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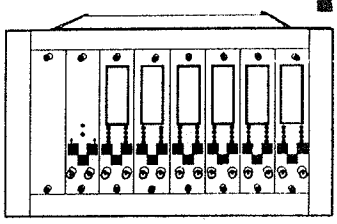
DOCUMENT NO. 80178-01

REV.	DATE
A	21154/ 8MAR89
B	8MAR89

3300/20 DUAL THRUST POSITION 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 Could Be Discontinued

IN THIS DOCUMENT PROCEDURES ARE GIVEN ONLY FOR ONE CHANNEL. PROCEDURES FOR OTHER CHANNELS ARE SIMILAR EXCEPT FOR THE OBVIOUS SUBSTITUTION OF CORRESPONDING SWITCHES, TERMINALS, AND INDICATORS.

SYMBOLS

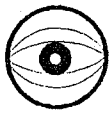
Special symbols are used in the manual to illustrate specifics in the step-by-step process. For example:



PRESS



FLASHING



OBSERVE



SCREWDRIVER

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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, 80171
- 3300 System Installation Instructions, 80172
- 3300 System Troubleshooting, 80173
- 3300/10 Power Supply, 80174
- 3300/01 System Monitor, 80175
- 3300 Dual Thrust Monitor Maintenance, 80176-01
- Dynamic Data Manager System, 46390-01

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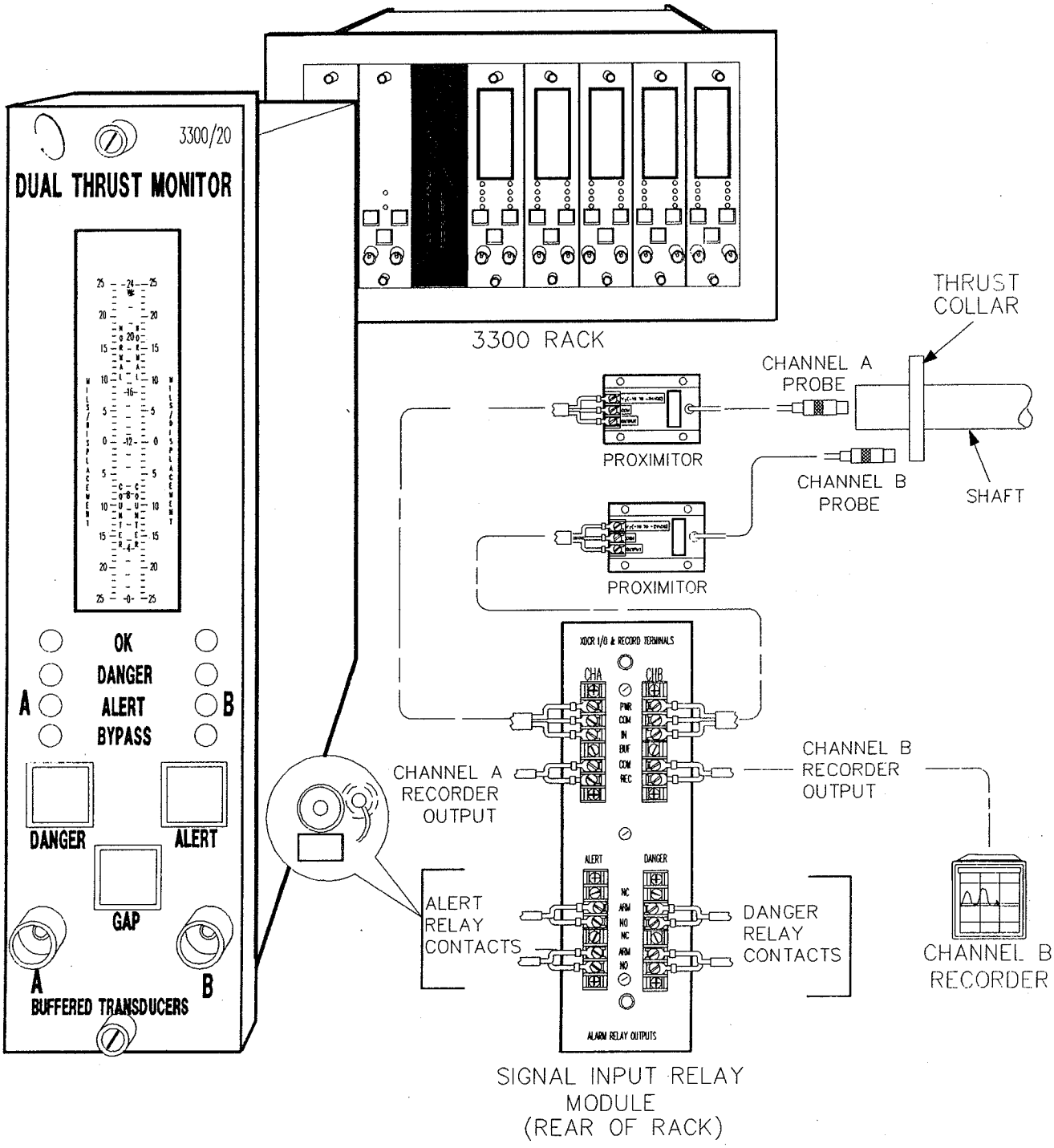
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1 DUAL THRUST MONITOR SYSTEM



