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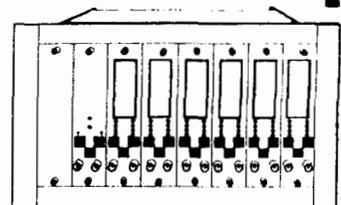
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REV.	DATE
A	21154/ 8MAR89
B	8MAR89

# **3300/20 DUAL THRUST POSITION MONITOR**

## **OPERATION MANUAL**

**BENTLY**  
**NEVADA**



# 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**

## 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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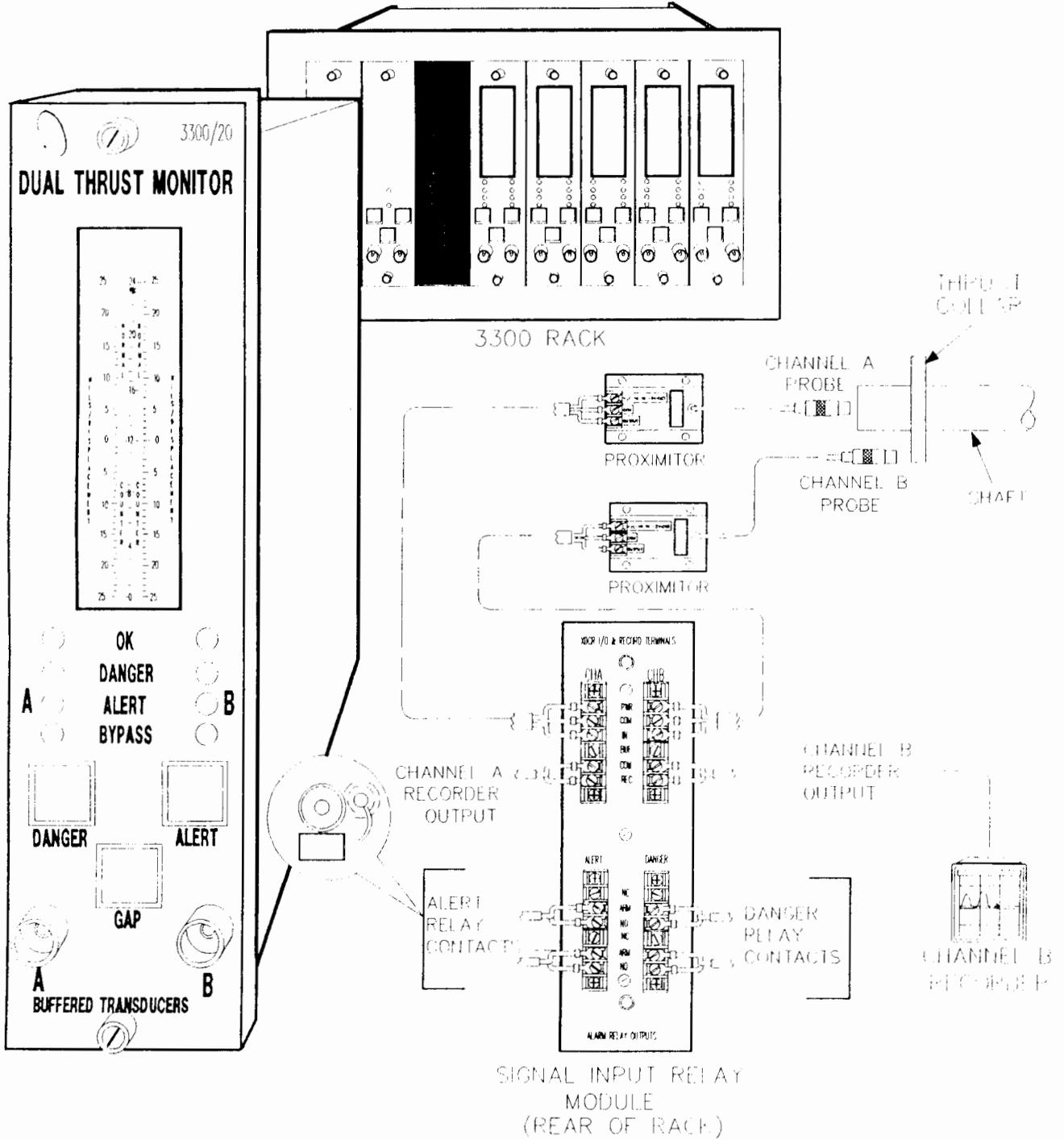
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## CONTENTS

TITLE	SECTION
DUAL THRUST MONITOR SYSTEM .....	1
MONITOR FUNCTIONS .....	2
MONITOR OPTIONS .....	3
PROGRAMMABLE OPTIONS .....	4
OK .....	5
BYPASS .....	6
ALERT .....	7
DANGER .....	8
MONITOR RANGES .....	9
READ CHANNEL THRUST POSITION .....	10
READ GAP VOLTAGE .....	11
READ ALERT SETPOINT LEVELS .....	12
READ DANGER SETPOINT LEVELS .....	13
SELF TEST .....	14

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# 1 DUAL THRUST MONITOR SYSTEM



## 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 proximator 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 non-latching 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.

# 3 MONITOR OPTIONS

DUAL THRUST MONITOR

PART NUMBER	FULL SCALE RANGE	TRANSDUCER INPUT	ALARM RELAY	AGENCY APPROVAL	BARRIERS USED
3300/29	AA	BB	CC	DD	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=1200 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

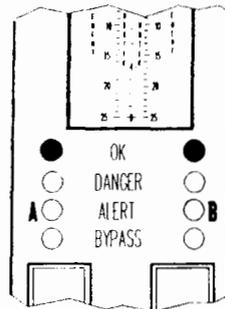
\*ONLY FOR RANGE OPTIONS 01, 02, 03, 11, AND 12  
 \*\*ONLY FOR RANGE OPTIONS 01 AND 11

# 4 PROGRAMMABLE OPTIONS

PROGRAMMABLE OPTIONS

FIRST OUT <input type="checkbox"/> ENABLED* <input type="checkbox"/> DISABLED	DANGER MODE <input type="checkbox"/> LATCHING* <input type="checkbox"/> NON-LATCHING
ALARM DELAYS <input type="checkbox"/> 1 SECOND <input type="checkbox"/> 1.5 SECONDS <input type="checkbox"/> 3 SECONDS <input type="checkbox"/> 6 SECONDS	RECORDER OUTPUTS <input type="checkbox"/> +4 TO +20 mA* <input type="checkbox"/> +1 TO +5 Vdc <input type="checkbox"/> 0 TO -10 Vdc
DANGER MODE <input type="checkbox"/> NON-LATCHING* <input type="checkbox"/> LATCHING	DANGER VOTING <input type="checkbox"/> OR VOTING FOR RELAY DRIVE <input type="checkbox"/> AND VOTING FOR RELAY DRIVE*
ALARM MODE <input type="checkbox"/> LATCHING* <input type="checkbox"/> NON-LATCHING	NORMAL DIRECTION <input type="checkbox"/> TOWARD PROBE* <input type="checkbox"/> AWAY FROM PROBE
*NORMALLY SHIPPED WITH OPTION UNLATCHED	DANGER BYPASS <input type="checkbox"/> ENABLED <input type="checkbox"/> DISABLED*

5	OK
---	----

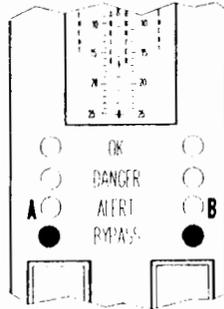


NOTE: EACH CHANNEL IN THE SYSTEM CONTROLS THE OK RELAY. THEREFORE, EITHER CHANNEL CAN CAUSE A NOT OK RELAY CONDITION (DEFENERGIZED RELAY).

LED DISPLAY	CONDITION	OK RELAY DRIVE *
A      B		
●    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 BYPASSED. *	OFF *
⊙    OK    ⊙	FLASHING AT 5 Hz - ERROR ENCOUNTERED DURING CYCLIC TEST READ ERROR MESSAGE. (SEE [14])	ON

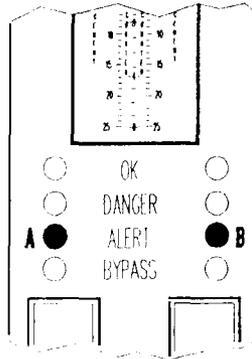
\*NOT OK CHANNEL CAN BE BYPASSED TO RESTORE RELAY OK CONDITIONS

**6 BYPASS**



LED DISPLAY		CONDITION	
A	B		
●	BYPASS	●	<ul style="list-style-type: none"> <li>○ MONITOR IN DANGER BYPASS MODE</li> <li>○ SYSTEM IN POWER UP MODE</li> <li>○ USER INVOKED SELF TEST IN PROGRESS</li> <li>○ BOTH CHANNEL BYPASS</li> </ul>
○	BYPASS	●	○ CHANNEL A OR B BYPASSED
●	BYPASS	○	

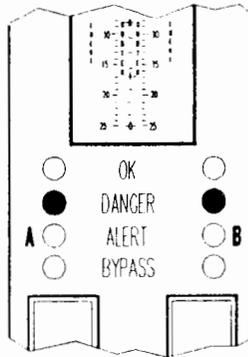
**7 ALERT**



LED DISPLAY		CONDITION	ALERT RELAY DRIVE
A	B		
●	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 LEDES TO FLASH.

**8 DANGER**



LED DISPLAY A                  B	CONDITION	DANGER RELAY DRIVE	
		OR VOTING	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.

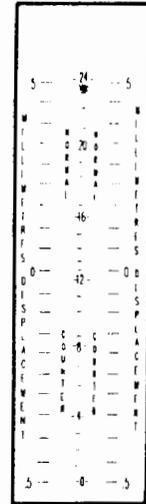
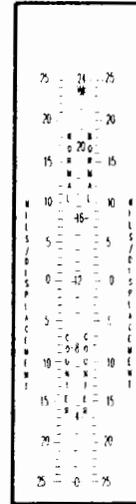
\*\*FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS IF TWO ALARMS OCCUR WITHIN 50 MILLISECONDS OR LESS OF EACH OTHER THEY COULD CAUSE BOTH LEDS TO FLASH.

# 9 MONITOR RANGES



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  FOR JUMPER PROGRAMMING

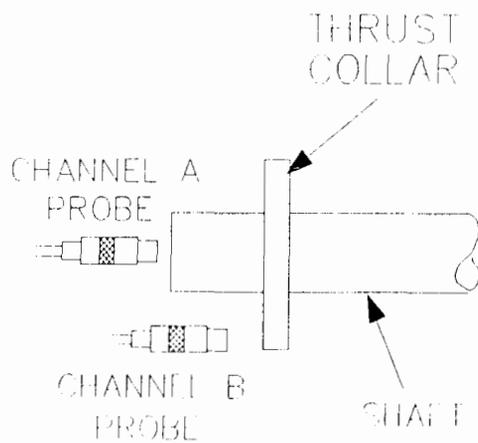
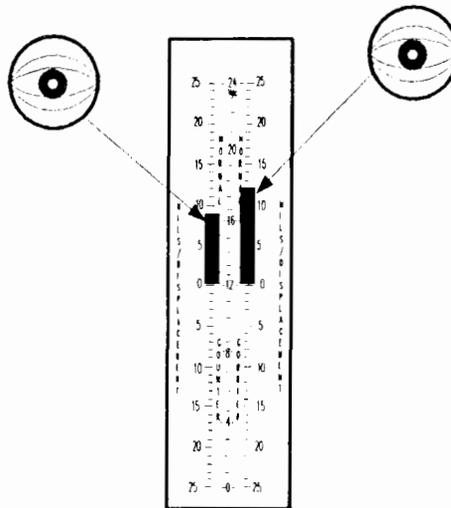


EXAMPLES OF METER SCALES

10

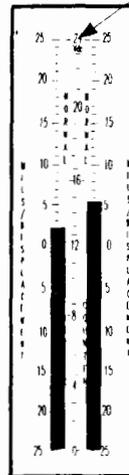
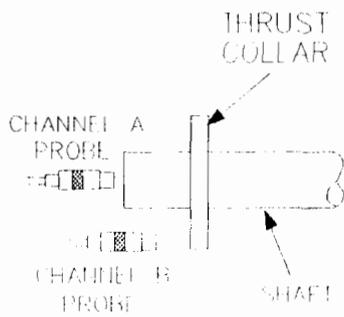
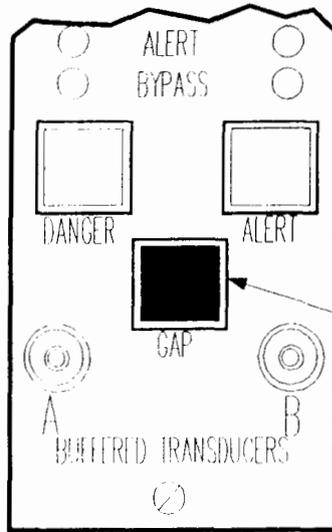
READ CHANNEL THRUST POSITION

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



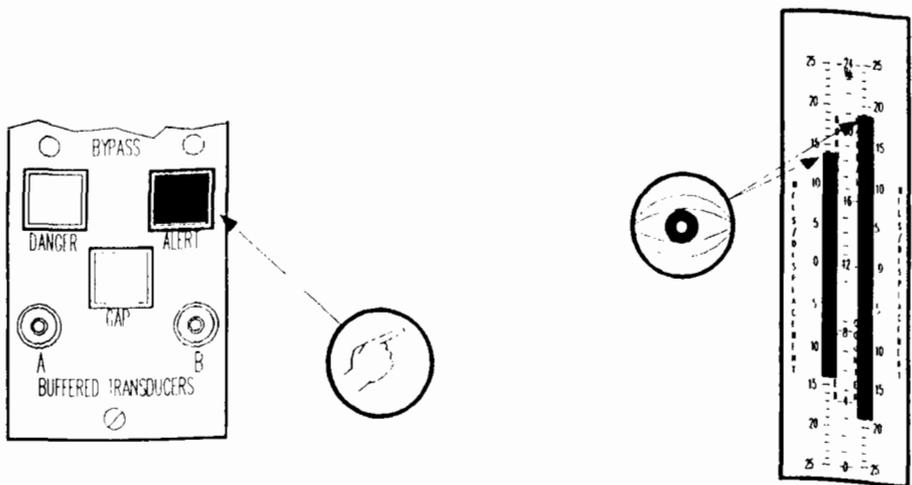
# 11 READ GAP VOLTAGE

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



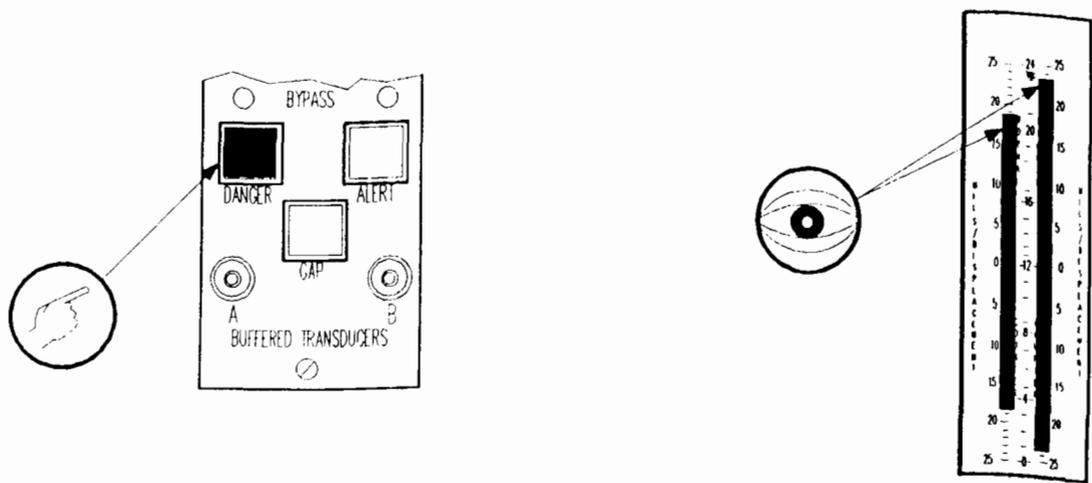
# 12 READ ALERT SETPOINT LEVELS

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

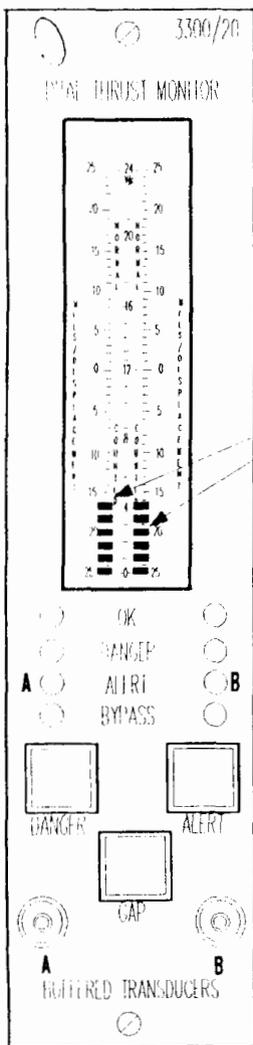
1. PRESS **DANGER** SWITCH AND READ DANGER SET POINTS (FOR BOTH CHANNEL A AND B) ON METER SCALE. BOTH NORMAL AND COUNTER SET POINTS ARE DISPLAYED



# 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:

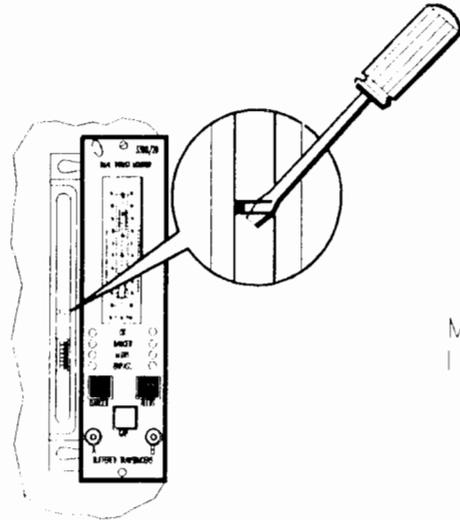
- o MONITORING IS ABORTED UNTIL THE ERROR IS RESOLVED.
- o ERROR CODE STORED IN MEMORY AND FLASHED ON LCD BARGRAPH DISPLAY.
- o **BYPASS** LED GOES ON AND **OK** LED FLASHES AT 5 HZ.
- o IF ERROR IS INTERMITTENT AND DISAPPEARS, MONITORING IS RESUMED AND **OK** LED FLASHES AT 5 HZ.
- o ERROR CODE STORED.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

**14 SELF TEST (CONT)**

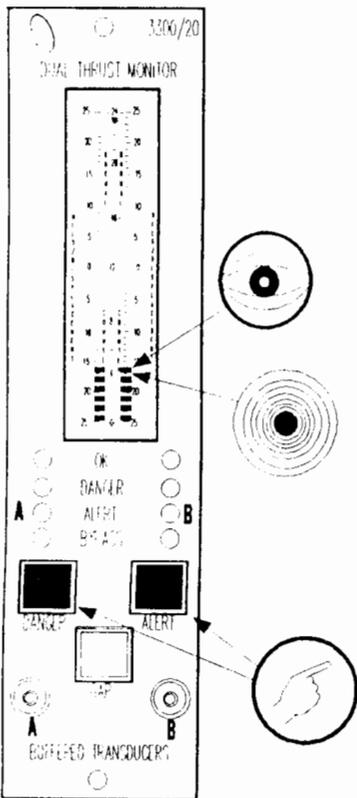
INITIAL USER INVOKED TEST BY SHORTING ACROSS TWO SELF-TEST (ST) PINS.



**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.

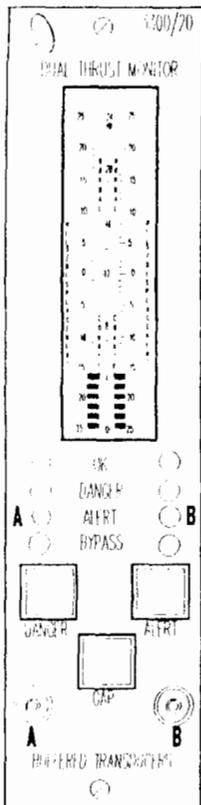


**NOTE**

ALTHOUGH BOTH COLUMNS OF 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, LED BARGRAPH DISPLAYS ALL SEGMENTS. TO REREAD LIST PRESS **ALERT** SWITCH. TO CLEAR LIST FROM MEMORY, PRESS AND HOLD **DANGER** SWITCH FOR APPROXIMATELY 1 SECOND.

# 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.

# INDEX

## A

Alert ..... 6

## B

Bypass ..... 5

## D

Danger ..... 7

Dual Thrust System ..... 1

## M

Monitor Functions ..... 2

Monitor Options ..... 3

Monitor Ranges ..... 8

## O

Options  
Programmable ..... 3

Monitor ..... 3

## P

Programmable Options ..... 3

## R

Read Alert Set point levels ..... 1

Read Danger Set point levels ..... 11

Read Channel Thrust Position ..... 9

Read Probe Gap Voltage ..... 10

## S

Self Test ..... 12



3300/20

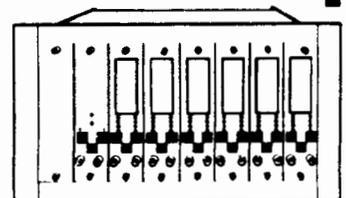
DUAL

THRUST POSITION

MONITOR

**MAINTENANCE MANUAL**

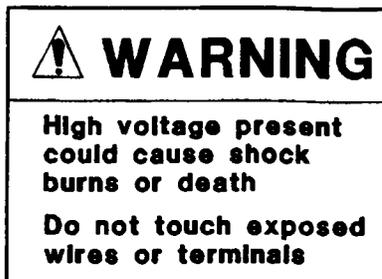
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NEVADA 



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Machine Protection Could  
Be Discontinued

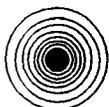
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## SYMBOLS

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



**PRESS**



**FLASHING**



**CONNECT**



**DISCONNECT**



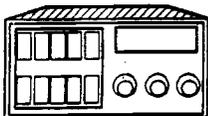
**OBSERVE**



**SCREWDRIVER**

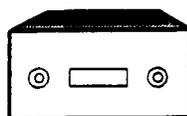
## TEST EQUIPMENT (Recommended)

### Digital Multimeter



4 1/2-Digit Display  
0 to 1000 Vac/Vdc  
0 to 10 megohms

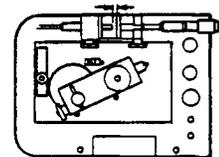
### Power Supply



0 TO -50 Vdc

### TK3 Calibration Instrument

Bently Nevada Corporation



TK3-2E (120/220 Vac,  
50/60 Hz)  
TK3-2G (40 to 90 psi  
@ 15 Std cfm max)

---

## FOREWORD

This document is for maintenance personnel who install and maintain the 3300 Monitoring System. The procedures presented should aid service personnel to maintain a Dual Thrust Monitor in a typical 3300 System.

### RELATED DOCUMENTS

- 3300 System Overview, 80171
- 3300 System Installation Instructions, 80172
- 3300 System Troubleshooting, 80173
- 3300 Power Supply, 80174
- 3300 System Monitor, 80175
- 3300 Dual Thrust Monitor Operation, 80178-01
- Dynamic Data Manager System, 46390-01

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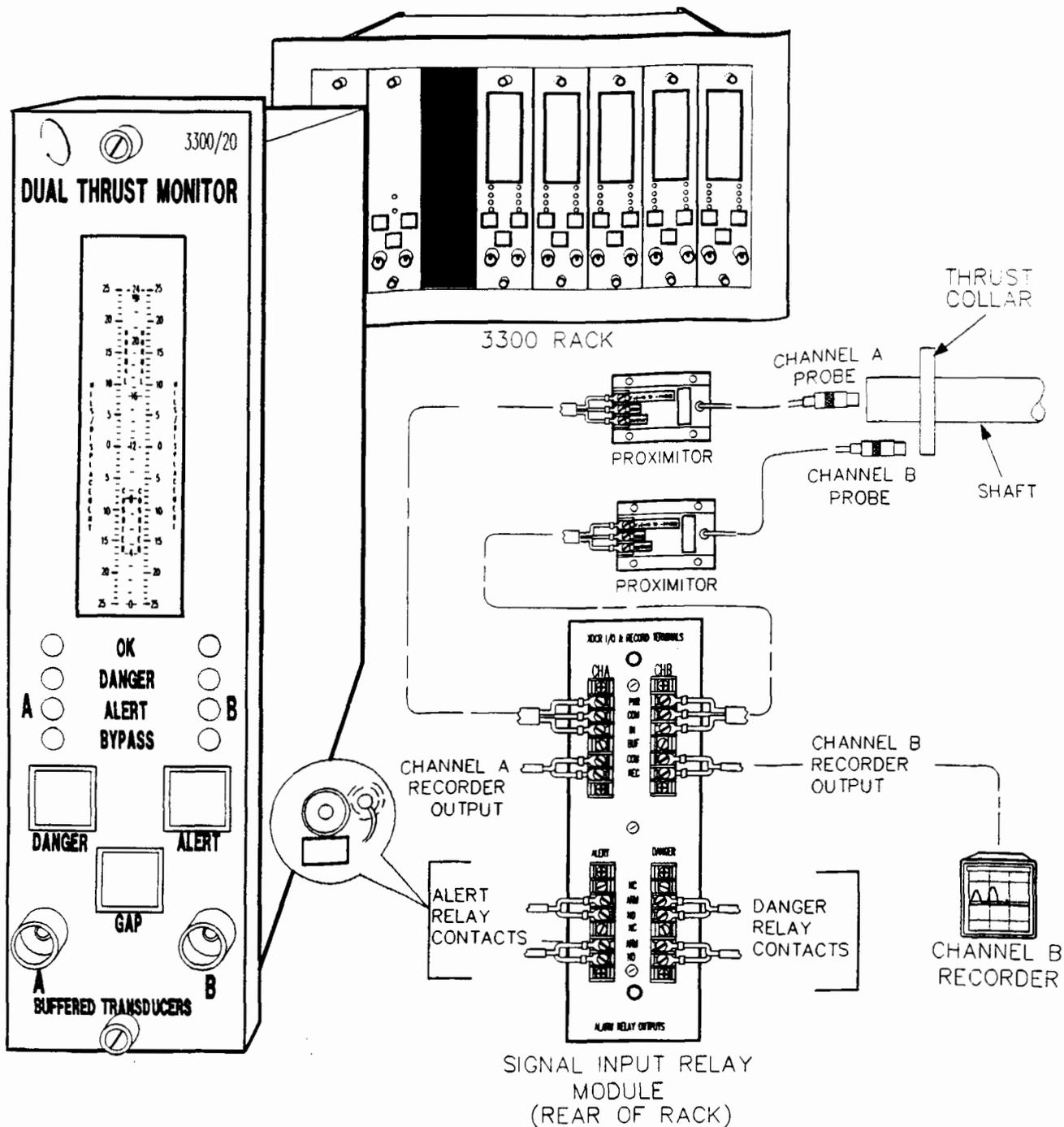
## CONTENTS

TITLE	SECTION
DUAL THRUST MONITOR SYSTEM . . . . .	1
MONITOR FUNCTIONS . . . . .	2
MONITOR OPTIONS . . . . .	3
PROGRAMMABLE OPTIONS . . . . .	4
OK . . . . .	5
BYPASS . . . . .	6
ALERT . . . . .	7
DANGER . . . . .	8
MONITOR RANGES . . . . .	9
READ CHANNEL THRUST POSITION . . . . .	10
READ PROBE GAP VOLTAGE . . . . .	11
READ ALERT SETPOINT LEVELS . . . . .	12
READ DANGER SETPOINT LEVELS . . . . .	13
SELFTEST . . . . .	14
DISASSEMBLY PROCEDURE . . . . .	15
FRONT PANEL ASSEMBLY REMOVAL . . . . .	16
SIGNAL INPUT RELAY MODULE . . . . .	17
INSTALLED PROGRAMMABLE OPTIONS . . . . .	18
FIRST OUT, ALARM DELAYS, METER RESPONSE TIME . . . . .	19
ALERT MODE, DANGER MODE, DANGER VOTING, OK MODE . . . . .	20
RECORDER OUT, NORMAL DIRECTION, DANGER BYPASS SWITCH . . . . .	21
REPLACE METER SCALE . . . . .	22
MONITOR FULL SCALE OPTIONS . . . . .	23
EXPANDER BOARD INSTALLATION/REMOVAL . . . . .	24

## CONTENTS (Continued)

TITLE	SECTION
ALARM SETPOINT ADJUST . . . . .	25
CHANNEL BYPASS . . . . .	26
DANGER BYPASS . . . . .	27
TEST CHANNEL ALARMS . . . . .	28
CALIBRATE CHANNEL . . . . .	29
TEST OK LIMITS . . . . .	30
ZERO VOLT ADJUST . . . . .	31
FIELD WIRING DIAGRAMS . . . . .	32
RECOMMENDED SPARE PARTS . . . . .	33
SPECIFICATIONS . . . . .	34
SCHEMATICS & DRAWINGS . . . . .	35

# 1 DUAL THRUST MONITOR SYSTEM



**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 two 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 channel 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 non-latching 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.

