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Gap Voltage Ø = 1.37 V

6.5 V

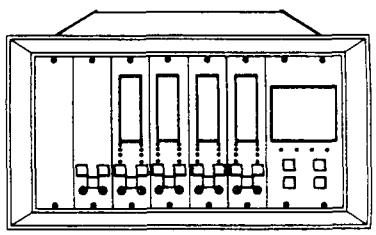
PART NO. 84413-01

Unit 1

3300/46 RAMP DIFFERENTIAL EXPANSION 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 Will Be Lost

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

SYMBOLS

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



12 Test OK Limits

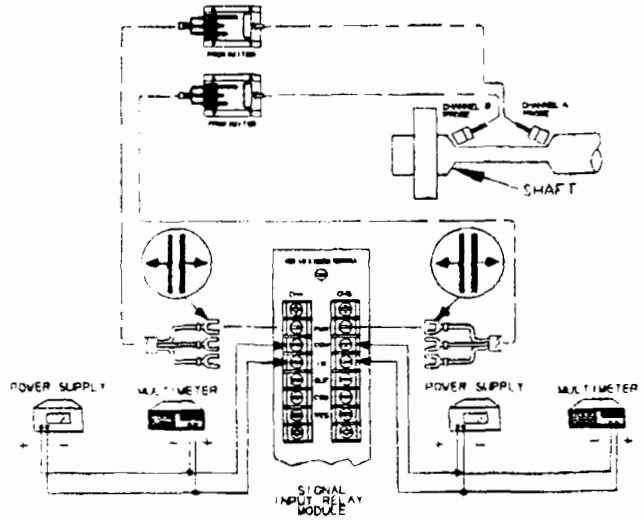


Figure 9

⚠ CAUTION

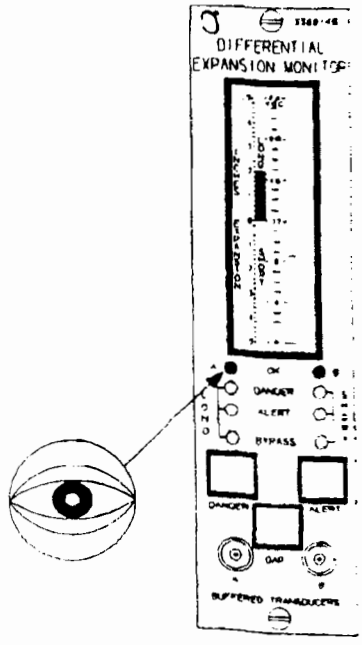
Test will exceed alarm setpoint levels causing alarms to activate. This could result in relay contact to change state. See Danger Bypass section 10.

⚠ WARNING

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

Do not touch exposed wires or terminals.

1. Disconnect **COM** and **IN** wiring from the channel A terminals on the Signal Input Relay Module.
2. Connect the multimeter and the power supply.
3. Adjust the power supply voltage for -9 Vdc.
4. Verify that the channel A **OK** LED is on.
5. Increase the power supply voltage (more negative) until the **OK** LED goes off (upper limit). Verify that the upper OK limit is within the upper OK voltage range (reference Table 8).



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12 Test OK Limits [Cont.]

6. Verify that the OK relay changes state (de-energized). Note : all other channels in the rack must be OK or bypassed in order for the relay to change state.

7. Decrease the power supply voltage (less negative) to -9 Vdc and verify that the **OK** LED comes back on and the OK relay energizes (if the Non-latching Not OK jumper is installed). Press the **RESET** switch on the System Monitor to reset latching Not OKs.

8. Gradually decrease the power supply voltage (less negative) until the **OK** LED goes off (lower limit). Verify that the lower OK limit is within the lower OK voltage range (reference Table 8).

9. Verify that the OK relay deenergizes.

10. When finished, disconnect the power supply and multimeter and reconnect **COM** and **IN** wiring to the channel A terminals on the Signal Input Relay Module. Verify that the OK LED comes on and the OK relay energizes (if the Non-latching Not OK jumper is installed). Press the **RESET** switch on the System Monitor to reset latching Not OKs.

