanning activity on a specific net. This is useful for disabling alarms on one network, while still scanning the others.

- Generate reports about communication diagnostics and history for any channel. This includes current status and communication alarm count.

## 2.2.9 Destination Diagnostic Report

The Destination Diagnostic Report contains diagnostic information for all stations. This information includes the date and time of the last session and the total number of sessions.

**Keycode Examples:**

- To get a report on all network diagnostic statistics for network N, use keycode **902 N**.
- To read the number of nodes in comalarm, use keycode **902 N * 2** (all channels on each node must be in comalarm)
- To get network alert count, use keycode **902 N * 3**
- To read diagnostic codes for last 10 network problems, use key code **902 N 4**

**Alarmware™ Example:**

To get a Destination Diagnostic Report, connect to the desired RTU and click Diagnostics on the main menu. Click the Destination Diagnostic Report checkbox from within the RTU Diagnostics dialog box, and click OK.

## 2.2.10 Perform a Diagnostic Self-Test on Device:

- This function performs a diagnostic Self-Test on a specified device.
- This function will return communication test results (normal or error code) for Device.
- The Dialer will reset all available network diagnostic counters and information.
- If you configure a Printer device for reporting, there is additional information printed.
- This self-test may take a long time to complete.

*Note: MODBUS only: Communication alarms may trip, but will be reset when exiting program mode.*

**Alarmware™ Example:**

To get a Device Diagnostic Report, connect to the desired RTU and click Diagnostics on the main menu. Click the Device Diagnostic Report checkbox from within the RTU Diagnostics dialog box, and click OK.

## 2.2.11 Self-Test on Network

Response to the self-test on a network will either be with *Normal...* or with the Error Code. All available network diagnostic counters and information will be reset. If a Printer device is configured, addition information will be printed.

*Modbus Note: During self-test, communication alarms may trip, but these alarms will be reset after exiting program mode.*

## 2.2.12 List All the Nodes in Communications Failure

This diagnostic report feature allows you to determine the number of communication errors (communication alarms that occurred during scanning). A node will be in communication error if any of the node's channels are in error.

## 2.2.13 Diagnostic Codes Translation List

| CODE | DESCRIPTION |
|------|-------------|
| 0 | no error condition detected |
| 1 | no key press |
| 2 | command parsing successful |
| 3 | tapp for transaction hasn't expired yet |
| 4 | successful poll, no value in response |
| 5 | net scan turned off |
| **command-line errors** | |
| 10 | unable to parse command entered |
| 11 | parameter value invalid |
| 12 | Data value too large or small |
| 13 | undefined path |
| 14 | SEQ out of GD:: range |
| 15 | string too long |
| 16 | PIN not unique |
| 17 | no empty or matching PIN slot |
| 18 | command does not apply to this type of object |
| 19 | Data value invalid per OI spec |
| **command execution errors** | |
| 30 | default value requested via operator interaction |
| 31 | operator PIN privilege prevents operation |
| 32 | in read-only program mode -- can't alter value |
| 33 | command needs logging destination configuration |
| 34 | data lost while recording speech message |
| 35 | FAX session prevented by FCC requirement for RTU phone number |
| **generic DEV/NET errors** | |
| 40 | device open for read operations only |
| 41 | device open for write operations only |
| 42 | write operation failed, no diagnostic |
| 43 | Data truncated to fit into buffer |
| 44 | no room in queue |
| 45 | unsupported device number |
| 50 | modem carrier has dropped |
| 51 | modem driver read is blocking on CPM event |

| CODE | DESCRIPTION |
|------|-------------|

| File errors | |
|---|---|
| 60 | file device at end of file |
| 61 | No NVM space available for writing |
| 62 | No FILE object exists for specified PATH |
| 63 | specified PATH is NVROM only |
| 64 | No NVM space available for file creation |
| 65 | No file directory exists for PATH |
| 66 | requested NVD data not found |
| 67 | file opened with access == NONE or illegal |
| 68 | file already opened |
| 69 | No room in directory for additional file |
| **NVM driver errors** | |
| 72 | operation failed, no diagnostic info available |
| 73 | command sequence error detected |
| 74 | Don't have compatible driver for this device |
| 75 | one or more blocks were flagged as corrupt |
| 76 | VPP low detected |
| 77 | block locked |
| **Miscellaneous device errors** | |
| 80 | NULL channel does not support request |
| 81 | NULL device does not support request |
| **Generic Destination errors** | |
| 90 | Destination does not support TEXT messaging |
| 91 | Destination is offline |
| 92 | pending transaction completed |
| 93 | session needs user input (WINTEL only) |
| 94 | session setup in progress |
| 95 | requested operation failed |
| 96 | requested operation completed |
| 97 | Destination is busy with other operation |
| 98 | Destination does not support requested language |
| 99 | message removed per Destination filtering parameter |

| CODE | DESCRIPTION |
|---|---|
| **"Abnormal" reset codes** | |
| 100 | <descriptive messages vary> |
| 101 | "device conflict on port %d" |
| 102 | "NVM Erase failure @0x%0X" |
| 103 | "CPU Privilege Violation" |

| 104 | "too many NVM chips" |
| 105 | "unsupported NVM device" |
| 106 | "unsupported NVM destination address (0x%08X)" |
| 107 | "unsupported NVM source address" |
| 108 | "unsupported NVM function flag" |
| 109 | "out of memory" |
| 110 | "memory list linkage error" |
| 111 | "unknown serialization specifier" |
| 112 | "WDOG expiration" |
| 113 | "firmware download completed" |
| 114 | "total power loss" |
| 115 | "CPU bus error" |
| 116 | "CPU address error" |
| 117 | "total system cleardown requested" |

## 2.3 Maintenance and Testing

Regular testing is the main element of a maintenance program for ongoing Catalyst RTU reliability. These tests should include interrupting primary power to the RTU for at least 4 hours to verify the gel cell battery maintains RTU operation for that time period. You may wish to temporarily disconnect the phone line or temporarily turn off the power failure alarm to avoid nuisance calls during the test period. The LOBAT light on the Catalyst activates whenever the battery voltage falls below a certain level. If the battery is not fully charged (as following installation or following a power failure) the light will be activated. **The LOBAT light does not necessarily warn of a battery wearing out**. It should be considered a secondary indication of battery and charger activity.

The only periodic replacement item on this product is the Gel Cell Lead Acid battery. *The life cycle of this battery is similar to that of an automobile battery, so it should be replaced every three years. (See 2.3.1 Battery Replacement in the Rest of the Story)* Note that this kind of battery cannot be stored for more than a few months without charging or it will deteriorate.