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2 MONITOR FUNCTIONS

DUAL THRUST POSITION - Thrust position is the average position, or change in position, of a rotor in the axial direction with respect to some fixed reference. The Dual Thrust Position Monitor provides continuous thrust position monitoring on 2 channels (A & B) for redundant protection. Normal thrust direction can be toward or away from the probe face. AND voting logic ensures that failure of one channel will not give a false Danger alarm. OR voting logic allows for two independent thrust channels in less critical applications.

PROBE GAP VOLTAGE - Probe gap is measured as a negative dc voltage that is directly proportional to the gap distance between the face of a proximity probe and the surface being monitored. Probe gap voltage for each channel is displayed on the front panel meter by pressing the GAP switch.

OK - When the proximitor output voltage 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 OK option, 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.

ALARM - Pressing the ALERT and DANGER switches on the front panel of the monitor causes the corresponding Alert (first-level alarm) or Danger (second-level alarm) setpoints on each channel to be displayed on the front panel meter. ALERT and DANGER LEDs light when the thrust position signal level exceeds preset levels for the selected time delay, and appropriate ALERT and DANGER alarm relay contacts are activated. Voting logic options determine when the Danger relay contacts are activated.

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 monitor was the first channel in the rack to go into alarm. Pressing the RESET switch acknowledges the First Out.

ALARM RELAYS - Monitor alarms can be programmed for either latching or nonlatching mode. In the nonlatching mode, the alarm resets automatically when the alarm condition 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 - For maintenance functions, a DANGER BYPASS switch on the monitor circuit board is set to inhibit the Danger relay drive. This function turns on the BYPASS LEDs. Other front panel functions are not affected. This function can be disabled using a jumper within the monitor.

BUFFERED OUTPUT - The Channels A and B coaxial cable connectors on the front panel of the monitor and terminals on the Signal Input Relay Module provide buffered signals from respective channel transducers. These connectors can be used for connection of external equipment.

RECORDER OUTPUT - A recorder output is provided for each channel. Depending on the option selected, the recorder output levels, proportional to full scale, are either 0 to -10 Vdc, +1 to +5 Vdc, or +4 to +20 mA.

SELF TEST - The monitor has three categories of self test: cyclic, power-up, 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 LCD bargraph error code. Should the error be intermittent, the monitor will return to operation, but the error codes are stored for retrieval during user-invoked self tests. Stored error codes are indicated by the OK LEDs flashing at 5 Hz provided that the channel is OK.

