

# MODEL AS-16

## Audio Sentry 16



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U.S.A.

Manufactured in the

## General Information

### General Description

The Belar Sentry 16 is an Audio/Logic monitoring system that continuously scans up to eight audio or program channels and eight logic or status inputs to detect changes in station operating parameters. It combines single-point monitoring of critical audio channels and equipment status, flexible local and remote alarm capabilities, and a computer interface for remote interrogation. The Sentry 16 senses changes in audio program levels, phase reversals occurring in the audio chain, and changes in equipment operational (logic) status.

### Specifications—General

Eight Analog (program) Input Channels, Eight Logic Input Channels; Unit control via front-panel pushbuttons and a 16-character dot-matrix alphanumeric display and an RS-232 interface; alarm readout through front-panel LED's, the alphanumeric display window, an audible piezo-electric alarm, dry SPDT contacts from two alarm relays, an open-collector external alarm output, and the RS-232 port. Out-of-tolerance conditions and alarm functions are set independently in each channel.

### Analog Channel Inputs

Channels 1–8:

Double-ended, differential-input with semi-automatic input sensitivity adjustment.

Input Level Range: ..... -10 dBu to +12 dBu (0.25 Vrms to 3.08 Vrms)

(Channels 1–4 have a secondary input level range of -22 dBu to 0 dBu, 0.062 Vrms to 0.77 Vrms, set by internal jumpers.)

Input impedance: ..... > 35 k $\Omega$  at 15 kHz

Alarm Level Threshold: ..... 10% to 95% of input reference level,  
user-selectable in each channel.

Alarm Level Resolution: ..... better than 2% at frequencies below 5 kHz

Input connector: 20-conductor removable terminal block with screw-actuated wire clamps.

### Logic Channel Inputs

Alarms may be set to trigger on logic highs, logic lows, low-to-high transitions, or high-to-low transitions, by user selection.

Channels 9–12:

Optically isolated, floating logic inputs. Compatible with unloaded TTL-family and 5-V CMOS and HCMOS-family logic with totem-pole outputs. Schmitt-trigger inputs.

Maximum common-mode DC: ..... <275 VDC.

Maximum differential input: ..... < 20 VDC.

Channels 13–16:

HCMOS (5-V) with Schmitt trigger inputs. Compatible with unloaded TTL-family and 5-V CMOS and HCMOS-family logic with totem-pole outputs. Internal 10-k $\Omega$  pullup to + 5 VDC.

Required swing: .....0.6 VDC for logic low, 3.3 VDC for logic high.

Maximum input: .....< 20 VDC.

Input connector: 20-conductor removable terminal block with screw-actuated wire clamps.

### Outputs

Two Alarm Relays: Alarm Relay and Alarm Timer Relay. Both relays have dry, form C contacts rated for 28 VDC maximum switched voltage, 500 milliamps maximum switched current, and 3 watts maximum switched power.

External Alarm: One open-collector NPN transistor, limited to less than +40VDC with respect to the Sentry 16 chassis ground, 50 milliamps maximum collector current, and less than about 250 milliwatts dissipation.

### Physical

Analog & Logic Input Connectors:

Two, twenty-conductor, removable, clamping screw terminal blocks with 5 mm lead spacing (Weidmuller BLZ series).

Serial Interface: .....RS-232

Unit Interface: ..... Wizard Standard Interface

Dimensions: ..... 1 EIA Rack Unit, 1.75" H x 16" D x 19" W

Power Requirements: .....15 watts, 100–240 VAC, 50–60 Hz

Unit Weight: ..... 3.3 pounds, xxx kg  
Shipping Weight: ..... XXXX pounds, xxx kg

## Unpacking

### Initial Inspection

Check the shipping carton for external damage. If the carton exhibits evidence of abuse in handling (holes, broken corners, etc.) ask the carrier's agent to be present when the unit is unpacked. Carefully unpack the unit to avoid damaging the equipment through use of careless procedures. Inspect all equipment for physical damage immediately after unpacking. Bent or broken parts, dents and scratches should be noted. If damage is found, refer to paragraph 2-2 for the recommended claim procedure. Keep all packing material for proof of claim or for possible future use.

The Sentry-16 is shipped with a Guide to Operations, 4 black rack-mount screws with cup washers, two removable 20-conductor Weidmuller BLZ screw terminal blocks, and a three-wire line cord.

### Claims

If the unit has been damaged, notify the carrier immediately. File a claim with the carrier or transportation company and advise bBelar of such action to arrange the repair or replacement of the unit without waiting for a claim to be settled with the carrier.

### Repacking for Shipment

If the unit is to be returned to Belar, attach a tag to it showing the owner and owner's address. A description of the service required should be included on the tag. The original shipping carton and packaging materials should be used for reshipment. If they are not available or reusable, Belar can provide a replacement box and packaging at a nominal cost. Alternatively, the unit should be repackaged in the following manner:

- a) Use a double-walled carton with a minimum test strength of 275 pounds.
- b) Use heavy paper or sheets of cardboard to protect all surfaces.
- c) Use at least 4 inches of tightly packed, industry approved, shock absorbing material such as extra firm polyurethane foam or rubberized hair. **Newspaper is not sufficient for cushioning material!**
- d) Use heavy duty shipping tape to secure the outside of the carton.
- e) Use large **FRAGILE** labels on each surface.

- f) Return the unit, freight prepaid. Be sure to insure the unit for full value.

## Front Panel Operation

As viewed from left to right on the front panel:  
[ INSERT FRONT PANEL DIAGRAM HERE. ]

The **MENU/PARAMETER WINDOW** is a 16-character dot-matrix alphanumeric display that displays menu selections and the associated parameters or settings, channel alarm indications, and unit information.

### The Pushbuttons:

To the right of the Menu/Parameter Window are two rows of numeric pushbuttons (“0” through “9”) and an array of six pushbuttons. The buttons are used to interrogate the status of the 16 channels of the Sentry 16 and to control operation of the unit. The numeric pushbuttons are used to identify and call up one of the 16 alarm channels for interrogation or adjustment. The **UP/DOWN MENU** buttons are used either to scroll through the 16 channels, to scroll through the menu selections, or to raise and lower certain operational parameters during Sentry 16 setup. The menu selections are arranged in two loops. The primary loop allows the user to examine settings for each of the 16 alarm channels and, after entering a personal identification number (PIN), to alter these settings. A secondary loop, accessible only from the Set Mode, allows examination of information specific to the unit and adjustment of several of the unit parameters. See the accompanying figure to view the structure of the menus.

The four remaining control buttons have specific functions in the control of the Sentry 16. The red pushbutton, or the “Mute” button, at the lower right is used exclusively to mute the internal audible alarm. This is a sort of *panic button* that silences the audible alarm so attention is more easily directed attending to the conditions triggering the alarms.

There is some variation in the functioning of the three remaining pushbuttons, depending on the parameter under adjustment. Generally, the **ENT** button acts as a means of

entering the parameter showing in the alphanumeric display into the Sentry 16 memory. It is also used to “enter”, or initiate a particular adjustment regime.

When the Sentry 16 is in the Scanning Mode, pressing the **SET** button initiates the SET MODE by prompting the user to enter a PIN. Entering a valid PIN allows an operator to make changes in the configuration and settings of the Sentry 16.

The **CLR** button allows users to de-activate the alarm indications in those channels for which the alarm-causing conditions have been removed. The **CLR** button also initiates the procedure to set the alarm timeout feature on each of the 16 channels.

To recap briefly, the **UP/DOWN MENU** buttons are used to scroll through channels, menus or settings. The **ENT** button enters setting values and, for the Logic channel setup, toggles certain menu choices. **SET** initiates PIN entry when the Sentry is in Scanning Mode, and **CLR** initiates entry selection or jumps out of the channel menus to return to the Scanning Mode. The red button mutes the audible alarms and deactivates the External Alarm transistor.

