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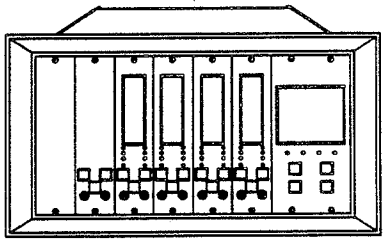
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PART NO. 84417-01

# 3300/48 CASE EXPANSION MONITOR

## OPERATION MANUAL

BENTLY NEVADA



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# NOTICE

## READ THE FOLLOWING BEFORE INSTALLING OR OPERATING EQUIPMENT

Bently Nevada Corporation has attempted to identify areas of risk created by improper installation and/or operation of this product. These areas of information are noted as **WARNING** or **CAUTION** for your protection and for the safe and effective operation of this equipment. Read all instructions before installing or operating this product. Pay particular attention to those areas designated by the following symbols.

**⚠ WARNING**

**High Voltage present Could cause shock, burns or death.**

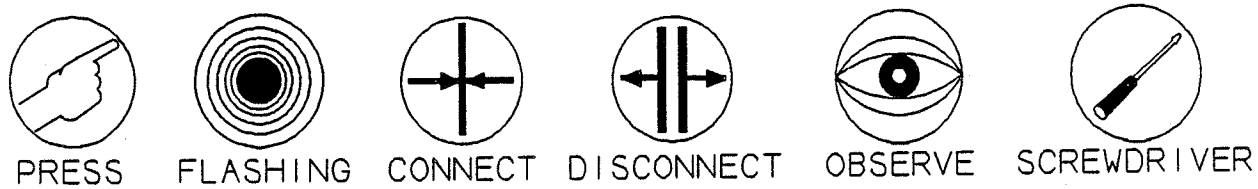
**Do Not touch exposed wires or terminals.**

**CAUTION**

Machine Protection Will Be Lost

In this document procedures are given only for channel A. Procedures for channel B are similar except for the obvious substitution of corresponding switches, terminals, and indicators.

SYMBOLS
Special symbols are used in the manual to illustrate specifics in the step by step processes. For example:






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# FOREWORD

This document is for control room personnel who operate the 3300 Monitoring System. The procedures are presented in step-by-step graphic format.

**RELATED DOCUMENTS**

3300 System Overview, 80177

3300 System Installation Instructions, 80172

3300 System Troubleshooting, 80173

3300/10 Power Supply, 80174

3300/01 System Monitor, 80175

3300/48 Case Expansion Maintenance, 84418-01

Dynamic Data Manager System, 46390-01

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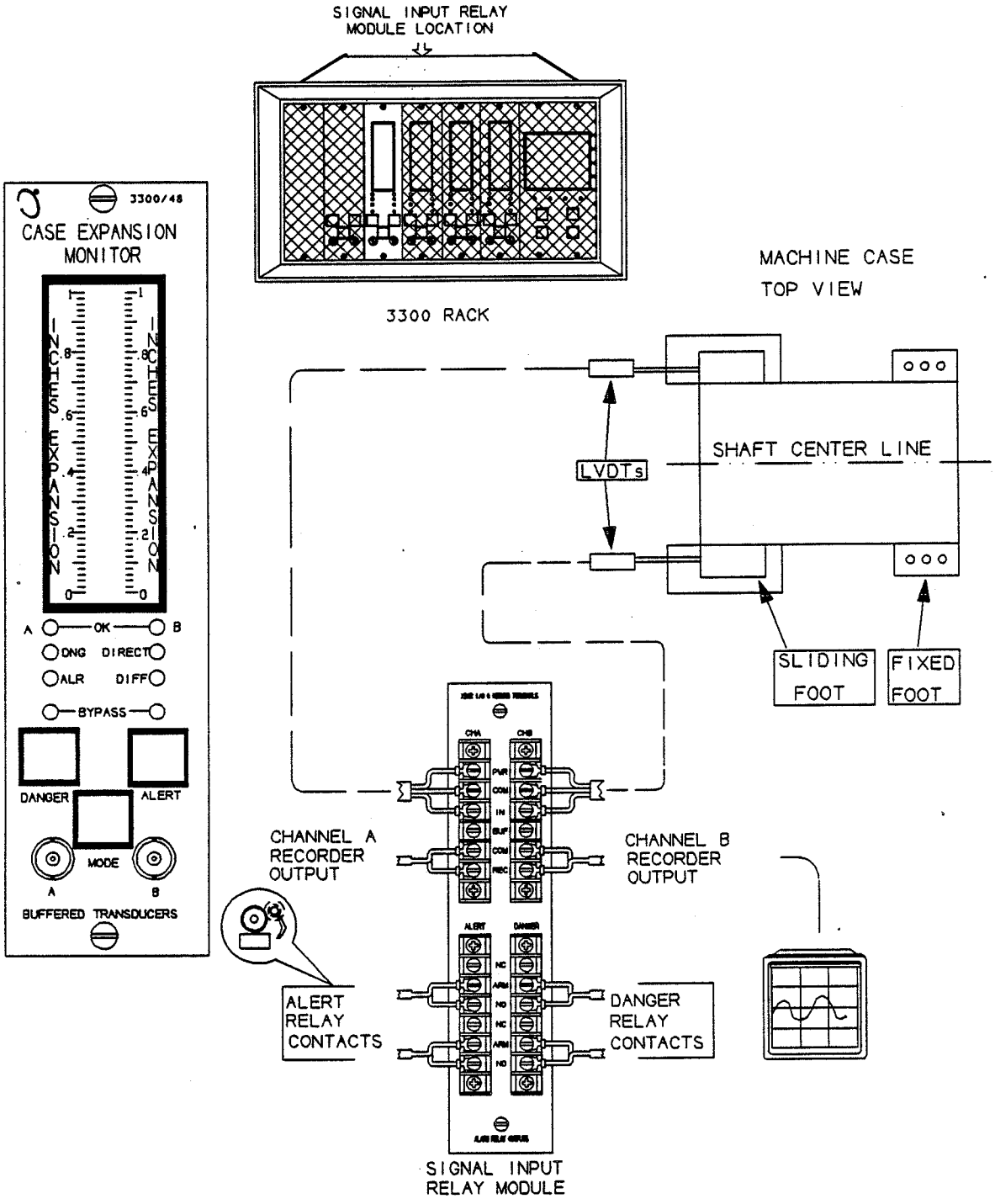