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

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3 MONITOR OPTIONS

DUAL THRUST MONITOR PART NUMBER 3300/20 — AA — BB — CC — DD — EE

FULL SCALE RANGE (AA)	TRANSDUCER INPUT (BB)	ALARM RELAY (CC)	AGENCY APPROVAL (DD)	BARRIERS USED (EE)
01=25-0-25 MILS 02=30-0-30 MILS 03=40-0-40 MILS 05=50-0-50 MILS 06=75-0-75 MILS 11=0.5-0-0.5 MILLIMETRES 12=1-0-1 MILLIMETRES 13=2-0-2 MILLIMETRES	01=7200 PROXIMITOR* 200 mV/MIL 02=14mm OR 11 mm PROBE 100 mV/MIL 03=3000 PROXIMITOR** 200 mV/MIL	00=NONE 01=5A EPOXY SEALED 02=5A HERMETICALLY SEALED 03=QUAD RELAYS EPOXY SEALED	00=NOT REQ'D 01=CSA 02=BASEEFA 03=CITY OF LA	00=NO 01=YES

*ONLY FOR RANGE OPTIONS 01, 02, 03, 11, AND 12
**ONLY FOR RANGE OPTIONS 01 AND 11

4 PROGRAMMABLE OPTIONS

PROGRAMMABLE OPTIONS

FIRST OUT	o ENABLED* o DISABLED
ALARM DELAYS	o .1 SECOND o 1 SECOND* o 3 SECONDS o 6 SECONDS
OK MODE	o NON-LATCHING * o LATCHING
ALERT MODE	o LATCHING * o NON-LATCHING

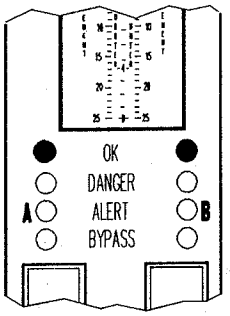
*NORMALLY SHIPPED WITH OPTION INSTALLED

DANGER MODE	o LATCHING* o NON-LATCHING
RECORDER OUTPUTS	o +4 TO +20 mA* o +1 TO +5 Vdc o 0 TO -10 Vdc
DANGER VOTING	o OR VOTING FOR RELAY DRIVE o AND VOTING FOR RELAY DRIVE*
NORMAL DIRECTION	o TOWARD PROBE* o AWAY FROM PROBE
DANGER BYPASS	o ENABLED o DISABLED *

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5 OK



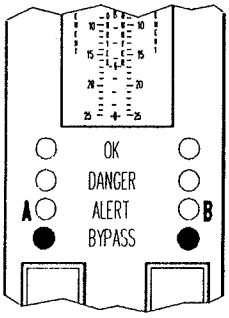
NOTE: EACH CHANNEL IN THE SYSTEM CONTROLS THE OK RELAY. THEREFORE, EITHER CHANNEL CAN CAUSE A NOT OK RELAY CONDITION (DEENERGIZED RELAY).

LED DISPLAY A B	CONDITION	OK RELAY DRIVE*
● OK ●	CHANNEL A AND B IN OPERATING RANGE.	ON
○ OK ● / ● OK ○	RESPECTIVE CHANNEL A OR B TRANSDUCER IN NOT OK CONDITION, OR BYPASSED. *	OFF*
○ OK ○	MONITOR IN SELF TEST, OR BOTH TRANSDUCERS NOT OK OR BY-PASSED.*	OFF*
◎ OK ◎	FLASHING AT 5 Hz = ERROR EN-COUNTERED DURING CYCLIC TEST. READ ERROR MESSAGE. (SEE 14)	ON