11. Repeat steps 1 through 10 for channel B.

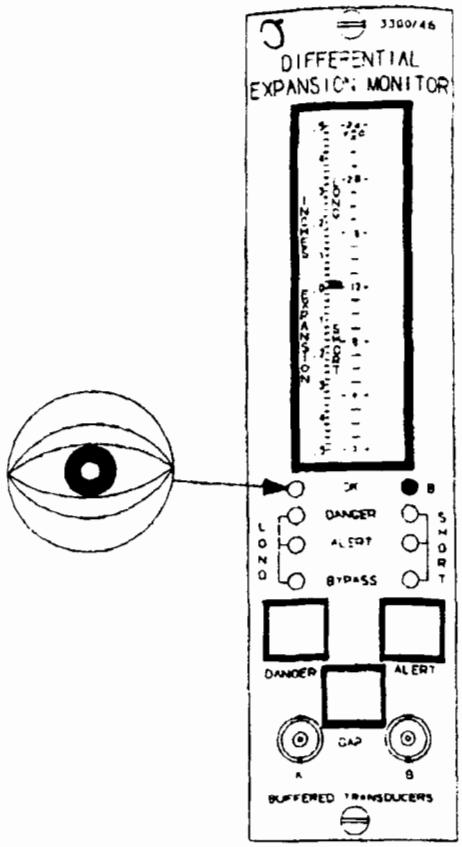


TABLE 8. OK Voltage Limits

Transducer Type	Lower OK Voltage Limits	Upper OK Voltage Limits
11 mm	-3.25 Vdc to -3.35 Vdc	-19.68 Vdc to -19.88 Vdc
14 mm	-1.65 Vdc to -1.75 Vdc	-18.20 Vdc to -18.40 Vdc
25, 35, and 50 mm	-1.30 Vdc to -1.40 Vdc	-12.40 Vdc to -12.60 Vdc

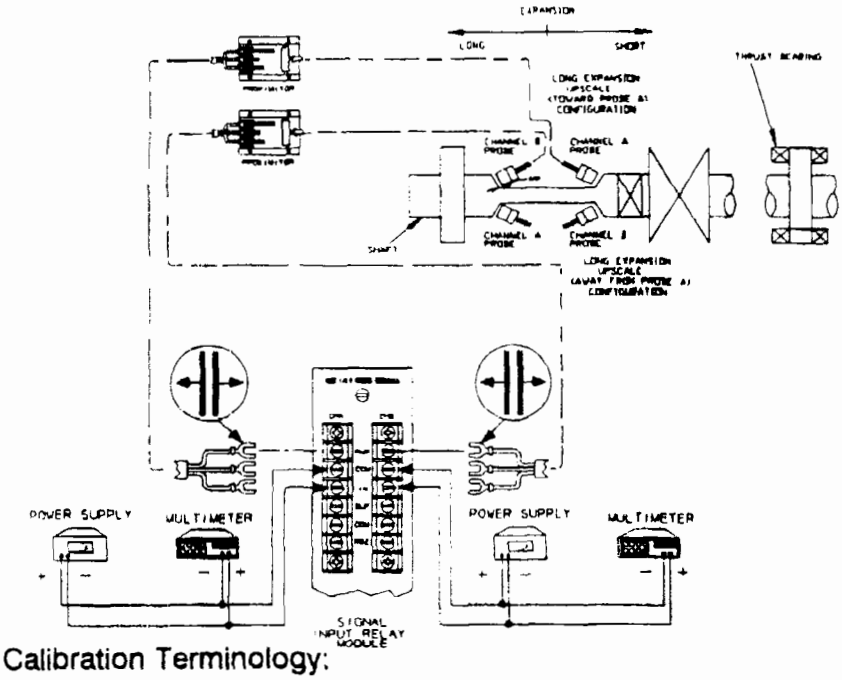
7668 2

35 mm Probes

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13 Calibrate Channels

Figure 1



⚠ CAUTION

Monitoring will be bypassed automatically during calibration. Machine Protection will be lost during calibration. See Danger Bypass section 10.

⚠ WARNING

High voltage present could cause shock, burns or death.