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# 1 CASE EXPANSION MONITOR SYSTEM

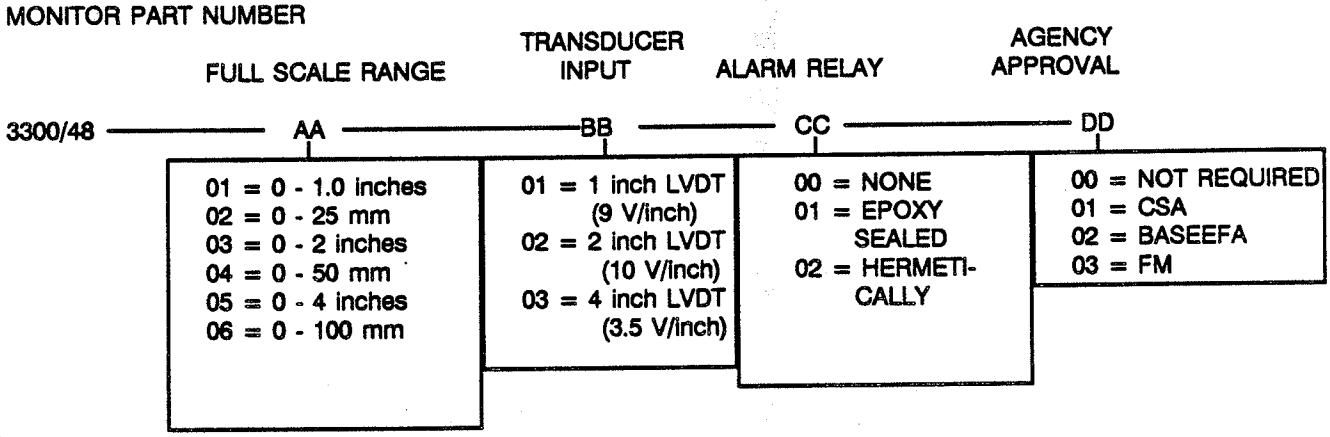





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# 2 MONITOR OPTIONS

CASE EXPANSION
MONITOR PART NUMBER






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# 3 PROGRAMMABLE OPTIONS

| Monitor Feature | Option | Monitor Feature | Option |
|---|---|---|---|
| First Out | Enabled *<br>Disabled | Danger Mode | Latching<br>Non-Latching |
| Alarm Delays | 0.1 sec<br>1 sec<br>3 sec *<br>6 sec | Recorder Output | +4 to +20 mA *<br>+1 to +5 Vdc<br>0 to -10 Vdc |
| OK Mode | Latching<br>Non-Latching * | Recorder Mode | Differential *<br>Direct |
| Alert Mode | Latching *<br>Non-Latching | Upscale Direction | Toward Transducer *<br>Away from Transducer |
| Meter Response Time | Fast *<br>Slow | Danger Bypass Switch | Enabled<br>Disabled * |
| Channel B | On *<br>Off | Timed OK Channel Defeat | Enabled<br>Disabled *# |

* As Shipped from Factory
\# Requires Non-Latching OKs



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# 4 MONITOR FUNCTIONS

CASE EXPANSION - The Case Expansion Monitor continuously monitors the expansion of the machine case on both sides of a machine. The monitor uses signals from two linear variable differential transducers (LVDT) mounted on both sides of the machine case. LVDTs can be oriented so that the expansion of the machine case is either toward or away from the LVDT. The Case Expansion Monitor provides an alarm if the expansion of the machine case is not the same on each side.

OK - When the output voltage of the LVDTs is within its upper/lower limits, the transducer is defined as OK. The OK detection circuit controls the channel OK LED and the monitor relay drive to the OK Relay. If the monitor has the Latching Not OK option chosen, a System Reset is required to reset the OK function.

OK RELAY - The OK Relay is located on the Power Input Module. Every channel in the rack must be OK or bypassed to energize the OK Relay.

DIRECT AND DIFFERENTIAL MODE - The Case Expansion Monitor can display the expansion of the machine case in two ways, direct or differential. In the direct mode, the monitor shows the amount of expansion as measured by the LVDTs on both sides of the machine. The two measurements are displayed on the bar graphs for channel A and B. In the differential mode, the monitor displays the difference between the two measured expansions. This difference is displayed on the bar graph for channel A, and the bar graph for channel B is blanked. The monitor can be toggled between direct and differential modes by pressing the MODE switch.