The LED Indicators:

At the extreme right of the front panel is an array of 18 LED indicators, arranged in two rows of nine. The two LED's in the first vertical column are special unit status indicators. The red LED labeled “MST” at the top of the first column is the master alarm LED. This LED is turned on anytime a valid alarm condition occurs in any of the active Sentry 16 input channels in which the Master LED has been enabled. The **MST** LED remains lit until all individual channel alarms that triggered the Master LED have been manually cleared by the User.

The yellow LED at the bottom of the first column of LEDs is the **SET** LED. It lights whenever the Sentry 16 is placed into the Set Mode by an Operator (or Supervisor, see below). Unit settings may be changed only in the Set Mode.

The remaining 16 three-color LEDs are assigned to each of the 16 respective channels indicated by the panel markings. These LEDs indicate one of five conditions for each channel. An LED remains dark when the associated Sentry 16 input channel has not been activated by the Operator. When green, an LED indicates the respective channel is active and is being scanned by the Sentry—no alarm condition for that channel is present. An orange (or amber) LED indicates that a program level or status alarm condition exists and the alarm delay timer for that channel is running but has not reached the time-out set by

the Operator. When a channel LED becomes red, a full alarm condition for that channel exists. The red channel LED remains latched until the alarm condition terminates *and* the user manually resets that channel. When in Set Mode the LED for the particular channel under examination blinks on and off, no matter the alarm condition for that channel alarm. Simultaneously, the menu for the particular channel is displayed in the parameter window.

In summary, the **MST** LED is lit by alarms occurring in channels in which it has been enabled. The **SET** LED lights whenever the Sentry 16 is in Set Mode and settings are being altered. The 16 individual channel LED's each indicate the following conditions:

- Green: Channel active, no-alarm condition
- Orange: Channel active, alarm timer initiated by an out-of tolerance condition
- Red: An alarm has occurred, or the alarm timer had run out before an out-of-tolerance condition was corrected
- blinking: Channel menu present in display while Sentry 16 in Set Mode
- dark, unlit: Channel inactive

## Rear Panel

Remote Alarm Connector: .....9-pin D-type connector receptacle.

Contact	Function
1	+5 VDC, sourcing current limited to about 50 milliamps (70 milliamps absolute maximum load)
2	chassis ground; return for + 5 VDC
3	Alarm Relay, common connection
4	Alarm Relay, normally closed contact
5	Alarm Relay, normally open contact
6	Timer Relay, common connection
7	Timer Relay, normally closed contact
8	Timer Relay, normally open contact
9	External alarm, open collector, limited to sinking 50 milliamps

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Sentry 16 Audio & Status Monitor

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Note: all relay contacts are electrically isolated from the Sentry 16 chassis.

[INSERT DRAWING OF CONNECTOR]

RS-232 Connector: ..... 9-pin D-type connector plug.

Contact	Type		Function
1	input	CD	Carrier Detect from external modem
2	input	Rx	Sentry 16 Receive Data
3	output	Tx	Sentry 16 Transmit Data
4	output	DTR	Sentry 16 Data Terminal Ready
5	common		Signal ground
6-9			Not used

[INSERT DRAWING OF CONNECTOR HERE]

Unit Interface Output: ..... 15-pin D-type connector receptacle.

Unit Interface Input: ..... 15-pin D-type connector receptacle.

These two connectors are the Sentry 16 interconnection to the Belar Wizard Unit Interface data bus. This bus connects with Belar equipment to enable unified remote operation.

[INSERT DRAWING OF CONNECTOR HERE]

Logic Inputs Connector: ... Removable, 20-conductor clamping screw-type terminal block (Weidmuller type BLZ, 180 degree with 5.0 mm spacing)



From left to right, viewed facing the rear panel from behind the unit:

Terminal Label	Function
1 G	Sentry 16 chassis ground
2 9-	channel 9 optically isolated logic input (return)
3 9+	channel 9 optically isolated logic input (positive source voltage)
4 G	Sentry 16 chassis ground
5 10-	channel 10 optically isolated logic input (return)
6 10+	channel 10 optically isolated logic input (positive source voltage)
7 G	Sentry 16 chassis ground
8 11-	channel 11 optically isolated logic input (return)
9 11+	channel 11 optically isolated logic input (positive source voltage)
10 G	Sentry 16 chassis ground
11 12-	channel 12 optically isolated logic input (return)
12 12+	channel 12 optically isolated logic input (positive source voltage)
13 G	Sentry 16 chassis ground (return)
14 13+	channel 13 standard-logic compatible input (positive source voltage)
15 G	Sentry 16 chassis ground (return)
16 14+	channel 14 standard-logic compatible input (positive source voltage)
17 G	Sentry 16 chassis ground (return)
18 15+	channel 15 standard-logic compatible input (positive source voltage)
19 G	Sentry 16 chassis ground (return)
20 16+	channel 16 standard-logic compatible input (positive source voltage)

[Insert drawing of connector here.]

All eight of the logic inputs are sufficiently sensitive to correctly register logic state when driven directly by TTL and +5V HCMOS outputs. The optically isolated logic inputs may require additional consideration. (See “Connection of Logic Inputs” under “Installation and Setup”, below.) Maximum differential input voltage of logic inputs is limited to V. (This voltage limit corresponds to approximately XXX milliamps for the channels 9–12 and XXX milliamps for channels 13–16.)

Analog Inputs Connector: ... Removable, 20-conductor clamping screw-type terminal block (Weidmuller type BLZ, 180 degree with 5.0 mm spacing)

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## Sentry 16 Audio & Status Monitor

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From left to right, viewed facing the rear panel from behind the unit:

Terminal Label	Function
1 1+	channel 1 non-inverting analog input
2 1-	channel 1 inverting analog input
3 G	Sentry 16 chassis ground
4 2+	channel 2 non-inverting analog input
5 2-	channel 2 inverting analog input
6 3+	channel 3 non-inverting analog input
7 3-	channel 3 inverting analog input
8 G	Sentry 16 chassis ground
9 4+	channel 4 non-inverting analog input
10 4-	channel 4 inverting analog input
11 5+	channel 5 non-inverting analog input
12 5-	channel 5 inverting analog input
13 G	Sentry 16 chassis ground
14 6+	channel 6 non-inverting analog input
15 6-	channel 6 inverting analog input
16 7+	channel 7 non-inverting analog input
17 7-	channel 7 inverting analog input
18 G	Sentry 16 chassis ground
19 8+	channel 8 non-inverting analog input
20 8-	channel 8 inverting analog input

[Insert drawing of connector here.]

The analog inputs are high-impedance (bridging), presenting a nominal load to ground of 35 k $\Omega$  in series with 270 picofarads at each terminal. Each channel has an instrumentation-type differential amplifier at its input. So, while the input voltage to a channel is measured as the potential difference between its “+” and “-” inputs, both the “+” and “-” input voltages are measured using the chassis ground of the Sentry 16 as the reference. Accordingly, common-mode voltages on any analog input pair should not exceed  $\pm 3$  V.

The semi-automatic level adjustment mechanism in the Sentry 16 brings a wide range of analog (program) input levels to the level required for proper operation of the internal level monitoring circuits. Maximum differential input level is +12 dBu, or approximately 3.1 VRMS. Minimum input level is -10 dBu, or about 250 millivolts RMS. If greater sensitivity is required, the gain of channels 1-4 may be increased by 12 dB by moving internal gain-setting jumpers located on the A3 board. See “Installation and Setup” for

instructions. With that change, the input sensitivity for channels 1–4 becomes –22 dBu to 0 dBu, or from about 62 millivolts RMS to about 775 millivolts RMS maximum. All levels here refer to the *nominal* line levels in use, or the RMS voltage when the signal level is at its full 100% nominal value.