# 3 MONITOR OPTIONS

DUAL THRUST MONITOR PART NUMBER	FULL SCALE RANGE	TRANSDUCER INPUT	ALARM RELAY	AGENCY APPROVAL	EXTERNAL BARRIERS USED
3300-00	AA	BB	CC	DD	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=2000 PROXIMITOR* 200 mV/MIL 02=14mm OR 11 mm PROBE 100 mV/MIL 03=3000 PROXIMITOR** 200 mV/MIL	00=NONE 01=EPOXY SEALED 02=HERMETICALLY SEALED 03=QUAD RELAYS EPOXY SEALED	00=NOT REQ'D 01=ISA 02=BASEEFA 03=F.M.	00=NO 01=ES

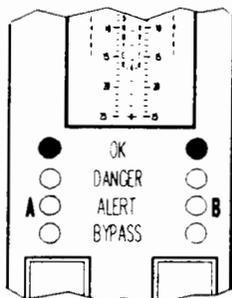
\*ONLY FOR RANGE OPTIONS 01, 02, 03, 11, AND 12  
 \*\*ONLY FOR RANGE OPTIONS 01 AND 11

# 4 PROGRAMMABLE OPTIONS

PROGRAMMABLE OPTIONS

FIRST OUT <input type="checkbox"/> ENABLED* <input type="checkbox"/> DISABLED	DANGER MODE <input type="checkbox"/> LATCHING* <input type="checkbox"/> NON-LATCHING
ALARM DELAYS <input type="checkbox"/> .1 SECOND <input type="checkbox"/> 1 SECOND* <input type="checkbox"/> 3 SECONDS <input type="checkbox"/> 6 SECONDS	RECORDER OUTPUTS <input type="checkbox"/> +4 TO +20 mA* <input type="checkbox"/> +1 TO +5 Vdc <input type="checkbox"/> 0 TO -10 Vdc
OK MODE <input type="checkbox"/> NON-LATCHING* <input type="checkbox"/> LATCHING	DANGER VOTING <input type="checkbox"/> OR VOTING FOR RELAY DRIVE* <input type="checkbox"/> AND VOTING FOR RELAY DRIVE*
ALERT MODE <input type="checkbox"/> LATCHING* <input type="checkbox"/> NON-LATCHING	NORMAL DIRECTION <input type="checkbox"/> TOWARD PROBE* <input type="checkbox"/> AWAY FROM PROBE
*NORMALLY SHIPPED WITH OPTION INSTALLED	DANGER BYPASS <input type="checkbox"/> ENABLED <input type="checkbox"/> DISABLED*

5	OK
---	----

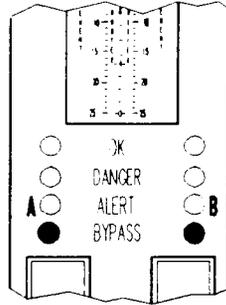


NOTE: EACH CHANNEL IN THE SYSTEM CONTROLS THE OK RELAY. THEREFORE, EITHER CHANNEL CAN CAUSE A NOT OK RELAY CONDITION (DEENERGIZED RELAY).

LED DISPLAY	CONDITION	OK RELAY DRIVE*
A      B		
●    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 ENCOUNTERED DURING CYCLIC TEST. READ ERROR MESSAGE. (SEE 14)	ON

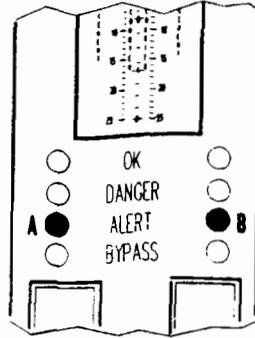
\*NOT OK CHANNEL CAN BE BYPASSED TO RESTORE RELAY OK CONDITIONS

6	BYPASS
---	--------



LED DISPLAY	CONDITION
A      B	
●      BYPASS      ●	<ul style="list-style-type: none"> <li>○ MONITOR IN DANGER BYPASS MODE</li> <li>○ SYSTEM IN POWER UP MODE</li> <li>○ USER INVOKED SELF TEST IN PROGRESS</li> <li>○ BOTH CHANNEL BYPASS</li> </ul>
○      BYPASS      ●	<ul style="list-style-type: none"> <li>○ CHANNEL A OR B BYPASSED</li> </ul>
●      BYPASS      ○	

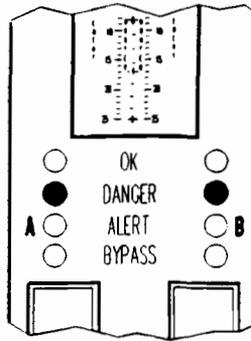
7	ALERT
---	-------



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

**8 DANGER**



LED DISPLAY A                      B		CONDITION	DANGER RELAY DRIVE	
			OR VOTING	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.

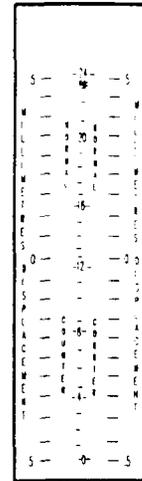
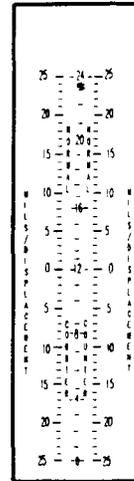
\*\*FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS IF TWO ALARMS OCCUR WITHIN 50 MILLISECONDS OR LESS OF EACH OTHER THEY COULD CAUSE BOTH LEDS TO FLASH.

# 9 MONITOR RANGES



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

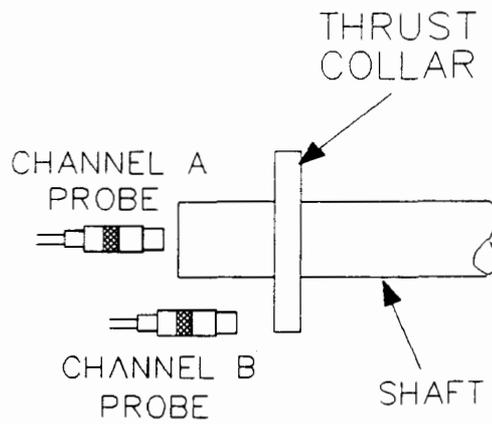
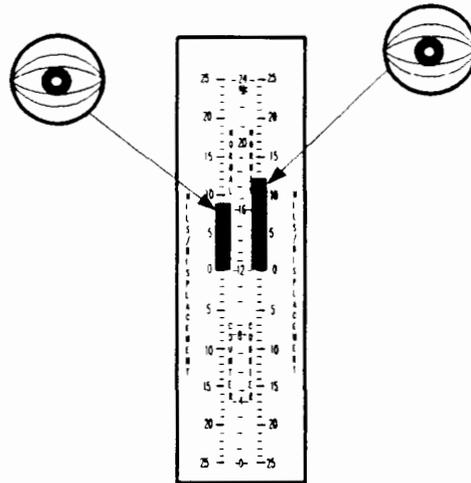


EXAMPLES OF METER SCALES

10

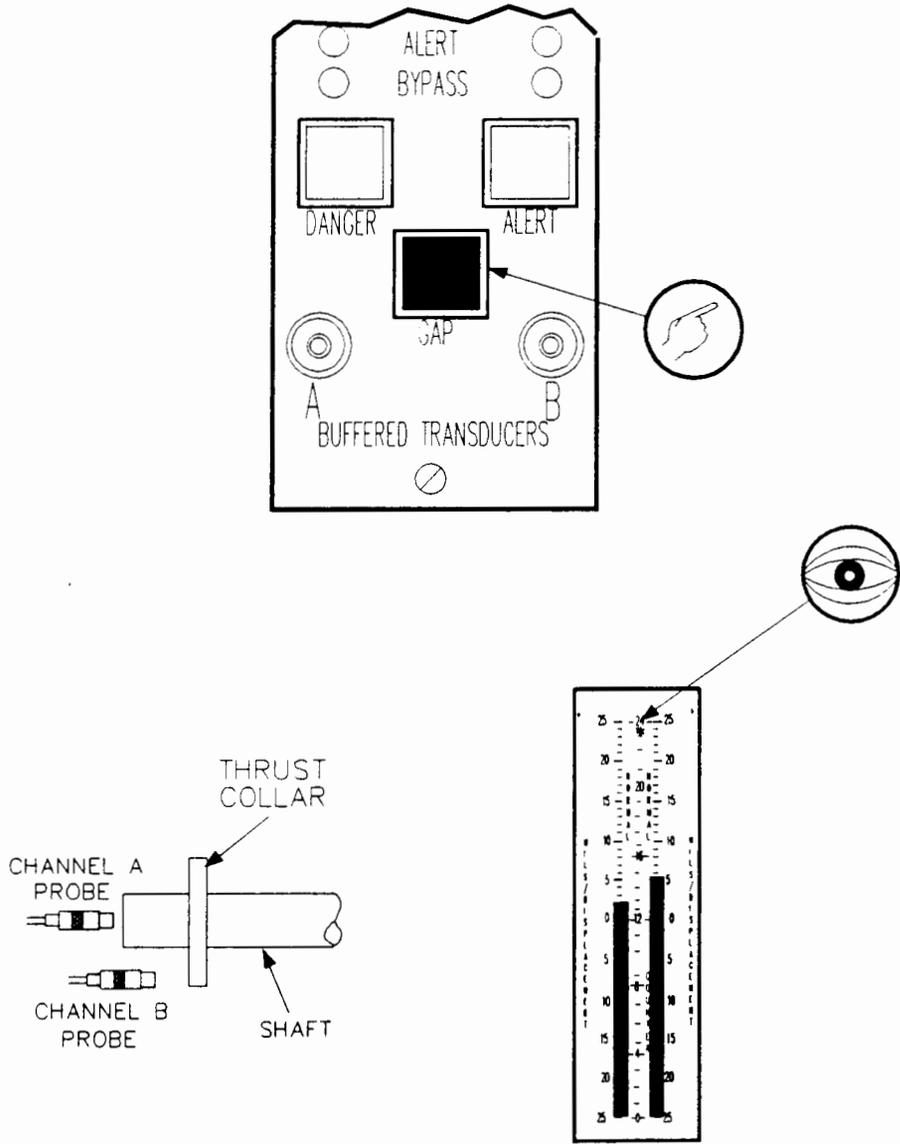
READ CHANNEL THRUST POSITION

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



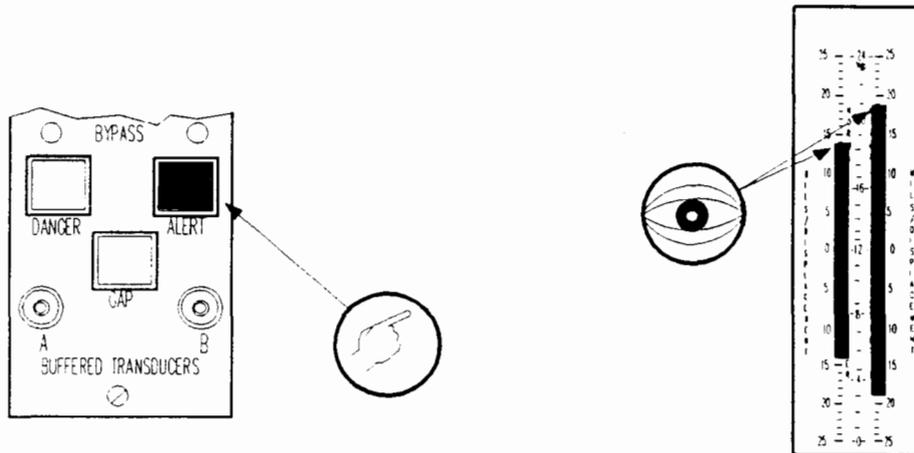
# 11 READ GAP VOLTAGE

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



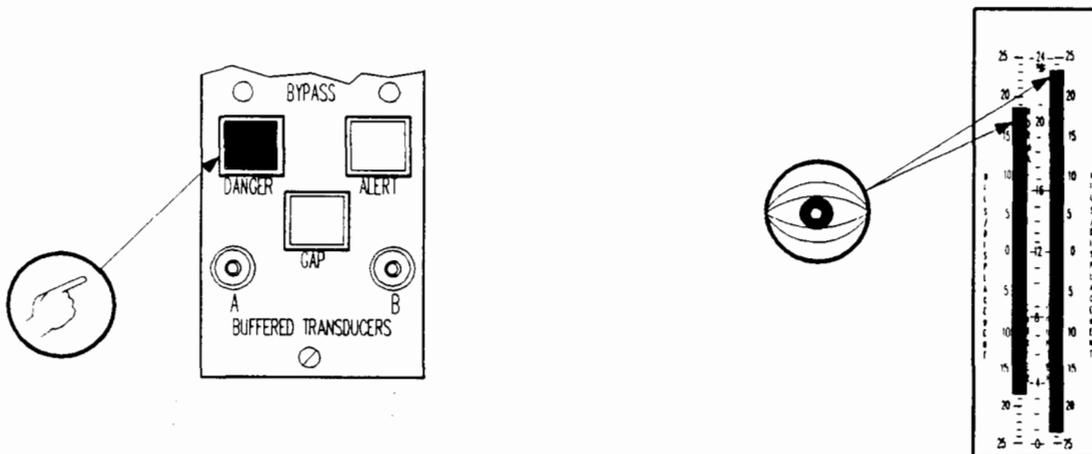
# 12 READ ALERT SETPOINT LEVELS

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



# 13 READ DANGER SETPOINT LEVELS

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

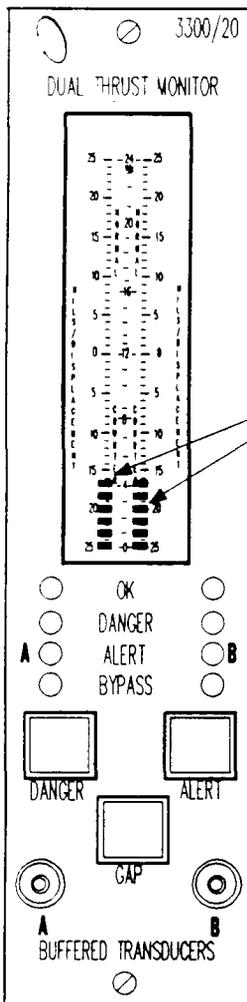


## 14

## 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:

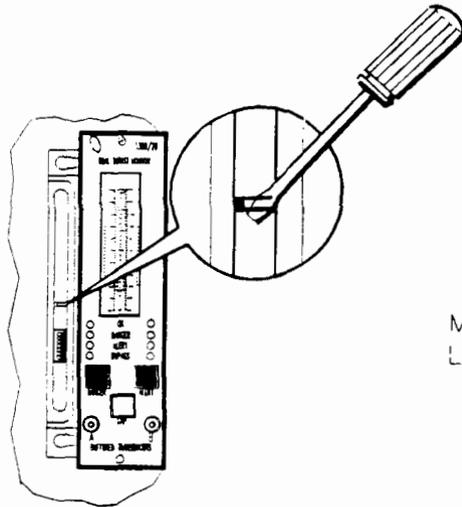
- o MONITORING IS ABORTED UNTIL THE ERROR IS RESOLVED.
- o ERROR CODE STORED IN MEMORY AND FLASHED ON LCD BARGRAPH DISPLAY.
- o **BYPASS** LED GOES ON AND **OK** LED FLASHES AT 5 HZ.
- o IF ERROR IS INTERMITTENT AND DISAPPEARS, MONITORING IS RESUMED AND **OK** LED FLASHES AT 5 HZ.
- o ERROR CODE STORED.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

**14 SELF TEST [CONT]**

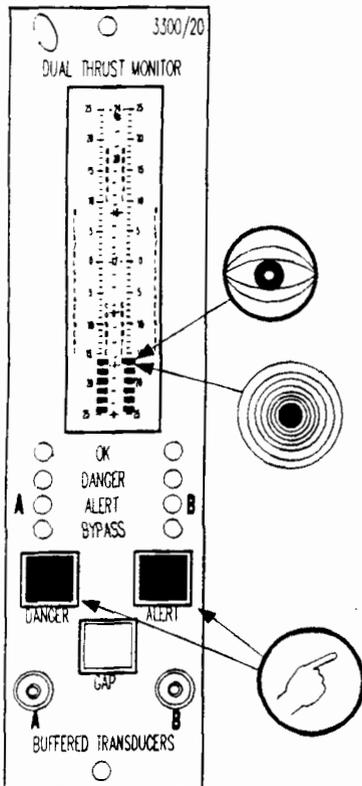
INITIATE USER INVOKED TEST BY SHORTING ACROSS TWO SELFTEST (ST) PINS.



**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.



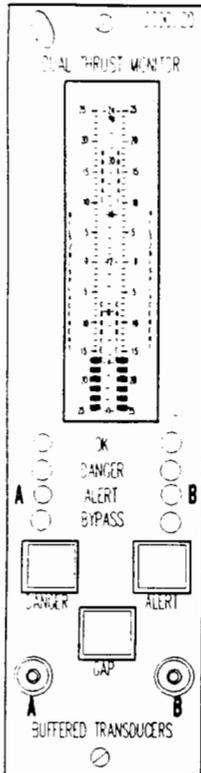
**NOTE**

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.

## 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 2 AND 3) ***
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. *

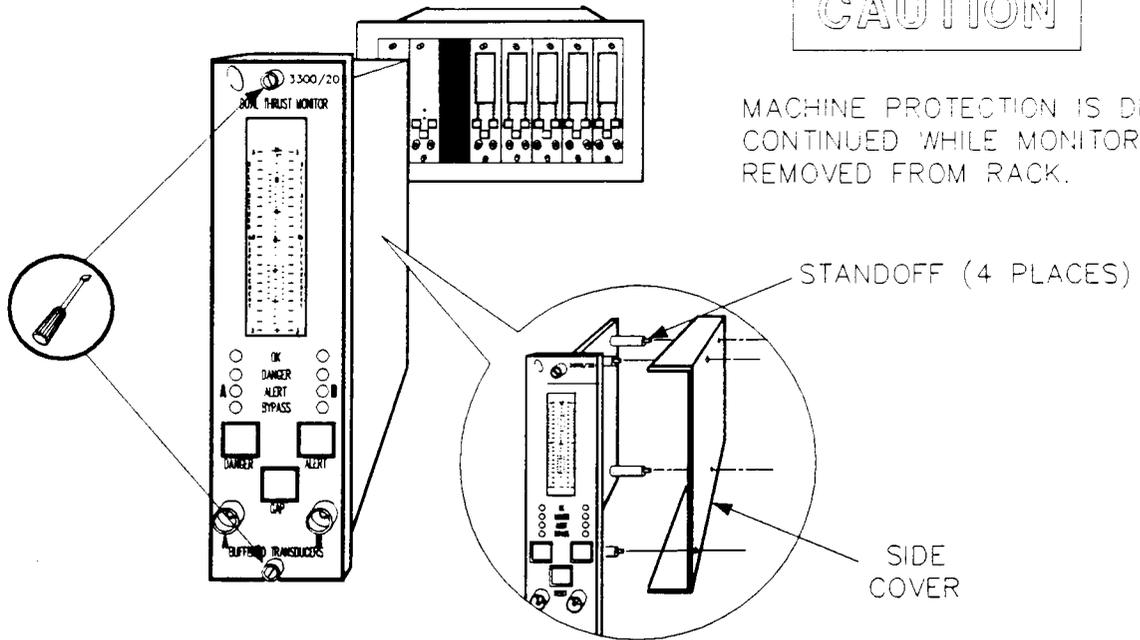
- \* TESTED ONLY AT POWER-UP OR USER-INVOKED SELF TEST. ERRORS NOT RECORDED, BUT ERROR CODES DISPLAYED ON FRONT PANEL METER.
- \*\* TESTED ONLY AT CYCLIC SELF TEST. ERRORS 2, 3, 14, AND 15 ARE NONRECOVERABLE; ERRORS 5 THROUGH 13 COULD BE INTERMITTANT AND RECOVERABLE.
- \*\*\* ERROR 4 IS A SET POINT SELF TEST FAILURE. THIS MAY BE CORRECTED BY ADJUSTING ALL SETPOINTS IN MONITOR.

# 15 DISASSEMBLY PROCEDURE

1. LOOSEN SCREWS AND PULL MONITOR FROM RACK.

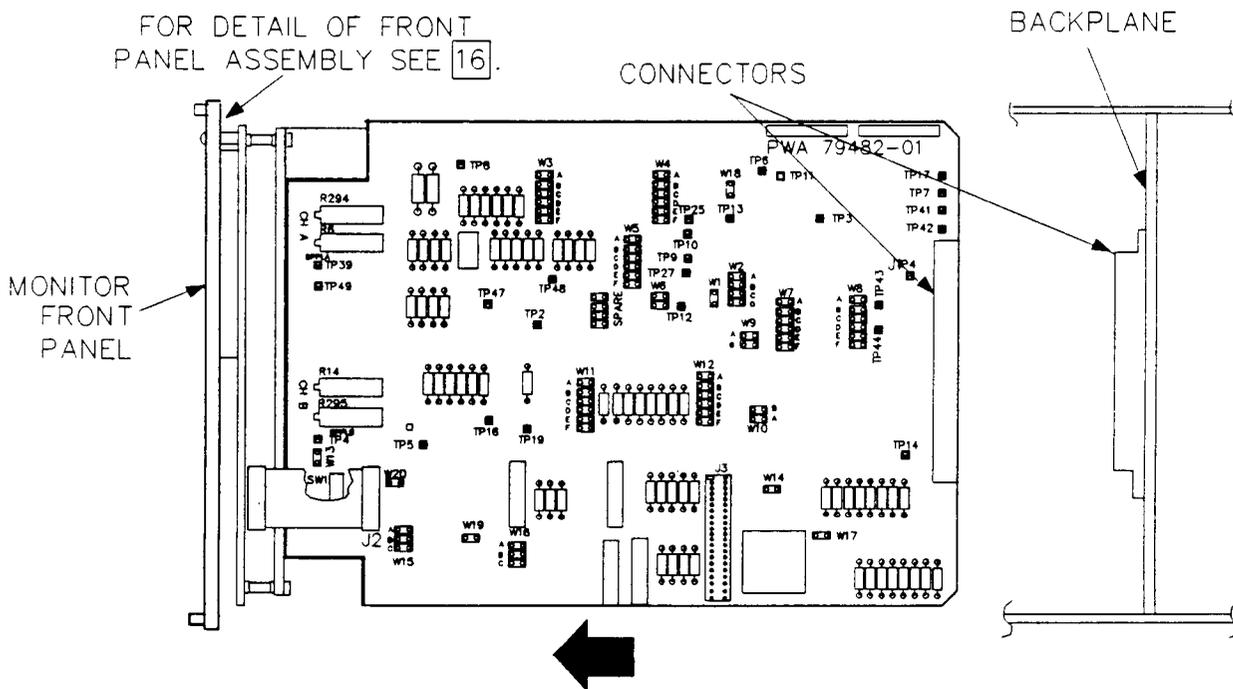
**CAUTION**

MACHINE PROTECTION IS DISCONTINUED WHILE MONITOR IS REMOVED FROM RACK.