ALARM - Since alarms for the case expansion monitor use differential values, alarm setpoints may be read when the monitor is in the differential mode only. Pressing the Alert or Danger Switch on the front panel of the monitor causes the corresponding Alert (first-level alarm) or Danger (second-level alarm) set points to be displayed on the channel A bargraph on the front panel. Pressing alarm switches when the monitor is in direct mode gives a blank display. When the differential expansion signal exceeds the preset levels for the selected time delay, the Alert and Danger LEDs come on and the appropriate Alert and Danger alarm relay contacts activate.

FIRST OUT - Separate First Out circuits exist for Alert and Danger alarms. A monitor with First Out option selected flashes a channel alarm LED if that channel was the first channel in the rack to go into alarm since the last reset. Pressing the RESET switch acknowledges the First Out.

ALARM RELAYS - Monitor alarms can be programmed for either the latching or non-latching mode. In the non-latching mode, the alarm resets automatically when the alarm no longer exists. In the latching mode, the alarm condition must be reset manually by pressing the RESET switch on the front panel of the System Monitor or by closing external Reset contacts. The alarm will not reset if the alarm condition still exists.

DANGER BYPASS - Danger Bypass inhibits the danger relay drive. Other monitor functions continue. When Danger Bypass is on, the Bypass LEDs for both channels are on. This function can be enabled by installing a programming jumper on the monitor.



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# 4 MONITOR FUNCTIONS [CONT]

BUFFERED OUTPUT - The Case Expansion Monitor provides the buffered output from the LVDTs at two locations: at the coaxial cable connectors on the front panel and at the terminals on the Signal Input Relay Module. These connectors can be used to connect the monitor to external equipment.

RECORDER OUTPUT - The range of recorder output can be 0 to -10Vdc, +1 to +5Vdc, or +4 to +20mA depending on which option is selected. In addition, recorder output can be in either direct or differential mode. In the direct mode, the recorder outputs are given for both channels and is proportional to the amount of expansion as measured by each transducer. In the differential mode, the recorder output is given on channel A only and is proportional to the absolute value of the difference between the expansion as measured by the two LVDTs.

SELF TEST - The monitor has three categories of self test: power-up, cyclic, and user-invoked.

Power-up self test is performed automatically each time the monitor power is turned on. A series of basic tests and transducer OK tests are performed.

Cyclic self test is performed automatically during monitor operation. Errors encountered during cyclic tests disable the monitor, and flash an error code on the LCD bar graph. If the error is intermittent, the monitor will return to operation, and the error codes are stored. Error codes can be read by performing a user-invoked test. Stored error codes are indicated by OK LEDs flashing at 5 Hz provided that the channel is OK.

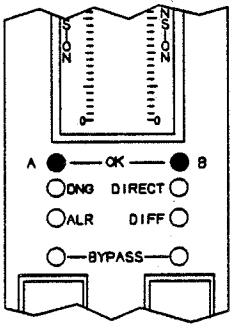
The User-Invoked test performs a power-up self test and allows error messages stored during cyclic tests to be read and cleared. Stored errors are annunciated by flashing the OK LEDs at 5 Hz and displaying the error codes on the front panel LCD bar graph.

Timed Ok Channel Defeat - The Timed OK channel defeat function prevents faulty transducer wiring from causing false alarms. If a transducer is determined to be Not OK, the channel OK LED goes off, the Channel Bypass LED comes on, the channel alarming is disabled, and the OK relay de-energizes. If a channel's input signal returns to an OK condition, the channel's OK LED will start flashing at a 1 Hz rate to indicate that the OK state is restored, the Bypass LED will go off, and after a 10 second delay monitoring is enabled. The Reset switch on the System Monitor front panel must be pressed to stop the OK LED from flashing.



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# 5 OK




Note: Since each channel in the system controls the OK Relay, either channel can cause a Not OK Relay conditon (de-energized relay).

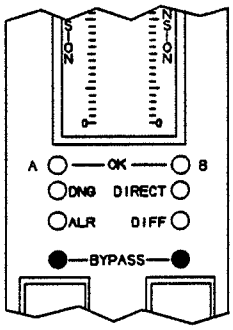
| LED DISPLAY A | | LED DISPLAY B | CONDITION | OK RELAY DRIVE * |
|---|---|---|---|---|
| ● | OK | ● | Channel A and B in operating range | ON |
| ● | OK | ○ | Respective channel A or B transducer in Not OK condition or bypassed. * | OFF * |
| ○ | OK | ● | | |
| ○ | OK | ○ | Monitor in self test, or both transducers in Not OK condition or bypassed. * | OFF * |
| ◉ | OK | ◉ | Flashing at 5 Hz = error encountered during cyclic test. To read error messages see section 10, pages 11-15. Flashing at 1 Hz = Transducer has been Not OK since last Reset | ON |

* Not OK channel can be bypassed to restore relay OK conditions



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# 6 BYPASS



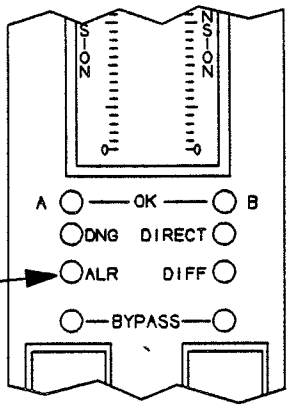

| LED DISPLAY A | | LED DISPLAY B | CONDITION |
|---|---|---|---|
| ● | BYPASS | ● | Monitor in DANGER BYPASS MODE<br>System in POWER UP MODE<br>User-Invoked Self Test in progress<br>Both channels bypassed |
| ● | BYPASS | ○ | Channel A or B bypassed |
| ○ | BYPASS | ● | |