*NOT OK CHANNEL CAN BE BYPASSED TO RESTORE RELAY OK CONDITIONS

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6 BYPASS

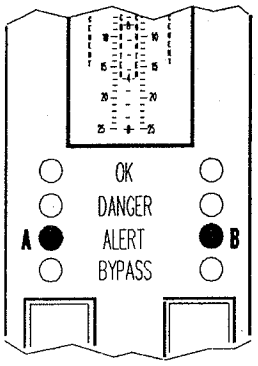


LED DISPLAY A	LED DISPLAY B	CONDITION
● BYPASS	●	o MONITOR IN DANGER BYPASS MODE o SYSTEM IN POWER UP MODE o USER INVOKED SELF TEST IN PROGRESS o BOTH CHANNEL BYPASS
○ BYPASS	●	o CHANNEL A OR B BYPASSED
● BYPASS	○	

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7 ALERT



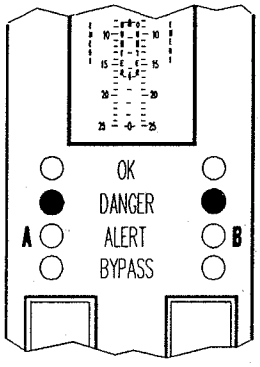
LED DISPLAY A	LED DISPLAY B	CONDITION	ALERT RELAY DRIVE
● ALERT	○	EITHER CHANNEL A OR B (OR BOTH) HAS EXCEEDED ALARM LEVEL. (SEE 12)	ON
○ ALERT	●		ON
● ALERT	●		ON
○ ALERT	(◎)	FIRST OUT CONDITION FOR RESPECTIVE A OR B CHANNEL THAT HAS EXCEEDED ALARM LEVEL. TWO CHANNELS MAY INDICATE FIRST OUT FOLLOWING SELF TEST. *	ON
(◎) ALERT	○		ON

*FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS. IF TWO ALARMS OCCUR WITHIN 50 MILLISECONDS OR LESS, THEY COULD CAUSE BOTH LEDS TO FLASH.

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8 DANGER



LED DISPLAY A	LED DISPLAY B	CONDITION	DANGER RELAY DRIVE: OR VOTING	DANGER RELAY DRIVE: AND VOTING*
● DANGER	○	EITHER CHANNEL A OR B (OR BOTH) HAS EXCEEDED ALARM LEVEL. (SEE 13)	ON	OFF
○ DANGER	●		ON	OFF
● DANGER	●		ON	ON
○ DANGER		FIRST OUT CONDITION FOR RESPECTIVE A OR B CHANNEL THAT HAS EXCEEDED ALARM LEVEL. TWO CHANNELS MAY INDICATE FIRST OUT FOLLOWING SELF TEST.**	ON	OFF
DANGER	○		ON	OFF

*IF EITHER CHANNEL IS BYPASSED, ALARM RELAY IS ACTIVATED IF NONBYPASSED CHANNEL IS IN ALARM.

**FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS IF TWO ALARMS OCCUR WITHIN 50 MILLISECONDS OR LESS OF EACH OTHER THEY COULD CAUSE BOTH LEDS TO FLASH.

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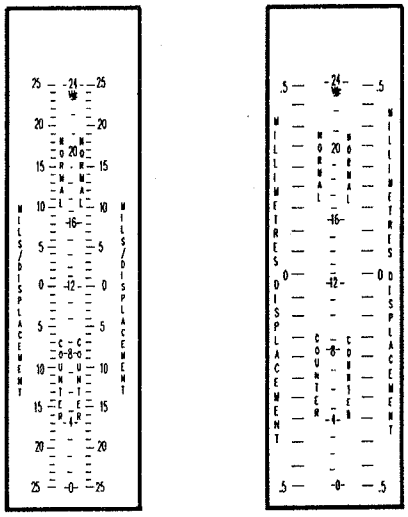
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9 MONITOR RANGES

3300/20 — [ ][ ] — [ ][ ] — [ ][ ] — [ ][ ] — [ ][ ] — [ ][ ]

FULL SCALE RANGE
01=25–0–25 MILS
02=30–0–30 MILS
03=40–0–40 MILS
05=50–0–50 MILS
06=75–0–75 MILS
11=0.5–0–0.5 MILLIMETRES
12=1–0–1 MILLIMETRES
13=2–0–2 MILLIMETRES