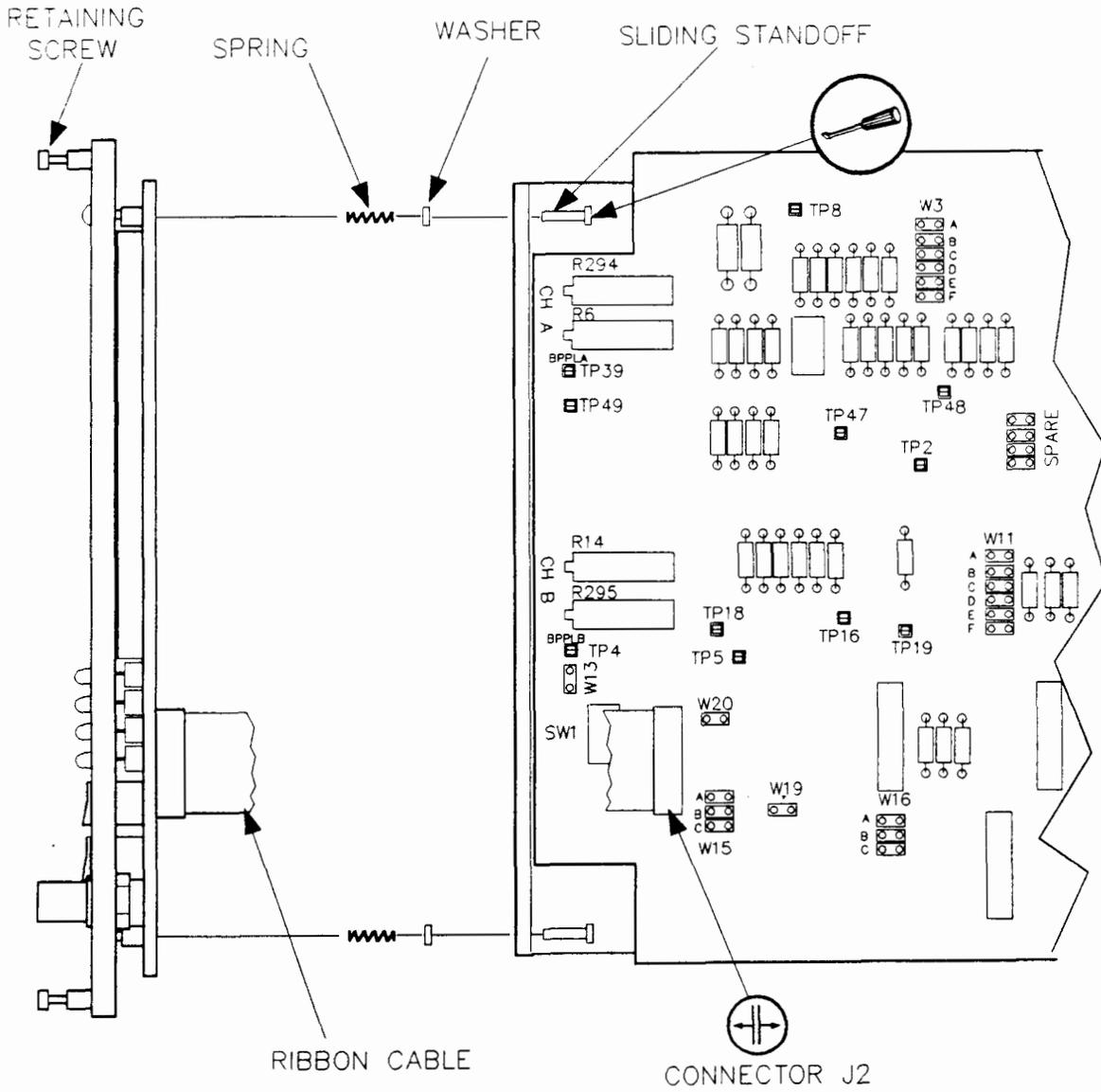


2. REMOVE SIDE COVER BY PINCHING PROTRUDING TIP ON EACH STANDOFF.

FOR DETAIL OF FRONT PANEL ASSEMBLY SEE 16.



# 16 FRONT PANEL ASSEMBLY REMOVAL



17

**SIGNAL INPUT RELAY MODULES**

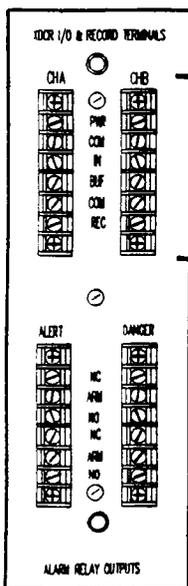
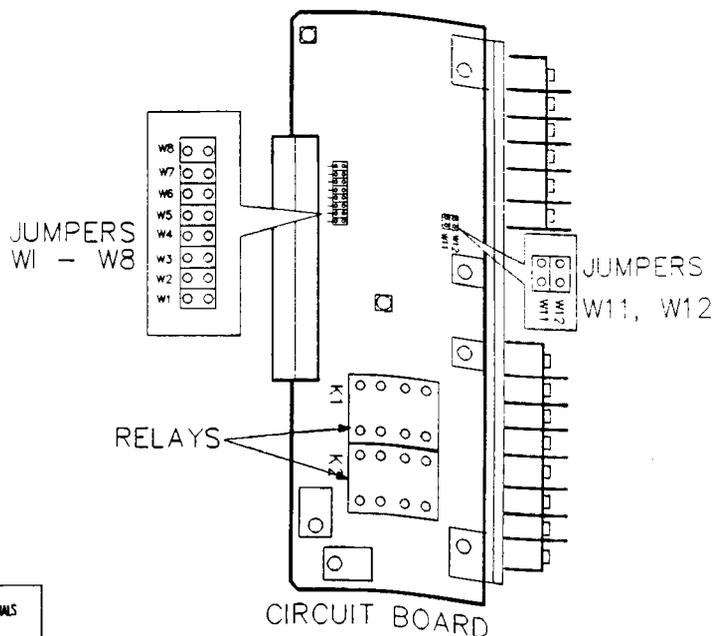
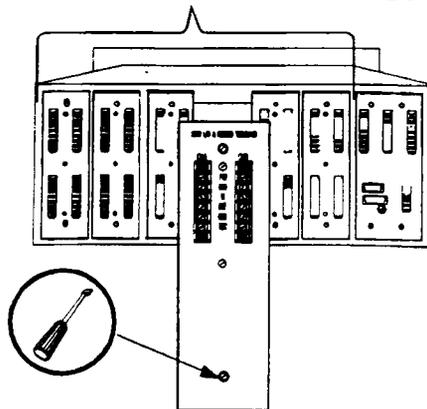


**WARNING**

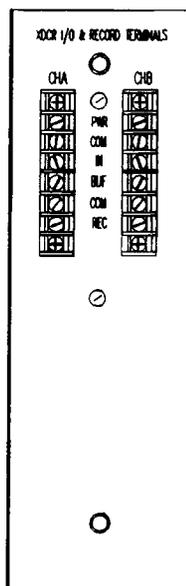
High voltage present  
could cause shock  
burns or death

Do not touch exposed  
wires or terminals

SIGNAL INPUT RELAY MODULES



FOR FIELD  
WIRING  
SEE 31



WITH RELAYS

WITHOUT RELAYS

ALERT RELAY	JUMPER *	
	IN	OUT
NORMALLY ENERGIZED	W3	W4, W11
NORMALLY DEENERGIZED	W4, W11	W3

DANGER RELAY	JUMPER *	
	IN	OUT
NORMALLY ENERGIZED	W2	W1, W12
NORMALLY DEENERGIZED	W1, W12	W2

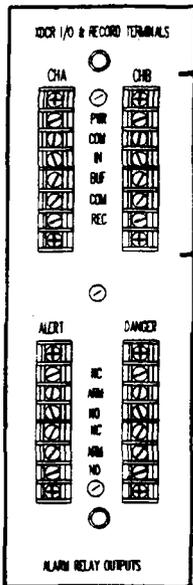
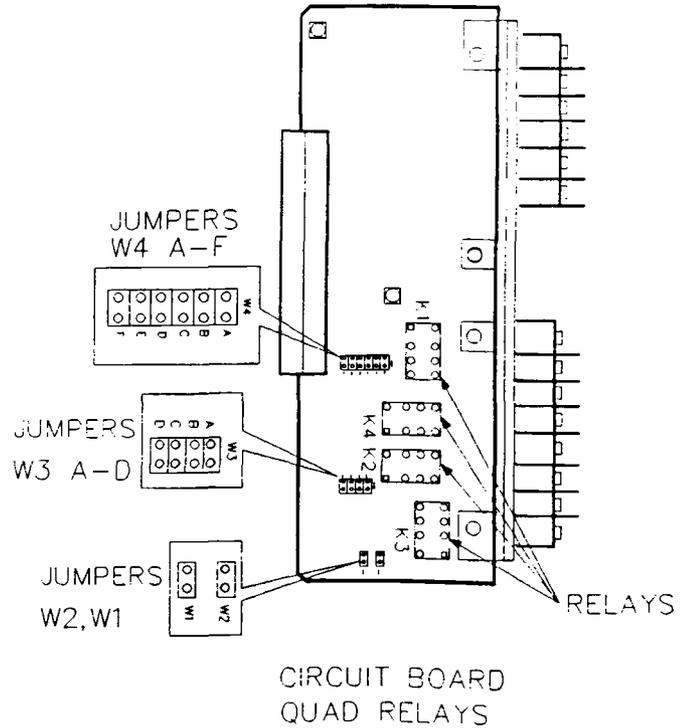
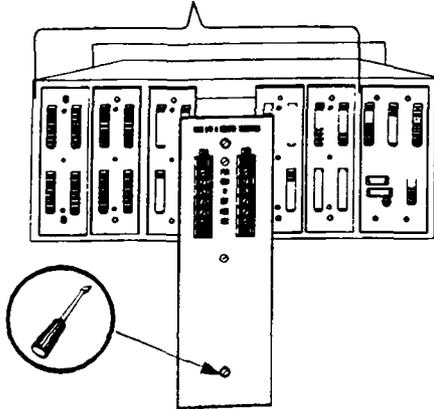
\* FOR CONFIGURATION OF RELAYS  
REFER TO INSTALLATION MANUAL

351701

# 17 SIGNAL INPUT RELAY MODULES [CONT.]

**⚠ WARNING**  
 High voltage present  
 could cause shock  
 burns or death  
 Do not touch exposed  
 wires or terminals

SIGNAL INPUT RELAY MODULES



FOR FIELD WIRING  
 REFER TO  
 MONITOR  
 MANUAL

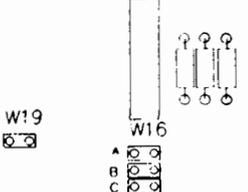
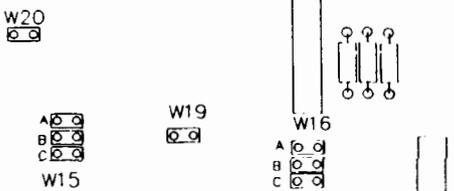
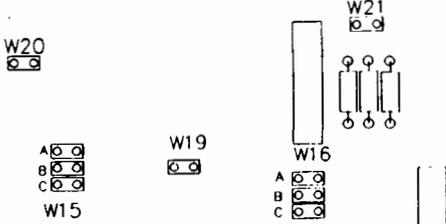
\*FOR INSTALLATION OF  
 RELAY MODULES, REFER  
 TO INSTALLATION MANUAL.

SIGNAL INPUT/QUAD RELAY CARD OPTION *		
RELAY OPTIONS	INSTALL	REMOVE
ALERT RELAYS NORMALLY DE-ENERGIZED	W2,3C W3D,4D	W3A,4C
ALERT RELAYS NORMALLY ENERGIZED	W3A,4C	W2,3C W3D,4D
DANGER RELAYS NORMALLY DE-ENERGIZED	W1,3B W4A,4E	W4B,4F
DANGER RELAYS NORMALLY ENERGIZED	W4B,4F	W1,3B W4A,4E

WITH QUAD RELAYS



**19 FIRST OUT, ALARM DELAYS, METER RESPONSE TIME**

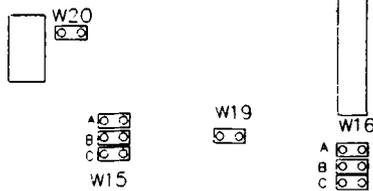
OPTION	JUMPER LOCATIONS												
<p>FIRST OUT</p> <table border="1" data-bbox="447 563 801 776"> <thead> <tr> <th colspan="2">JUMPERS</th> </tr> <tr> <th>INSTALLED</th> <th>REMOVED</th> </tr> </thead> <tbody> <tr> <td>W16A</td> <td>---</td> </tr> <tr> <td>---</td> <td>W16A</td> </tr> </tbody> </table> <p> <input type="radio"/> ENABLED  <input type="radio"/> DISABLED                 </p>	JUMPERS		INSTALLED	REMOVED	W16A	---	---	W16A					
JUMPERS													
INSTALLED	REMOVED												
W16A	---												
---	W16A												
<p>ALARM DELAYS</p> <table border="1" data-bbox="459 904 801 1212"> <thead> <tr> <th colspan="2">JUMPERS</th> </tr> <tr> <th>INSTALLED</th> <th>REMOVED</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>W15A,B</td> </tr> <tr> <td>W15B</td> <td>W15A</td> </tr> <tr> <td>W15A</td> <td>W15B</td> </tr> <tr> <td>W15A,B</td> <td>---</td> </tr> </tbody> </table> <p> <input type="radio"/> 0.1 SECOND  <input type="radio"/> 1 SECOND  <input type="radio"/> 3 SECONDS  <input type="radio"/> 6 SECONDS                 </p>	JUMPERS		INSTALLED	REMOVED	---	W15A,B	W15B	W15A	W15A	W15B	W15A,B	---	
JUMPERS													
INSTALLED	REMOVED												
---	W15A,B												
W15B	W15A												
W15A	W15B												
W15A,B	---												
<p>METER RESPONSE TIME</p> <table border="1" data-bbox="447 1361 801 1698"> <thead> <tr> <th colspan="2">JUMPERS</th> </tr> <tr> <th>INSTALLED</th> <th>REMOVED</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>W21</td> </tr> <tr> <td>W21</td> <td>---</td> </tr> </tbody> </table> <p> <input type="radio"/> FAST  <input type="radio"/> SLOW                 </p>	JUMPERS		INSTALLED	REMOVED	---	W21	W21	---					
JUMPERS													
INSTALLED	REMOVED												
---	W21												
W21	---												

REMOVED JUMPERS CAN BE SAVED BY PLUGGING ONLY ONE PIN OF JUMPER INTO JUMPER SOCKET.

20

**ALERT MODE, DANGER MODE, DANGER VOTING, OK MODE**

JUMPER LOCATIONS



OPTION

ALERT MODE

- LATCHING
- NON LATCHING

JUMPERS	
INSTALLED	REMOVED
W15C	---
---	W15C

DANGER MODE

- LATCHING
- NON LATCHING

JUMPERS	
INSTALLED	REMOVED
W16B	---
---	W16B

DANGER VOTING

- AND
- OR

JUMPERS	
INSTALLED	REMOVED
W16C	---
---	W16C

OK MODE

- LATCHING
- NON LATCHING

JUMPERS	
INSTALLED	REMOVED
W19	---
---	W19

# 21 RECORDER OUT, NORMAL DIRECTION, DANGER BYPASS SWITCH

RECORDER OUT OPTION	JUMPER LOCATIONS*																		
<p style="text-align: center;">+4 TO +20 mA</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th style="text-align: left;">JUMPERS INSTALLED</th></tr> <tr><td style="text-align: center;">W7A,C,E,F</td></tr> <tr><td style="text-align: center;">W8B,C</td></tr> <tr><td style="text-align: center;">W10A,B</td></tr> <tr><td style="text-align: center;">W11B,C</td></tr> <tr><td style="text-align: center;">W12A,C,E,F</td></tr> </table> <p style="text-align: center;">+1 TO +5 Vdc</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th style="text-align: left;">JUMPERS INSTALLED</th></tr> <tr><td style="text-align: center;">W7B,D</td></tr> <tr><td style="text-align: center;">W8A,E</td></tr> <tr><td style="text-align: center;">W10A,B</td></tr> <tr><td style="text-align: center;">W11A,E</td></tr> <tr><td style="text-align: center;">W12B,D</td></tr> </table> <p style="text-align: center;">0 TO -10 Vdc</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th style="text-align: left;">JUMPERS INSTALLED</th></tr> <tr><td style="text-align: center;">W7B,D</td></tr> <tr><td style="text-align: center;">W8D,F</td></tr> <tr><td style="text-align: center;">W9A,B</td></tr> <tr><td style="text-align: center;">W11D,F</td></tr> <tr><td style="text-align: center;">W12B,D</td></tr> </table>	JUMPERS INSTALLED	W7A,C,E,F	W8B,C	W10A,B	W11B,C	W12A,C,E,F	JUMPERS INSTALLED	W7B,D	W8A,E	W10A,B	W11A,E	W12B,D	JUMPERS INSTALLED	W7B,D	W8D,F	W9A,B	W11D,F	W12B,D	
JUMPERS INSTALLED																			
W7A,C,E,F																			
W8B,C																			
W10A,B																			
W11B,C																			
W12A,C,E,F																			
JUMPERS INSTALLED																			
W7B,D																			
W8A,E																			
W10A,B																			
W11A,E																			
W12B,D																			
JUMPERS INSTALLED																			
W7B,D																			
W8D,F																			
W9A,B																			
W11D,F																			
W12B,D																			
<p>* REMOVE ALL JUMPERS FROM W7, W8, W9, W10, W11, AND W12 THEN REINSTALL ACCORDING TO TABLE</p>																			

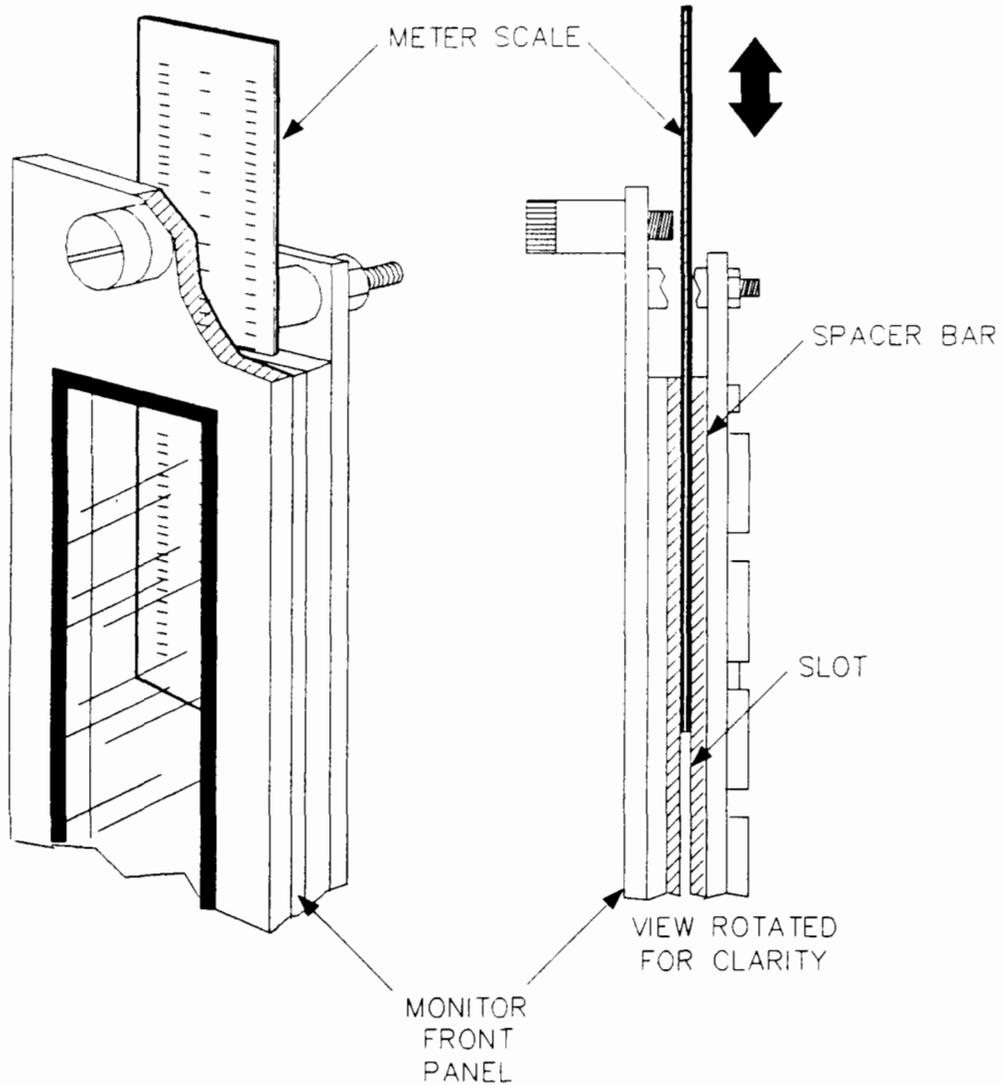
NORMAL DIRECTION	JUMPERS		
	INSTALL	REMOVE	
AWAY FROM PROBE	CH A	---	
	CH B	---	
TOWARDS PROBE	CH A	W1	
	CH B	W18	
DANGER BYPASS SWITCH OPTION	JUMPERS		
	INSTALL	REMOVE	
ENABLE	W20	---	
DISABLE	---	W20	

22

REPLACE METER SCALE

1. VERIFY MONITOR FULL SCALE OPTION (SEE 23 )
2. OBTAIN METER SCALE FROM REAR OF MANUAL AND INSERT IN FRONT PANEL AS SHOWN.

NOTE. TO ENSURE CORRECT FITTING AND ALIGNMENT, THE METER SCALE MUST BE CUT FROM THE PLASTIC SHEET EXACTLY ALONG THE MARKED OUTLINE.

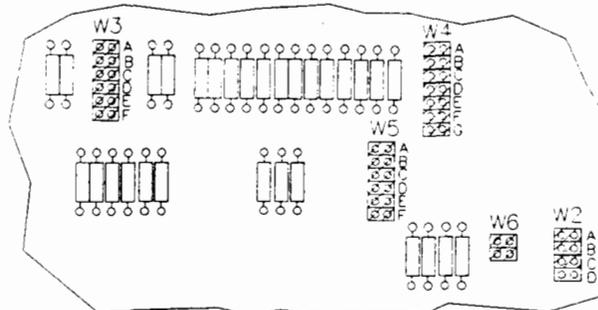


# 23 MONITOR FULL SCALE OPTIONS

## JUMPER LOCATIONS

CAUTION

CHANGING FULL SCALE  
REQUIRES RECALIBRA-  
TION OF BOTH CHANNELS.  
(SEE 29)



## FULL SCALE OPTIONS

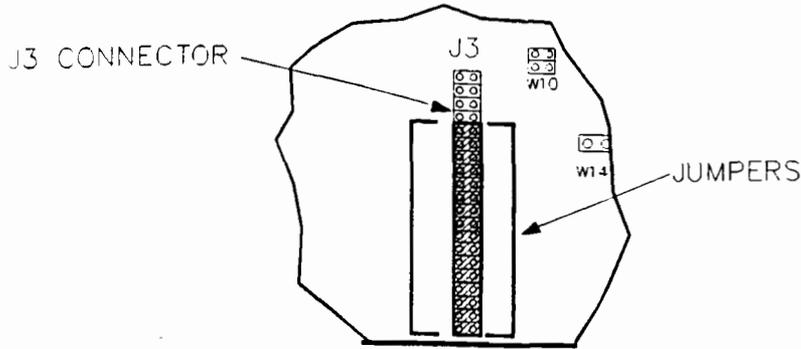
TRANSDUCERS	MILS					MILLIMETRES		
	25-0-25	30-0-30	40-0-40	50-0-50	75-0-75	0.5-0-0.5	1-0-1	2-0-2
3000 SERIES (200 mV/MIL)	W2A,B	/	/	/	/	W2C	/	/
	W3D	/	/	/	/	W3B	/	/
	W4C,E,G	/	/	/	/	W4C,E,G	/	/
	.....	/	/	/	/	.....	/	/
	W6B	/	/	/	/	W6B	/	/
7200 SERIES WITHOUT BARRIERS (200 mV/MIL)	W2A,B	W2A	W2A	/	/	W2C	W2A	/
	W3F	W3E	W3D	/	/	W3F	W3D	/
	W4A,E,G	W4A,F,G	W4A,E,G	/	/	W4A,E,G	W4A,E,G	/
	W5A,D	W5A,D	W5A,D	/	/	W5A,D	W5A,D	/
	W6B	W6A	W6B	/	/	W6B	W6B	/
7200 SERIES WITH BARRIERS (192 mV/MIL)	W2A,B	W2A	W2A	/	/	W2C	W2A	/
	W3F	W3E	W3D	/	/	W3F	W3D	/
	W4D,E	W4D,F	W4D,E	/	/	W4D,E	W4D,E	/
	W5C,F	W5C,F	W5C,F	/	/	W5C,F	W5C,F	/
	W6B	W6A	W6B	/	/	W6B	W6B	/
7200 SERIES 11 mm (100 mV/MIL)	W2C	W2C	W2C	W2A,B	W2B	W2A,B	W2C	W2A
	W3A	W3E	W3B	W3B	W3D	W3B	W3B	W3C
	W4B,G	W4B,G,F	W4B,E,G	W4B,E,G	W4B,E,G	W4B,E,G	W4B,E,G	W4B,E,G
	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E
	.....	W6A	W6B	W6B	W6B	W6B	W6B	W6B
7200 SERIES 14 mm (100 mV/MIL)	W2C	W2C	W2C	W2A,B	W2B	W2A,B	W2C	W2A
	W3A	W3E	W3B	W3B	W3D	W3B	W3B	W3C
	W4A,G	W4A,G,F	W4A,E,G	W4A,E,G	W4A,E,G	W4A,E,G	W4A,E,G	W4A,E,G
	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E	W5B,E
	.....	W6A	W6B	W6B	W6B	W6B	W6B	W6B

\*REMOVE JUMPERS FROM W2-A,B,C, W3-A,B,C,D,E,F, W4-A,B,C,D,E,F, W5-A,B,C,D,E,F, AND W6-A,B BEFORE CHANGING TO A DIFFERENT FULL SCALE OPTION.