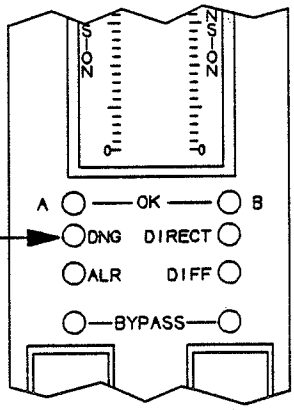
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# 7 ALERT AND DANGER

Alert LED




Danger LED



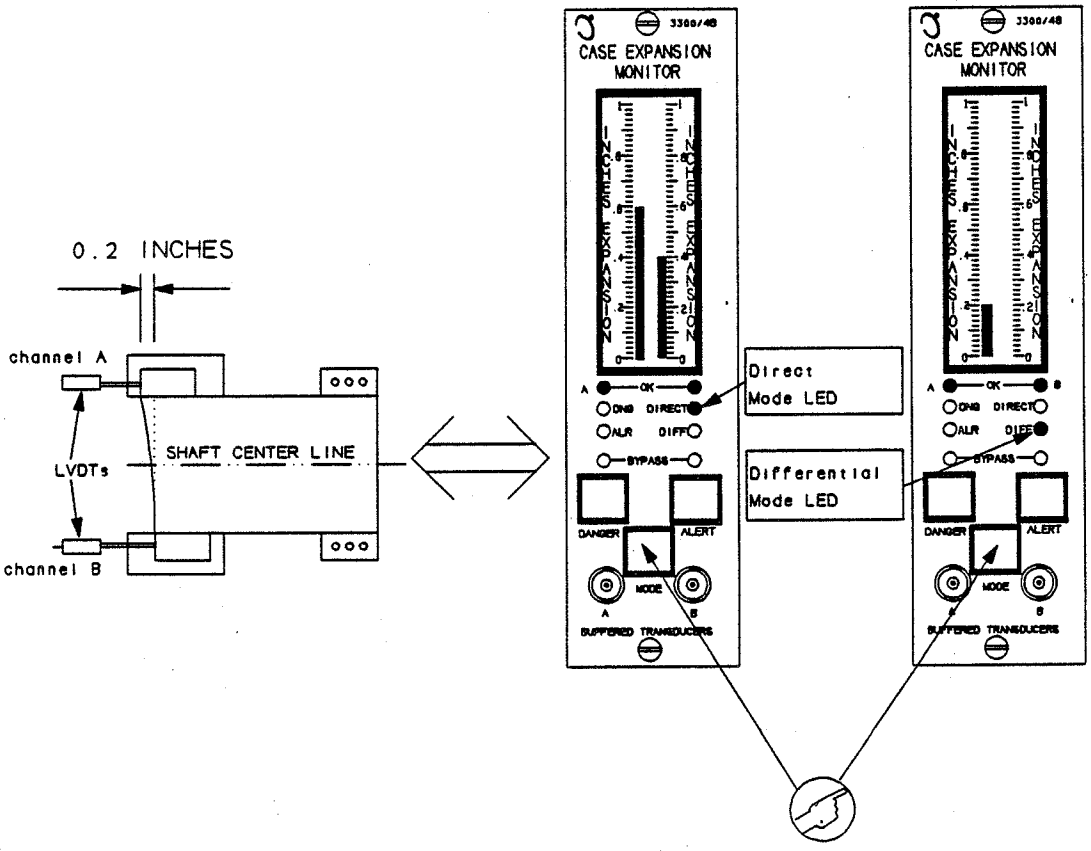

| LED DISPLAY | CONDITION | ALERT RELAY DRIVE |
|---|---|---|
| ○ ALR | The difference in case expansion as measured by channels A and B is less than the alert level. | OFF |
| ● ALR | The difference in case expansion exceeds the alert level. | ON |
| ◉ ALR | The difference in case expansion exceeds the alert level, and this is the first alert alarm on the rack. | ON |

| LED DISPLAY | CONDITION | DANGER RELAY DRIVE |
|---|---|---|
| ○ DNG | The difference in case expansion as measured by channels A and B is less than the danger level. | OFF |
| ● DNG | The difference in case expansion exceeds the danger level. | ON |
| ◉ DNG | The difference in case expansion exceeds the danger level, and this is the first danger alarm on the rack. | ON |



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# 8 READ DIRECT OR DIFFERENTIAL MODE




Use the Mode Key to toggle between direct and differential mode.