Replacement batteries can be ordered from RACO or directly from the manufacturer as printed on the battery.

Another replacement item that is not periodic is the fuse. It is suggested that two fuses be stored with the Catalyst. Occasionally a fuse will blow in response to a substantial high voltage transient on the power line, resulting in a power failure alarm. This occurs more commonly with 120 VAC input power than with DC power sources. Usually replacing the fuse will restore normal operation with no further need for service. The type of fuse depends upon the input power configuration:

| | |
|---|---|
| 120 VAC Littelfuse 229.003 | 3 amp |
| 12 VDC Littelfuse 229.001 | 1 amp |
| 24 VDC converter module | Bussman BK/GMC 700 ma |
| 48 VDC converter module | Bussman BK/GMC 315 ma |
| 125 VDC converter module | Bussman BK/GMC 200 ma |

## 2.3.1 Battery Replacement

- The gel cell battery is much like a car battery. At the end of its life when called on to deliver power, it discharges very quickly without prior warning. The best protection is to replace the battery every 3 years regardless of any test results.
- The battery is a Power Sonic PS 640 or equivalent, 4 AH 6 volts.
- **Batteries should be purchased near the time of intended installation, since they can deteriorate over time when stored**.

**You may order a replacement battery from RACO at the address below:**

# RACO Manufacturing and Engineering Co.
## 1400 62nd Street
## Emeryville, CA 94608

or from: Power Sonic, Redwood City, CA, USA: (650) 364-5001

# 3.0 Customer Support

## 3.1 Before Calling Customer Support

**Before consulting the RACO Customer Service Department, or your local RACO Representative for assistance, please have the following information available:**

- Provide information on your RTU configuration and its symptoms. This includes the worksheets and the performance history of the RTU.
- Provide information on network operating parameters. This includes cabling specification, protocol, node addresses and equipment types, loading patterns, and usage by other applications.
- Addresses and properties of all data table locations of interest to the application.
- Ability, as required, to access the RTU itself and specific nodes, their ladder logic, program listings, or Alarmware™.

## 3.2 Phone Technical Support Procedures

**Make sure you have the following information before you call:**

- **Serial Number:** This number is found on the inside door of the RTU.  If you are not at the RTU or would like to get a complete Factory Settings Report use Alarmware™. After Alarmware™ is connected to your Catalyst RTU for the first time, the serial number is recorded in the RTU information data. To view serial number with Alarmware™ click on the RTU name from the Select RTU dialog. Click on the Edit button. The serial and model numbers can be viewed from this Add/Edit RTU dialog.
- **Note the RTU's symptoms:** Exact speech pattern, content of the messages, whether it is making calls or not. The more specific and accurate you are in describing the symptoms, the quicker the Customer Support Department will be able to diagnose and troubleshoot your problem. In many cases, this will prevent returning the RTU to the factory unnecessarily.
- **Copy .NVM and Message.txt Files:** To help us find the source of your problem, it may become necessary to provide us a copy of the Catalyst's .NVM file located in the Aware\Data directory. You may also be asked to provide a copy of the message.txt file located in the Aware directory.

If you need phone support regarding Alarmware™, you will not need a serial number but you will need to provide a detailed description of the problem you are having.

## 3.3 Customer Technical Support

RACO's Customer Support staff is committed to supporting our customers. In today's world of rapidly evolving technological solutions to industrial control and monitoring needs, you need to have the assurance that there is more than just a manual behind the product. Whether you have questions about implementing a solution, or need help during startup, we are standing by to assist.

**Our toll-free line:** **1-800-449-4539**

**Our fax line:** **1-510-658-3153**

**email:** customerservice@racoman.com

**Web-site:** www.racoman.com

## 3.4 Service Requirements

In the event of equipment malfunction, our Company or an authorized agent should perform all repairs. It is the responsibility of users requiring service to report the need for service to our Company or to one of our authorized agents. Service can be obtained at:

## 3.5 Returning RACO Products to the Factory

RACO Manufacturing and Engineering Company
1400 62nd Street
Emeryville, CA 94608  USA

**To avoid shipping damage, pack your RTU well!**

- A factory-issued RMA (Returned Materials Authorization) must be obtained prior to shipment and marked prominently on the outside of the shipping package.
- To avoid extra charges, return any product or swapped parts (such as replacement circuit boards) to the factory at the address below:

**Remember to:**

- Put the return address on the package
- Include a packing slip
- Have the Serial and RMA numbers handy when you call in for tracking

## 3.6 Software Problem Report

If you encounter a problem with the Alarmware™ program, or would like to request enhancements to the existing application, please complete the Software Problem Report and return to RACO via U.S. Mail, Fax, or Email.

**Please provide the following information:**

| Submitter Information | |
|---|---|
| **Date** | |
| **Company Name** | |
| **Address** | |
| **Phone Number** | |
| **Contact Name** | |
| **Email Address** | |
| **Problem Report** | |
| **Short Description of Problem** | Give a short and concise description of the problem you found. |
| **Description** | Give a complete description of the problem (or enhancement request). Include all relevant information. |
| **Steps to Reproduce** | Try to include the exact steps performed that lead to the reported problem. |
| **Effect** | Explain effect of problem. For example, did the program cause an invalid page fault within Windows, or did the unit firmware crash? Is the problem aesthetic, or is it an enhancement request? Please include any relevant type of information regarding effect. |
| **Factory Settings and Configuration Report** | Please include a copy of your Factory Settings and Configuration Reports. These reports include important information for reproducing reported problem. If it is possible to send the .NVM files via email, then the determining the problem and reproducing the problem become that much easier. |
| **Log File** | If the Log File information is useful, please include a Log File in the problem report. |
| **Reproducible?** | Did the problem occur more than once? Can the problem be easily reproduced? |
| **Comments** | This field is used for any other relevant information. |

## 3.7 FCC Notice to Users

## FCC Requirements

1.    The Federal Communications Commission (FCC) has established Rules that permit this device to be directly connected to the telephone network.  Standardized jacks are used for these connections.  This equipment should not be used on party lines or coin phones.

2.    If this device is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and until repair has been made.  If this is not done, the Telephone Company may temporarily disconnect service.

3.    The Telephone Company may make changes in its technical operations and procedures; if such changes affect the compatibility or use of this device, the Telephone Company is required to give adequate notice of the changes.  You will be advised of your right to file a complaint with the FCC.