# 24

## EXPANDER BOARD INSTALLATION/REMOVAL

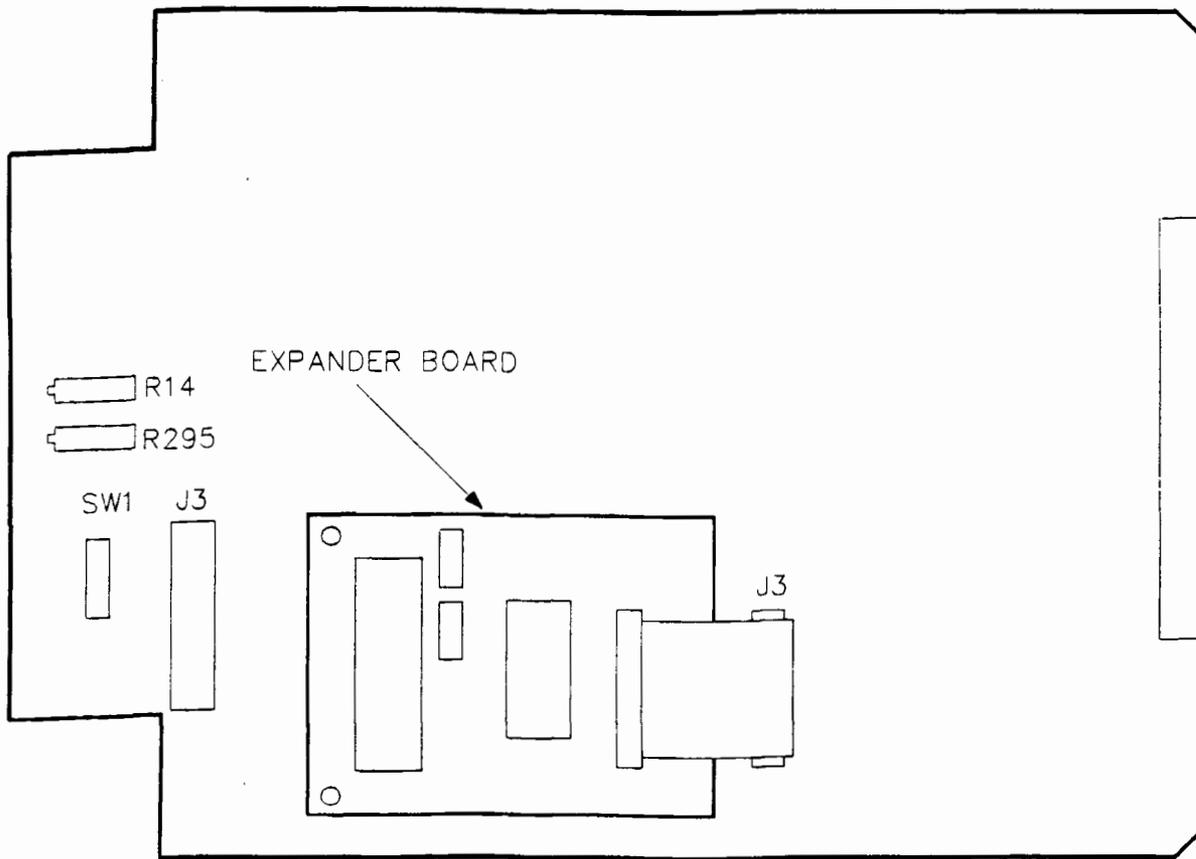
REMOVE MONITOR FROM RACK AND REMOVE SIDE COVER. (SEE 13)



**CAUTION**

MONITORING IS DISCONTINUED WHILE MONITOR IS REMOVED FROM RACK.

VIEW SHOWING EXPANDER BOARD REMOVED. JUMPERS MUST BE INSTALLED AS SHOWN.



VIEW SHOWING EXPANDER BOARD INSTALLED

## 25

## ALARM SETPOINT ADJUST

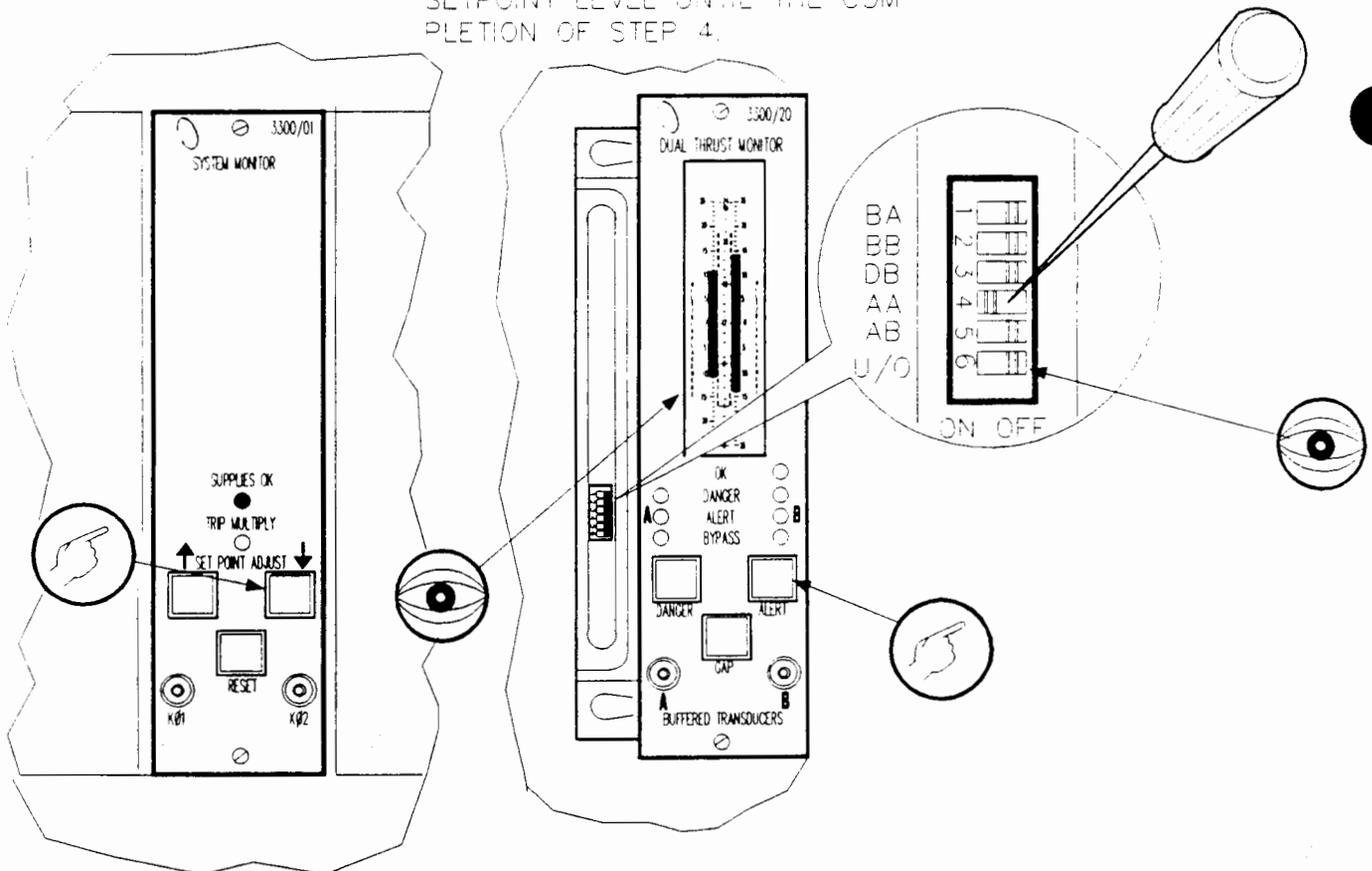
## NOTE

SETPONTS CAN NOT BE ADJUSTED WITH TRIP MULTIPLY INSTALLED AND ACTIVATED BY CONTACT CLOSURE.

1. OPEN FRONT PANEL. SET RESPECTIVE **AA** (CHANNEL A ADJUST) OR **AB** (CHANNEL B ADJUST) SWITCH TO ON; SELECT OVER OR UNDER SETPOINTS BY SETTING U/O SWITCH TO DESIRED POSITION. RESPECTIVE CHANNEL BAR-GRAPH STARTS FLASHING.
2. TO ADJUST **ALERT** OR **DANGER** SETPOINTS, PRESS AND HOLD **ALERT** OR **DANGER** SWITCH ON FRONT PANEL.
3. USE  $\uparrow$  OR  $\downarrow$  SWITCHES ON SYSTEM MONITOR TO ADJUST SETPOINT LEVEL UP OR DOWN.
4. RESET **AA** OR **AB** SET SWITCH; CLOSE FRONT PANEL.

## NOTE

MONITOR RESPONDS TO PREVIOUS SETPOINT LEVEL UNTIL THE COMPLETION OF STEP 4.



452501

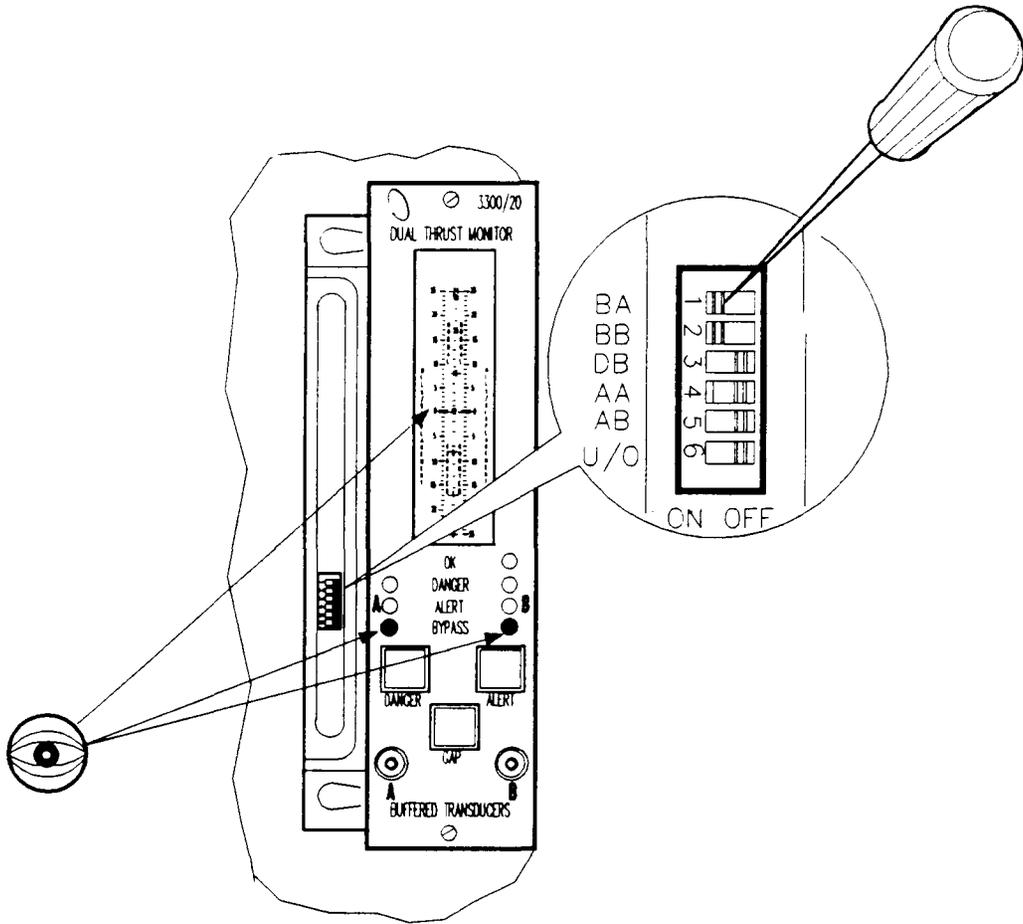
# 26 CHANNEL BYPASS

SET **BA** (CHANNEL A BYPASS) OR **BB** (CHANNEL B BYPASS) SWITCH TO ON.  
CORRESPONDING BYPASS LED GOES ON, **OK** LED GOES OFF, AND AMPLITUDE GOES TO 0.

**CAUTION**

MACHINE PROTECTION WILL BE LOST WHILE CHANNEL BYPASS IS ON.

NOTE  
WHEN CHANNEL BYPASS IS SWITCHED ON, CHANNEL ALARMS ARE CLEARED.

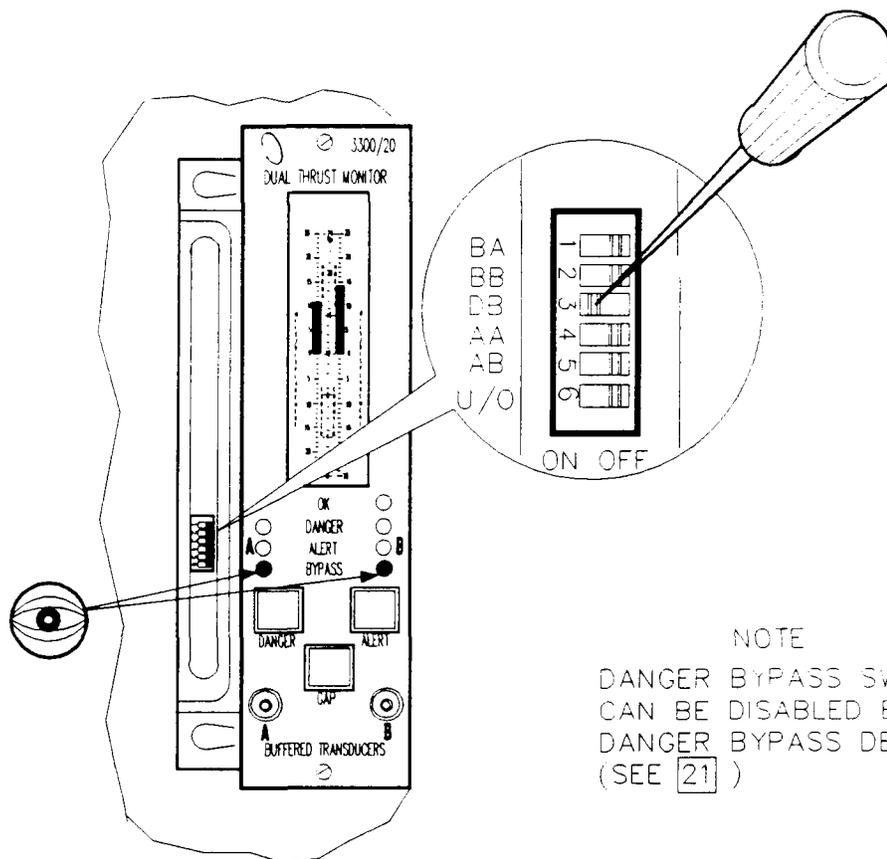


**27 DANGER BYPASS**

SET DB DANGER BYPASS SWITCH TO ON; BOTH CHANNEL BYPASS LED'S GO ON; DANGER ALARM LED'S ON FRONT PANEL CAN GO ON BUT DANGER RELAY DRIVE WILL NOT BE ACTIVATED IF A DANGER SETPOINT IS EXCEEDED. SEE [13] TO READ DANGER SETPOINTS.

**CAUTION**

MACHINE PROTECTION WILL BE LOST WHILE DANGER BYPASS IS ON.



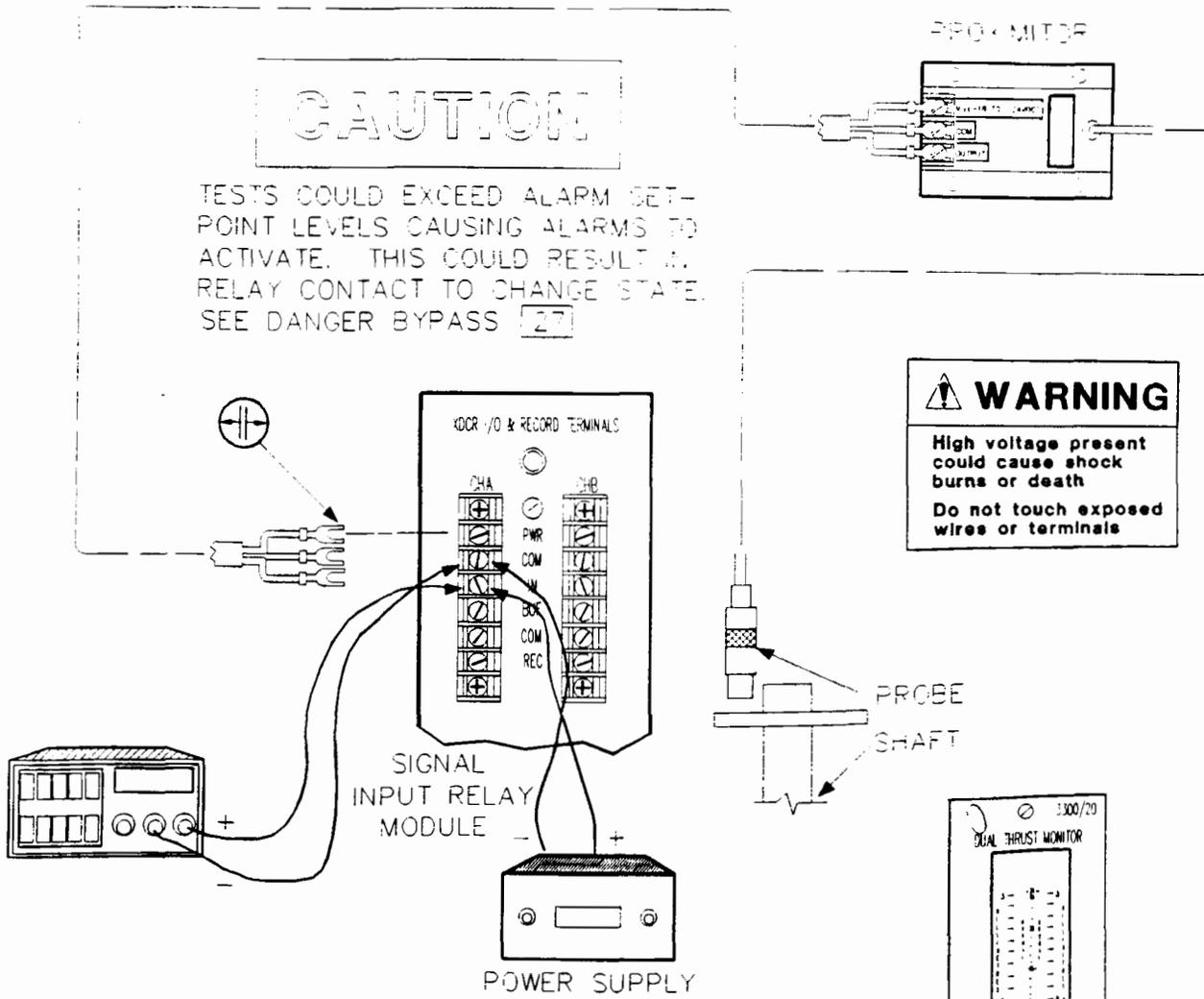
NOTE  
DANGER BYPASS SWITCH  
CAN BE DISABLED BY  
DANGER BYPASS DEFEAT.  
(SEE [21] )

# 28 TEST CHANNEL ALARMS

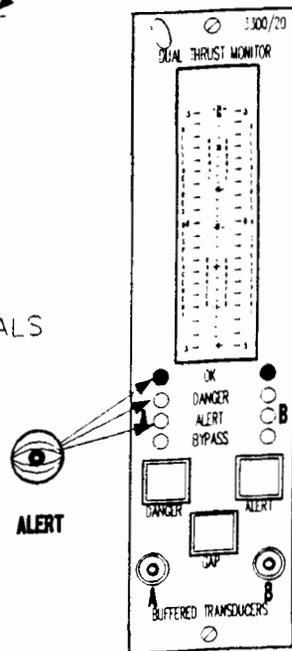
**CAUTION**

TESTS COULD EXCEED ALARM SET-POINT LEVELS CAUSING ALARMS TO ACTIVATE. THIS COULD RESULT IN RELAY CONTACT TO CHANGE STATE. SEE DANGER BYPASS [27]

**WARNING**  
 High voltage present could cause shock burns or death  
 Do not touch exposed wires or terminals



1. DISCONNECT **COM** AND **IN** WIRING FROM CHANNEL A TERMINALS ON SIGNAL INPUT RELAY MODULE.
2. CONNECT MULTIMETER AND POWER SUPPLY.
3. ADJUST VOLTAGE FOR 0 MIL (0mm) ON MONITOR DISPLAY.
4. PRESS **RESET** SWITCH AND VERIFY **OK** LEDs ARE ON, AND **ALERT** AND **DANGER** LEDs ARE OFF.



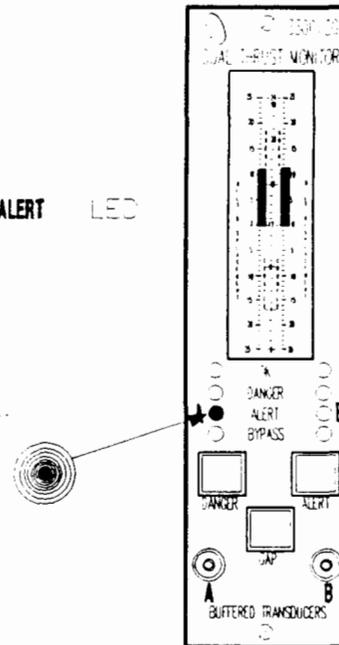
28

## TEST CHANNEL ALARMS [CONT.]

5. ADJUST POWER SUPPLY VOLTAGE PAST ALERT SETPOINT LEVEL AND VERIFY THAT **ALERT** LED GOES ON (FLASHING IF FIRST OUT OPTION).

6. VERIFY THAT ALERT RELAY CHANGED STATE.

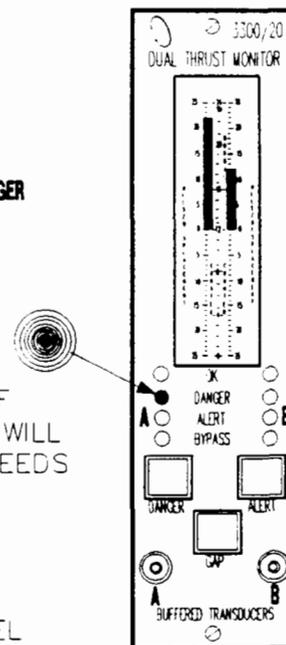
7. PRESS **RESET** SWITCH AND VERIFY THAT **ALERT** LED REMAINS ON STEADY.



8. ADJUST POWER SUPPLY VOLTAGE PAST DANGER SETPOINT LEVEL AND VERIFY THAT **DANGER** LED GOES ON (FLASHING IF FIRST OUT OPTION).

9. VERIFY THAT DANGER RELAY CHANGED STATE. IF DANGER "AND" VOTING LOGIC SELECTED, RELAY WILL NOT CHANGE STATE UNTIL OTHER CHANNEL EXCEEDS DANGER SETPOINT OR IF DANGER BYPASS IS ON.

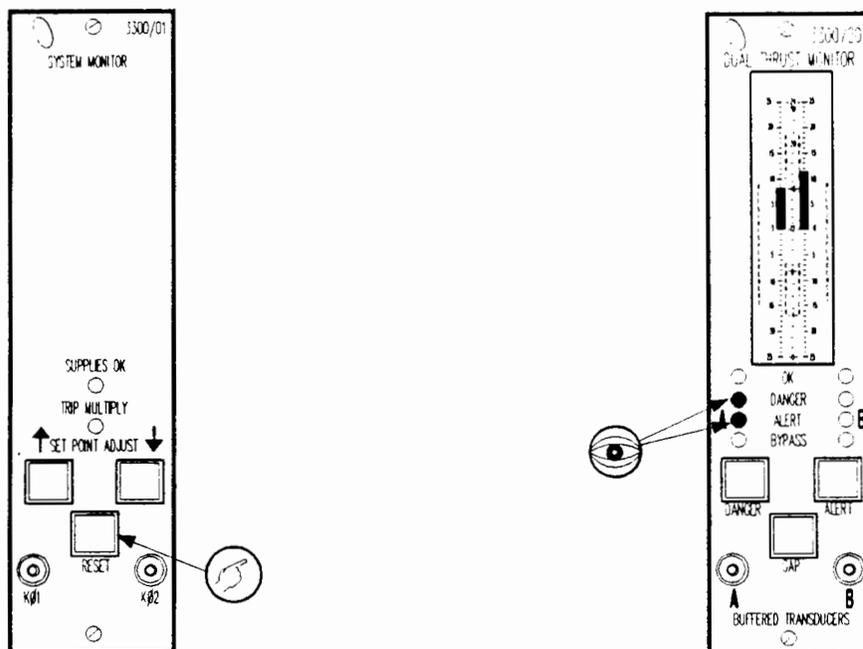
10. AND VOTING IS NOT ACTIVE IF SECOND CHANNEL IS BYPASSED.



28

## TEST CHANNEL ALARMS [CONT.]

11. PRESS **RESET** SWITCH. VERIFY **ALERT** AND **DANGER** LEDs REMAIN ON AND STEADY.



12. REDUCE AMPLITUDE TO BELOW ALARM SETPOINT LEVELS AND OBSERVE THAT **ALERT** AND **DANGER** LEDs GO OFF (IF NONLATCHING). PRESS **RESET** SWITCH TO RESET LATCHING ALARMS.

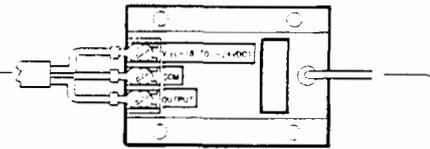
13. REPEAT STEPS 5 THROUGH 12 FOR OPPOSITE ALARM (COUNTER OR NORMAL).