The monitor in the illustration on this page indicates that the total expansion of the machine case

| | | |
|---|---|---|
| on channel A side | = | 0.6 inches |
| on channel B side | = | 0.4 inches |
| Difference in expansion | = | 0.2 inches |



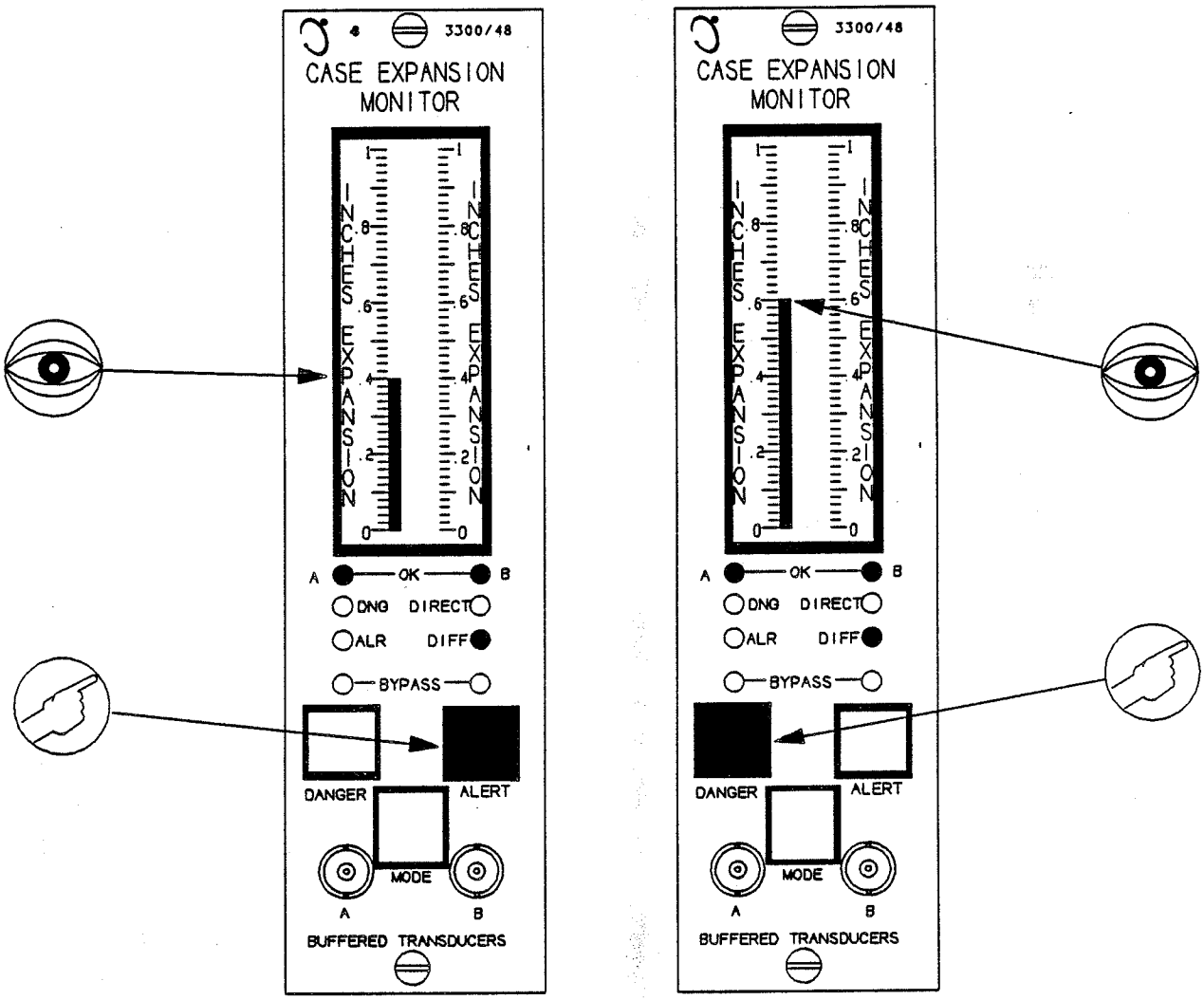
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# 9 READ SETPOINT LEVELS

Note: You can read the setpoints in Differential Mode only. If you try to read the setpoints in direct mode, the display will be blank.

Alert SetPoint = 0.4 inches

Danger SetPoint = 0.6 inches

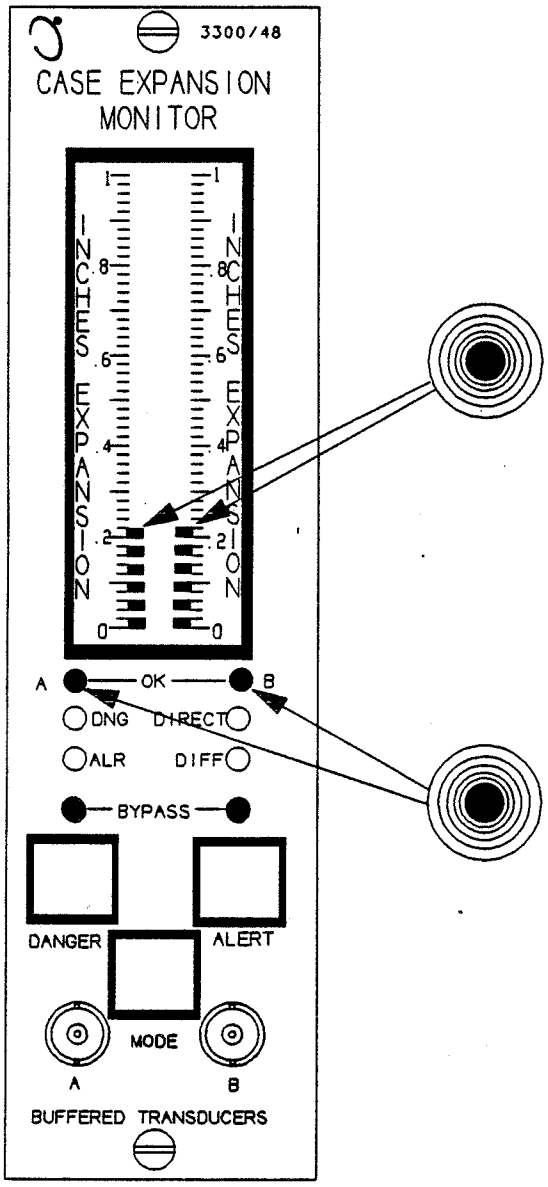





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# 10 SELF TESTS

The three levels of self tests are
- power-up - performed only when the monitor is turned on
- cyclic - continuously performed by the monitor
- user-invoked - performed only when initiated by the user.