Do not touch exposed wires or terminals.

Calibration Terminology:

TSF is defined as Transducer Scale Factor. 11mm and 14mm = 100 mV/mil (3.937 V/mm), 25mm and 35mm = 20 mV/mil (0.7874 V/mm), 50mm = 10 mV/mil (0.3937 V/mm).
MR is the range from the bottom of the meter to the top of the meter (in inches).
FUSV is the full upscale voltage.
ZPV is the zero position voltage.
⊗ is the ramp angle (see figure below and section 6 for ramp angle options).

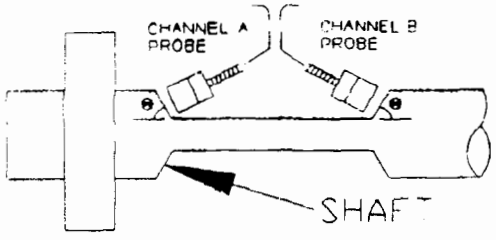


TABLE 9. Zero Position Voltage

Transducer Type	Zero Position Voltage (ZPV)
01 (11mm)	-11.6 ± 0.65 Vdc
02 (14mm)	-10.0 ± 0.65 Vdc
03 (25mm)	⟹ - 6.5 ± 0.30 Vdc
04 (35mm) ⟸	
05 (50mm)	

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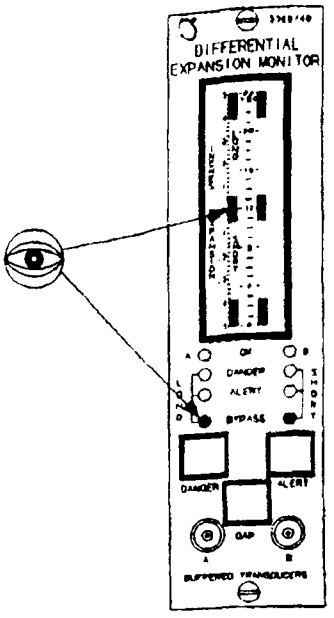
13 Calibrate Channels [Cont.]

1. Disconnect **COM** and **IN** wiring from the Channel A terminals on the Signal Input Relay Module.

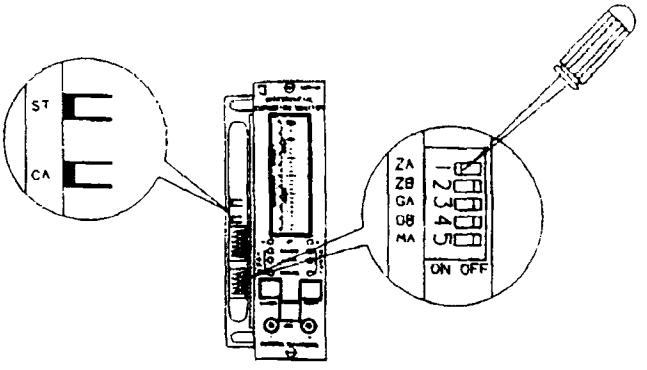
2. Connect a power supply and a multimeter to **COM** and **IN** with polarity as shown in Figure 1 on page 24.

3. Open front panel.

4. Short calibration terminals (**CA**) using a clip lead (a jumper may be used if the monitor is on an extender card). A test pattern will appear on the display when the calibration terminals are shorted and no calibration dip switches are set. Both **BYPASS** LEDs will come on.



5. Activate the Channel A zero adjust dipswitch (**ZA**) by moving it to the left. Measure the voltage at Test Point Channel A (**TA**) using the multimeter. Adjust the power supply to ZPV (reference Table 9). Press the **GAP** switch and use the (↑) and (↓) switches on the System Monitor to adjust the voltage at **TA** to get +2.5 ± 0.03Vdc.