# 29 CALIBRATE CHANNEL

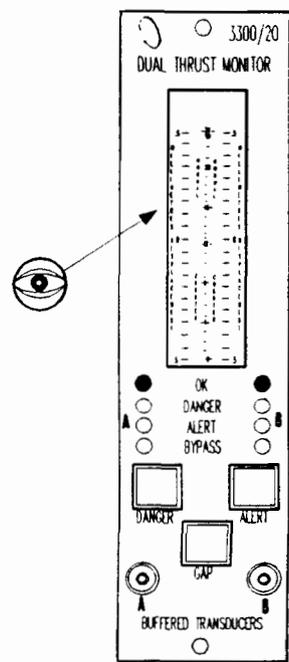
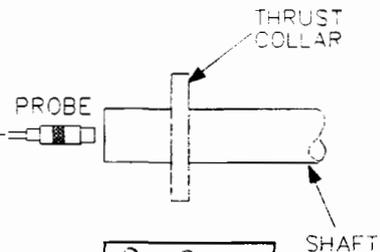
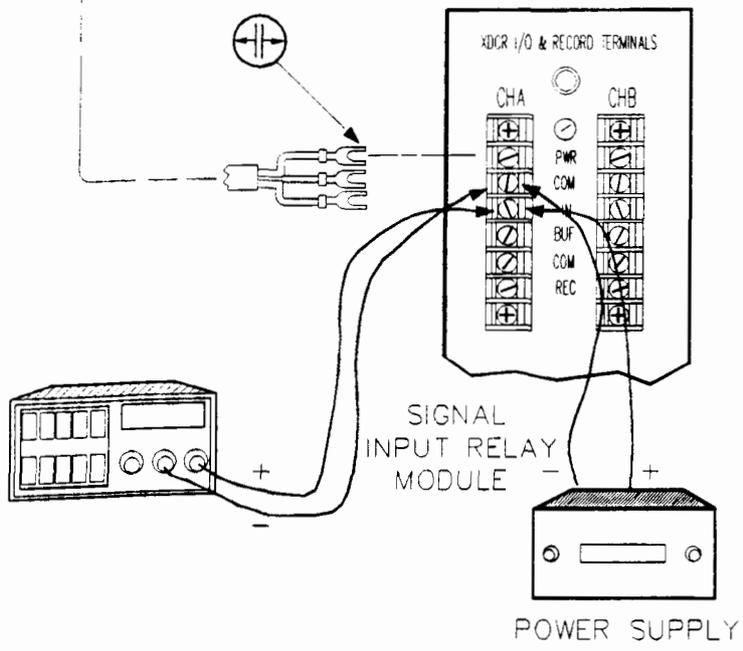
**CAUTION**

PROCEDURE COULD EXCEED ALARM SET-POINT LEVELS CAUSING ALARMS TO ACTIVATE. THIS COULD RESULT IN RELAY CONTACTS CHANGING STATE. (SEE DANGER BYPASS [27])

PROXIMATOR



**WARNING**  
 High voltage present could cause shock burns or death  
 Do not touch exposed wires or terminals



1. DISCONNECT COM and IN WIRING FROM CHANNEL A TERMINALS ON SIGNAL INPUT MODULE.
2. CONNECT MULTIMETER AND POWER SUPPLY.
3. SLIDE FRONT PANEL TO RIGHT AND ADJUST POWER SUPPLY FOR VOLTAGE OF +2.5 Vdc ON CHANNEL A TEST POINT (BPPLA).
4. VERIFY MONITOR DISPLAY INDICATES 0 MIL (0 mm). CHANGE POWER SUPPLY VOLTAGE FOR FULL VALUE.  
 1 MIL = 200mV  
 1 mm = 7.84 Vdc

## 29

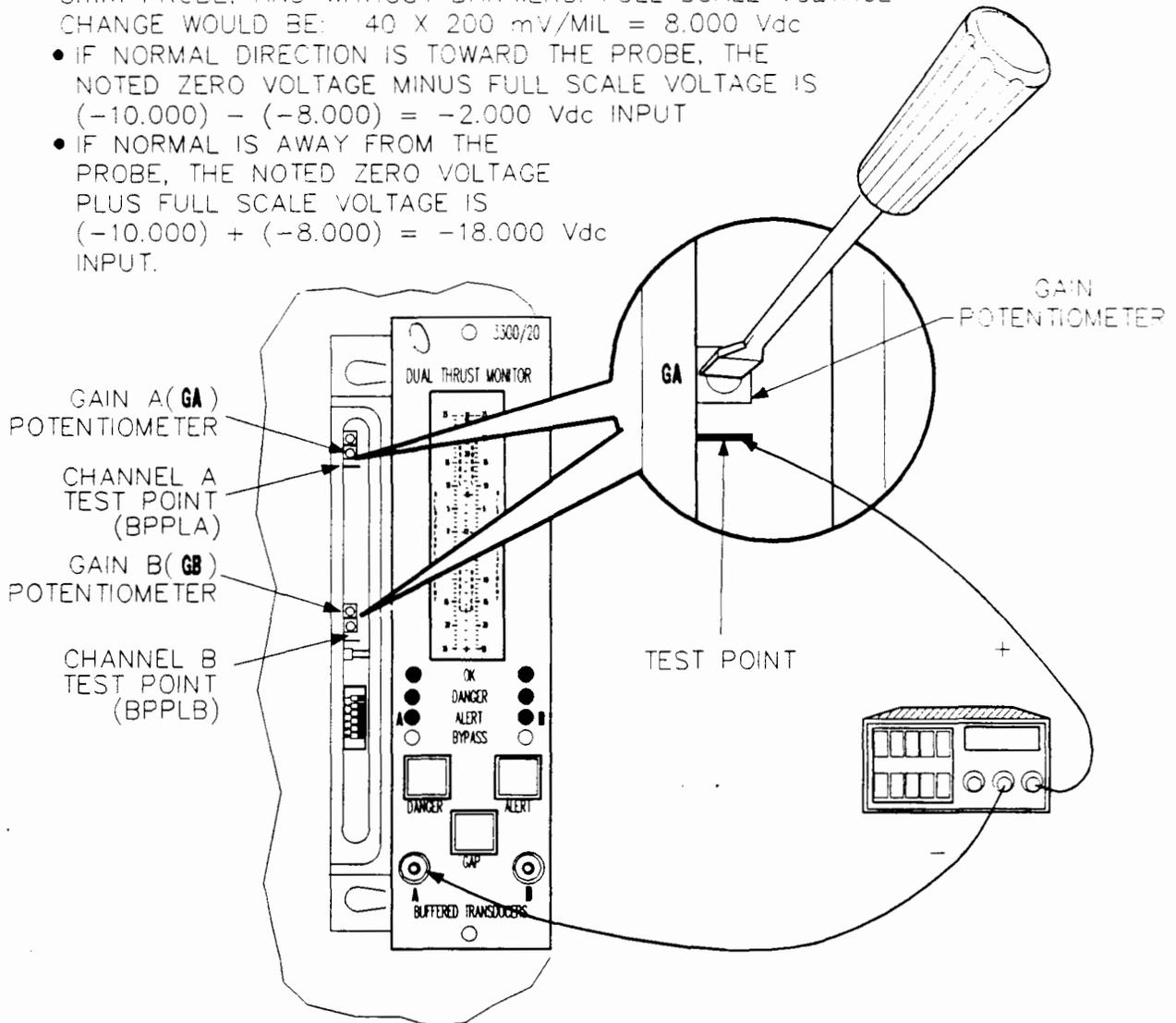
## CALIBRATE CHANNEL [CONT.]

5. ADJUST POTENTIOMETERS (GA OR GB) FOR 5.00 Vdc ON CHANNEL A TEST POINT IF DIRECTION IS NORMAL, 0.00 IF DIRECTION IS COUNTER.

FOR EXAMPLE:

THE SCALE FACTOR IS 200 mV/MIL FOR 40-0-40 RANGE, WITH 5mm PROBE, AND WITHOUT BARRIERS. FULL SCALE VOLTAGE CHANGE WOULD BE:  $40 \times 200 \text{ mV/MIL} = 8.000 \text{ Vdc}$

- IF NORMAL DIRECTION IS TOWARD THE PROBE, THE NOTED ZERO VOLTAGE MINUS FULL SCALE VOLTAGE IS  $(-10.000) - (-8.000) = -2.000 \text{ Vdc}$  INPUT
- IF NORMAL IS AWAY FROM THE PROBE, THE NOTED ZERO VOLTAGE PLUS FULL SCALE VOLTAGE IS  $(-10.000) + (-8.000) = -18.000 \text{ Vdc}$  INPUT.



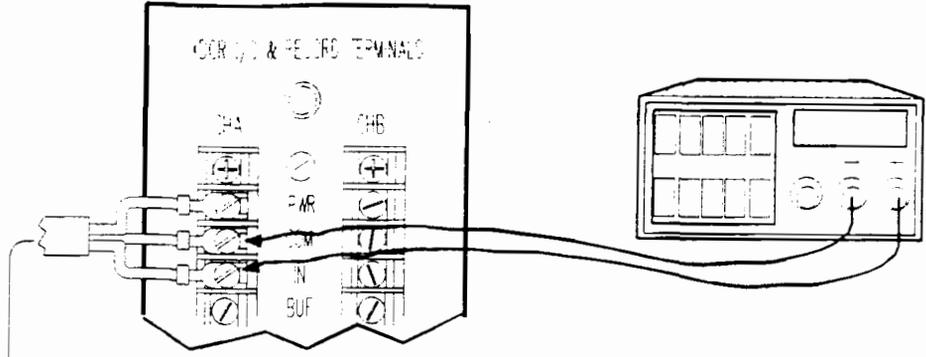
6. VERIFY FRONT PANEL = FULL SCALE AND VERIFY RECORDER OUTPUT TO THE OPTION SELECTED.

30

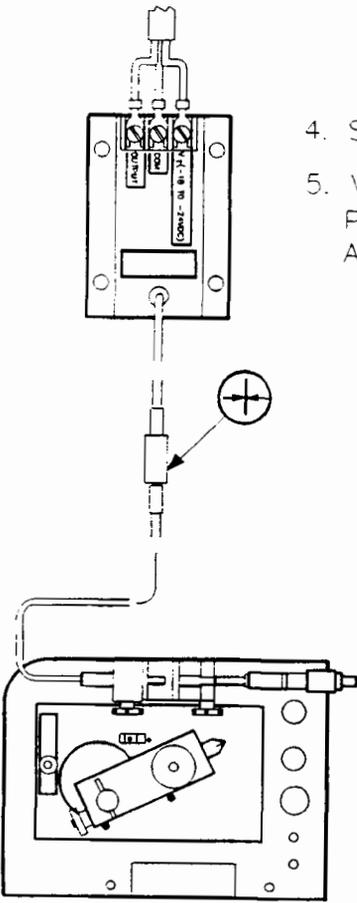
TEST OK LIMITS

1. DISCONNECT MULTIMETER TO CHANNEL A OF SIGNAL INPUT RELAY MODULE

**WARNING**  
 High voltage present  
 could cause shock  
 burns or death  
 Do not touch exposed  
 wires or terminals



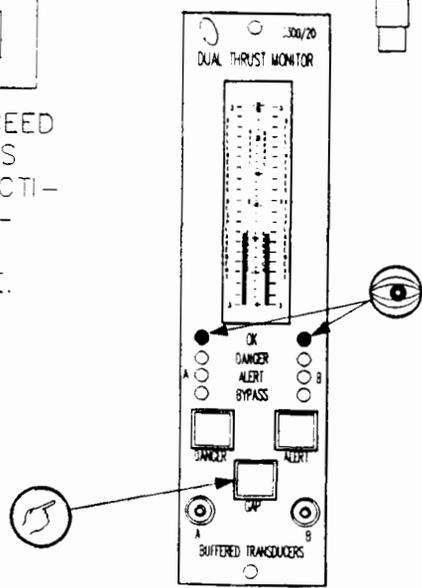
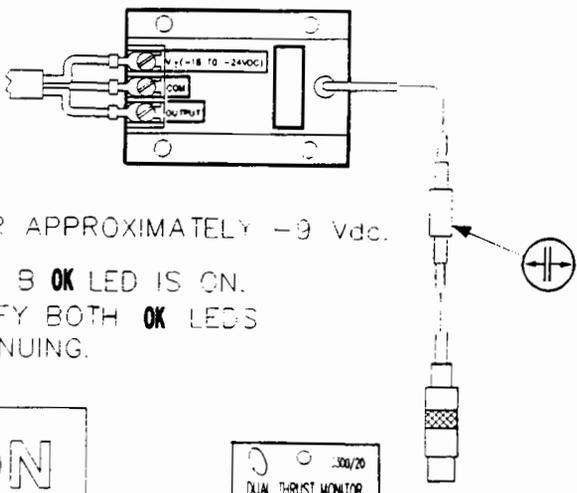
2. DISCONNECT EXTENSION CABLE FROM PROBE
3. RECONNECT EXTENSION CABLE TO AN IDENTICAL SUBSTITUTE PROBE IN THE CALIBRATION INSTRUMENT



4. SET GAP VOLTAGE FOR APPROXIMATELY -9 Vdc.
5. VERIFY THAT CHANNEL B OK LED IS ON. PRESS RESET AND VERIFY BOTH OK LEDs ARE ON BEFORE CONTINUING.

**CAUTION**

PROCEDURE COULD EXCEED ALARM SETPOINT LEVELS CAUSING ALARMS TO ACTIVATE. THIS COULD RESULT IN RELAY CONTACTS CHANGING STATE. SEE [27] FOR DANGER BYPASS.



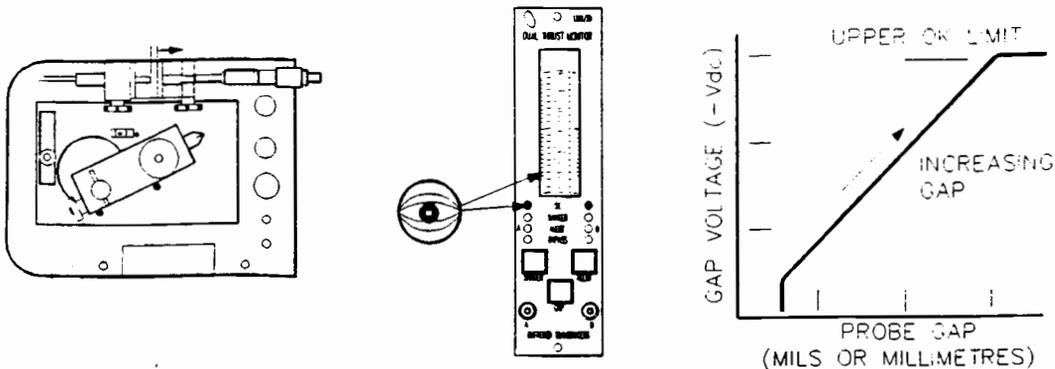
30

## TEST OK LIMITS [CONT.]

6. INCREASE GAP UNTIL **OK** LED GOES OFF (UPPER LIMIT).
7. CHECK PROBE GAP VOLTAGE ON MULTIMETER:

3000 TRANSDUCER	-12.56 Vdc to -13.07 Vdc
7200 TRANSDUCER \ WITHOUT BARRIERS	-13.51 Vdc to -13.90 Vdc
7200 TRANSDUCER \ WITH BARRIERS	-17.71 Vdc to -17.91 Vdc
7200 TRANSDUCER \ 11 mm PROBE	-19.78 Vdc to -20.14 Vdc
7200 TRANSDUCER \ 14 mm PROBE	-18.17 Vdc to -18.53 Vdc

8. VERIFY CHANGE STATE OF OK RELAY. NOTE THAT ALL CHANNELS MUST BE **OK** OR BYPASSED IN ORDER FOR THE **ARM** AND **NO** CONTACTS OF THE OK RELAY (NORMALLY ENERGIZED) TO BE CONNECTED.



9. GRADUALLY DECREASE PROBE GAP TO  $-9$  Vdc. PRESS **RESET** UNTIL **OK** LED GOES ON. **OK** LED SHOULD BE ON BETWEEN UPPER AND LOWER OK LIMITS.
10. DECREASE PROBE GAP UNTIL **OK** LED GOES OFF (LOWER LIMIT).
11. CHECK PROBE GAP VOLTAGE ON MULTIMETER:

3000 TRANSDUCER	-1.15 Vdc to -1.41 Vdc
7200 TRANSDUCER \ WITHOUT BARRIERS	-1.27 Vdc to -1.43 Vdc
7200 TRANSDUCER \ WITH BARRIERS	-1.27 Vdc to -1.43 Vdc
7200 TRANSDUCER \ 11 mm PROBE	-2.96 Vdc to -3.25 Vdc
7200 TRANSDUCER \ 14 mm PROBE	-1.45 Vdc to -1.45 Vdc



453002

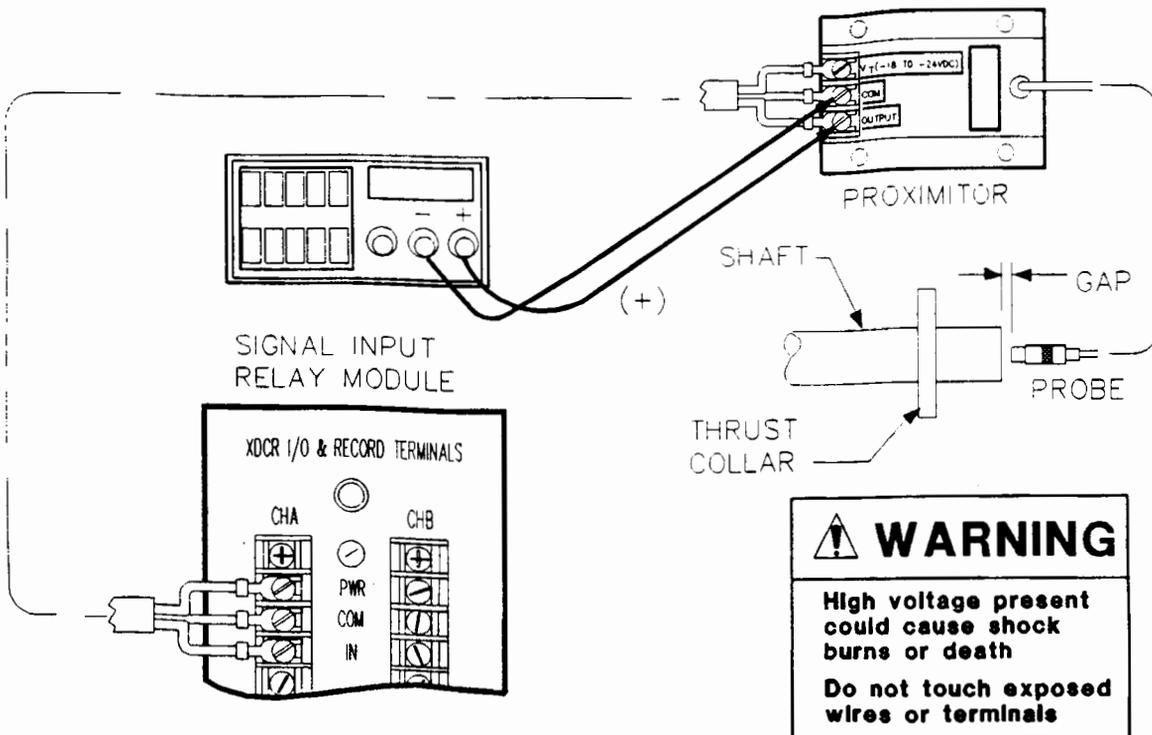
# 31 ZERO VOLTAGE ADJUST

NOTE

WHEN INSTALLING A PROBE IN A MACHINE THE ROTOR MUST BE AT ITS ZERO POSITION AND THE PROBE GAP IS SET ELECTRICALLY TO A ZEROING VOLTAGE DETERMINED BY THE TRANSDUCER USED.

1. ENSURE THAT ROTOR IS SET TO THE DESIRED ZERO POSITION (AGAINST ACTIVE OR INACTIVE BEARING, OR CENTER OF FLOAT ZONE).
2. CONNECT MULTIMETER TO **OUTPUT** AND **COM** TERMINALS ON PROXIMATOR.
3. ADJUST PROBE GAP FOR ZEROING VOLTAGE SPECIFIED BELOW FOR THE TRANSDUCER INSTALLED.

TRANSDUCER	VOLTAGE
3300	-7.0 ±0.5 Vdc
7200	
• WITHOUT EXTERNAL BARRIERS	-10.0 ±0.200 vdc
• WITH EXTERNAL BARRIERS	-9.83 ±0.200 Vdc
• 11 mm	-11.6 ±0.200 Vdc
• 14 mm	-10.0 ±0.200 vdc



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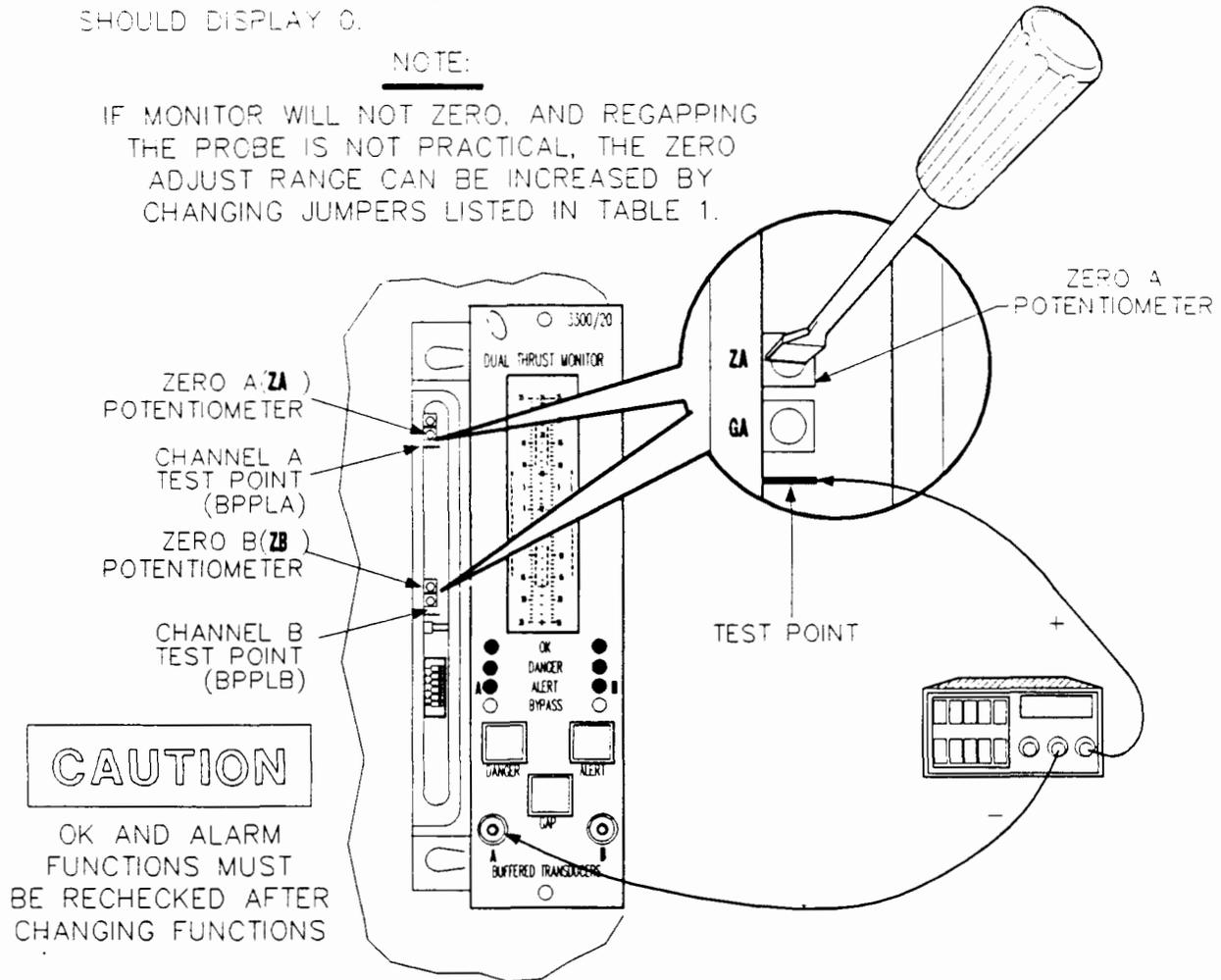
31

ZERO VOLTAGE ADJUST [CONT]

- ON THE MONITOR, SLIDE FRONT PANEL TO RIGHT, CONNECT MULTIMETER TO CHANNEL A TEST POINT BPPLA AND ADJUST CHANNEL A ZERO POTENTIOMETER FOR +2.500 Vdc. MONITOR BARGRAPH SHOULD DISPLAY 0.

NOTE:

IF MONITOR WILL NOT ZERO, AND REGAPPING THE PROBE IS NOT PRACTICAL, THE ZERO ADJUST RANGE CAN BE INCREASED BY CHANGING JUMPERS LISTED IN TABLE 1.