SEE 23 FOR JUMPER PROGRAMMING

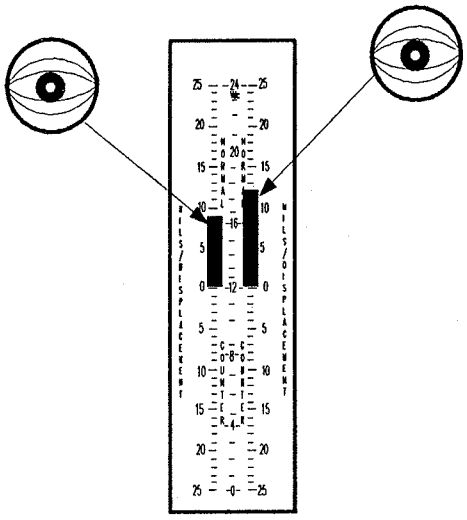


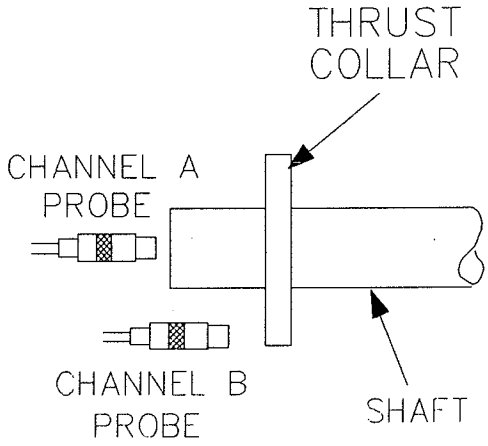
EXAMPLES OF METER SCALES

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10 READ CHANNEL THRUST POSITION

MONITOR CONTINUOUSLY INDICATES MEASURED THRUST POSITION VALUES FOR CHANNELS A AND B.



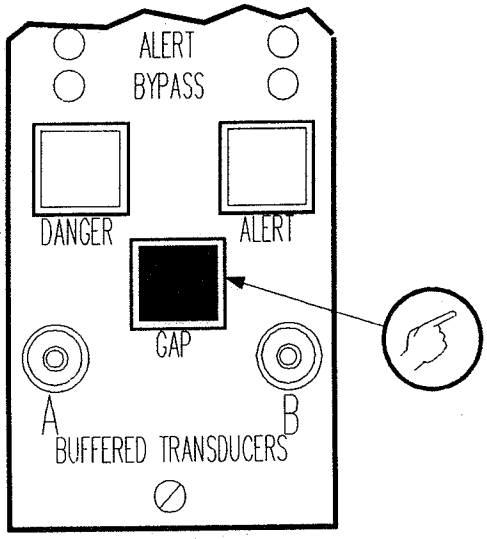


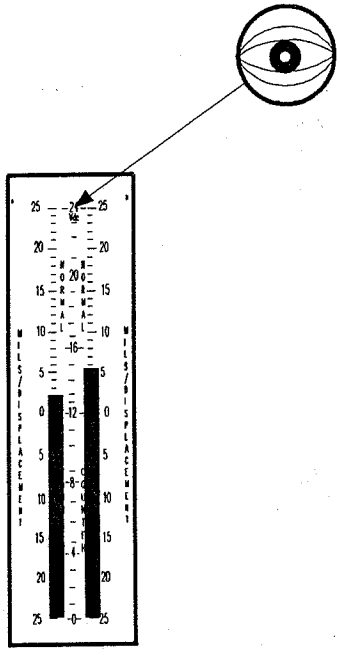
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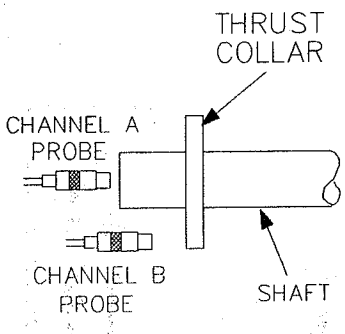
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11 READ GAP VOLTAGE