The monitor on this page is giving a signal that a continuing error has been detected during a self test. When a continuing error is detected,

monitoring is stopped until the error is resolved,

the error code is flashed on the LCD bar graph and stored in memory,

the Bypass LED comes on and the OK LED flashes at 5 Hz.

If the error goes away, monitoring is resumed and the OK LEDs flash at 5 Hz. The error code, however, remains stored in the monitor and may be read by using the user-invoked self test.

Note:

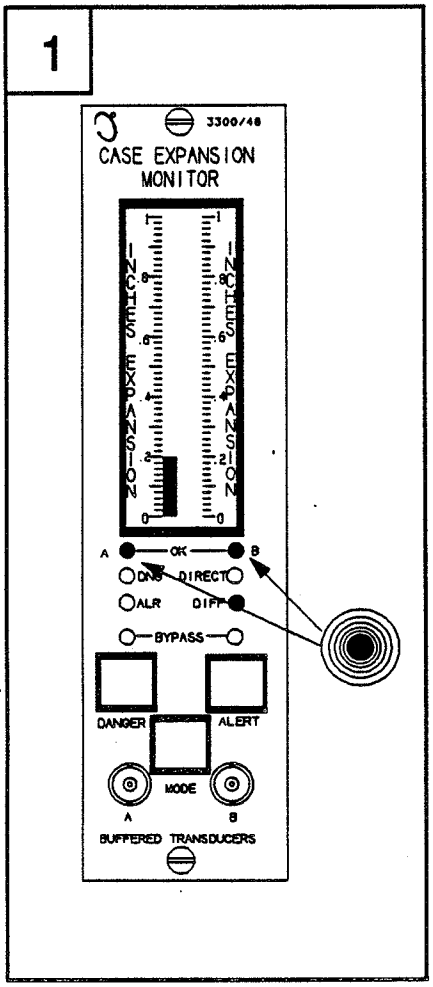
Although both columns of the bar graph flash, the error code is only the sum of the bar graph segments displayed in one column. For example the monitor on this page is displaying error code 6.

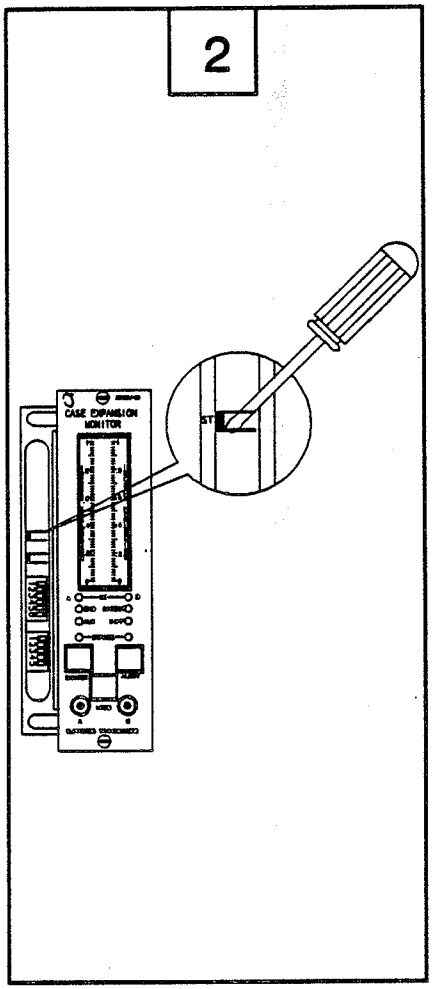


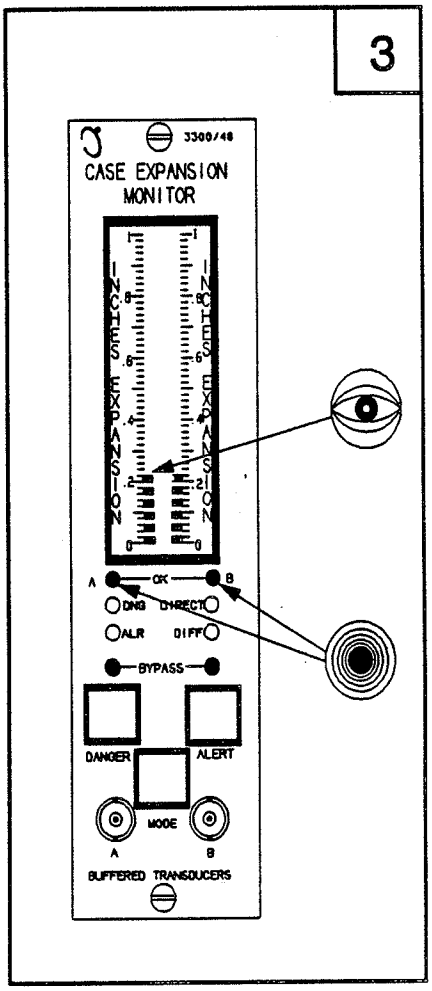
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# 10 SELF TESTS

Follow these steps to read the error codes that have been stored in the monitor:




**1**

Flashing OK LEDs show that error codes are stored in the monitor.