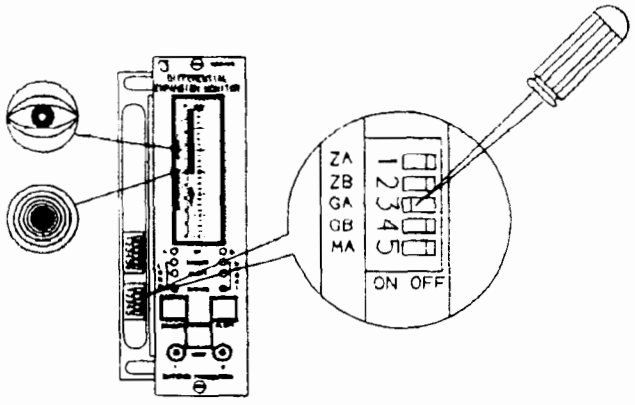
6. Deactivate the Channel A zero adjust dipswitch (**ZA**) by moving it to the right. If the short is removed from the calibration terminals before the dipswitch is deactivated, the adjustment will not be stored.

7. Repeat steps 1-6 for Channel B substituting **ZB** and **TB**.

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13 Calibrate Channels [Cont]

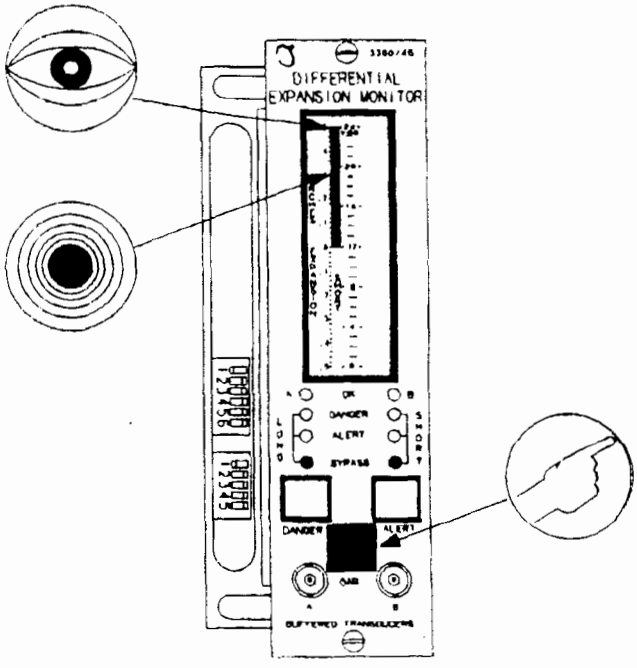
8. Activate the Channel A gain adjust dip switch (**GA**) by moving it to the left. The Channel A bargraph will begin to flash. Measure the voltage at Test point Channel A (**TA**) using the multimeter. Adjust the power supply to the Full Upscale Voltage (**FUSV**) (reference Table 10).



9. Press the **GAP** switch and use the System Monitor (↑) and (↓) switches to adjust the gain until the Test point Channel A (**TA**) is at +5.0 ±0.05 Vdc and the **BYPASS** LED is on steady (not flashing). The flashing **BYPASS** LED indicates an overrange condition. If this occurs, reduce the gain using the System Monitor (↓) switch.

10. Deactivate the Channel A gain adjust dip switch (**GA**) by moving it to the right. If the short is removed from the calibration terminals (**CA**) before the dip switch is deactivated, the adjustment will not be stored.

11. Repeat steps 8 through 10 for Channel B substituting **GB** and **TB**.



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13 Calibrate Channels [Cont]

12. Activate the meter adjust dip switch (**MA**) by moving it to the left. The differential expansion signal will begin to flash on the left LCD display.

13. Measure the voltage at test point Channel A (**TA**) using the multimeter. Adjust both power supplies to ZPV (reference Table 9). Press the **GAP** switch and use the System Monitor (↑) and (↓) switches to adjust the voltage at **TA** to +2.5 ± 0.03Vdc.

14. Deactivate the meter adjust dip switch (**MA**) by moving it to the right. If the short is removed from the calibration terminals (**CA**) before the dip switch is deactivated, the adjustment will not be stored.