AC Power Entry Module & Fuse Holder     IEC standard connector

The power fuse is accessible by removing the power cord and withdrawing the moveable holder using the blade of a small common screwdriver.

### Installation

The Sentry 16 is designed to mount in a standard 19-inch electronic equipment rack. When the unit is mounted above high heat producing equipment such as power amplifiers, consideration should be given to cooling, which requires free movement of cooler air around The Sentry 16. In no instance should the ambient temperature near the chassis be allowed to rise above 45° C (113° F).

The procedures below should be followed for standard installations.

1. The Sentry 16 can be operated from a 100 V to 240 V AC, single-phase, 50–60 Hertz power source with no user adjustments. The fuse should be a 5 mm x 20 mm type GMA-3A, 3 Amp-250 V (UL/CSA) or T3.15A-250V (IEC) fuse only. A spare fuse is mounted in the spare fuse compartment in the power entry module on the rear panel.
2. Connect the supplied three-wire grounded power cord between the Sentry 16 AC receptacle and the AC power source outlet. The Sentry 16 will immediately turn on, as there is no power switch. The MENU/PARAMETER window will momentarily display “BELAR SENTRY 16”, followed by “VERSION X.XX”, where “X.XX” is the version of the Sentry 16 software stored internally in an EPROM. The Sentry 16 will then begin operating in the Scanning Mode. At this point, the behavior of the Sentry 16 depends on whether or not any altered operating settings were previously stored by an Operator or Supervisor.
3. Once unit operation is verified, connection of the inputs and outputs may proceed.

Connection of Inputs:

All inputs to the Sentry 16 are applied via two removable 20-conductor clamping screw-type terminal blocks. The connection diagrams for the analog input terminal block and the logic input terminal block are shown in the “Rear Panel” section of this manual. The terminal blocks may be removed from the Sentry 16 for ease in making the connections. Wires carrying the program and logic/status signals from the sources should be stripped to expose at least 7 mm (approximately ¼”) of the conductor of each wire for insertion into the clamps. The terminal clamps are tightened on each connection with a common screwdriver with a blade no more than 3.5 mm (approximately 1/8”) wide.

Note: stranded wire is recommended for connections to the Sentry 16. Not only does stranded wire offer some give to the input terminal clamps, it better resists breaking at the stress point where the wire conductor leaves the clamp.

### Connection of Analog Inputs:

Analog (typically program) signals from balanced sources should be connected across the differential inputs (the “+” and “-“ inputs) of the appropriate channel. Each pair of analog input channels on the Sentry 16 shares one ground terminal that connects to the chassis ground of the Sentry 16. For single-ended program inputs, the “signal” wire should be connected to the “+” input terminal of Sentry 16 input channels, with the “ground” or “return” conductor connected to the nearest Sentry 16 ground terminal. The corresponding “-“ input terminal of this Sentry 16 channel should also be connected to this Sentry ground terminal.

### Connection of Logic Inputs:

Logic input signals to the Sentry 16 are of two types: floating and ground-referenced. Logic input channels 9–12 are optically isolated and may float at up to 275 VDC off the Sentry 16 chassis ground. The current sourcing (positive voltage) input conductors should be connected to the “+” terminal of their respective channels (terminals 3, 6, 9, and 12 of the Logic terminal block); the current sinking (return) wires should be connected to the “-“ terminal of the respective channel (terminal block connections 2, 5, 8, and 11). The drain wires from shielded cables for floating inputs may be attached to the adjacent chassis ground connections (terminals 1, 4, 7, and 10). Logic inputs 13–16 are restricted to just two terminals each: signal (positive voltage) and ground (return). Logic input signal must be at least +3.3 VDC to register “logic high”; input voltage must be less than +0.6 VDC to register “logic low”. This allows direct connection of unloaded TTL-family devices with totem-pole outputs, and both CMOS and HCMOS logic devices operating from +5VDC.

### Connection of Outputs:

Remote alarm connections are made by soldering to a 9-pin, D-type plug, which mates with the rear-panel Remote Alarm receptacle J1A. Connections to the RS-232 port are made by soldering to a 9-pin, D-type receptacle which mates with J1B on the rear panel.

### Setting of Gain Jumpers: Channels 1–4

Internal adjustment to the Sentry 16 can increase the input sensitivity range of any of the first four analog (program) channels to  $-22$  dBu to 0 dBu (or about 62 to 775 millivolts RMS). This represents an addition of 12 dB gain. The adjustment proceeds as follows:

1. Remove AC power to the Sentry 16 and input and output connections.
2. Remove the 6 cover screws (two on each side, two on top).
3. Locate the A3 analog board on the left side of the unit, as seen facing the front panel, and adjacent to the modular power supply.
4. Near the rear of the A3 board are four blue vertical circuit jumpers, P1–P4, adjacent to the etched circuit board markings “CHAN 1”, “CHAN 2”, “CHAN 3”, and “CHAN 4”. In their normal position, these blue jumpers are placed in their leftmost position, nearest the side of the chassis with the power entry module and the modular power supply.
5. To increase the gain for a channel, remove the blue circuit jumper for that channel and place it in its rightmost position, shorting the vertical pins at the center and right end of the miniature header soldered to the board. Repeat as required for the other of channels 1–4.
6. Replace the cover and the six screws and re-establish the electrical connections to the Sentry 16.

## Setup

Before it is possible to set up and operate the Sentry 16, personnel must understand the security structure and the operating modes of the unit. This information follows.

Directions for accessing the setup menu for a specific channel are presented. Then the different alarms are described, along with a description of how the alarms interact. Specific instructions are presented for setting the alarm timers, the audio gains and alarm thresholds, and the channel descriptors. Finally, the clearing of alarms, viewing the unit information, and setting the phase-reversal alarm are discussed.

### **Sentry 16 Security: PINs, “Users”, “Operators”, and “Supervisors”**

To prevent unauthorized changing of settings, the Sentry 16 has a two-tiered security structure. Those working with the Sentry 16 at the lower level of security are referred to as “Users”; those working at the higher level are either “Operators” or “Supervisors”.

**User:**

A user is anyone with access to the front panel of the Sentry 16. A User can examine all settings for the 16 channels via the pushbuttons and the Menu/Parameter display. A User can also mute the audible alarm using the red Mute button and reset any alarmed channel for which the out-of-tolerance condition has ended. No PIN is necessary for personnel to perform these operations.

**Operator:**

An Operator may change all of the unit and channel settings of the Sentry 16. An Operator gains control of the unit by entering the Sentry 16 Set Mode and entering the Operator PIN. See “Changing Operating Mode” below for directions on accessing the Set Mode.

**Supervisor:**

A Supervisor has the same operating privileges as an Operator. The only difference is that the Supervisor has a distinct PIN.

PINs for the Sentry 16 are set at the factory.

[Editors note: We may want to refer to a separate, removable page at the front of the manual that contains the two PINs. This sheet could be removed by the engineering or programming supervisor—or whoever opens the box.]

**Summary:** Users are any personnel with access to the front panel of the Sentry 16. They may view all channel settings and reset Sentry 16 alarms once the triggering conditions have been cleared. Operators and Supervisors can, additionally, set all channel alarm parameters, view unit information, and set certain parameters in the Unit Information menu.

**Accessing the Menu for a Specific Channel:**

The operating and control menus for an individual channel may be accessed in two ways.