**2**

Initiate the user-invoked test by shorting across the self-test pins behind the panel. The self-test pins are labeled ST on the inner panel.

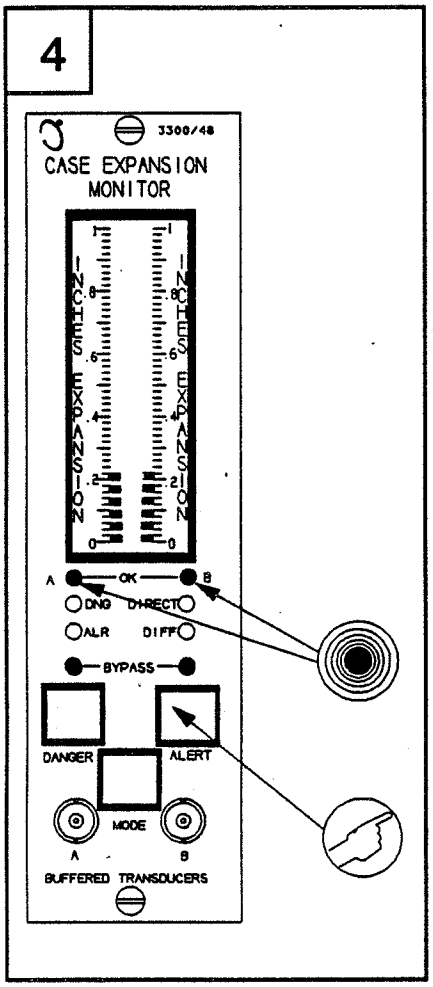
**3**

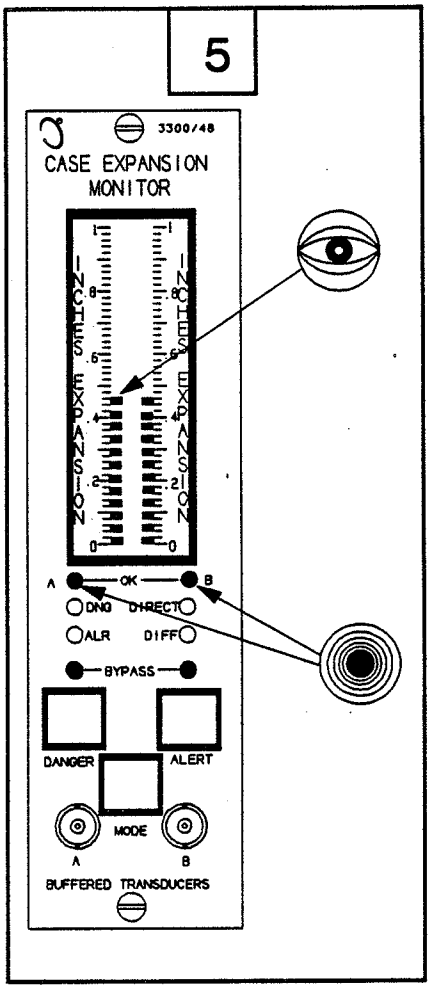
The first error code is displayed on the bar graph. Read the code by counting the number of bars on one side. Error code number 6 is displayed on this monitor.

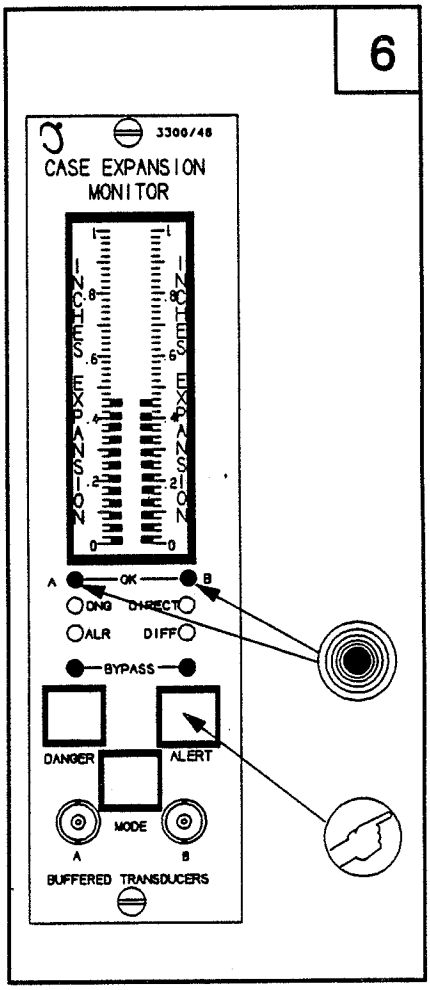


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# 10 SELF TESTS




**4**

Press and hold the alert switch for 1 second to toggle to the next error code.

**5**

Read the second stored error code. This bar graph is displaying error code 12.