1. PRESS **GAP** SWITCH AND READ GAP VOLTAGE FOR BOTH CHANNEL A AND CHANNEL B ON METER USING CENTER METER SCALE.





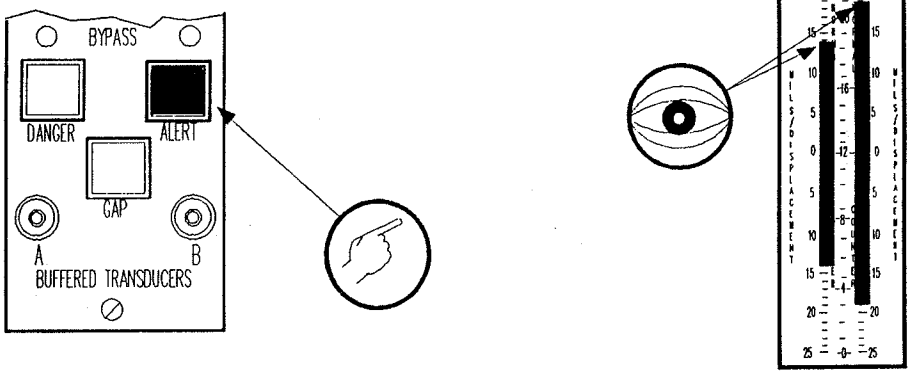


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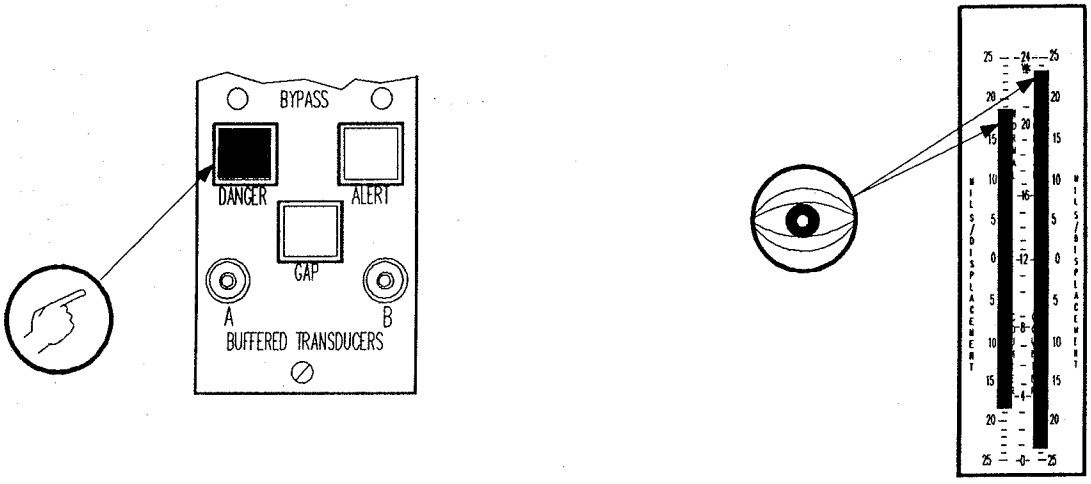
12 READ ALERT SETPOINT LEVELS

1. PRESS **ALERT** SWITCH AND READ ALERT SET POINTS (FOR BOTH CHANNEL A AND B) ON METER SCALE. BOTH NORMAL AND COUNTER SET POINTS ARE DISPLAYED



13 READ DANGER SETPOINT LEVELS

1 PRESS **DANGER** SWITCH AND READ DANGER SET POINTS (FOR BOTH CHANNEL A AND B) ON METER SCALE. BOTH NORMAL AND COUNTER SET POINTS ARE DISPLAYED