**CAUTION**

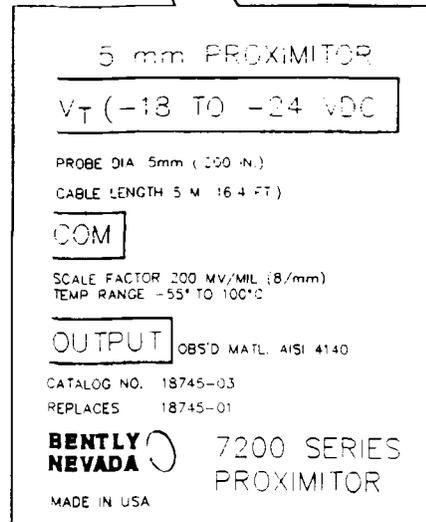
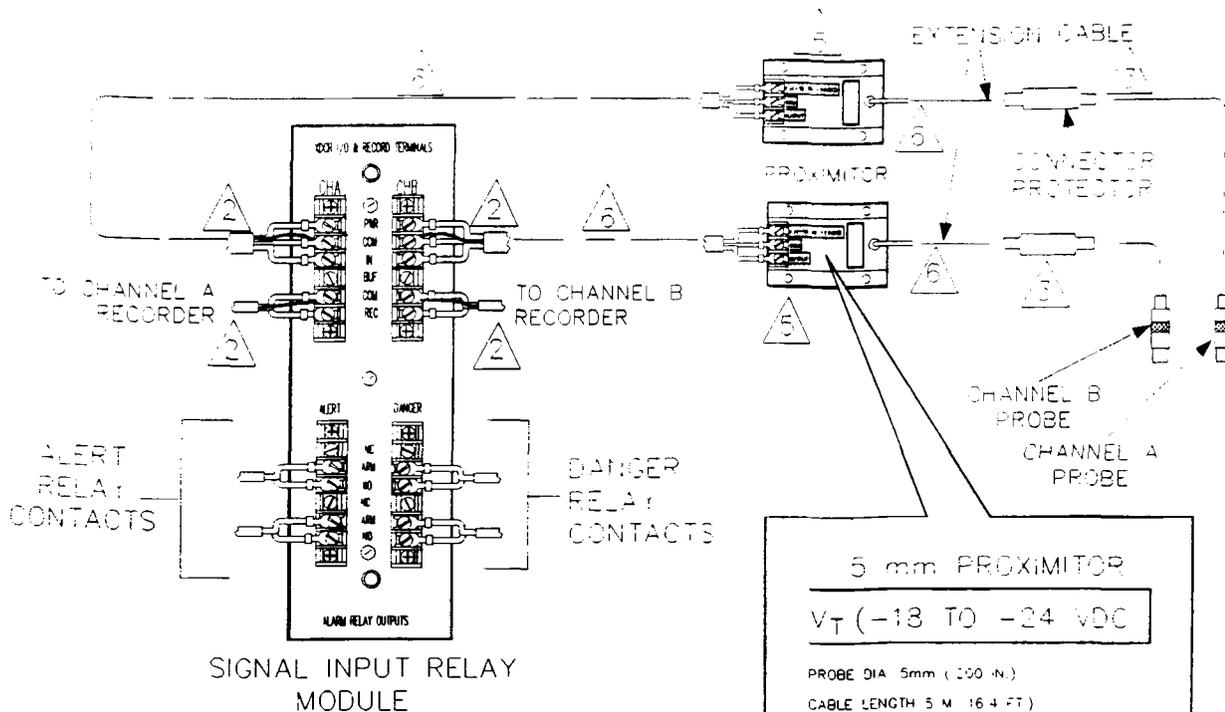
OK AND ALARM FUNCTIONS MUST BE RECHECKED AFTER CHANGING FUNCTIONS

TABLE 1

TRANSDUCER	RANGE	ZERO ADJUSTMENT RANGE	
		FROM	TO
3000	25-0-25 MILS	W3D ( $\pm 2.5$ MILS)	W3B ( $\pm 7.5$ MILS)
7200 WITH/WITHOUT BARRIERS	40-0-40 MILS 1-0-1 mm	W3D ( $\pm 2.5$ MILS) W3D ( $\pm 0.0635$ mm)	W3B ( $\pm 7.5$ MILS) W3B ( $\pm 0.1270$ mm)
7200 WITH 11 mm/ 14 mm PROBE	75-0-75 MILS 2-0-2 mm	W3D ( $\pm 5.0$ MILS) $\rightarrow$ W3C ( $\pm 0.0635$ mm)	W3B ( $\pm 7.5$ MILS) W3D ( $\pm 0.1905$ mm) OR W3B ( $\pm 0.3810$ mm)

## 32

## FIELD WIRING DIAGRAMS



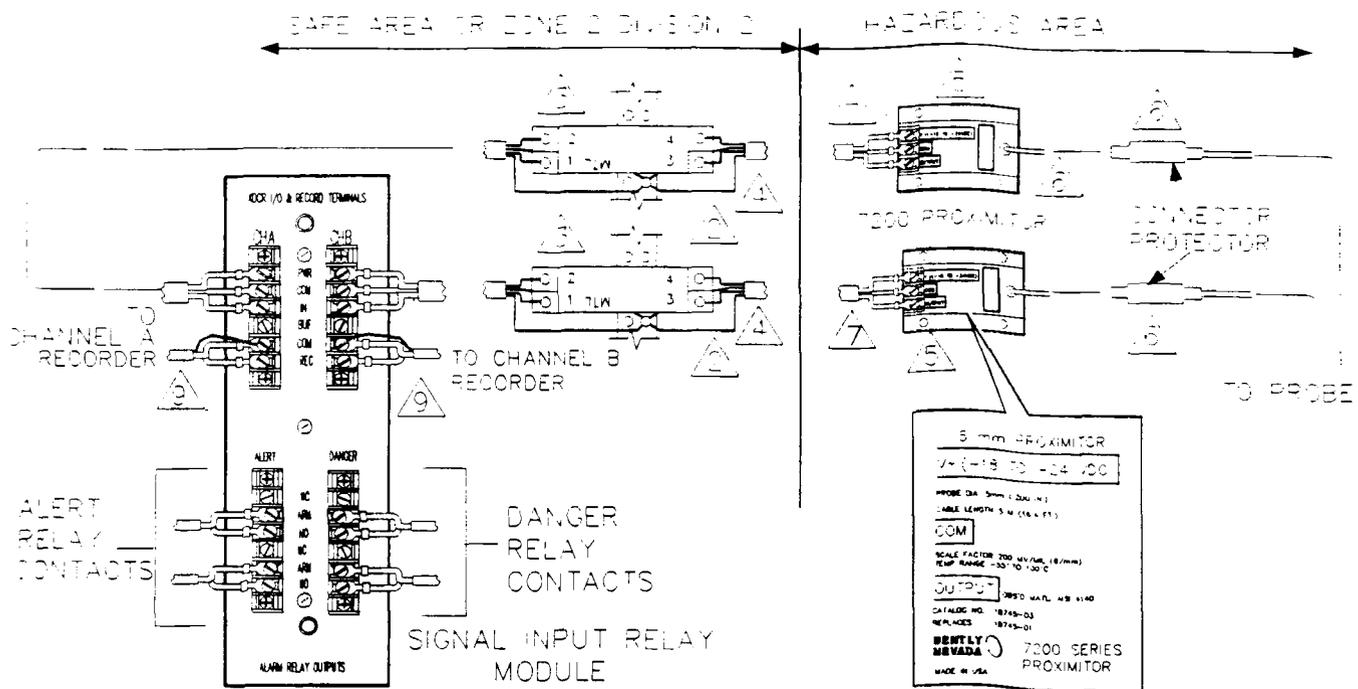
1. WIRING RECOMENDATIONS:  
SIGNAL MODULE TO PROXIMITORS:  
18- TO 22- AWG SOLID OR STRANDED  
3-WIRE SHIELDED WITH INSULATING  
SHEATH.

SIGNAL MODULE TO RECORDER/READOUT:  
18- TO 22- SOLID OR STRANDED, 2-WIRE SHIELDED WITH INSULATING SHEATH.

2. SHIELDS TERMINATED TO SIGNAL MODULE COMMON.
3. TO ELECTRICALLY ISOLATE AND PROTECT COAXIAL CONNECTIONS, USE CON-  
NECTOR PROTECTOR KIT PART NO. 40113-02.
4. TO MINIMIZE GROUND LOOP NOISE PROBLEMS, A SINGLE POINT EARTH  
GROUND (GND) TO SYSTEM COMMON (COM) CONNECTION IS RECOMMENDED.
5. PROXIMITOR CASE MUST BE ELECTRICALLY ISOLATED FROM EARTH GROUND.  
ELECTRICAL ISOLATION: 500 VAC (RMS) MIN. ISOLATION KIT PN 19094-01 MAY  
BE USED TO SATISFY THE ISOLATION REQUIREMENT.
6. MAXIMUM CABLE LENGTH BETWEEN SIGNAL INPUT RELAY MODULE AND PROX-  
IMITOR MUST NOT EXCEED 1000 FEET (300 METRES).

32

## FIELD WIRING DIAGRAMS [CONT.]



## 1. WIRING RECOMMENDATIONS:

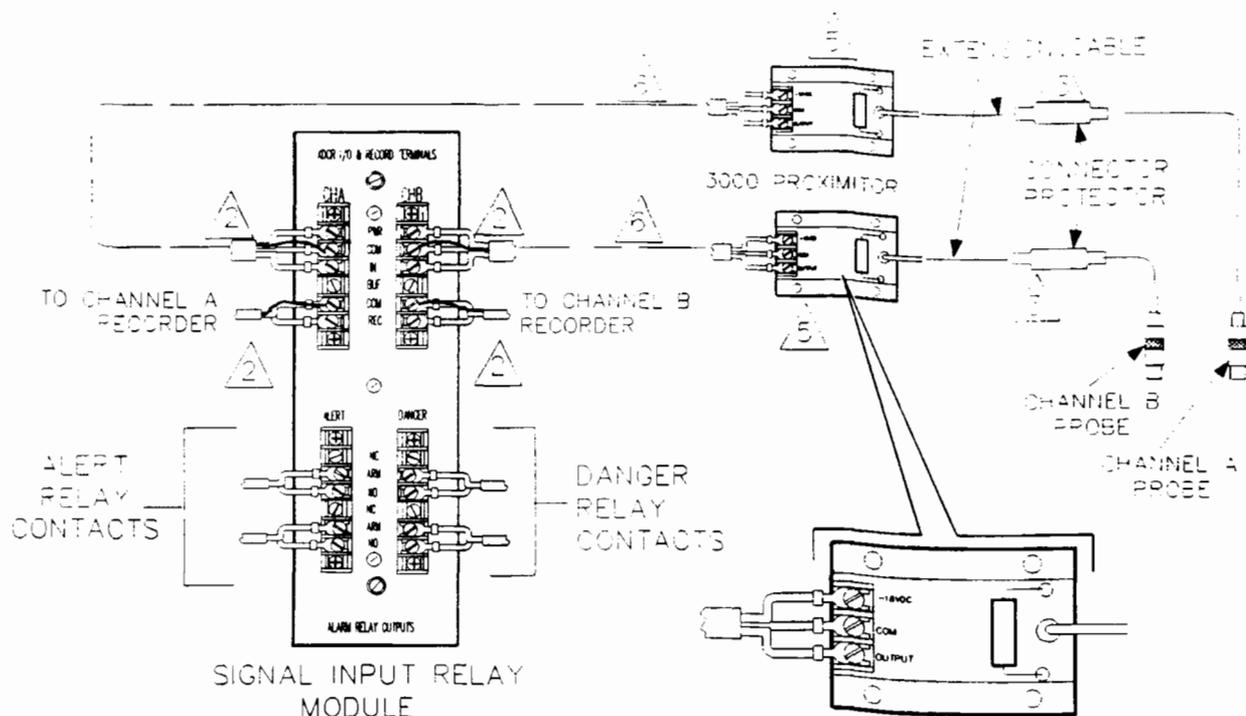
SIGNAL MODULE TO BARRIER-BARRIER TO PROXIMATOR: 14- TO 18-AWG SOLID OR STRANDED, 3 WIRE SHIELDED WITH INSULATING SHEATH  
 SIGNAL MODULE TO RECORDER/READOUT: 18- TO 22- AWG SOLID OR STRANDED, 2-WIRE SHIELDED WITH INSULATING SHEATH.

2. SHIELDS ARE JOINED AS SHOWN TERMINATING AT BARRIER GROUND. SHIELDS SHOULD BE INSULATED.
3. USE MTL SAFETY BARRIER PER DWG BA22000, NOTE 17.
4. BARRIERS ARE MOUNTED TO BARRIER RAIL. BARRIER RAIL IS THE SYSTEM GROUND AND IS USED TO TERMINATE THE POTENTIAL EQUALIZATION BUS. TOTAL EARTH LOOP IMPEDANCE MUST NOT EXCEED 1 OHM.
5. PROXIMATOR CASE MUST BE ELECTRICALLY ISOLATED FROM EARTH GROUND. ELECTRICAL ISOLATION: 500 VAC (RMS) MIN. ISOLATION KIT PART NO. 19094-01 MAY BE USED TO SATISFY THE ISOLATION REQUIREMENT.
6. TO ELECTRICALLY ISOLATE AND PROTECT COAXIAL CONNECTIONS, USE CONNECTOR PROTECTOR KIT PART NO. 40113-02.
7. MAXIMUM CABLE LENGTH BETWEEN BARRIER AND PROXIMATOR MUST NOT EXCEED 1000 FEET (300 METRES).
8. TO MINIMIZE GROUND LOOP NOISE PROBLEMS, A SINGLE POINT EARTH GROUND (GND) TO SYSTEM COMMON (COM) CONNECTION IS RECOMMENDED.
9. RECORDER SHIELDS TERMINATE AT RACK SIGNAL COMMON.
10. BARRIERS LOCATED IN DIVISION 2 OR ZONE 2 HAZARDOUS AREAS MUST BE INSTALLED IN NEMA 4 OR IP 54 OR APPROVED PROTECTIVE HOUSING.
11. MONITORS MUST BE RE-CALIBRATED WITH BARRIERS IN THE LINES.

553202

## 32

## FIELD WIRING DIAGRAMS [CONT.]



## 1. WIRING RECOMMENDATIONS:

SIGNAL MODULE TO PROXIMATORS: 18- TO 22- AWG SOLID OR STRANDED, 3 WIRE SHIELDED WITH INSULATING SHEATH.

SIGNAL MODULE TO RECORDER/READOUT: 18- TO 22- AWG SOLID OR STRANDED, 2-WIRE SHIELDED WITH INSULATING SHEATH.

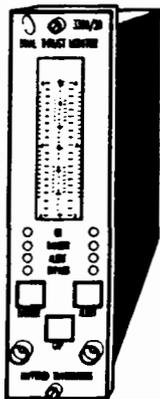
2. SHIELDS TERMINATED TO SIGNAL MODULE COMMON.
3. TO ELECTRICALLY ISOLATE AND PROTECT COAXIAL CONNECTIONS, USE CONNECTOR PROTECTOR KIT PART NO. 40113-02.
4. TO MINIMIZE GROUND LOOP NOISE PROBLEMS, A SINGLE POINT EARTH GROUND (GND) TO SYSTEM COMMON (COM) CONNECTION IS RECOMMENDED.
5. PROXIMATOR CASE MUST BE ELECTRICALLY ISOLATED FROM EARTH GROUND. ELECTRICAL ISOLATION: 500 VAC (RMS) MIN. ISOLATION KIT PART NO. 19094-01 MAY BE USED TO SATISFY THE ISOLATION REQUIREMENT.
6. MAXIMUM CABLE LENGTH BETWEEN SIGNAL INPUT RELAY MODULE AND PROXIMATOR MUST NOT EXCEED 1000 FEET (300 METRES).

# 33 RECOMMENDED SPARE PARTS

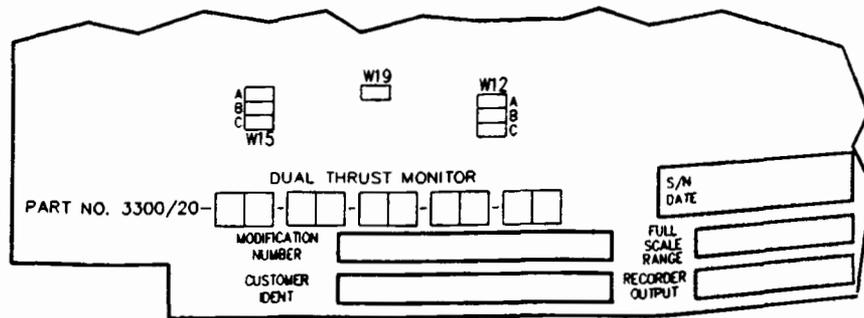
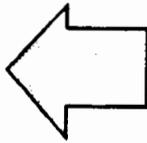
QTY PER MON	DESCRIPTION	REPLACEMENT PART NUMBER
1	FRONT PANEL ASSEMBLY	82362-01 *
1	MONITOR CIRCUIT ASSEMBLY	79482-01 *
1	SIGNAL INPUT RELAY MODULE	
	NO RELAY	81544-01 *
	EPOXY SEALED RELAY	81545-01 *
	QUAD EPOXY SEALED	84152-01 *
	HERMETICALLY SEALED RELAY	81546-01 *
	NO RELAY, WITH INTERNAL BARRIERS	84345-03 *
	EPOXY SEALED RELAY, WITH INTERNAL BARRIERS	84345-02 *
	HERMETICALLY SEALED RELAY, WITH INTERNAL BARRIERS	84345-01 *

\* TO ORDER REPLACEMENT PARTS, SPECIFY THE COMPLETE CATALOG NUMBER, 3300/20 - ----- , AND THE REPLACEMENT PART NUMBER.

IF THE MONITOR HAS BEEN MODIFIED, SPECIFY THE MODIFICATION NUMBER ON THE PARTS ORDER. CUSTOMER MUST SET PROGRAMMABLE OPTIONS - MONITOR SHIPPED AS SHOWN IN SECTION 4 OF THIS MANUAL. IF IN DOUBT ABOUT THE PART NUMBER, CALL YOUR BENTLY NEVADA CORPORATION REPRESENTATIVE BEFORE ORDERING.



3300/20



MONITOR IDENTIFICATION LABEL

553301

**34****SPECIFICATIONS****INPUT**

<b>Signal Input</b>	Two channels, proximity input, 10k $\Omega$ input impedance
<b>Signal Scale Factor</b>	2 00mV/mil (8V/mm) with 3300 or 7200 with 5mm/8mm probe 100 mV/mil (4V/mm) with 7200 with 11mm/14mm probe

**SIGNAL CONDITIONING**

<b>Monitor Range</b>	Full scale meter range selected per Option Table.
<b>Accuracy</b>	$\pm 0.33\%$ of full scale error typical at 77 $^{\circ}$ F (25 $^{\circ}$ C) $\pm 1\%$ of full scale error maximum at 77 $^{\circ}$ F (25 $^{\circ}$ C)

**Response To Step Change**

See Table 1 On Following Page

**ALARMS**

<b>Alarm Set Points</b>	Alert/Danger alarm levels (adjustable from 0 to 100% of full scale)
<b>Alarm Delay</b>	Alarm delay times are user-programmable per options, plus time delay of signal averaging

**DISPLAYS**

<b>Meter</b>	LCD bargraph, dual scale with outside scales marked per monitor full scale frequency range and center scale marked for probe gap voltage at 1.6% resolution.
<b>LEDs</b>	Green LEDs annunciate transducer OK condition, red LEDs annunciate DANGER, ALERT, and BYPASS conditions.
<b>Meter Time Constant</b>	Response time is user selectable, See Table 2 on following page

**CONTROLS**

<b>Front Panel</b>	Front panel switches (3) for reading ALERT and DANGER setpoint levels, and for reading probe Gap voltage
<b>Internal</b>	Switches on circuit board for setpoint adjustment, Danger Bypass, Channel Bypass and thrust direction
<b>External</b>	External remote controls: Reset, Inhibit, and setpoint adjust ( $\uparrow$ and $\downarrow$ )

**OUTPUT**

<b>Recorder</b>	Output proportional to selected full scale monitor range and protected against continuous short circuit to ground: + 4 to + 20mA, 12 V compliance + 1 to + 5 Vdc, 100-ohm output impedance 0 to -10 Vdc, 100-ohm output impedance
<b>Transducer Power</b>	-24 Vdc or -18 Vdc determined by transducer option selected in power supply, short-circuit protected
<b>Alarms &amp; OK</b>	Relay drives for alarms (ALERT and DANGER) and monitor transducer OK
<b>Relay Contact Rating</b>	Dual Relays: 5A @120 VAC 50/60 Hz 5A @ 28 VDC Quad Relays: 0.6A @120 VAC 50/60 Hz 2A @ 30 VDC
<b>Temperature</b>	Operating: +32 $^{\circ}$ F to +149 $^{\circ}$ F (0 $^{\circ}$ C to +65 $^{\circ}$ C) Storage: -40 $^{\circ}$ F to +185 $^{\circ}$ F (0 $^{\circ}$ C to +85 $^{\circ}$ C)
<b>Humidity</b>	0 to 95%, noncondensing

## 34

## SPECIFICATIONS [CONT]

SIGNAL RESPONSE TIME

TO REDUCE THE MONITOR'S SUSCEPTIBILITY TO AXIAL VIBRATION AND SHAFT RUNOUT, THE SIGNAL CONDITIONING PERFORMS A RUNNING AVERAGE OF THE SHAFT POSITION. THIS AVERAGE CAUSES STEP CHANGES IN AXIAL VIBRATION TO BE INTEGRATED OVER TIME. THE CONSTANT CHANGES ACCORDING TO THE MONITOR TIME DELAY AS SHOWN IN TABLE 1.

TABLE 1 RESPONSE TO STEP CHANGE

ALARM TIME DELAY	SIGNAL CONDITION RESPONSE TIME CONSTANT *
0.1 SEC	81 mS
1 SEC	180 mS
3 SEC	639 mS
6 SEC	1294 mS

METER RESPONSE

THE METER RESPONSE TIME CAN BE SELECTED TO BE FAST OR SLOW. WITH A FAST RESPONSE, THE METER WILL FOLLOW THE THRUST POSITION EXACTLY AS SEEN BY THE MONITOR. IN INSTALLATIONS WHERE THERE IS A LARGE AC COMPONENT OF THE THRUST SIGNAL, THIS WILL CAUSE APPARENT METER JITTER. SELECTING THE SLOW METER RESPONSE WILL REDUCE THE METERS RESPONSE TO RAPIDLY CHANGING SIGNALS BUT DOES NOT AFFECT THE MONITOR'S RECORDER OR ALARM CIRCUITS.

TABLE 2 METER TIME CONSTANT \*

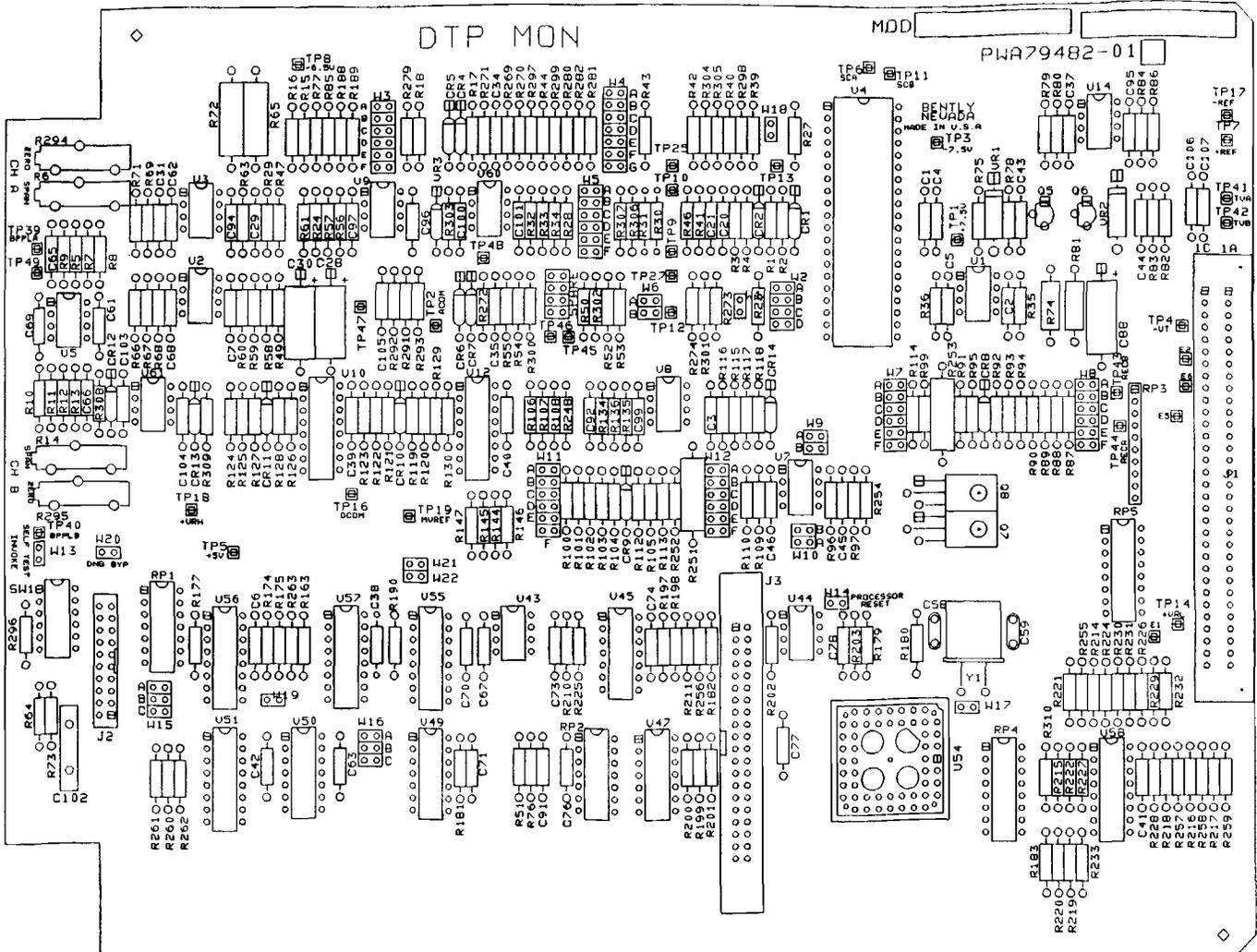
TIME DELAY OPTION	METER RESPONSE OPTION	
	FAST	SLOW
0.1 SEC	81 mS	639 mS
1 SEC	180 mS	967 mS
3 SEC	639 mS	1294 mS
6 SEC	1294 mS	1622 mS

\* THE TIME CONSTANT APPROXIMATES A SIMPLE RC RESPONSE CURVE WHERE ONE TIME CONSTANT= 63% OF FINAL VALUE. FIVE TIME CONSTANTS= 99% OF FINAL VALUE.