4.    If the telephone company requests information on what equipment is connected to their lines, inform them of:

     (a)   The telephone number to which this unit is connected.
     (b)   The ringer equivalence number  0.8B
     (c)   The USOC jack required. [RJ11C]
     (d)   The FCC Registration Number: EMRUSA-42010-AL-E

Items (b) and (d) are indicated on the label.  The Ringer Equivalence Number (REN) is used to determine how many devices can be connected to your telephone line.  In most areas, the sum of the REN's of all devices on any one line should not exceed five (5.0).  If too many devices are attached, they may not ring properly.

# 4.0 Floobydust

**(A Mixed bag of items which are not necessarily related)**

## 4.1 Adjusting Catalyst's Internal Speaker Volume

- The loudness of the front panel speaker can be adjusted via the small square variable resistor (trimpot) on the main circuit board. This trimpot is marked **SPKR** and requires a small, flat blade screwdriver to make the adjustment.
- This setting also controls the volume delivered to jack **J1**, marked **SPEAKER OUT**, which may be used to drive external speakers, or other audio devices.
- This trimpot cannot be used to turn the speaker sound off completely. If you wish to silence the speaker completely, use the Alarmware™ configuration setting (Configuration | Devices | Phone Config) provided for that purpose.

## 4.2 External Speaker Connections

- An audio output suitable for driving an external speaker of 4 to 16 ohms impedance, headphones, or other audio system, is available via the jack **J1**, marked **SPEAKER OUT**, located in the upper right hand area of the main circuit board.
- This jack is designed to accommodate an RCA-type phono plug. The tip end will be the audio signal, and the shell will be the ground.
- The output signal has a nominal impedance of 8 ohms and a nominal average amplitude of 1 volt RMS, when the speaker volume trimpot marked **SPKR** is set to full clockwise position.

## 4.3 PLC Watch-Dogging of RTU

The Catalyst RTU has its own internal watch-dogging intended to provide the strongest possible guarantee of mission readiness.

It is possible to add an additional level of system self-checking by using a PLC to monitor the health of the RTU. The strategy involves using the RTU's DNA capability to provide the PLC with a "heartbeat" indication that the RTU scan is active. When this heartbeat is not seen for a specified period of time, the PLC knows that the RTU is not scanning the PLC.

An example ladder logic implementing this strategy is described below. Please note that this strategy only provides an indication that the RTU scan is active. It will not detect failures involving other RTU subsystems, such as a severed speaker wire. Furthermore, indication failure does not necessarily imply that the RTU itself has failed (the RTU scan could be turned off, the PLC cable disconnected, etc).

Required PLC configuration: Uses 1 timer, 1 output relay, 1 discrete and 1 16-bit register.

| EXAMPLE | SYMBOL | DESCRIPTION |
|---------|--------|-------------|
| 00010 | RTU_HEART | When set to '1' by RTU, failure timer is reset |
| 40001 | RTU_ACCUM | Accumulator for RTU failure timer |
| #0400 | RTU_PRESET | 400 second trip delay for RTU failure timer |
| 00001 | RTU_FAILED | Output relay for RTU failure indication |

Required RTU Configuration: Uses 1 physical input and 1 channel.

1)  Select one of the RTU's physical inputs and call it RTU1.  Leave this input ungrounded so it will always
    have the logical value 1.

2)  Configure any channel of the RTU as follows:
    (a)  SNA = 0*1*RTU1
    (b)  DNA = 1*1*RTU_HEART (assuming PLC is node 1)


```
|||||||||||||||||||| RTU Watchdog Ladder Logic Diagram ||||||||||||||||||||||
 |
 |
 | RTU failure timer, always enabled, reset when RTU_HEART is 1
1+-------+----+--- - - - - - - - - - - - - - - - - - - - - - --( )
 |       #0400 |                              00001
 |       |     |
2+--+/+--+T1.0+-
 |00010 |40001|
 |      |     |
 |      +-------+
 |
 | Clear RTU_HEART every ladder logic scan
3+    ----- - - - - - - - - - - - - - - - - - - - - - - - - ------( )
 |                                             00010
 |
 |
 |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
```


## 4.5 Integrating the Catalyst and Analog Cellularm


The Catalyst defaults are designed for ordinary telephone line connections. When using the Cellularm
there are certain delays that are inherent to cellular connections. The incoming and outgoing sessions will
take longer to make connection to selected destination types.  These delays will need to be extended.

There are also ways to optimize the performance of data and fax transmissions over a cellular phone
network. This is accomplished by the use of modem initialization commands.

## 4.5.1 Setting Session Delays

The Catalyst has three delays that will need to be changed in order to make incoming and outgoing Cellularm connections:

1.  Outgoing Call Answer Limit
2.  Call-In Timer
3.  Protocol Detection for Incoming Calls Timer

In order to change the length of these timers, you must either connect with Alarmware™, or make the changes from the front panel using keycodes.

To make the necessary changes using Alarmware™, connect to the unit and go to the "Configuration Menu." From the Configuration Menu, select "Devices." The following dialog will appear:

**Device Settings**

| RTU Modem | Printer | Log |
|---|---|---|
| Phone Config | Physical Inputs | Modbus Port | Alarmware Port |

RTU Phone Number :     1-510-594-4236

Call Progress Monitoring Enable :   ☑

Outgoing Call Answer Limit :     60    seconds

Speaker Enable :   ☑

Country :     USA

Dialing Mode :   Tone

Ring Answer Delay :   1    rings

After answering, wait a maximum of  75   seconds for the session to start

Clear All

Clear Item

Help

Close

> You will need to increase the "Outgoing Call Answer Limit" to at least 60 seconds. Some cellular networks will require more.
>
> The Call-In Timer is seen here as "After answering, wait a minimum of 60 seconds for the session to start." This delay can be increased to 75 seconds.
>
> In both cases, you will want to test these timers to determine if the proper timing is achieved.

To change the "Protocol Detection Timer" you will need to select "Session Params" from the Configuration Menu:

**Session Parameters**

Redial Attempts :     1    attempts

Session Timeout :     120    seconds

Reporting Priority Based Upon:     Destinations

Intersession Delay :     0.5    minutes

Clear Item

Clear All

Close

Help

Microphone Listening Period at End of Session :     Off

During voice sessions, give the menu prompt no more than :     1    times

When starting a data session, wait no more than :     20    seconds to determine the protocol

> Extend the "Protocol Detection for Incoming Calls Timer" to 20 seconds. That should be adequate to ensure there is enough time for the Catalyst to determine the type of protocol to be used in the current session.