15. Remove the clip lead (jumper) from the calibration terminals (**CA**).

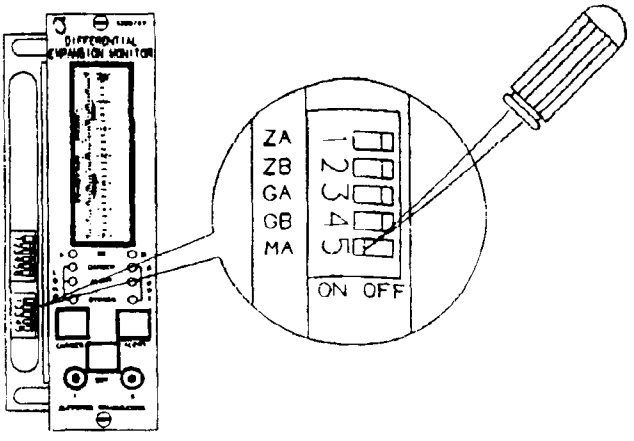


TABLE 10. Formulas for Full Upscale Volts

Direction	Full Upscale Volts (FUSV) Vdc Single Ramp Option Dual Ramp Option	Probe A Probe A or B	Probe B
Upscale Toward Probe A	ZPV +(0.5 sin ⊗)(TSF)(MR)		ZPV + (0.5 tan ⊗)(TSF)(MR)
Upscale Away From Probe A	ZPV -(0.5 sin ⊗)(TSF)(MR)		ZPV - (0.5 tan ⊗)(TSF)(MR)

Example: A user has a 25mm probe and a 0.25-0-0.25 inch full scale range. The monitor is configured for upscale toward probe A with dual ramp angles of 14 degrees.
(1 inch = 1000 mils, 1V = 1000mV)

TSF = 20mV/mil
MR = 0.5 inches
FUSV = -6.5Vdc + (0.5 sin 14)(20mV/mil)(1V/1000mV)(1000mils/inch)(0.5inches) = -5.29 Vdc

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FORWARD

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

RELATED DOCUMENTS

3300 System Overview, 80177

3300 System Installation Instructions, 80172

3300 System Troubleshooting, 80173

3300/10 Power Supply, 80174

3300/01 System Monitor, 80175

3300/46 Ramp Differential Expansion Maintenance, 84414-01

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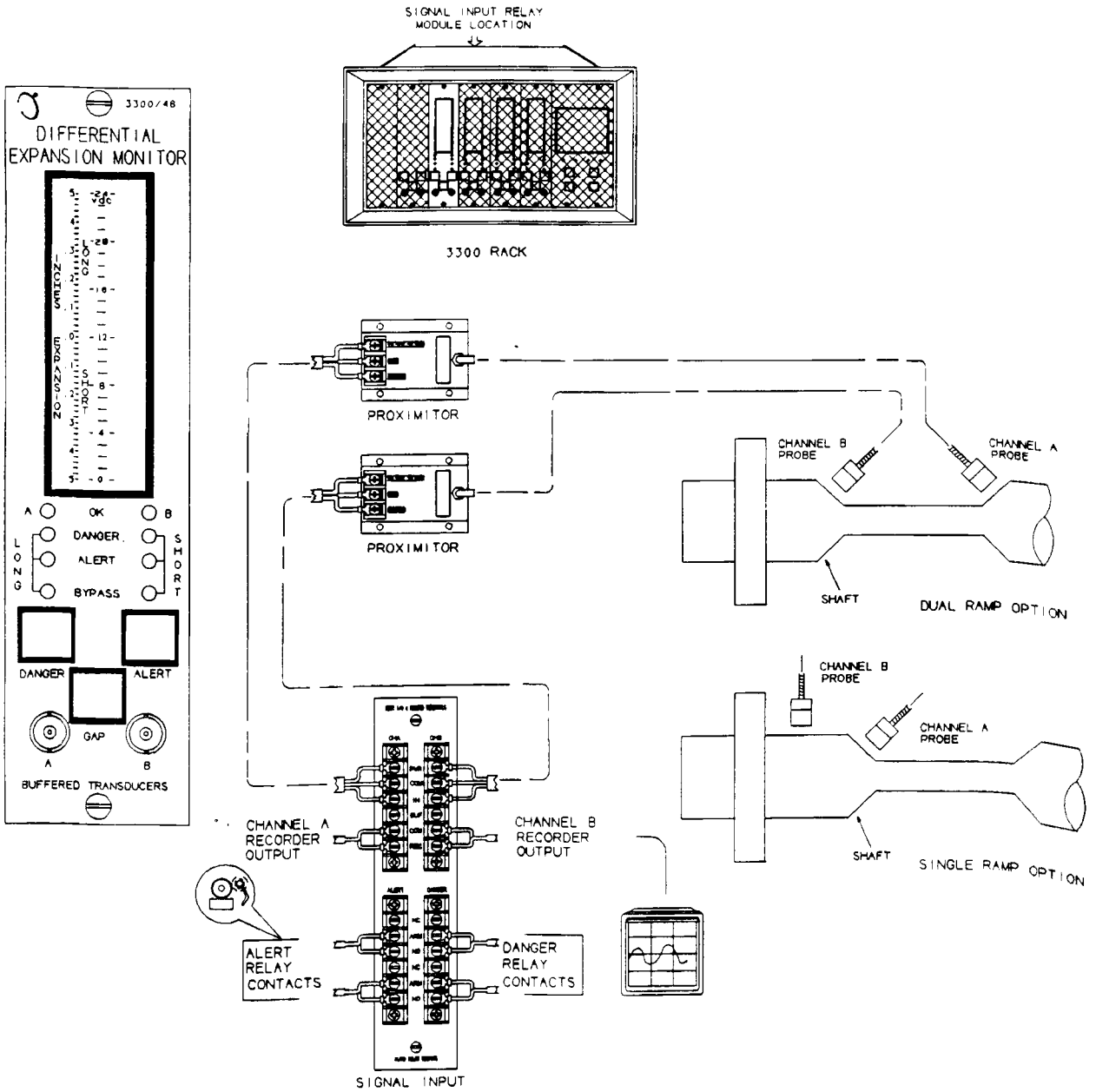
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1 DIFFERENTIAL EXPANSION MONITOR SYSTEM