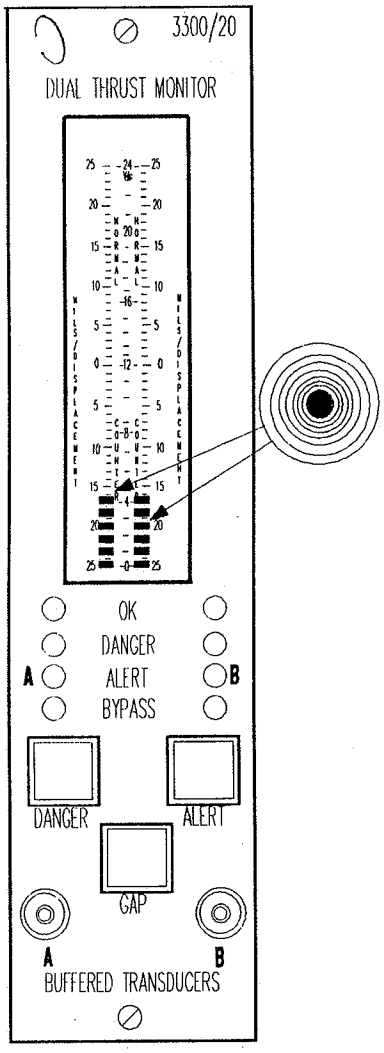
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14 SELF TEST

THE MONITOR HAS THREE LEVELS OF SELF TESTS:

- o POWER UP TEST: PERFORMED ONLY WHEN MONITOR IS TURNED ON.
- o CYCLIC TEST: PERFORMED CONTINUOUSLY.
- o USER INVOKED TEST: PERFORMED ONLY WHEN INITIATED BY USER.



IF ERRORS ARE DETECTED DURING CYCLIC SELF TESTS:

- o MONITORING IS ABORTED UNTIL THE ERROR IS RESOLVED.
- o ERROR CODE STORED IN MEMORY AND FLASHED ON LCD BARGRAPH DISPLAY.
- o **BYPASS** LED GOES ON AND **OK** LED FLASHES AT 5 HZ.
- o IF ERROR IS INTERMITTENT AND DISAPPEARS. MONITORING IS RESUMED AND **OK** LED FLASHES AT 5 HZ.
- o ERROR CODE STORED. USER INVOKED TEST DISPLAYS AND CLEARS ERROR.

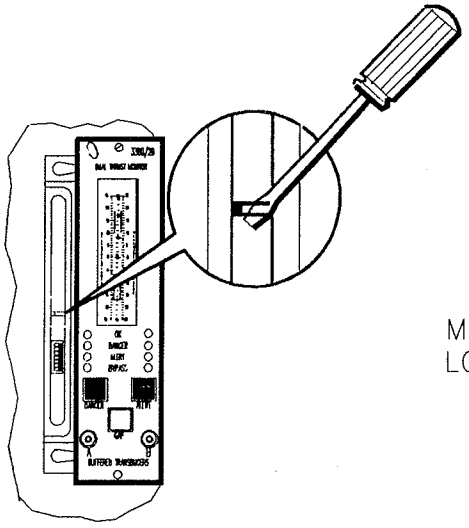
IF ERRORS ARE DETECTED DURING POWER UP TEST OR USER INVOKED TEST:

- o MONITORING IS ABORTED UNTIL USER-ACTION RESOLVES PROBLEM.
- o TEST CAN BE RERUN WITH MONITOR POWER UP OR USER INVOKED TEST.