## 4.5.2 Using Keycodes from the Front Panel

To extend the Outgoing Call Timer to 60 seconds, use **403\*60**

To extend the Call-In Timer to 75 seconds, use **406\*75**

To extend the Protocol Detection Timer to 20 seconds, use **827\*20**

## 4.5.3 Optimizing Data and Fax Transmission

You should also configure the Catalyst modem to optimize performance. To insert a modem initialization command into the Catalyst, select "Devices" from the Configuration Menu and click on the RTU Modem tab:
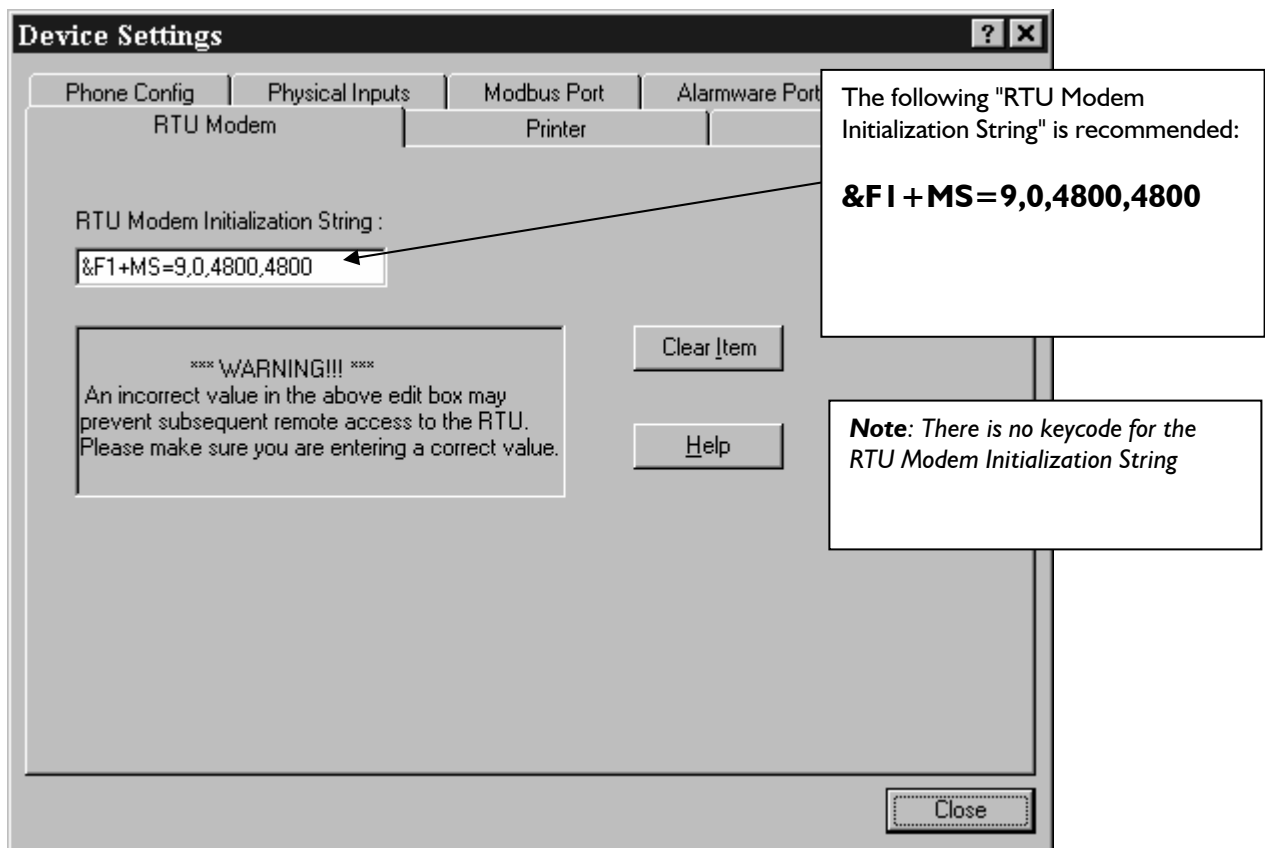


We also recommend that you enter the same command for the **Alarmware**™ modem. To access the Alarmware™ modem settings, you should start Alarmware™ and then "Cancel" the "Select RTU" dialog box. You will then have access to the "Options Menu." From the Options menu, select "Modem."

**MODEM Settings**

Port Number :  COM2       Baud Rate :  4800

Initialization String :    &F1+MS=9,0,4800,4800

Outgoing Call Answer Limit :   300.0   seconds

OK          Cancel          Help
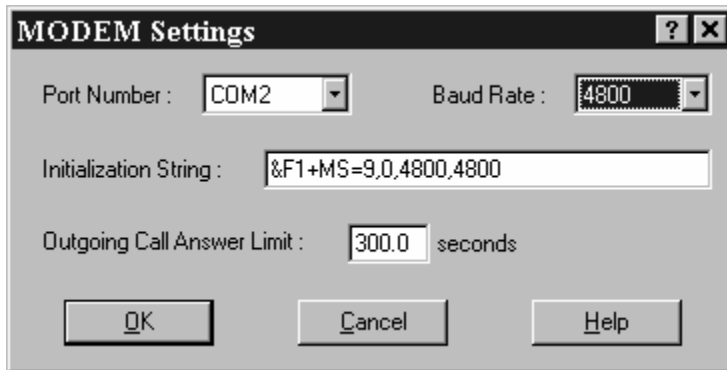
- Configure the "Initialization String" as before with the same commands: &F1+MS=9,0,4800,4800
- It also helps to set the "Baud Rate" to 4800 to match the initialization string.
- Extend the "Outgoing Call Answer Limit" as shown.

When connecting with a **Remote Data Terminal** you will need to add the modem commands to the Windows modem configuration:

1. First launch the Windows Control Panel.
2. From the Control Panel, select "Modems."
3. Select the proper modem from the list of available modems.
4. Click on "Properties."
5. Next click on the "Connection" tab.
6. Next click on the "Advanced" button.
7. Enter the Modem Initialization Commands as shown.