When the Sentry 16 is in Scanning Mode, simply pressing a single or double numeric key sequence, will cause the display to jump to the top of the setup menu for the specified

channel. (Note that there is no need for an enter key: single digits other than “0” and “1” cause the unit to jump directly to the menu for the specified channel. Pressing “1” places the digit “1” at the leftmost position of the display window and puts the Sentry in a wait state. If the ENT button is then pushed, the unit jumps to channel 1. If any other valid second numeric key is entered, the Sentry 16 jumps to the appropriate channel. Invalid numeric digits have no effect.)

The second way to access a specific channel’s menu from the Scanning Mode is to simply press either of the UP/DOWN MENU buttons. The scanning message disappears from the display and the next channel in the circular sequence is accessed. Pressing “^” jumps to channel 1 and proceeds to high channel numbers. The DOWN arrow jumps to channel 16 and progressively lower-numbered channels. Holding down either of the UP/DOWN buttons activates an auto-repeat feature that scrolls through the channels in either ascending or descending order.

Summary: To access a menu for a specific channel, either  
Press, or hold down an UP or DOWN MENU key, *or*  
Press the numeric key sequence representing the channel number desired.

### **The Two Operating Modes**

The Sentry 16 operates in two fundamental modes: Scanning Mode and Set Mode.

Scanning Mode:

The Set Mode allows Users, Operators, and Supervisors to view Sentry 16 channel settings and to clear alarms in channels in which the out-of-tolerance conditions have ceased.

This is the normal mode of operation. When no alarm conditions are present, operation in this mode is indicated by appearance of the word “–SCANNING–” in the Menu/Parameter window. During Scanning, the Sentry 16 successively steps through each of the active channels, interrogates its status, and then repeats the process. The status of each channel is checked several times per second. (Active channels are those with corresponding lit front-panel channel LEDs that are illuminated in any color.) As an indication of actual cycling and scanning by the processor, the left and right “–” symbols in the display will alternately blink.

Once a valid alarm condition occurs, “–SCANNING–“ disappears from the display window and is replaced by one or a sequence of blinking channel descriptors for each of the channels in an alarm state. Those channels with valid alarms are no longer scanned. However, the Sentry 16 remains in the Scanning Mode, and all other active channels continue to be scanned for changes in status.

When the yellow “SET” LED on the front panel is extinguished, the Sentry 16 is operating in Scanning Mode. The Sentry 16 must be in Scanning Mode for an Operator (or Supervisor) to initiate the authorization process to change to the Set Mode and alter Sentry 16 settings. When AC line power is first applied, the Sentry 16 begins operation in Scanning Mode.

### Set Mode:

The Set Mode allows Operators and Supervisors to alter Sentry 16 settings and to view Sentry 16 Unit Information.

Sentry 16 settings may only be altered when the unit is in the Set Mode. When the yellow “SET” LED is lit, the Sentry 16 is operating in Set Mode. Upon entering Set Mode, the text “SET MODE” will appear in the Menu/Parameter display. After channel adjustments have been initiated, the display will revert to showing menu selections for the individual channels. A blinking channel LED of any color indicates that the designated channel is under active adjustment. Scanning of the status of this one channel ceases. Note that, just as in Scanning Mode, during Set Mode operation, the Sentry 16 successively steps through each of the active channels, interrogates its status, and then repeats the process. The only channel that is not scanned in Set Mode is the channel under active adjustment.

When Set Mode is first entered, pressing numeric key “0” will switch the Sentry 16 to the Unit Information menu.

Once an individual channel menu has been opened in Set Mode (by pressing “ENT” when a channel descriptor is displayed), the Sentry 16 monitors activity of the Operator. Four minutes of inactivity will cause the Sentry 16 to terminate Set Mode, reverting to Scanning Mode. This is done as a security measure. Before Set Mode can be re-initiated, the channel menu must be exited and operation returned to the Scanning Mode.



Summary: Scanning Mode is the normal mode of operation. In it, all active channels are regularly scanned for changes in status. In Scanning Mode, valid alarms cause their identifiers to flash in the alphanumeric display and their channel LEDs to light red. Any personnel can reset alarms and examine the settings for each active channel. Operation in Set Mode is required to alter channel settings or to examine the unit information. Entry of a PIN is required to access Set Mode.

### Changing Operating Mode

Changing from Scanning Mode to Set Mode:

1. Press the “SET” key. “ENTER PIN” will briefly display, followed by the prompt “PIN=”.
2. Enter a valid four-digit PIN. As each digit is entered, an asterisk “\*” will appear in the display. If the entered PIN was valid, the message “PIN VALID” will appear, followed by “SET MODE”. If the PIN was invalid, “PIN INVALID” will blink briefly on the display, followed again by “ENTER PIN”. (Press “CLR” to escape this sequence.)

Changing from Set Mode to Scanning Mode:

Once adjustments to a particular channel are complete, the Operator typically scrolls to the “EXIT STATUS” message in the channel menu and escapes to the menu of channel numbers and descriptors by saving the settings or aborting the changes. From this point, there are two ways to return to Scanning Mode.

First, from the menu of channel descriptors:

Using the Up/Down Menu keys, scroll down to entry just below the Channel 1 descriptor or to just above the Channel 16 descriptor. The Sentry 16 will enter Scanning Mode and display “–SCANNING–”.

Second, from the menu of channel descriptors:

Press “CLR”. The Sentry 16 will enter Scanning Mode and display “–SCANNING–”.

Summary: Press “SET” to enter the Set Mode from Scanning Mode. The Sentry 16 will prompt the user for his or her PIN. To exit Set Mode, first exit any channel menu by scrolling to “EXIT STATUS” and pressing “ENT”. Then, from the menu of channel

descriptors, either press “CLR” or scroll the first position “below” Channel 1 or the position just “above” Channel 16.

### **The Alarms**

Note: the alarms listed must be *enabled* in the respective channel menu for operation to occur, unless otherwise noted. Appearance in all capital letters indicates text that appears as shown in the channel menu displays. An “out-of-tolerance” condition is one in which a user-set parameter limit (in level or state) in a particular channel is presently being violated by the input signal. A “valid alarm condition” exists in a channel whenever the input signal is out-of-tolerance *and* the timer initiated by that condition, if one has been set up, has run to its maximum set value. The alarms are listed alphabetically.

**ALARM** an internally mounted, audible piezo-electric whistle (approximately 3 kHz at approximately 75 dBA) activated when an alarm condition becomes valid; requires the MST LED (or “MASTER LED”, see below) be enabled for operation; mutes with the MUTE button; re-activated for successive alarms occurring in other channels.

**ALARM RELAY** a single-pole-double-throw (SPDT) relay activated when enabled in any channel in which a valid alarm condition exists; requires the MST LED (see below) to be enabled for operation; all channel alarms in channels in which the Alarm Relay is enabled must be cleared for de-activation.

**Channel LED** operates whenever the respective Sentry channel is enabled; see description of colors above under “Front Panel Operation”.

**External Alarm** the open collector of an NPN transistor which is pulled low whenever the ALARM whistle (see above) is active; no distinct entry appears in the menu.

**MASTER LED** the front-panel red “MST” LED lit when enabled and any alarm condition becomes valid; requires all channels with the Master LED enabled to be cleared of valid alarm conditions before it will extinguish.

**MENU/PARAMETER Window** A flashing text message appears in the alphanumeric display for the channel in which a valid alarm condition exists. The flashing text is simply the text descriptor for the alarmed channel. The text is either the Sentry 16 default channel label, or a text descriptor entered for the channel by an

Operator via the channel menu operations. (See “Setting Channel Display Text” under “Installation and Setup”.) When valid alarm conditions exist in more than one channel, the text descriptors for the alarmed channels are flashed successively in the display, in the order of ascending channel number.

**TIMER CHIRP** an audible chirping function of the internal piezo-electric whistle (see “ALARM” above) activated by any alarm timer which is running; mutes with the MUTE button; is re-activated successively by the triggering of timers in other channels.