NOTE: CHANNEL B RECORDER OUTPUT ONLY ACTIVE DURING CALIBRATION

2 MONITOR OPTIONS

RAMP DIFFERENTIAL EXPANSION
MONITOR PART NUMBER

	FULL SCALE RANGE	TRANSDUCER INPUT	ALARM RELAY	AGENCY APPROVAL
3300/46	AA	BB	CC	DD
	01 = 5-0-5mm 02 = 0 - 10mm 03 = 0.25-0-0.25 INCHES 04 = 0 - 0.5 INCHES 05 = 10-0-10mm 06 = 0 - 20mm 07 = 0.5-0-0.5 INCHES 08 = 0 - 1.O INCHES 09 = 1.0-0-1.0 INCHES 10 = 0 - 2.0 INCHES 11 = 25-0-25mm 12 = 0 - 50mm	01 = 11mm, 100 mV/mil 02 = 14mm, 100 mV/mil 03 = 25mm, 20 mV/mil 04 = 35mm, 20 mV/mil 05 = 50mm, 10 mV/mil	00 = NONE 01 = EPOXY SEALED 02 = HERMETI-CALLY SEALED 03 = EPOXY SEALED QUAD	00 = NOT REQUIRED 01 = CSA 02 = BASEEFA 03 = FM

3 PROGRAMMABLE OPTIONS

MONITOR FEATURE	OPTION	MONITOR FEATURE	OPTION
FIRST OUT	ENABLED * DISABLED	DANGER MODE	LATCHING * NONLATCHING
ALARM DELAYS	0.1 SECOND 1 SECOND 3 SECOND * 6 SECOND	RECORDER OUTPUTS	+4 TO +20 mA * +1 TO +5 Vdc 0 TO -10 Vdc
NOT OK MODE	NONLATCHING * LATCHING	RAMP OPTION	DUAL * SINGLE
ALERT MODE	LATCHING * NONLATCHING	UPSCALE DIRECTION	TOWARD PROBE A * AWAY FROM PROBE A
METER RESPONSE TIME	FAST * SLOW	DANGER BYPASS SWITCH	ENABLED DISABLED *
RAMP ANGLE	4 TO 45 DEGREES (1 DEGREE INCREMENTS) **	NOT OK MONITOR DEFEAT	ENABLED DISABLED *#