**6**

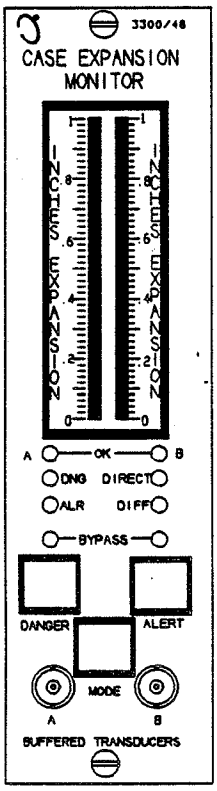
Read through all the other stored codes by pressing and holding the alert switch one second.



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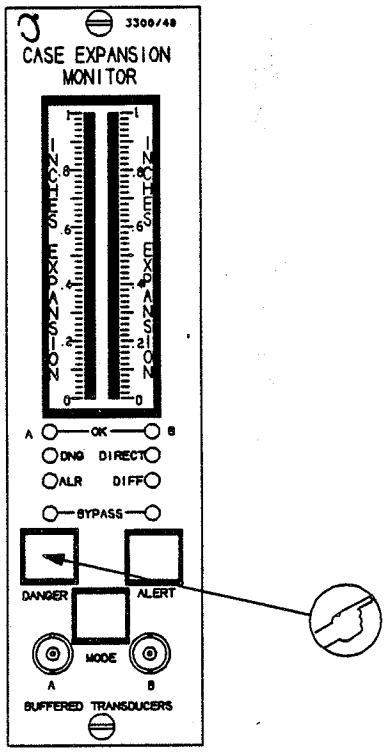
# 10 SELF TESTS

7



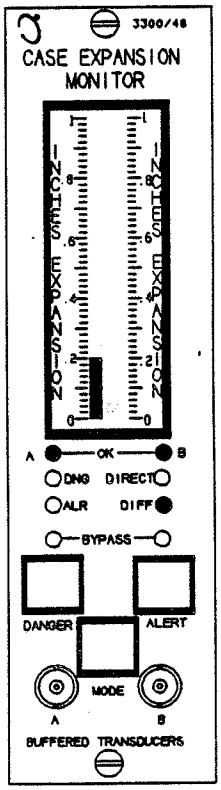

All codes have been read when the bar graph LCD comes on at full range of scale.

8




Press the DANGER switch to reset the monitor or Press the ALERT switch to reread the list.

9

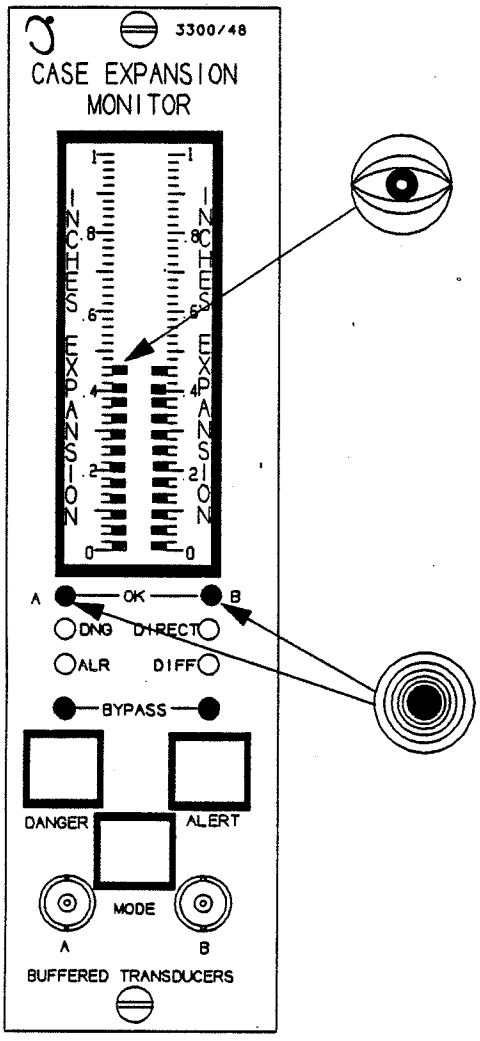



After the monitor is reset, the error codes are removed from memory and the monitor begins operating again.



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# 10 SELF TESTS




| Error Code | Description |
|---|---|
| 2 | ROM CHECKSUM has failed. * |
| 3 | EEPROM failure number 1. ** |
| 4 | EEPROM failure number 2. *** Adjust set points |
| 5 | +7.5V/-VT node out of tolerance. ** |
| 6 | +VRH node out of tolerance. ** |
| 7 | +5V node out of tolerance. ** |
| 8 | MVREF node out of tolerance. ** |
| 9 | +7.5V node out of tolerance. ** |
| 10 | +VRL node out of tolerance. ** |
| 12 | +5V/-7.5V node out of tolerance. ** |
| 14 | RAM failure. * |
| 17 | COP Watchdog not configured. |
| 18 | +5V/-5V or +15V node out of tolerance. ** |
| 21 | Incorrect switch or switch combination. **** |
| 22 | Incorrect jumper configuration. * |

* Tested only at Power Up or User Invoked Self Test. This error is displayed on the front panel but is not stored in memory.

** Tested only at Cyclic Self Test. Errors 2, 3, and 14 are non-recoverable and errors 5 through 13 could be intermittent and recoverable.

*** Error 4 is a setpoint failure and may be corrected by adjusting all setpoints in the monitor.

**** Tested only when monitor is in calibration mode.



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