**TIMER RELAY** a SPDT relay activated whenever the timer for any channel is running; de-activated only when all timers have run out or have been reset.

### **Alarm Setup: General**

The Sentry 16 offers the capability of tailoring the out-of-tolerance conditions to be detected, as well as the specific alarm indications desired for individual application situations. The Sentry 16 extends this flexibility to sixteen independently programmable channels, making it a highly versatile device usable for monitoring the status of many kinds of systems.

The following figure depicts the structure of the alarm hierarchy for one analog (program) channel. The Timer Chirp, the Timer Relay, the audible Alarm, and the Alarm Relay are the alarm functions common to each of the 16 Sentry channels. Each of the four alarms can be activated by any of the channels. (For clarity, the four alarm buses connecting the outputs of the 16 channels to the four alarms are not shown. Nor is the bus for muting the audible alarm shown.)

[Insert channel alarm diagram here.]

The salient features shown by the diagram are:

1. The Master LED must be enabled for the Alarm Relay, the audible Alarm, or the external alarm to function.
2. The front-panel channel LED's and the Menu/Parameter display window indicate valid alarm conditions in active channels independently of any other settings.
3. The Timer Chirp and the Timer Relay alarms are not latched—when all timers cease, these alarms are de-activated.

In words, the alarm output functions behave as follows:

(This description applies only to Sentry 16 input channels that have been enabled by an Operator—those actively scanned by the Sentry 16 processor. See “The Alarms”, below, for definitions of “out-of-tolerance” and “valid alarm condition”.)

Every active channel of the Sentry 16 has its respective channel LED lit. Every out-of-tolerance condition alters the color of the corresponding channel LED. The text descriptor for every channel sensing a valid alarm condition flashes in the display window, either by itself, or as part of a sequence of flashing text descriptors of all alarmed channels.

For channels set to alarm immediately (timeout disabled), the first detection of an out-of-tolerance condition at the input activates any enabled alarms for that channel. The corresponding channel LED also turns red. The alarms for this channel remain active (are “latched”) until the out-of-tolerance condition has ended *and* the user has reset (or “cleared”) the channel, in that order.

The Timer Relay and Timer Chirp alarm, when enabled, function only while an alarm timer (started by an out-of-tolerance condition) continues to run. Corresponding channel LED’s are lit amber. Once all timers have reached their respective Operator-set limit times, the Timer Chirp and the Timer Relay alarms are de-activated. (These are “non-latching” alarms.) If the out-of-tolerance condition does not cease before the timer runs out, any alarm functions that are enabled in that channel are activated and are latched in the on state. Then, the channel descriptor for the corresponding channel begins flashing in the display window, either by itself, or as part of a sequence of flashing text descriptors of all alarmed channels.

### **Setting Channel Alarm Timers**

Each channel of the Sentry 16 has an independent alarm timer than can be set to delay the activation of the system-level Sentry 16 alarms after the onset of an out-of-tolerance condition. The alarm timers are automatically disabled in Logic Input channels that are set to detect logic-level transitions.

The Channel Timer *must* be set to a value other than “0 MS” before the Channel Timer for that channel may be enabled. So the time value is set first. (Once acceptable timer values have been set in a channel, successive enabling/disabling of the Timeout may be accomplished without first setting the timer value.)

The procedure for setting an alarm timer is:

1. Enter Set Mode and scroll the menu for the desired channel. Press “ENT”.
2. Scroll to the channel menu item “CHAN TMR = 0 MS”.
3. Press “ENT”. Briefly, the display will read “SET CHAN TIMEOUT”, and then the timer setting display will return.
4. Use the UP/DOWN menu keys to scroll to the desired timer value.
5. Press “ENT”. “TIMEOUT SET” will appear briefly in the display before the timer setting re-appears.
6. Scroll to “TIMEOUT DISABLED”.
7. Press “ENT” to toggle the display to read “TIMEOUT ENABLED”.
8. The Timer Relay and Timer Chirp may now be enabled and will function.

Note that disabling the Channel Timer in the menu locks out operation of the Timer Relay and the Timer Chirp for that channel. (The menu settings automatically change to reflect this.) With the timer disabled, out-of-tolerance conditions in that channel will cause any alarms to occur immediately upon detection of an out-of-tolerance condition.

If the channel alarm timer-setting process is accidentally initiated, or if after starting the process, it is desired to return to the previously stored value, pressing “CLR” will return the previously stored timer setting to the display and terminate the timer-setting process.

Summary: To set an alarm timer, in Set Mode scroll to and enter the desired channel menu. (Do this by pressing “ENT” with the channel descriptor present in the window.) Scroll to “CHAN TMR=XXXX MS” and press “ENT”. Use the UP/DOWN Menu buttons to scroll to the desired time and press “ENT”. Scroll to “TIMEOUT”. Enable the Timeout by toggling with the “ENT” key. Enable timed alarms as desired.

### Setting Channel Gains

During setup, the gain of the analog channels must be set to place the input signals at the proper internal operating level of the Sentry 16. This is a semi-automatic process in the Sentry 16, one initiated by the Operator. (Note: stereo program signals must have the Left channel signal applied to one Sentry 16 analog input channel and the Right channel signal applied to another: Sentry analog channels are monaural.)

Gain setting can be handled under both for steady-state tones at nominal line level, as well as under live program conditions. Use of a level tone is more reliable and is preferred.

Using a Tone:

1. Place a tone at nominal line level on the analog signal line attached to the Sentry 16 input channel. (Frequency is not critical but is best between 200 Hz and 5 kHz.)
2. Enter the Set Mode and scroll to “CHAN GAIN=XXXX” for the channel to be set.
3. Press “CLR”. The display will momentarily display “SET CHANNEL GAIN”, and then prompt a choice of method with “1=PROGRAM 2=TONE”.
4. Press “2”. The prompt “APPLY TEST TONE” will appear.
5. Press “ENT”.
6. Briefly, “SETTING GAIN” will appear in the display, followed by “GAIN SETTING IS DONE”. The display finally reverts to showing the new gain: “CHAN GAIN=XXXX”. Note that the gain is not recorded until the channel settings are saved.

Using Program Material:

1. Make sure the program material present on the analog signal line is what is normally carried and that the program levels are regularly reaching the highest levels normally present.
2. Enter the Set Mode and scroll to “CHAN GAIN=XXXX” for the channel to be set.
3. Press “CLR”. The display will momentarily display “SET CHANNEL GAIN”, and then prompt a choice of method with “1=PROGRAM 2=TONE”.
4. Press “1”. The prompt “APPLY PROGRAM” will appear.
5. Press “ENT”.
7. “SETTING GAIN” will appear in the display, followed by “GAIN SETTING IS DONE”. The display finally reverts to showing the new gain: “CHAN GAIN=XXXX”. Note that the gain is not recorded until the channel settings are saved.

If the analog input signal does not fall within the prescribed range during the gain setting process, either the prompt “INCREASE INPUT” or the prompt “DECREASE INPUT” will flash briefly in the display, followed by either “APPLY TEST TONE” or “APPLY PROGRAM”. The process then resumes upon pressing the “ENT”, as before.

Using a steady-state tone at nominal line level is the most reliable means of setting gain in the Sentry 16, and is the preferred method. When using program material to set Sentry 16 gains, care must be exercised in selecting the interval during which the adjustment process is performed. Otherwise, unreliable operation of threshold alarms may result.

Note also that the program level alarm *threshold* adjustments are user-set percentages of the operating level as determined by the measuring system of the Sentry 16. When tone-based level adjustment is used, the alarm thresholds are percentages of the level of the tone used for level adjustment. When program-based level setting is performed, the program level alarm threshold is the Operator-set percentage of the Sentry 16 estimate of the maximum program level encountered on the signal line during the level setting process. Accounting for this difference when making threshold settings is important for optimum operation.