**Advanced Connection Settings**

☐ Use error control
  ☐ Required to connect
  ☐ Compress data
  ☐ Use cellular protocol

☑ Use flow control
  ⦿ Hardware (RTS/CTS)
  ○ Software (XON/XOFF)

Modulation type
Standard

Extra settings
&F1+MS=9, 0, 4800, 4800

☑ Append to log

View Log          OK          Cancel
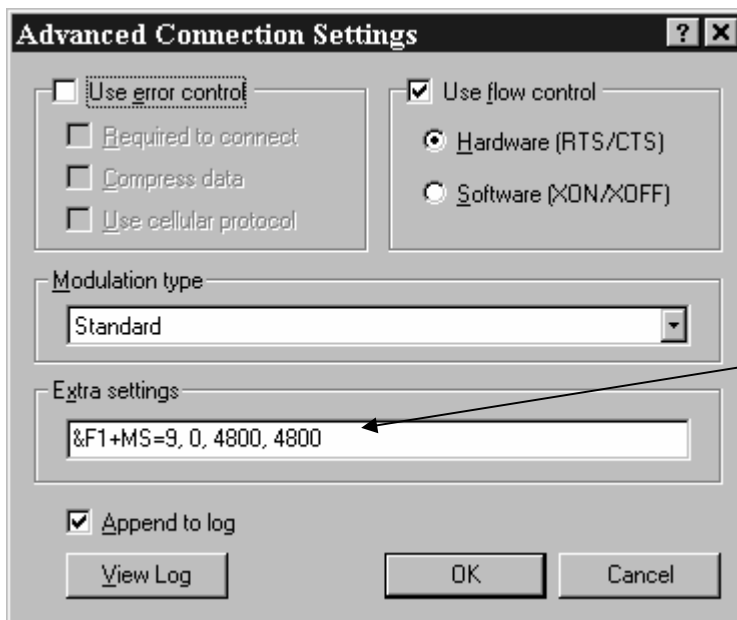
The Modem Initialization Commands are entered in the "Extra Settings" field as shown here…

## 4.6 Integrating the Catalyst and a Digital Cellularm System

Most digital cellular phones cannot transmit or receive data via the RJ11 phone jack. The only exception among the Telular product group that we use is the Phonecell SX5e GSM 850/1900. Therefore, when using a Catalyst coupled with a Cellularm, this is the phone to select. There are, however, a number of configuration issues to deal with both on the phone and on the Catalyst.

First, let's deal with the phone. When setting up service, the user should specify a SIM chip that has CSD (circuit switched data). This will result in a service with a voice only phone number plus a second, data only, phone number, and perhaps a third number for analog FAX as well.

The voice number is dialed when placing voice calls to the Catalyst.  The Catalyst uses this line for placing outgoing calls to voice, numeric or alpha numeric pager destinations.  If these are the only destination types you use, you can get by with just the 1 voice number.

The data number is dialed when placing Alarmware or Remote Data Terminal calls to the Catalyst.  The Catalyst uses this line for placing outgoing calls to Email and Remote Data Terminal destinations.  If you are not using Alarmware or RDT destinations, you do not need the second data line.

The analog fax number does not support incoming fax report requests. (These dial-in, or "polling" requests can be done using a land line).  The Catalyst does require the fax number for placing outgoing calls to Fax destinations.  If you are not using Fax destinations you do not need the analog fax line.

After the SIM chip has been installed, and service has been activated, the Phonecell **must** be configured as follows.  If the Phonecell was originally shipped with your Catalyst RTU, steps 1-7 below have already been performed at the factory.

1.  Connect the Catalyst or a telephone handset to the Phonecell's RJ11 jack designated with the telephone icon.

2.  Press the "dial out" button on the Catalyst, or take the handset off hook.  You should hear dial tone.

3.  Quickly enter #*114*4#.  This sets the data modulation to a Baud Rate of 9600.

4.  You should now hear dial tone. Hang up by pressing the normal key.  If you heard any other strange tones, you will need to reenter the code.

5.  Go off hook again and quickly enter #*115*0*7#.  This sets the Air Interface Data Rate to a Baud Rate of 9600 and Error Correction to on.

6.  Hang up when dial tone is heard again.  Retry if any other tones are heard.  You must hang up between each code string entry.

7.  Finally, enter #*113*1*0#.  This sets the RJ11 jack for data mode and sets carrier timing delays to the default values.

Now, it is necessary to configure the Catalyst to operate correctly with the Phonecell device. This involves the following steps:

8.  Set the "GSM digital cell phone" configuration item to "ON". This may be done by entering keycode 409*0 from the front panel or over the phone in program mode. Or, use the Device->Phone Configuration page in Alarmware.
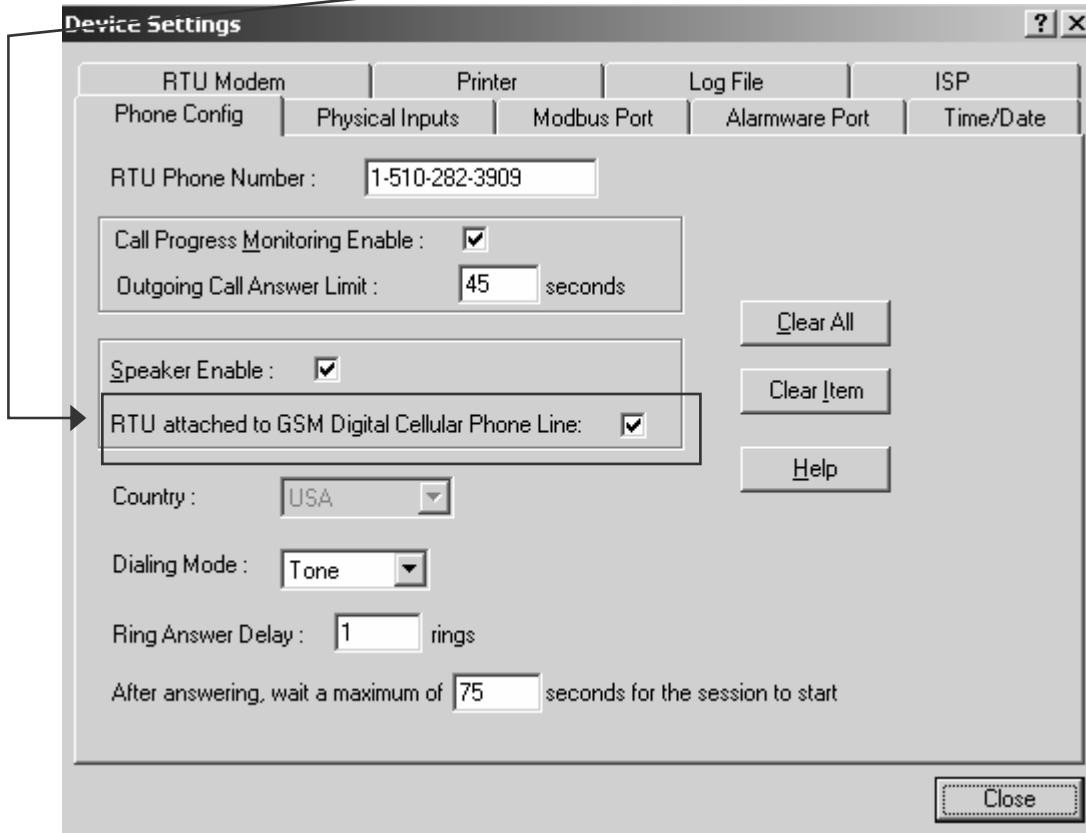


9.  If you are not using Alarmware or any data or fax mode destinations you may skip the remaining steps.

10. The RTU phone number as shown and used by Alarmware **must** be set to the Phonecell's data number. Do this using keycode 409 *<phone number>, or from the Device->Phone Configuration page in Alarmware.