<b>35</b>	<b>SCHEMATICS &amp; PWA DRAWINGS</b>
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DRAWING TITLE . . . . .	DRAWING NO. . . . .	NO. OF SHEETS
PWA DUAL THRUST MONITOR . . . . .	.79482 . . . . .	SHEET 1 OF 1
SCHEMATIC DIAGRAM DUAL THRUST MONITOR . . . . .	.79483 . . . . .	SHEETS 7 OF 7
3300 SIGNAL NAMES . . . . .	. . . . .	SHEET 1 OF 1
SCHEMATIC DIAGRAM DUAL RADIAL VIBRATION FRONT PANEL . . . . .	.78413 . . . . .	SHEET 1 OF 1
ASSEMBLY SIRM EPOXY . . . . .	.78462 . . . . .	SHEET 3 ONLY
SCHEMATIC DIAGRAM SIRM EPOXY . . . . .	.78463 . . . . .	SHEETS 2 OF 2
SCHEMATIC DIAGRAM QUAD RELAY . . . . .	.83730 . . . . .	SHEETS 2 OF 2

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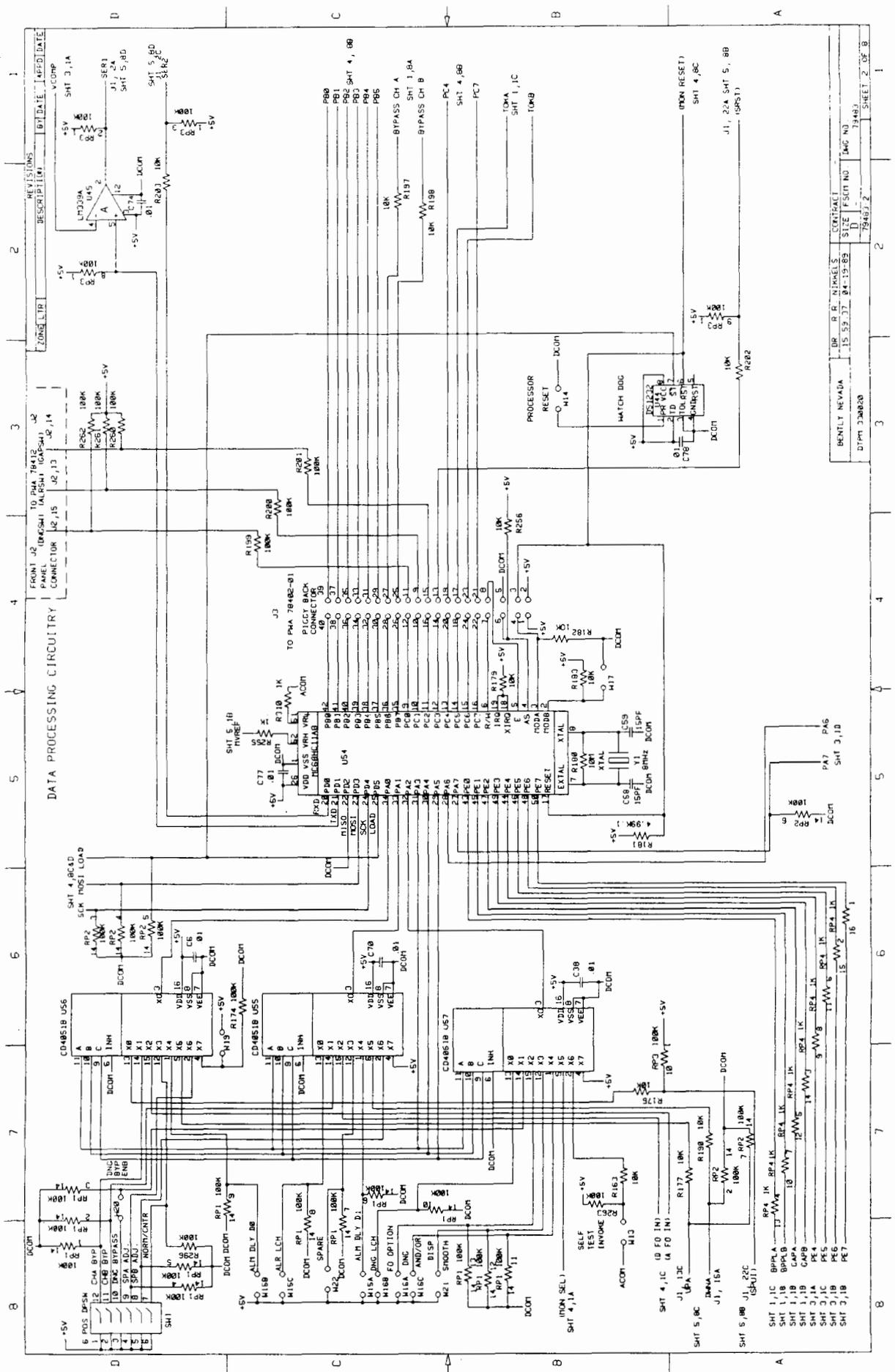


DTP MON

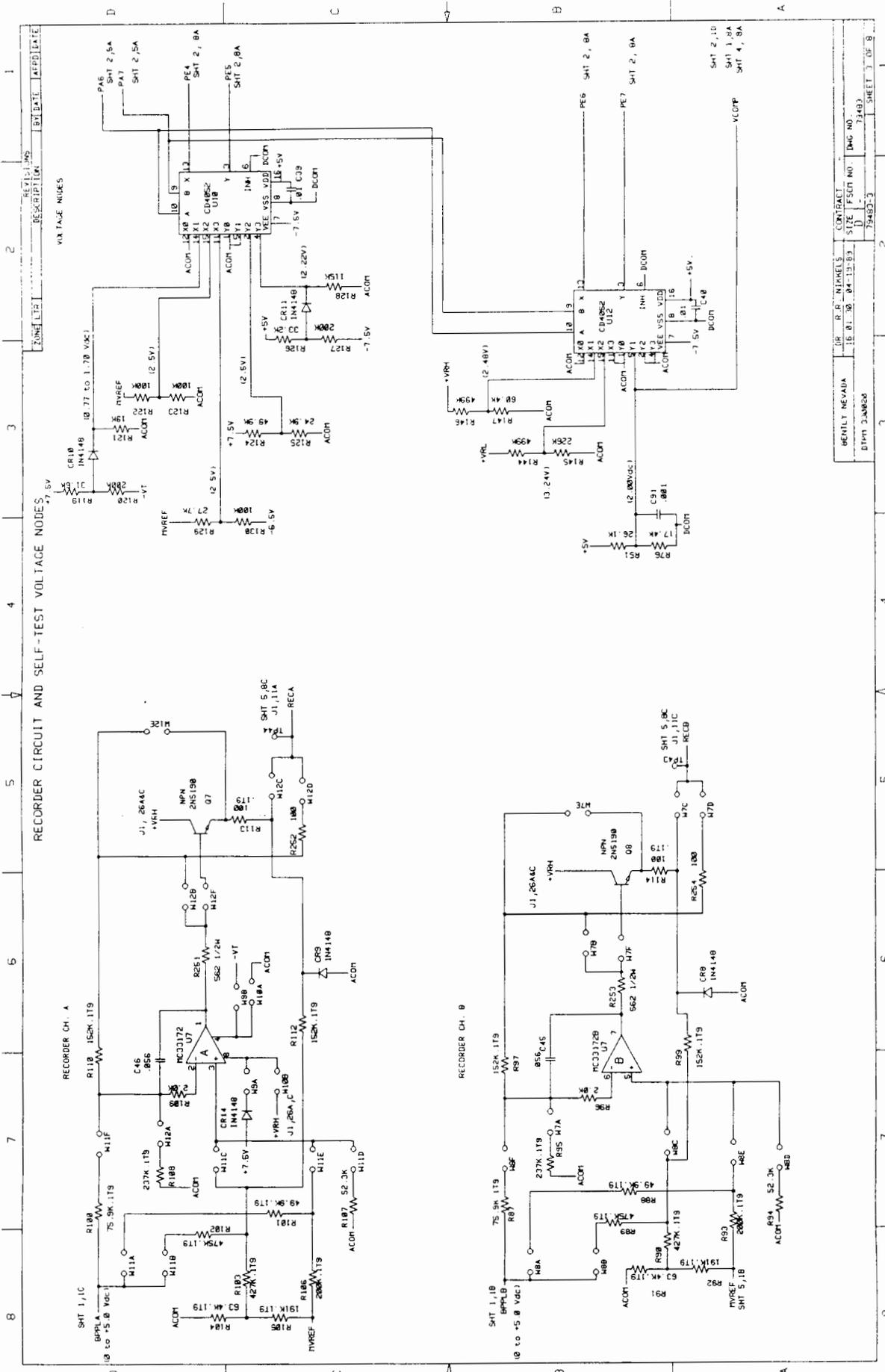
MDD

PWA79482-01

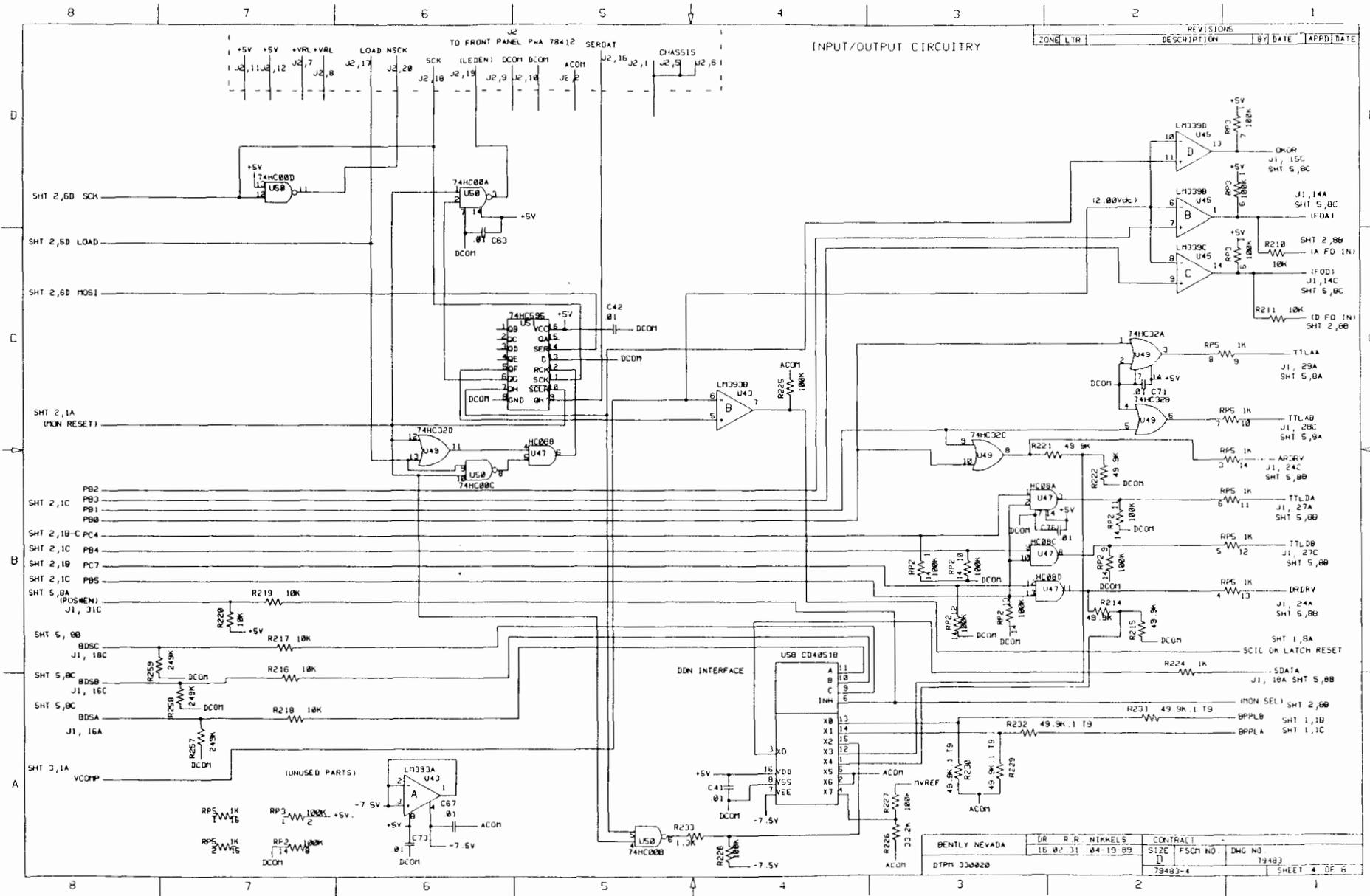




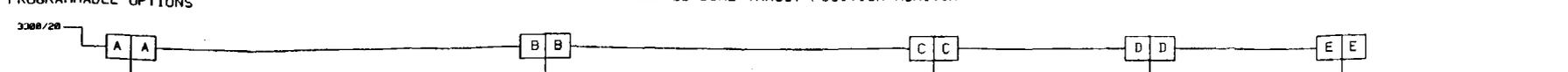
SCHMATIC DIAGRAM DUAL THRUST 79483 SH 2 OF 8



SCHEMATIC DIAGRAM DUAL THRUST 79483 SH 3 OF 8







FULL SCALE RANGE				
OPT	RANGE	JUMPER		
		11mm & 14mm 100mV/MIL	5mm & 8mm 200mV/MIL	3000 200mV/MIL
01	25-0-25 MILS	W2C, W3A W4X, W5X: NJ	W2A, W2B, W3F W4E, W5B	W2A, W2B, W3D W4E, W5B
02	30-0-30 MILS	W2C, W3E W4F, W5A	W2A, W3E W4F, W5A	W2A, W3D W4E, W5B
03	40-0-40 MILS	W2C, W3B W4E, W5B	W2A, W3D W4E, W5B	W2A, W3D W4E, W5B
05	50-0-50 MILS	W2A, W2B, W3B W4E, W5B	W2C, W3F W4E, W5B	W2C, W3B W4E, W5B
06	75-0-75 MILS	W2B, W3D W4E, W5B	W2C, W3F W4E, W5B	W2C, W3B W4E, W5B
11	0.5-0-0.5 mm	W2A, W2B, W3B W4E, W5B	W2C, W3F W4E, W5B	W2C, W3B W4E, W5B
12	1.0-0-1.0 mm	W2C, W3B W4E, W5B	W2A, W3D W4E, W5B	W2C, W3B W4E, W5B
13	2.0-0-2.0 mm	W2A, W3C W4E, W5B	W2A, W3D W4E, W5B	W2C, W3B W4E, W5B

JUMPER FUNCTION: W2A - W2D : SCIC GAIN SELECTION  
W3A - W3F : ZEROING ADJUSTMENT RANGE  
W4E, W4F, W5A, W5B : ATTENUATOR SELECTION

TRANSDUCER OPTION		
OPT	RANGE	JUMPER
01	7200 - 5mm and 8mm (200 mV/mil)	WITHOUT BARRIERS W4A, W5A, W5D, W4G WITH BARRIERS W4D, W5C, W5F
02	7200 - 11mm PROX (100mV/mil)	W4B, W5B, W5E, W4G
03	7200 - 14mm PROX (100mV/mil)	W4A, W5B, W5E, W4G
04	3000 PROX (200 mV/mil)	W4C, W4C

JUMPER FUNCTION: W4A - W4D : TRANSDUCERS SELECTION  
W5A-W5F, W4C : OK LIMIT SELECTION

ALARM RELAY OPTIONS	
00	NONE
01	SAMP, EPOXY RELAY
02	SAMP, HERMETIC RELAY

APPROVALS OPTION	
00	NONE
01	CSA
02	BASEEFA
03	CITY OF LA

BARRIER OPTIONS		
00	NONE	ALL TRANSDUCER OPTIONS
01	WITH BARRIER	5mm & 8mm ONLY

SEE OPTION BLOCK 00 FOR JUMPER SELECTION

LAST USED	NOT USED
C107 C113 E6 J3 Q8 R310 RPS S41 TP49 U61 W22 Y1	RP2 PINS 0 & 14 RP3 PINS 4 & 1 RPS PINS 1 & 16 RPS PINS 2 & 15 U43 A

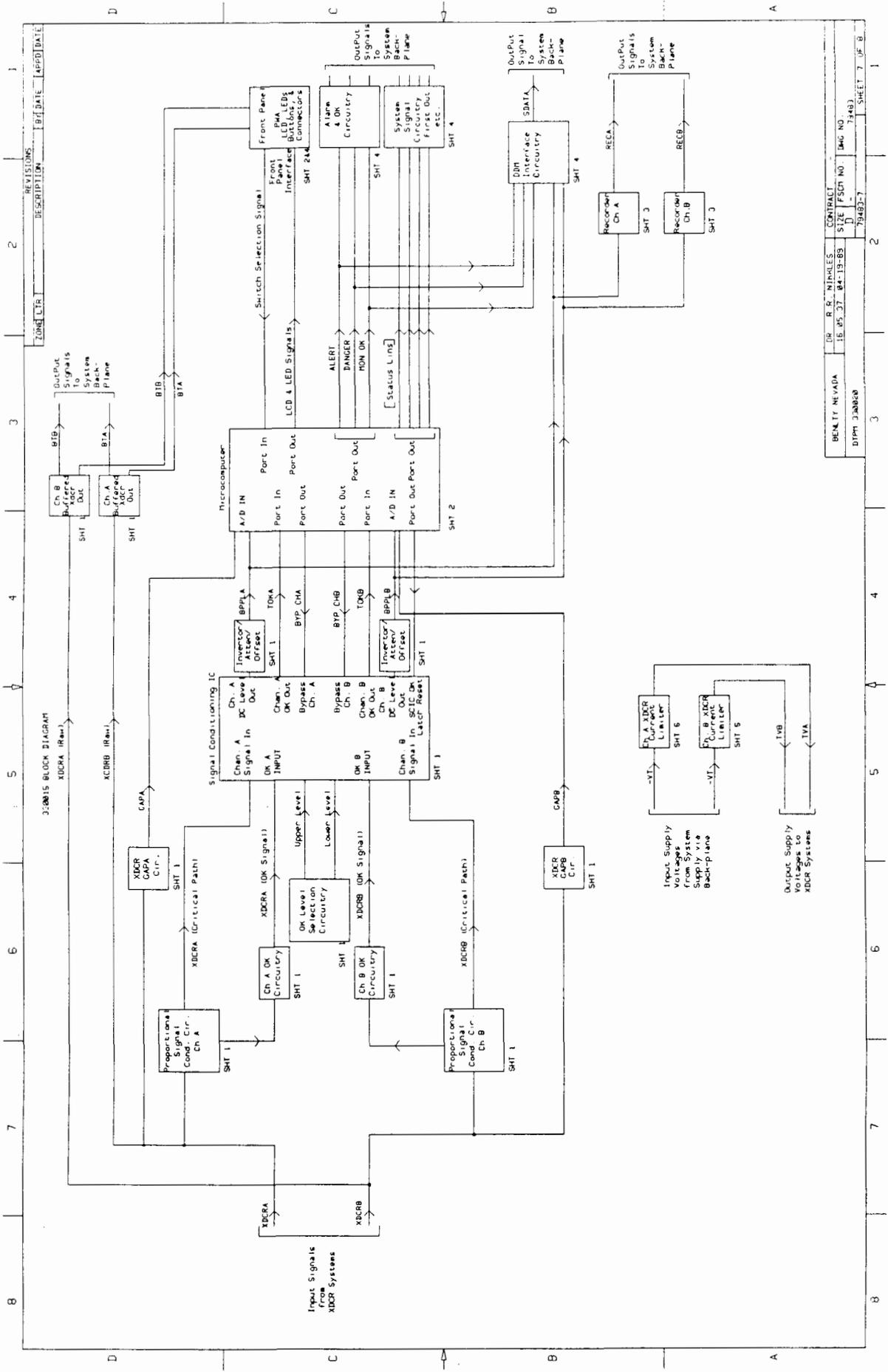
PROGRAMMABLE OPTIONS											
FIRST OUT		ALARM DELAY		NOT-OK MODE		ALERT MODE		DANGER MODE		DANGER BYPASS	
ENABLED		1 SEC		NON-LATCHING		LATCHING MODE		LATCHING MODE		DISABLED	
ENABLED	W16A	0.1 SEC.	NJ	LATCHING	W19	LATCHING MODE	W15C	LATCHING MODE	W16B	ENABLED	W20
DISABLED	NJ	1 SEC.	W15B	NON-LATCHING	NJ	NON-LATCHING MODE	NJ	NON-LATCHING MODE	NJ	DISABLED	NJ
		3 SEC. W15A									
		6 SEC. W15A, W15B									

VOLTAGE TABLE					
DEVICE NAME	PIN NUMBER	VOLTAGE LEVEL	DEVICE NAME	PIN NUMBER	VOLTAGE LEVEL
U1, U2, U8	8	+7.5 V.	U4	28	+7.5 V.
	4	-7.5 V.		27	ACOM
	8	+7.5 V.		32	-7.5 V.
U3, U14	4	-Vt	U10, U12, U5B	16	+5 V.
	8	+5 V.		8	DCOM
U44	4	DCOM	U5, U9, U61	7	-7.5 V.
	3	+5 V.		8	+VRH
U45	12	DCOM	U43	4	-7.5 V.
	14	+5 V.		8	+5 V.
U47, U49, U5B	7	DCOM	U60	4	-7.5 V.
	16	+5 V.		8	+VRH (+12 ZENER)
U51	8	DCOM	U7	4	-Vt
	8	DCOM		8	JUMPER PROGRAMMABLE
U54	26	+5 V.			
	1	DCOM			
U55, U56, U57	16	+5 V.			
	7 AND 8	DCOM			
U7	8	+7.5V OR +VRH			
	4	-Vt OR ACOM			

RECORDER OUTPUTS			THRUST DIRECTION		DANGER VOTING	
SHIPPED AS : +4 TO +20 mA			NORMAL TOWARDS		OR RELAY DRIVE	
+4 TO +20 mA	W7A, W7C, W7E, W7F W8B, W8C, W10A, W10B W11B, W11C, W12A, W12C W12E, W12F		NORMAL AWAY	NJ	AND RELAY DRIVE	W16C
			NORMAL TOWARDS	W1 - CHA W1B - CH B	AND RELAY DRIVE	NJ
0 TO -10 Vdc	W7D, W7D, W8D, W8F W8A, W8B, W11D, W11F W12B, W12D					
+1 TO +5 Vdc	W7B, W7D, W8A, W8E W10A, W10B, W11A, W11E W12B, W12D					

15. ( ) WITH SIGNAL NAME DENOTES ACTIVE LOW.
  14. DELETED
  13. FRONT PANEL DNG #78413
  12. BACK-PLANE DNG #78473
  11. THERE'S AN OPTION TABLE IN THE P1T SPEC. AND DNG 330020.
  10. THIS SCHEMATIC REPRESENTS PHA 79482-01.
  9. SCHEMATIC DISK #79489
  8. P AND T SPEC. #154532
  7. TYPICAL VOLTAGE VALUES ARE LISTED IN "1". REF TO P AND T SPEC FOR THE CORRECT VALUES AND TOLERANCES.
  6. "NJ" INDICATES THAT NO JUMPER IS INSTALLED.
  5. THE ILLEGAL OPTIONS HAVE BEEN CROSSED-OUT.
  4. EACH BLOCK IS A SET OF JUMPERS AND ALL OF THE JUMPERS SHOULD BE REMOVED FOR THAT OPTION BEFORE THE CONFIGURATION IS SELECTED.
- NOTES: UNLESS OTHERWISE SPECIFIED

DISPLAY SMOOTHING	
FAST	
FAST	NJ
SLOW	W21



REV	DESCRIPTION	DATE
1	INITIAL	10/1/83
2	REVISED	10/1/83
3	REVISED	10/1/83
4	REVISED	10/1/83
5	REVISED	10/1/83
6	REVISED	10/1/83
7	REVISED	10/1/83
8	REVISED	10/1/83

DR - R. R. NIPPLES	CONTRACT
16 05 37 84-19-B5	SIZE / FSDN NO
79483-7	79483
79483-7	SHEET 7 OF 8

3300/20 SIGNAL NAMES

REVISIONS			
ZONE	LTR	DESCRIPTION	BY DATE

ABBREVIATIONS OF THE SIGNALS USED IN THE SCHEMATIC

SIGNALS ON THE SCHEMATIC	COMPLETE SIGNAL NAME	SIGNALS ON SCHEMATIC	COMPLETE SIGNAL NAME
ACDR	Analog Common	IPOS(EN)	Reck Slot Position Enable
ACDR A	Transducer Common Channel A	RECA	Recorder Channel A
ACDR B	Transducer Common Channel B	RECB	Recorder Channel B
ALM DLY D0	Alarm Delay Digit 0	SPA ADJ	Set-Point Channel A Adjustment
ALM DLY D1	Alarm Delay Digit 1	SPB ADJ	Set-Point Channel B Adjustment
ALR LCH	Alert Latching	SCIC OK LATCH RESET	Signal Conditioning IC OK Latch Reset Command
ARDRV	Alert Relay Drive	SCK	Serial Clock
(A FO IN)	Alert First Out Input	SDATA	DDM Static Data
(ALRSH)	Alert Switch	SER1	Serial Communications Transmit
BDSA	Buffered DDM Static Data Select Line A	SER2	Serial Communications Receive
BDSB	Buffered DDM Static Data Select Line B	(SPUI)	System Power Up Inhibit
BDS C	Buffered DDM Static Data Select Line C	(SRST)	System Reset
BPLA	Buffered Proportional Channel A	TOKA	Transducer OK Channel A
BPLB	Buffered Proportional Channel B	TOKB	Transducer OK Channel B
BTA	Buffered Transducer Signal Channel A	TTLA	TTL Alert Drive Channel A
BTB	Buffered Transducer Signal Channel B	TTLB	TTL Alert Drive Channel B
BYPASS CH A or BYP CHA	Channel A Bypass	TTLBA	TTL Danger Drive Channel A
BYPASS CH B or BYP CHB	Channel B Bypass	TTLBB	TTL Danger Drive Channel B
CH A BYPASS or CHA BYP	Channel A Bypass	VCOMP	Comparator Threshold Voltage (+2 Volts)
CH B BYPASS or CHB BYP	Channel B Bypass	UPA	UP Arrow
CHASSIS	Chassis Common	XDCRA	Transducer Signal Channel A
COMMONA	Transducer Common Channel A	XDCRB	Transducer Signal Channel B
COMMONB	Transducer Common Channel B		
DCOM	Digital Common		
DNG AND/OR	Danger And/Or Option	+5V or +5Vdc	+5 Volts Digital Supply
DNG BYPASS or DNG BYP	Danger Bypass	+7.5V or +7.5Vdc	+7.5 Volts Analog Supply
DNG BYP BYP	Danger Bypass Bypass	+VRH	High Rough Supply Voltage
DNG LCH	Danger Latching	+VRL	Low Rough Supply Voltage
(DNCSH)	Danger Switch	+REF	+5 Volts Reference from System Supply
DRDRV	Danger Relay Drive	-REF	Common for +REF
DRNA	Danger Arrow	-VT or -VT	Transducer/Analog Supply
(D FO IN)	Danger First Out Input	-6.5V or -6.5Vdc	-6.5 Volts Reference
(DFA)	Alert First Out Drive	-7.5V or -7.5Vdc	-7.5 Volts Analog Supply
(DFO)	Danger First Out Drive		
FO OPTION	First Out Option		
CAPA	Transducer Cap Signal Channel A		
CAPB	Transducer Cap Signal Channel B		
(GAPSH)	Cap Switch		
LOAD	Shift Register Latches Load Command		
(LEDEN)	LED Drive Enable		
(MON RESET)	Monitor Reset		
(MON SEL)	Monitor Select		
MOSI	Master Out/ Slave In		
MVREF	+5 Volts Voltage Reference		
NORM/CNTR	Normal/Counter Set-Point Adjustment Selection		
NSCK	Inverted Serial Clock		
OKOR	Monitor OK Bus Drive		
PA	Port A		
PB	Port B		
PC	Port C		
PD	Port D		
PE	Port E		