During the interval in which gain setting is under way, scanning of audio levels in other audio channels is halted. Full scanning resumes immediately once the gain determination has been made. The process of channel gain setting using a tone takes about 2 seconds; gain setting using program audio takes approximately 5 seconds.

Summary: Working in the desired channel menu in Set Mode, scroll to CHAN GAIN=XXXX and press “CLR”. The Sentry 16 will prompt the user to apply tone or program material. Make the selection and then press “ENT”. The gain setting process will occur automatically. Upon completion, the new gain setting will be displayed. If a “PROGRAM” source (choice number 1) was selected, alarm thresholds are referenced to an estimate of the highest program level.

### **Setting Audio Channel Alarm Threshold**

Each of the active audio (program) channels requires a reasonable audio level alarm threshold setting to function well as an alarm. The alarm threshold is a percentage of the peak value of either an audio level tone or the highest typical value of program material, whichever is used in setting the channel gain. Audio levels that fall below this threshold are considered “out-of-tolerance”.

To set the audio level alarm threshold for an active channel:

1. In Set Mode, scroll to the desired channel and enter that channel menu by pressing “ENT”.

2. Using the UP/DOWN parameter keys, scroll to the “THRESHOLD= XX %” menu entry.
3. Press “ENT”. The words “SET LVL THRESHOLD” will appear briefly in the display, followed by the current threshold value.
4. Select the desired level threshold percentage in *either of two ways*:
  - a. Using the UP/DOWN keys, scroll until the desired threshold percentage appears in the Menu/Parameter window display. The allowed range is from 10% to 95%.
  - b. *Or*, press “CLR”. The numeric threshold value in memory will be blanked out. Then use the numeric keys to enter the new threshold.
5. Press “ENT”. The display will briefly read “THRESHOLD ENTERED” before indicating the final value set for the threshold. If a threshold outside the 10%–95% range was entered, the message “INVALID ENTRY” will appear in the display, prompting entry of another value.

Because audio (program) levels fluctuate, judicious selection of a time limit may also be important to obtain most benefit from the Sentry 16.

Summary: To set an alarm timer, in Set Mode scroll to and enter the channel menu desired. Scroll to “THRESHOLD=XX%” and press “ENT”. Using the Up/Down keys, scroll to the desired percentage between 10% and 95%; *or* press “CLR”, followed by two valid numeric keys. Press “ENT”. The threshold will be updated and appear in the display.

### Setting Channel Descriptors

Sixteen individual channel descriptors may be set by an Operator to enable direct textual identification of alarm conditions when they occur. Each descriptor is limited to 13 characters. The characters available are, in the order they appear in the selection menu, the capitalized alphabet (“A”–“Z”), space, the symbols “!”, “#”, “\$”, “%”, “&”, “'”, “(”, “\*”, “+”, “,” (comma), “-”, “.” (period), “/”, and the numerals “0” through “9”.

1. Enter the Set Mode
2. Scroll to the channel to be set and press “ENT”. If already in the menu for that channel, scroll to the top of the menu for that channel. The top item has the channel number occupying the two leftmost places in the display, followed by the default or a previously entered descriptor.
3. Press “CLR”



The Menu/Parameter Window will display the channel number followed the prompt “A”.

4. Use the UP/DOWN Menu buttons to select the first desired character from the above list to go in the “A” position.

5. Press “ENT”. This will enter the first selected character, move an imaginary cursor to the second character position and place another copy of the character just selected in the window.

6. Repeat this process for the remaining 12 character positions.

When the thirteenth character is entered, control of the display will be lost and the Sentry 16 will display “TEXT ENTERED” briefly, ending the process.

Note that spaces must be selected to fill out the display if all 13 character positions are not required for the descriptor. If an error is made, the display may be filled out, and when “EXIT STATUS” is displayed and entered, the “CLR” button may be pushed when “SAVE CHANGES?” appears. This aborts the save process and returns control to the user.

Summary: In Set Mode, enter the desired channel menu. If not already there, scroll to the channel descriptor for that channel. Press “CLR”. The letter “A” appears in the display. Scroll through the alphabet, numerals, and symbols (including the space) in the menu to the desired character. Press “ENT”. Repeat the selection process for the remaining 12 places in the display window.

### **Saving Channel Settings**

As long as the Sentry 16 remains in Set Mode, an Operator may make multiple changes to any channel settings. Once the “EXIT STATUS” function for a channel has been activated (by the Operator pressing the “ENT” button), the Operator is prompted twice to approve saving the changes. Only two consecutive affirmative responses will permanently retain the new settings in memory—overwriting the old. Otherwise, the previously saved settings are retained. Note that if the final menu settings for a channel are no different from those previously stored, no saving process is prompted or required when the channel menu is exited. Note that saved settings are permanent, unaffected by AC line failures.

So, to permanently save channel settings:

1. In Set Mode, scroll to “EXIT STATUS”.
2. Press “ENT”. The text “SAVE CHANGES?” will appear in the display.
3. Press “ENT”. The text “ARE YOU SURE?” will appear in the display.

4. Press “ENT”. The settings are saved to non-volatile memory and control is returned at the channel descriptor item of the channel menu.

### Clearing Channel Alarms

The condition causing an alarm must first be brought into tolerance before the alarm indication for that channel may be cleared from the Sentry 16.

To clear an alarm indication from the Sentry 16:

1. Press “CLR”. The text “CLEAR CH. ALARM” will momentarily appear in the MENU/PARAMETER window, followed by the prompts “ENTER CHANNEL #” and “ALARM CHANNEL= “.
2. To select the channel to be reset or cleared, *either*
  - a. Using the numeric keys, enter the one or two-digit number of the channel to be cleared,
  - b. *or* by pressing the Up/Down Menu keys, scroll through just the numerical sequence of all channels with valid alarms to the desired alarmed channel.
3. Press “ENT”. The display will briefly indicate “CLEARING CHANNEL”. Unless the alarm condition for the channel has reoccurred, the channel LED will turn green. Unless alarms for other channels remain to be cleared, all Sentry 16 indications and relay activity associated with the channel alarm just cleared will cease.
4. Repeat for any other desired channels.

### Viewing Unit Information

Sentry 16 Unit Information may be viewed only in Set Mode. So, an Operator or Supervisor PIN is required.

1. In Scanning Mode, press “SET”.
2. Enter a valid PIN to access the top level of the Set Mode menus.
3. Press “0”. The display will read “UNIT INFORMATION”.
4. To select the specific information item, *either*
  - a. Use the UP/DOWN MENU keys to scroll to the desired entry in the menu,
  - b. *or*, using the numeric keys, enter the digit corresponding the identification number of the entry desired. (The identification numbers are shown in parentheses following the menu items listed below.)

5. When the desired entry is reached, press “ENT” to display the selected information.

In general, pressing “ENT” retrieves the indicated information from memory. Pressing “ENT” a second time advances to a routine to alter the contents of the memory for that item. If alteration of the item is not possible, the message “CANNOT CHANGE” is displayed momentarily. Except for textual information, entries are modified using the UP/DOWN Menu keys. When modification is complete, the “ENT” key is pressed, and a second pressing of “ENT” is requested for confirmation of the change. (If, at the last minute it is desired not to make the modification permanent, press “CLR” instead of “ENT”.) To exit a particular selection and return to the uppermost level of the Unit Information menu, press “CLR”.

Below are the items displayed in the Unit Information menu, with their associated identification numbers.

UNIT ID (1)                      This item contains the text “BELAR SENTRY 16”. It cannot be changed.