11. Add the appropriate "bypass string" to the start of each telephone number for each destination. This string commands the Phonecell to use a particular phone line while dialing out. The bypass strings are listed in table below.
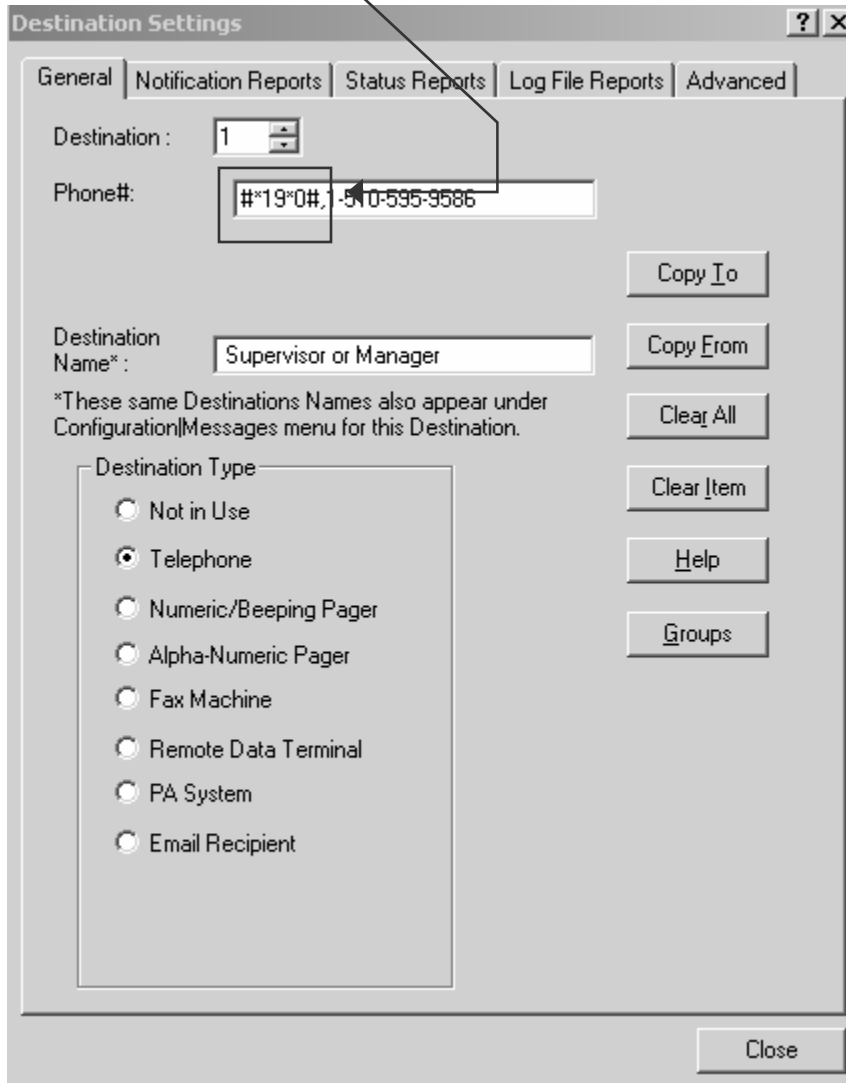


12. Edit the destination's "call back number" as desired, using Alarmwares Config->Destination->Advanced page tab. This is useful since the default number is the data number, but personnel will most likely be calling the unit back using voice mode. The third column in table below indicates if this feature is supported for the destination type.

13. The Catalyst's "Protocol Detection Time Limit" must be greater than 20 seconds. You may need to try different values to find the most successful connection rate.
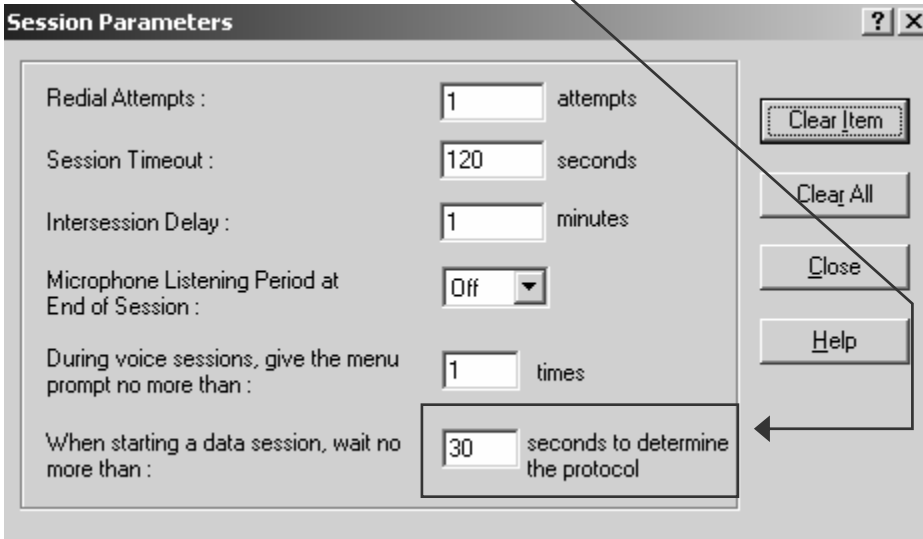


14. Note that anytime the "Dial Out" key is pressed for originating a call in speaker phone mode, the bypass string #*19*0# will need to be dialed first.

| Destination Type | Bypass String | Edit Call Back Number |
|---|---|---|
| Telephone/Voice | #*19*0#, | No |
| Numeric/Beeping Pager | #*19*0#, | **Yes** |
| AlphaNumeric Pager | #*19*0#, | **Yes** |
| Fax Machine | #*19*1#, | No |
| Remote Data Terminal | #*19*2#,<br>Technically, the bypass string is not required, but can be included for consistency | **No** |
| PA System | None required | **No** |
| Email Recipient | Not Available | **Yes** |

## 4.6.1 Limitations when using the Catalyst and a Digital Cellularm System

- Incoming Polling Calls for the FAX are not supported
- Incoming Polling Calls for Remote Data Terminals when PINs are required for the session to start are not supported
- Data transfer rate is limited to 9600 baud
- The success rate for report completion is reduced when the size of the report is increased. It is important to keep the size of the report under 50 Kbytes. Reports over this size will typically fail at some point during the transfer.
- Data sent to Remote Data Terminals will include some garbage characters at the end of the report. These characters are induced by the cell network and can corrupt the Remote Data Terminal port, preventing further connections without rebooting your computer. To avoid these problems, it is suggested that you use LOGTRAN for transferring Log File information. Log file size limitations still apply however.