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14 SELF TEST [CONT]

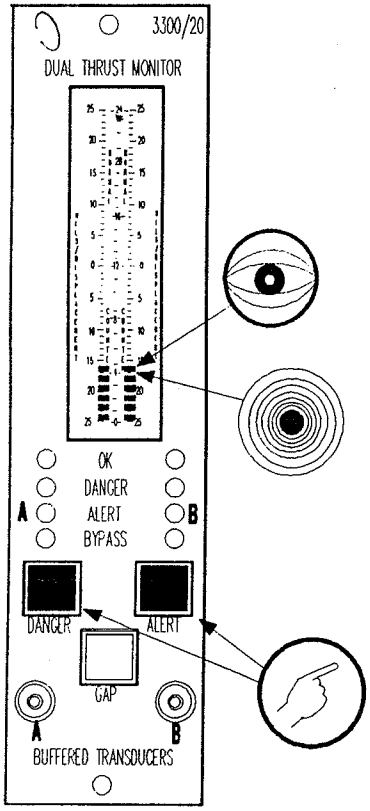
- INITIATE USER INVOKED TEST BY SHORTING ACROSS TWO SELF-TEST (ST) PINS.



CAUTION

MACHINE PROTECTION WILL BE LOST FOR DURATION OF TEST

- AT COMPLETION OF USER INVOKED TEST MONITOR WILL RECALL STORED ERROR CODES, IF ANY. THESE ERROR CODES MUST BE READ AND CLEARED WITH USER INTERACTION TO ALLOW MONITORING TO CONTINUE. TIMED OK CHANNEL DEFEAT IS ACTIVE FOR APPROXIMATELY 30 SECONDS FOLLOWING THIS ACTION.



NOTE

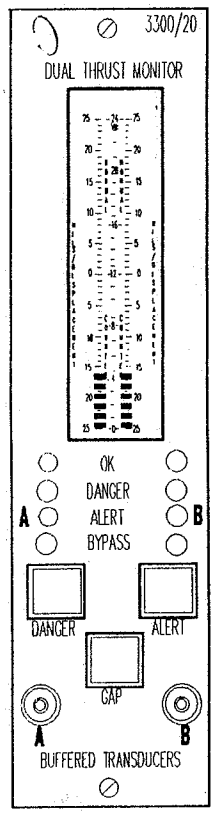
ALTHOUGH BOTH COLUMNS ON BARGRAPH FLASH, ERROR CODE IS ONLY THE SUM OF BARGRAPH SEGMENTS DISPLAYED IN ONE COLUMN. EXAMPLE SHOWS ERROR CODE 6.

- READ CODES ON LIST; STEP THROUGH EACH ERROR CODE ON LIST BY PRESSING AND HOLDING **ALERT** SWITCH FOR APPROXIMATELY 1 SECOND.
- AT THE END OF LIST, LCD BARGRAPH DISPLAYS ALL SEGMENTS. TO REREAD LIST PRESS **ALERT** SWITCH. TO CLEAR LIST FROM MEMORY, PRESS AND HOLD **DANGER** SWITCH FOR APPROXIMATELY 1 SECOND.

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14 SELF TEST [CONT]



ERROR CODE	DESCRIPTION
2.	ROM CHECKSUM HAS FAILED. *
3.	EEPROM FAILURE NO.1. **
4.	EEPROM FAILURE NO.2; ADJUST SET POINTS. (SEE 12 AND 13) ***
5.	+7.5/−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. **
11.	MVREF/−6.5V NODE OUT OF TOLERANCE. **
12.	+5V/−7.5V NODE OUT OF TOLERANCE. **
13.	SCIC CLOCK FAILURE **
14.	RAM FAILURE. *
15.	IC U4 OUTPUT DISAGREES WITH GAP VOLTAGE VALUE. *

* TESTED ONLY AT POWER−UP OR USER−INVOKED SELF TEST. ERRORS NOT RECORDED, BUT ERROR CODES DISPLAYED ON FRONT PANEL METER.

** TESTED ONLY AT CYCLIC SELF TEST. ERRORS 2, 3, 14, AND 15 ARE NONRECOVERABLE; ERRORS 5 THROUGH 13 COULD BE INTERMITTANT AND RECOVERABLE.

*** ERROR 4 IS A SET POINT SELF TEST FAILURE. THIS MAY BE CORRECTED BY ADJUSTING ALL SET POINTS IN MONITOR.

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