SERIAL NUMBER (2)              This is self-explanatory. Sentry 16 serial numbers take the form “71XXXX”. It cannot be changed.

USER INFORMATION (3)          This is a text entry 10 characters long to aid the user in working with the Sentry 16 remotely. The text is altered as described in “Setting a Channel Descriptor” above.

PHASE CHECKING (4)            This is the gateway to the submenu for the stereo phase-checking function of the Sentry 16. When enabled, this system detects phase reversals occurring between the left and right channels of stereo program material applied to channels 1 and 2 of the Sentry 16. See “Setting Stereo Phase Reversal Alarm” in this section for details.

RS-232 PORT (5)                The UP/DOWN Menu keys enable or disable the rear-panel RS-232 port.

RS-232 DATA RATE (6)        This allows setting of the data transmission rates for the rear-panel RS-232 connection. The choices are 1200, 2400, 4800, or 9600 bits per second. The UP/DOWN menu keys scroll through the choices. “ENT” makes the selection.

- EPROM VERSION (7)      Self-explanatory. Cannot be changed.
- EPROM CODE DATE (8)    Self-explanatory. Cannot be changed.
- EPROM CHECKSUM (9)    An error check for the EPROM. Cannot be changed.

### **Setting Stereo Phase Reversal Alarm**

When the left and right channels of a stereo program source are connected to Channels 1 and 2 of the Sentry 16 and both channels are enabled, a stereo phase checking feature of the Sentry 16 may be activated. When active, special hardware and software compares the sum and difference levels in the stereo program and detects when a phase reversal has occurred in one of the channels. Both the Sentry 16 audible Alarm and Alarm Relay may be enabled to indicate a phase reversal, but there is no alarm timer option. The front-panel Master LED lights and an error message appears automatically when a phase reversal is detected. For the purposes of displaying and clearing phase-reversal alarms, the phase-reversal detection system is designated as “Channel 17” of the unit.

To enable the Phase Checking alarm system:

1. Make sure the Left and Right audio signals are applied to Channels 1 and 2, that the Sentry 16 gain setting function has been run on both channels, and that Channels 1 and 2 are enabled.
2. Enter the Set Mode and immediately press the numeral “0” key. The words “UNIT INFORMATION” will appear in the Menu/Parameter display.
3. Scroll up four entries in the information menu to “PHASE CHECKING”. Alternately, one may press “4”.
4. Press “ENT”. The unit will display the prompt “1=STATUS 2=ALARM”.
5. Press “1” to examine or enable the alarm. The display will read “PHASE CHECK ENB” or “PHASE CHECK DIS”, depending on whether it is enabled or disabled.
6. Press “CLR” if the present status is desired, *or* press the Up/Down keys to toggle the status setting. If “CLR” is pressed, the Sentry 16 will return to the “PHASE CHECKING” entry in the Unit Information menu. Altering the state will bring the prompt “ARE YOU SURE?” to the display. Pressing “ENT” again will bring “STATUS CHANGED” to the display and save the change. The unit will then revert to the “PHASE CHECKING” entry in the Unit Information menu. (Pressing “CLR” at the “ARE YOU SURE?” prompt will break out of the change-saving process and return the Operator to “PHASE CHECKING”.)

If the Phase Checking system has been enabled, any phase reversal will automatically light the red “MST” LED and flash the message “17 PHASE ERROR” in the display window. The aural Alarm and Alarm Relay, for external indications, must be enabled separately. This is done in steps 6 through 10.

7. With “PHASE CHECKING” in the display, press “ENT”. Again, the display will indicate “1=STATUS 2=ALARM”.
8. Press “2”. The display window will briefly indicate the present state of the alarms. For example, “AUD=ON , RLY = OFF” might appear. Then, the display shows “1=AUDIO, 2=RELAY” to prompt the choice of alarm to be modified.
9. Choose the alarm to be modified by pressing “1” or “2”. Again, depending on the alarm and whether it is enabled, something like “ENB AUDIO ALARM?” or “DIS ALARM RELAY?” will appear in the display.
10. Press “ENT” to make the indicated change (or “CLR” if it is desired not to make the change). “ARE YOU SURE?” will then appear to prompt pressing the “ENT” key a second time to save the change. As in step 5, pressing “CLR” at either point in the sequence will bring the display back to the “PHASE CHECKING” menu entry without altering or saving any settings.
11. Repeat steps 6 through 9, if desired, to set the other alarm function.

Once a phase reversal occurs and then has been corrected, the alarm is cleared by pressing “CLR”, then entering “17”, and finally pressing “ENT” at the channel selection prompt.

Note: Both channels 1 and 2 must be enabled for the phase reversal alarm to function.

Summary: The phase-reversal sensing alarm compares the left and right audio present in Sentry 16 channels 1 and 2 for the correct phase relationship. The alarm is activated by entering the Unit Information menu:

1. Enter Set Mode and immediately press “0”.
2. Scroll through the Unit Information menu to the “Phase Checking” sub-menu.
3. Press “ENT”.
4. Press “1” to enter the Status sub-menu.
5. Toggle the alarm on or off with the Up/Down keys. Enter the choice with the “ENT” key.
6. Again at the “Phase Checking” prompt, press “ENT”.
7. Press “2” to set the Aural Alarm and the Alarm Relay.
8. Press “1” or “2” to select the aural Alarm or the Alarm Relay, respectively.

9. Use the “ENT” or “CLR” button, to change or retain, respectively, the desired setting.
10. Repeat for the other alarm, as desired.

Phase-reversal alarms are terminated by clearing “Channel 17”.

### **Operational Shortcuts & Notes**

Keys pressed before the Sentry 16 can process them are simply ignored. Simply pause and repeat pressing the desired key.

Individual channel menus may be accessed *directly* in either Scanning Mode or Set Mode by pressing the corresponding one or two-key numeric sequence. (This does not work for the phase-checking system, designated as channel 17. The phase checking system is accessed through the Unit Information menu.)

Additionally, the numeric keys may be used to directly enter audio level alarm thresholds, channel numbers of channels with alarms to be cleared, and to jump directly to specific items in the Unit Information menu. See the relevant preceding paragraphs for details.

Following are shortcuts to common operations aided by use of the “CLR” button:

1. “CLR” returns to the Scanning Mode directly from any of the channel descriptors.
2. If it is desired *not* to save the changes made in a channel menu, following the “EXIT STATUS” and “ENT” key sequence, press “CLR”. This returns the menu to the channel descriptor text. Pressing “CLR” a second time returns the Sentry 16 to the Scanning Mode.
3. “CLR” blanks the audio level threshold value in the display during the threshold setting process and also blanks channel number entries made to clear alarms (both before the “ENT” button is pressed).
4. When altering channel timer settings, once “SET CHAN TIMEOUT” has appeared in the display, pressing “CLR” will return the previously saved timer value to the display and terminate the current time-setting process.
5. The “CLR” button may be used to break out of other settings and sequences.

When clearing alarmed channels, the Up/Down Menu keys may be used to access just the alarmed channels: Press “CLR”. When the prompt “ALARM CHANNEL= “ finally appears, press either the Up or the Down Menu key. This scrolls through all channels with valid alarm conditions in numerical order. Press “ENT” to clear the alarm for the

desired channel. This process may be repeated. (Channel selection may also be made via numerical key sequences.)

In four cases, certain channel menu settings lock out, or inhibit, the operation of certain other channel menu functions and settings. And, this possibility is not always clear from reading the individual setting displays. The cases are:

1. When a channel "TIMEOUT" is disabled, neither the Timer Relay, nor the Timer Chirp for that channel will function, even if Timer Relay and Timer Chirp are enabled in the channel menu.
2. Neither the audible Alarm, nor the Alarm Relay will function in a channel in which the Master LED ("MST" LED) is disabled, even if Alarm and Alarm Relay are enabled in the channel menu.
3. Whenever a Logic Channel is set to operate in "TRANSITION ALARM" mode, the functions "TIMEOUT", "TIMER CHIRP", and "TIMER RELAY" are all automatically disabled. These menu entries are automatically altered to reflect this change.
4. As mentioned under "Setting Stereo Phase Reversal Alarm", the phase reversal alarm will not function without both Channels 1 and 2 being actively scanned.