- During "Over the Phone" programming, some spurious DTMF tones might be heard. These tones are induced by the network, but should have no effect on the programming of the Catalyst. It is recommended that during OTP programming, you enter the keycodes at a slower pace than you would normally. This is to ensure that the keycode entered is completely relayed to the Catalyst due to the time lag over the cell network.

## 4.7 Interfacing the Catalyst and the Automation Direct Terminator I/O

The Catalyst is very well suited to be interfaced to the Automation Direct Terminator I/O (T1K) distributed I/O product. However, there are a few changes that need to be made from the default configuration of each product.

*Please Note: This document will refer to certain pages of the T1K User Manual, so please have the manual available when you are ready to make settings changes.*

### 4.7.1 Setting the Catalyst Modbus Port Parameter

The Catalyst Modbus Port is configured for "Even" Parity by default. In order to communicate with the T1K, you will need to change the Parity setting to "Odd."

To make the necessary change using Alarmware™, connect to the unit and go to the "Configuration Menu." From the Configuration Menu, select "Devices." Click on the "Modbus Port" tab. The following dialog will appear:
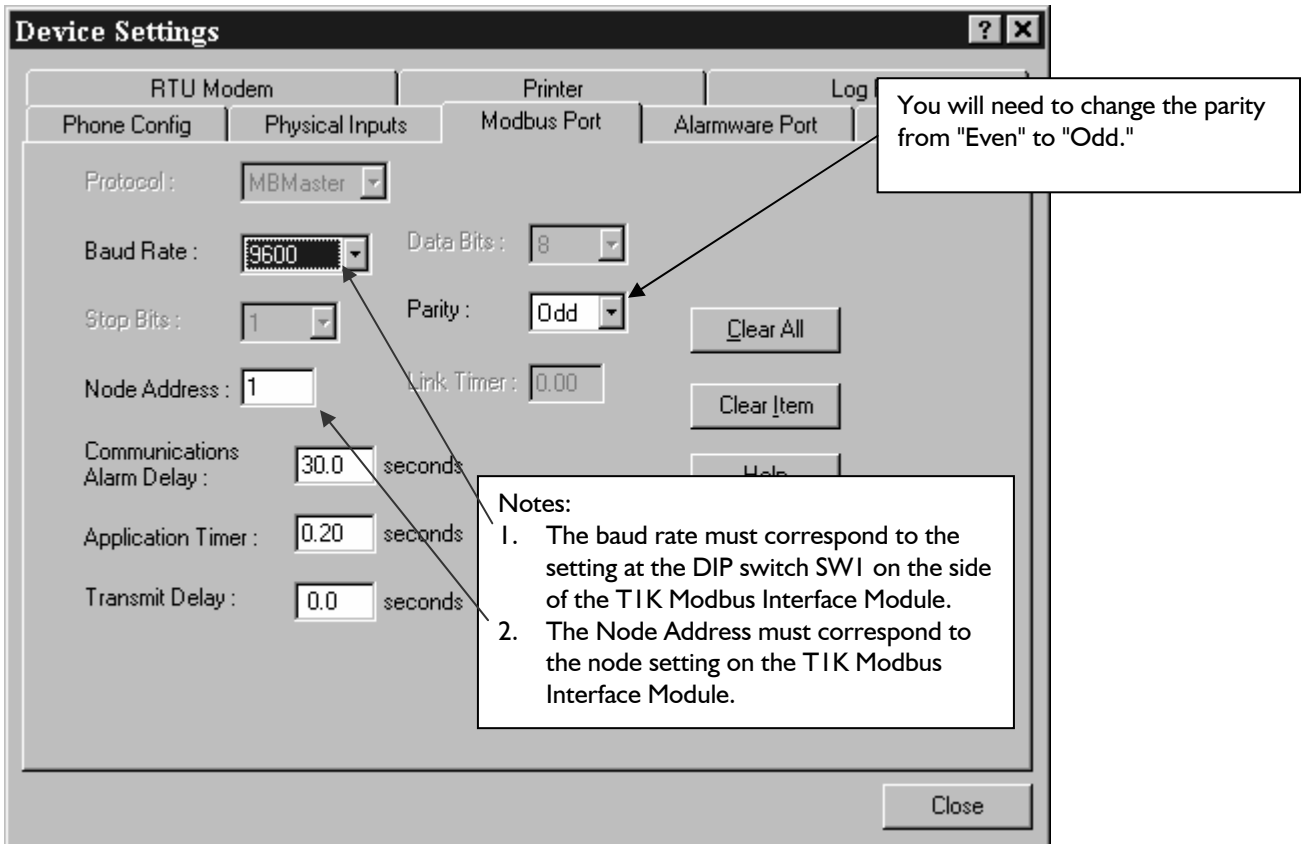
## 4.7.2 Terminator I/O Base Controller Settings

Most of the Terminator I/O Base Controller settings will be left in their default settings, with the following exceptions:

- You will need to set the T1K baud rate to 9600 baud. Refer to pages 2-4 of the "*T1K Modbus Base Controller User Manual*." You will be instructed on how to change the SW1-SW3 DIP switches to achieve 9600 baud.
- Set the "Node Number" switches to the desired Node. Refer to pages 2-7 of the "*T1K Modbus Base Controller User Manual*." The default node address for the Catalyst is 1.