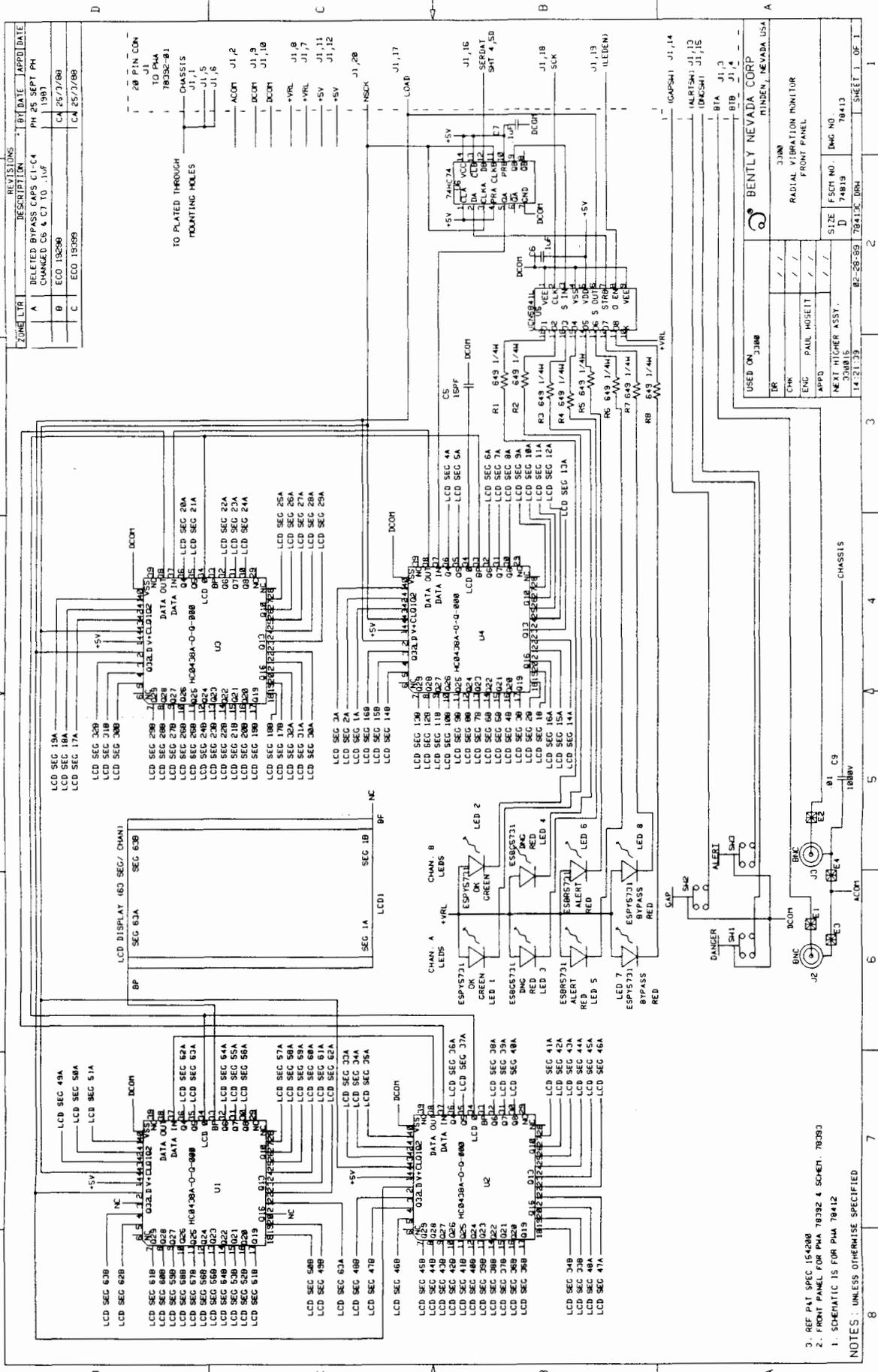
14. A SIMILAR ABBR. TABLE IS THE P AND T SPEC.

NOTES: UNLESS OTHERWISE SPECIFIED

BENTLY NEVADA	DR R.R. NIKKELS	CONTRACT	
	16.06.57 04-19-89	SIZE	FSCIT NO.
		D	79483
330020 DFP		79483-B	SHEET 8 OF 8

**3300/20 SCHEMATIC SIGNAL NAMES  
ABBREVIATIONS OF THE SIGNALS USED IN THE SCHEMATIC**

SIGNALS ON THE SCHEMATIC	COMPLETE SIGNAL NAME	SIGNALS ON THE SCHEMATIC	COMPLETE SIGNAL NAME
ACOM	ANALOG COMMON	MVREF	+5VOLTS VOLTAGE REFERENCE
ACOMA	TRANSDUCER COMMON CHANNEL A	NSCK	INVERTED SERIAL CLOCK
ACOMB	TRANSDUCER COMMON CHANNEL B	OKOR	MONITOR OK BUS DRIVE
ALM DLY D0	ALARM DELAY DIGIT 0	(POSWEN)	RACK SLOT POSITION ENABLE
ALM DLY D1	ALARM DELAY DIGIT 1	RECA	RECORDER CHANNEL A
ALR LCH	ALERT LATCHING	RECB	RECORDER CHANNEL B
ARDRV	ALERT RELAY DRIVE	SPA ADJ	SETPOINT CHANNEL A ADJUSTMENT
(A FO IN)	ALERT FIRST OUT INPUT	SPB ADJ	SETPOINT CHANNEL B ADJUSTMENT
(ALRSW)	ALERT SWITCH	SCIC OK LATCH RESET	SIGNAL CONDITIONING IC OK
BDSA	BUFFERED DDM STATIC DATA SELECT LINE A		LATCH RESET COMMAND
BDSB	BUFFERED DDM STATIC DATA SELECT LINE B	SCK	SERIAL CLOCK
BDSC	BUFFERED DDM STATIC DATA SELECT LINE C	SDATA	DDM STATIC DATA
BPPLA	BUFFERED PROPORTIONAL CHANNEL A	SER1	SERIAL COMMUNICATIONS TRANSMIT
BPPLB	BUFFERED PROPORTIONAL CHANNEL B	SER2	SERIAL COMMUNICATIONS RECEIVE
BTA	BUFFERED TRANSDUCER SIGNAL CHANNEL A	(SPUI)	SYSTEM POWER UP INHIBIT
BTB	BUFFERED TRANSDUCER SIGNAL CHANNEL B	(SRST)	SYSTEM RESET
BYPASS CH A OR BYP CHA	CHANNEL A BYPASS	TOKA	TRANSDUCER OK CHANNEL A
BYPASS CH B OR BYP CHB	CHANNEL B BYPASS	TOKB	TRANSDUCER OK CHANNEL B
CH A BYPASS OR CHA BYP	CHANNEL A BYPASS	TTLAA	TTL ALERT DRIVE CHANNEL A
CH B BYPASS OR CHB BYP	CHANNEL B BYPASS	TTLAB	TTL ALERT DRIVE CHANNEL B
CHASSIS	CHASSIS COMMON	TTLDA	TTL DANGER DRIVE CHANNEL A
COMMONA	TRANSDUCER COMMON CHANNEL A	TTLDB	TTL DANGER DRIVE CHANNEL B
COMMONB	TRANSDUCER COMMON CHANNEL B	VCOMP	COMPARATOR THRESHOLD VOLTAGE (+2VOLTS)
DCOM	DIGITAL COMMON	UPA	UP ARROW
DNG AND/OR	DANGER AND/OR OPTION	XDCRA	TRANSDUCER SIGNAL CHANNEL A
DNG BYPASS OR DNG BYP	DANGER BYPASS	XDCRB	TRANSDUCER SIGNAL CHANNEL B
DNG BYP BYP	DANGER BYPASS BYPASS		
DNG LCH	DANGER LATCHING	+5V OR +5VDC	+5VOLTS DIGITAL SUPPLY
(DNGSW)	DANGER SWITCH	+7.5V OR +7.5 VDC	+7.5VOLTS ANALOG SUPPLY
DRDRV	DANGER RELAY DRIVE	+VRII	HIGH ROUGH SUPPLY VOLTAGE
DMNA	DANGER ARROW	+VRL	LOW ROUGH SUPPLY VOLTAGE
(D FO IN)	DANGER FIRST OUT INPUT	+REF	+5VOLTS REFERENCE FROM SYSTEM SUPPLY
(FOA)	ALERT FIRST OUT DRIVE	-REF	COMMON FOR +REF
(FOD)	DANGER FIRST OUT DRIVE	-VT OR -Vt	TRANSDUCER/ANALOG SUPPLY
FO OPTION	FIRST OUT OPTION	-6.5V OR -6.5VDC	-6.5 VOLTS REFERENCE
GAPA	TRANSDUCER GAP SIGNAL CHANNEL A	-7.5 OR -7.5VDC	-7.5 VOLTS ANALOG SUPPLY
GAPB	TRANSDUCER GAP SIGNAL CHANNEL B		
(GAPSW)	GAP SWITCH		
LOAD	SHIFT REGISTER LATCHES LOAD COMMAND	PA_	PORT A_
(LEDEN)	LED DRIVE ENABLE	PB_	PORT B_
OVER/UND	OVER/UNDER SETPOINT ADJUSTMENT	PC_	PORT C_
(NORMAL COUNTER)	SELECTION	PD_	PORT D_
(MON RESET)	MONITOR RESET	PE_	PORT E_
(MON SEL)	MONITOR SELECT		
MOSI	MASTER OUT/SLAVE IN		



ZONE	LTR	DESCRIPTION	BY	DATE	APPROVAL
A		DELETED BYPASS CAPS C1-C4	PH	25 SEPT 1987	
B		CHANGED C5 & C7 TO .1UF	EC	1982-88	
C		ECO 1982-88	CA	25/7/88	
		ECO 1982-88	CA	25/7/88	

USED ON: 3388	
DR	3388
ENG	PAIL HOSSETT
APPD	
SIZE	FSCR NO. DMC NO.
	D 74819 78413
	3388B
	14.21.39
	82-28-59 78413C DRH

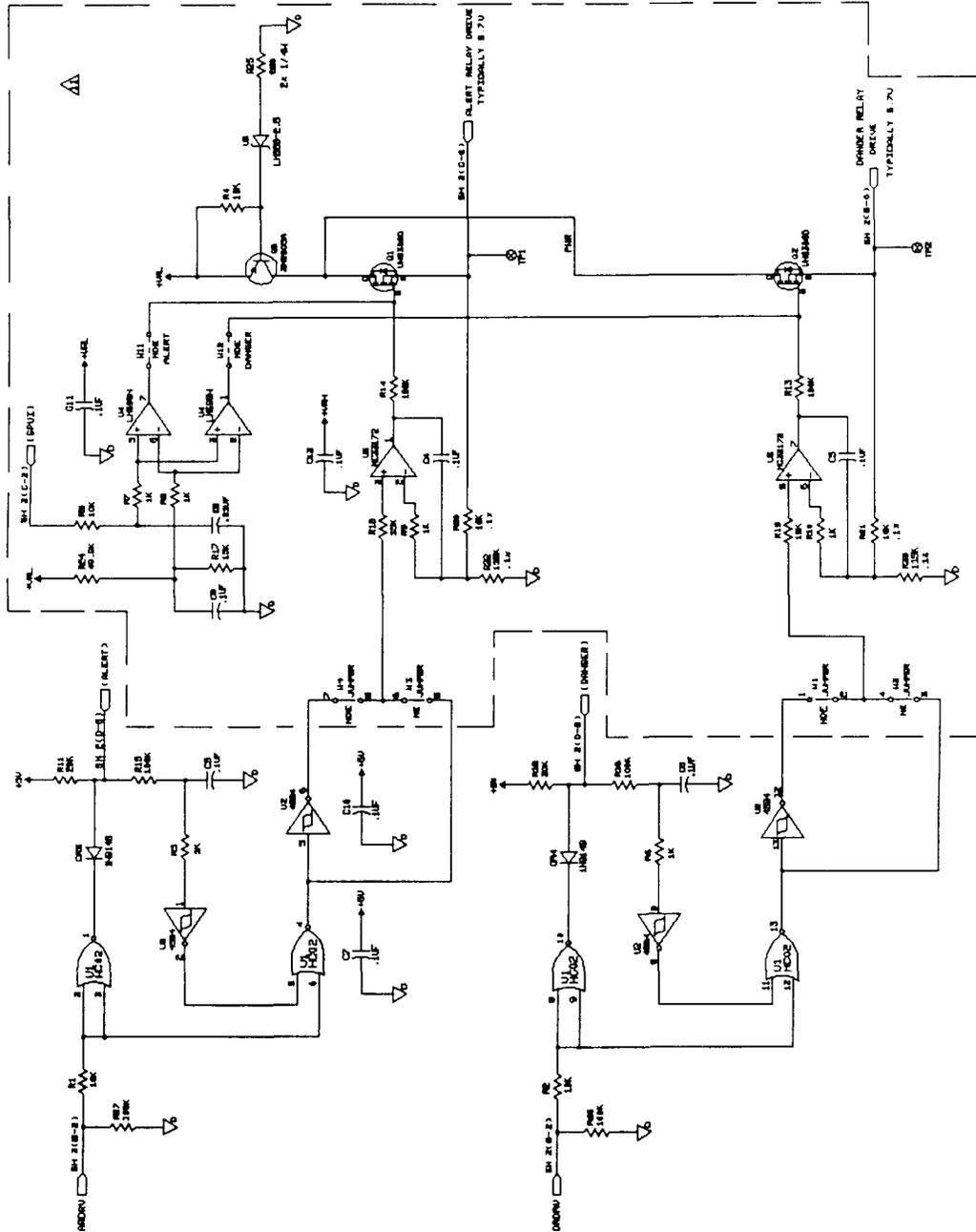
BENTLY NEVADA CORP	
MINNEN, NEVADA USA	
RADIAL VIBRATION MONITOR	
FRONT PANEL	
NEXT HIGHER ASSY.	
14.21.39	

SCHEMATIC DIAGRAM FRONT PANEL 78413 SH 1 OF 1

- 3. REF PAT SPEC 1542300
- 2. FRONT PANEL FOR PNA 78392 & SCHEM. 78393
- 1. SCHEMATIC IS FOR PNA 78412

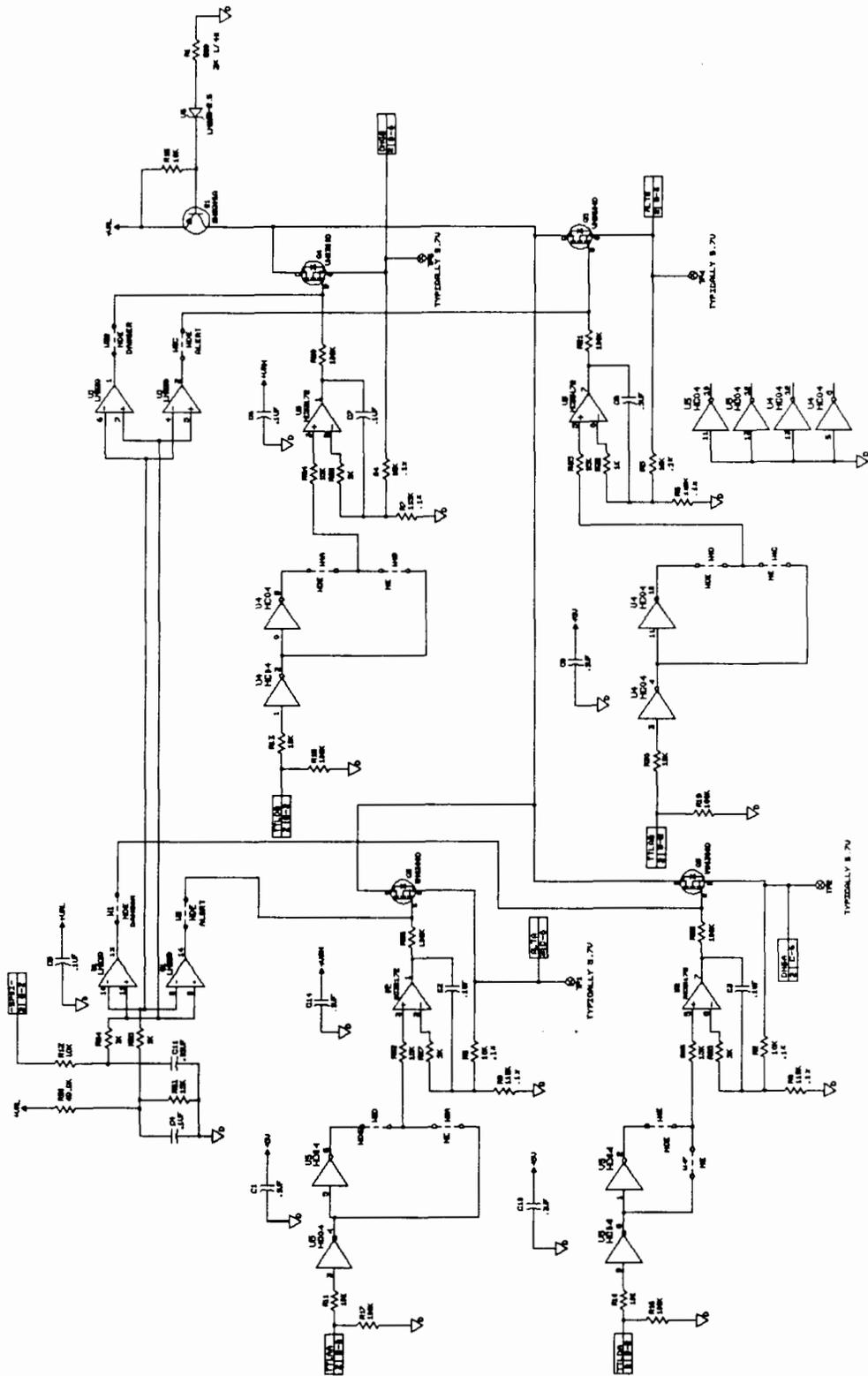
NOTES: UNLESS OTHERWISE SPECIFIED



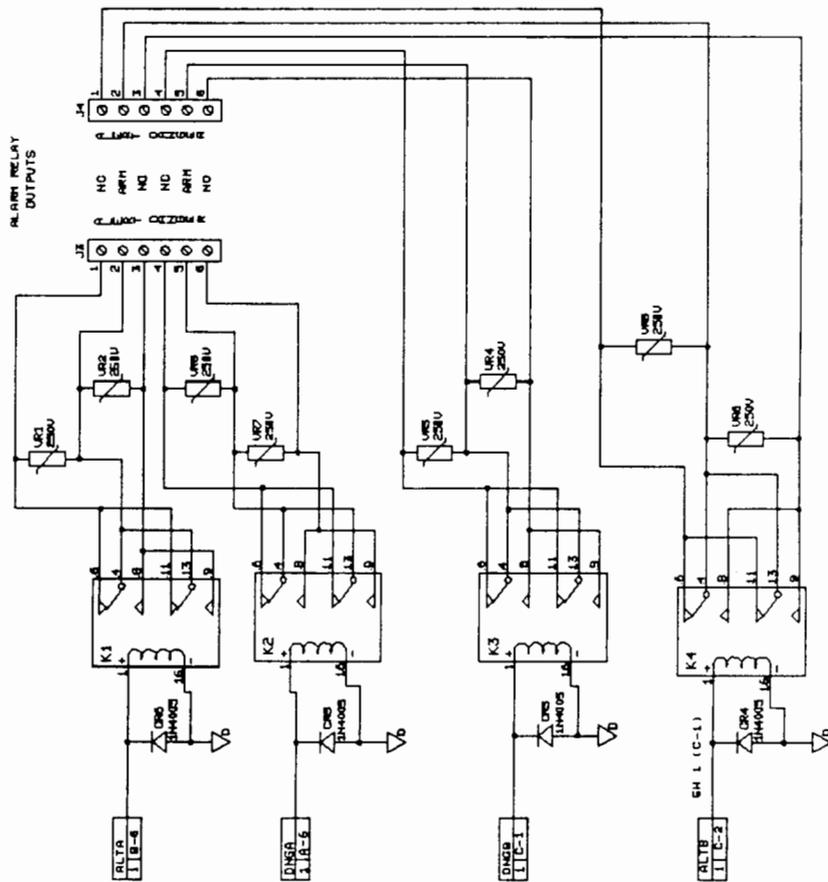
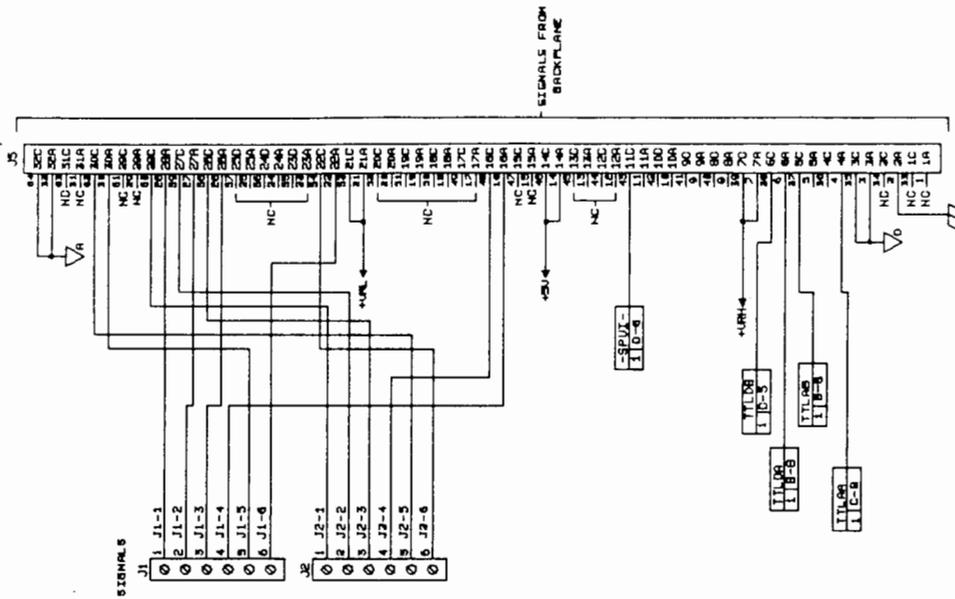


SCHMATIC DIAGRAM  
SIRM EPOXY





SCHEMATIC DIAGRAM  
QUAD RELAY



SCHEMATIC DIAGRAM  
QUAD RELAY

# INDEX

<b>A</b>	
Alarm Delays Option . . . . .	20
Alarm Setpoint Adjust . . . . .	26
Alert . . . . .	6
Alert Mode Option . . . . .	21
<b>B</b>	
Bypass . . . . .	5
<b>C</b>	
Calibrate Channel . . . . .	32
Channel Bypass . . . . .	27
<b>D</b>	
Danger . . . . .	7
Danger Bypass . . . . .	28
Danger Bypass Switch Option . . . . .	22
Danger Mode Option . . . . .	21
Danger Voting Option . . . . .	21
Disassembly Procedure . . . . .	15
Dual Thrust Monitor Option . . . . .	1
<b>E</b>	
Expander Board Installation/Removal . . . . .	25
<b>F</b>	
Field Wiring Diagrams . . . . .	38
First Out Option . . . . .	20
Front Panel Removal . . . . .	16
<b>I</b>	
Installed Programmable Option1 . . . . .	19
<b>M</b>	
Meter Response Time . . . . .	20
Monitor Full Scale Options . . . . .	24
Monitor Functions . . . . .	2
Monitor OK Limits Option . . . . .	21
Monitor Options . . . . .	3
Monitor Ranges . . . . .	8

<b>N</b>	
Normal Direction . . . . .	22
<b>O</b>	
OK . . . . .	4
Options	
Alarm Delays . . . . .	25
Alarm Setpoint . . . . .	25
Alert Mode . . . . .	21
Danger Bypass Switch . . . . .	22
Danger Mode . . . . .	21
First Out . . . . .	20
Frequency Response . . . . .	20
Installed Programmable . . . . .	19
Programmable . . . . .	3
Monitor Full Scale . . . . .	24
Monitor OK Limits . . . . .	21
Monitor Options . . . . .	3
Recorder Out . . . . .	22
<b>P</b>	
Programmable Options . . . . .	3
<b>R</b>	
Read Alert Setpoint Levels . . . . .	11
Read Danger Setpoint Levels . . . . .	11
Read Channel Thrust Position . . . . .	9
Read Gap Voltage . . . . .	10
Recorder Out Options . . . . .	22
Recommended Spare Parts . . . . .	41
Replace Meter Scale . . . . .	23
<b>S</b>	
Schematics . . . . .	46
Selftest . . . . .	12
Signal Input Relay Modules . . . . .	17
Specifications . . . . .	42
Drawings . . . . .	46
<b>T</b>	
Test Channel Alarms . . . . .	34
Test OK Limits . . . . .	34
<b>Z</b>	
Zero Voltage Adjust . . . . .	36

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