### **Error Messages**

There are several messages that may appear during the process of changing Sentry 16 channel settings. Each message is described below, along with its resolution.

**"CANNOT ENABLE"** This message may appear when attempting to enable the Alarm or the Alarm Relay. Neither function can be enabled with the Master LED disabled. Simply enable the Master LED first. Then enable the Alarm or the Alarm Relay as desired.

**"INVALID ENTRY"** Message appears when attempting to enter an audio level threshold less than 10% or greater than 95%. Enter a value between 10% and 95%.

**"NO TIMEOUT SET"** Message appears when attempting to enable the Timeout function when the Channel Timer is set to 0 milliseconds. Simply set Channel Timer to any value greater than 0 milliseconds before attempting to enable the channel Timeout.

## Description of Channel Menu Functions

Following are descriptions of the operational characteristics of each of the selections in the individual alarm channel operating menus. They are described in the order they appear in the circular menu for each analog (program) channel. The text within the brackets lists choices possible for the associated item. See the end of the list for the entries specific to the Logic Input channels.

### CHANNEL [ENABLED / DISABLED ]

This function activates the indicated channel. When disabled, the channel is not scanned by the Sentry 16 for either level or status. No channel-specific outputs are provided.

### TIMEOUT [ENABLED / DISABLED ]

This activates a delay between the time an alarm condition occurs and when the alarm condition is passed to the system-level alarm indicators of the Sentry 16. During this interval, the front-panel channel LED indicator is lit in orange. If the alarm condition is removed before the timer reaches the limit set by the user, the timer resets to zero and the channel LED returns to green. If the timer reaches the set limit before the alarm condition is removed, the channel LED turns red and the alarm is passed to the system-level indicators of the Sentry 16.

### TIMER RELAY [ENB / DIS ]

When the channel timer relay is enabled, the coil of the Sentry 16 Timer Relay is activated [deactivated ] during the interval that that the channel alarm timer is running. This allows activation of external alerting systems when alarm conditions occur intermittently in any of the alarm channels.

### TIMER CHIRP [ ENB / DIS ]

The Timer Chirp is an audible beeping alarm (chirp) that indicates that an out-of-tolerance condition exists *and that* the Channel Alarm Timer is running. It is enabled only when *both* Timer Chirp *and* the Channel Timer functions are enabled for the channel. The beeping continues as long as the Channel Alarm Timer is running, or until the Mute button is pressed, whichever comes first. The chirp halts if the out-of-tolerance condition terminates. The chirp audibly alerts users nearby the Sentry 16 whenever an out-of-tolerance condition occurs. If it becomes intrusive, the chirp triggered by this channel may be muted by pressing the red Mute button on the front panel. Note that muting the chirp does not reset a channel alarm condition that may subsequently occur. Note also that the Timer Chirp function works independently of an audible alarm that may or may not be enabled in the channel. As well, it works independently of chirps on



other channels. The actual beep of the chirp sound lasts about 100 milliseconds and repeats on about a one-second interval.

**CHAN TMR=XXXX MS**

This window allows setting of the channel alarm timer. The range is 0 milliseconds to 2 minutes. The first 10 seconds is adjustable in 250 millisecond increments. Then the value increases to 15, 20, and from there in 10 second increments to 120 seconds (2 minutes).

**MASTER LED [ENB / DIS ]**

This activates the red MST (master) LED on the front panel when the prescribed alarm condition for the channel becomes valid (*i. e.* both the alarm state is true and the timer, if active, has run out). This function also enables activation of other alarm functions for the channel. With the Master LED disabled, neither the alarm relay nor the timer chirp function will function.

**ALARM [ENABLED / DISABLED ]**

When enabled, this function activates the audible piezo-electric buzzer inside the chassis whenever an alarm condition becomes valid. The buzzer is muted by pressing the red pushbutton on the front panel.

**ALARM RELAY [ENB / DIS ]**

Enabling the Alarm Relay causes the coil of this relay to be activated [de-activated] whenever the channel alarm condition becomes valid (*i. e.* both the alarm state is true and the timer, if active, has run out). This allows activation of external alerting systems when alarm conditions occur.

**CHAN GAIN=XXXX**

This menu display provides a gateway to activating the semi-automatic program level adjustment feature. Pressing “CLR” when this item appears in the display initiates the gain setting process. (See “Installation and Setup”.) The number present in the display indicates the present gain setting of the program level multiplying digital-to-analog converter. The gain range is 0 to 4095.

**THRESHOLD=XX%**

This menu display provides a gateway for the operator to set the program level alarm threshold, as well as to display its present value. Pressing “ENT” or “CLR” when this text is shown prompts the user to change the threshold percentage by using the UP/DOWN menu arrow pushbuttons. The range is 10% to 95%, measured with respect to the program level reference level set in the “CHAN GAIN” function above.

#### EXIT STATUS

This is a gateway to move one level up in the menu hierarchy. By pressing “ENT” at this prompt, the user leaves the menu for a specific channel and is then free to access menus for other channels, or to return to the Scanning Mode. If settings for this specific channel have been changed, pressing “ENT” will also prompt the operator to approve saving the new settings to static memory.

#### ENTER TEXT

This is a hidden menu item that is reached only after the following conditions are satisfied: 1) the Sentry 16 is in the “Set Mode”, 2) the display window has been advanced to the top of the menu for the desired channel, 3) the “ENT” button has been depressed, activating the circular menu for that channel, and 4) with the channel number and descriptor in the display window, the “CLR” button has been depressed. For instructions, see “Setting A Channel Descriptor” under “Installation and Setup”.

The Logic Input channels 9–16 do not use the menu items “CHAN GAIN=XXXX” and “THRESHOLD=XX%”. The items below appear in their place:

#### LOGIC LEVEL ALRM

This menu selection is the gateway that allows the Operator to set the respective Sentry 16 logic input channel to alarm when either a high or low logic level is present at its input. Pressing the up arrow “^” places either “LOW LEVEL” or “HIGH LEVEL” in the display window, and “ENT” allows the Operator to toggle between these two choices. Either the UP or DOWN arrow then exits this menu selection and moves to the next menu item. As desired, the Operator may toggle between the “LOGIC LEVEL ALRM” and “TRANSITION ALARM” menu selections and their respective choices by pressing the “ENT” button.

#### TRANSITION ALARM

This menu selection is the gateway that allows the Operator to set the respective Sentry 16 logic input channel to alarm when either a low-to-high or a high-to-low logic transition occurs at the channel input. Pressing the up arrow “^” places either “ALARM: EDGE RISE” or “ALARM: EDGE FALL” in the display window, and “ENT” allows the Operator to toggle between these two choices. Either the UP or DOWN arrow then exits this menu selection and moves to the next menu item. As desired, the Operator may toggle between the “LOGIC LEVEL ALRM” and “TRANSITION ALARM” menu selections and their respective choices by pressing the “ENT” button. Note that selection

of either of the “TRANSITION ALARM” alarms disables the “TIMEOUT”, “TIMER RELAY”, and “TIMER CHIRP” options.

## Sentry 16 ASCII RS-232 Interface Commands

### Using the Wizard Software

### Diagrams, Schematics, and Parts Lists

### **Replaceable Parts.**

[The Belar standard text.]

### **Ordering Information**

[The standard Belar text.]