## 4.7.3 Modbus Address Mapping

Please refer to pages 3-4 of the "*T1K Modbus Base Controller User Manual*" for the technical details of the T1K Modbus 584/984 addressing.

| Discrete Inputs | |
|---|---|
| Starting Address | 10001 |
| Number of Addresses | 1024 |
| Catalyst SNAs* (Node 1) | 1*1*10001 through 1*1*11024 |

| Discrete Outputs (Coils) | |
|---|---|
| Starting Address | 00001 |
| Number of Addresses | 1024 |
| Catalyst SNAs* (Node 1) | 1*1*00001 through 1*1*01024 |

| Analog Inputs | |
|---|---|
| Starting Address | 30001 |
| Number of Addresses | 64 |
| Number of Channels | 32 |
| Catalyst SNAs* (Node 1) | 1*1*30001 through 1*1*30064 |
| **Special Note**: Analog points occupy 2 consecutive 16-bit integers, but the second of the two are not used. Therefore, the first analog point address is 30001. The second is 30003. The third is 30005, and so on. | |

| Analog Outputs | |
|---|---|
| Starting Address | 40001 |
| Number of Addresses | 64 |
| Number of Channels | 32 |
| Catalyst SNAs* (Node 1) | 1*1*40001 through 1*1*40064 |
| The special note above for analog inputs also applies to analog outputs. | |

* SNA refers to "Source Net Address" for the Catalyst Channel Setting.

## 4.7.4 Catalyst Scaling for Terminator I/O Analog Channels

The resolution of Terminator I/O analog points is 14 bits (13 bits plus the sign bit) for inputs, and 12 bits for analog outputs.

| Available Voltage Spans | Available Current Spans |
|:---:|:---:|
| 0-5V | 0-20mA |
| 0-10V | 4-20mA |
| +/- 5V | -20 to +20mA |
| +/- 10V | |

Please Note:

1.  As observed in the table above, Automation Direct analog modules allow both positive and negative (bipolar) inputs and outputs. However, the Catalyst cannot monitor negative currents or voltages. For signals monitored by the Catalyst that swing both positive and negative, while the signal is negative the Catalyst will report erroneous readings.

2.  For Voltage inputs, the T1K product does not provide a way to set the gain of the inputs.. Therefore regardless of the desired input voltage span, the resolution is always the same, 1 count in 8192 (or 1.22mV) for inputs and 1 count in 2048 for outputs (or 4.88mV).

## 4.8 Catalyst LED Patterns

The following describes the various LED patterns seen on the Catalyst front panel and their indications:

**All LEDs ON:**          This is the first LED pattern seen when the RTU boots.  It indicates that IRQs are enabled, SPI bus initialized, and the firmware is scanning the NVM space for a newly downloaded firmware image.
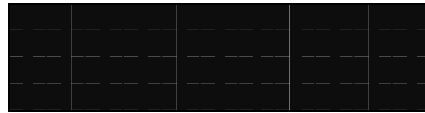


**Checkerboard:**          This is animation pattern shown below.  It is the second pattern shown when the product boots.
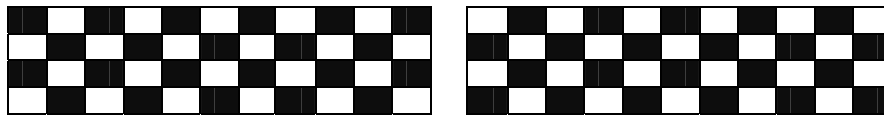


**It persists however long it takes to either:**
a)  Install the new firmware image found earlier (if any).  When that installation complete (or failed for whatever reason), then the "all LEDs on" pattern is briefly displayed before continuing to b).
b)  Perform all devices, file system, and task initializations.  If the file system fails any integrity tests (as will happen after any firmware download), a reformat operation will occur.  See the "NVRAM Format" pattern description below.  The checkerboard will resume when formatting complete.

**All LEDs OFF:**          When seen briefly after the checkerboard during boot, then all tasks have been initialized and normal operations with the usual indications have begun. When seen after power off button pressed, the RTU has successfully saved current state information and powered down.
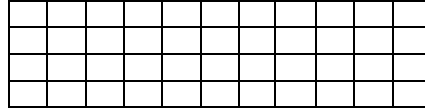
**Usual Indications:**   Each LED shows a specific RTU or channel state as indicated by the LED legend and described in section xxx of the Catalyst Operator's Manual. When this pattern is seen after the checkerboard, the RTU has booted successfully and is available for all normal box activities.

**Firmware Download:**   This animated pattern consists of a single lighted column moving sequentially from left to right. It is seen while the RTU is busy with Alarmware downloading new firmware and hence unavailable for all other normal box activities.

…...

…..etc….
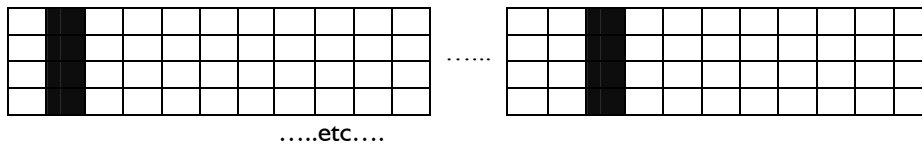
**NVRAM Format:**   This is a funny animated pattern sampled below. The **CHECK** led (farthest left) is constantly on. LEDs to the right indicate which NVM block number is currently being formatted. The rows form a two's complements of the binary representation of that block number. As each block is processed, the pattern will slowly count up.

Block 0

Block 1

Block 2

…..etc….
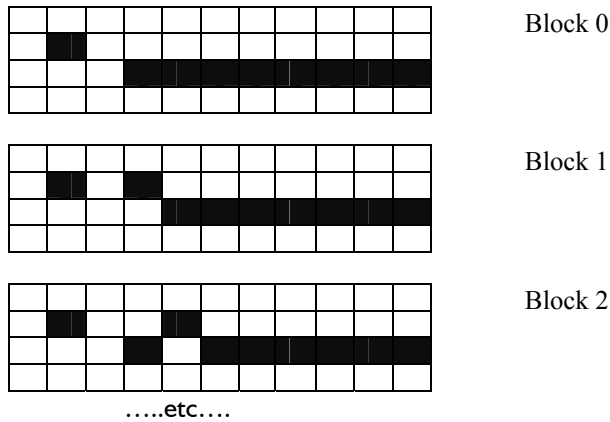
- When seen, the RTU is reformatting the entire NVRAM file system and hence unavailable for normal activities until the operation is complete. Then all configuration information will have returned to factory defaults.
- This pattern will be seen during RTU boot only if file system corruption is detected, a new firmware installation was successful or a firmware download attempt failed. It is seen during normal RTU operations only when specific programming commands request file system cleardown.
- Hardware problems may cause this pattern to freeze or repeatedly restart after reaching a certain block number.

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