* AS SHIPPED FROM FACTORY
\# REQUIRES NONLATCHING OK OPTION
** AS SHIPPED FROM FACTORY: 11/14mm = 7 deg, 25/35/50mm = 12 deg

4 MONITOR FUNCTIONS

RAMP DIFFERENTIAL EXPANSION - The Ramp Differential Expansion Monitor provides continuous monitoring of shaft growth relative to the machine case. Normal expansion direction can be toward or away from the probe A.

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 system OK relay. If the monitor has the latching Not 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 Alert (first-level alarm) or Danger (second-level alarm) setpoints to be displayed on the front panel meter. **ALERT** and **DANGER** LEDs come on when the differential expansion signal level exceeds preset levels for the selected time delay, and appropriate Alert and Danger alarm relay contacts are activated.

FIRST OUT - Separate First Out circuits exist for Alert and Danger alarms. A monitor with First Out option selected flashes the **LONG** or **SHORT** alarm LED if that particular alarm was the first alarm since the last reset. Pressing the **RESET** switch acknowledges the First Out.

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

DANGER BYPASS - For maintenance functions, a Danger Bypass switch on the monitor circuit board behind the front panel can be set to inhibit the Danger relay drive. This function causes the **BYPASS** LEDs to be turned on. Other front panel functions are not affected. This function can be enabled by installing a jumper on 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.

4 MONITOR FUNCTIONS

RECORDER OUTPUT - Depending on the option selected, the recorder output levels proportional to the measured differential expansion signal are 0 to -10Vdc, +1 to +5Vdc, or +4 to +20mA.

SELF TEST - The monitor has three categories of self test: Power-up, Cyclic, and User-invoked.

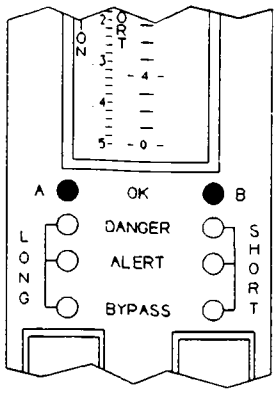
Power-up self test is performed automatically each time the monitor power is turned on. A series of basic tests and transducer OK tests are performed.

Cyclic self test is performed automatically during monitor operation. Errors encountered during cyclic tests disable the monitor, and flash error code on the LCD bargraph. If the error is 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 **OK** LEDs flashing at 5 Hz provided that the channel is OK.

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

Not OK Monitor Defeat - The Not OK Monitor Defeat function prevents faulty transducer wiring from causing false alarms. If a transducer is determined to be Not OK, the channel **OK** LED goes off, the Channel **BYPASS** LED comes on, the differential expansion signal is clamped to zero position, alarming is disabled, and the OK relay deenergizes. If a channel's input signal returns to an OK condition, the channel's **OK** LED will start flashing at 1Hz to indicate that the OK state is restored. After ten seconds, the **BYPASS** LED will go off, and alarming is enabled. The **RESET** switch on the System Monitor front panel must be pressed to stop the **OK** LED from flashing.

5 OK

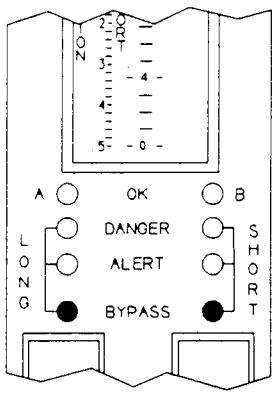


NOTE: EACH CHANNEL IN THE SYSTEM CONTROLS THE OK RELAY. THEREFORE, EITHER CHANNEL CAN CAUSE A NOT OK RELAY CONDITION (DEENERGIZED RELAY)

LED DISPLAY A		B	CONDITION	OK RELAY DRIVE *
●	OK	●	CHANNEL A AND B IN OPERATING RANGE	ON
●	OK	○	RESPECTIVE CHANNEL A OR B TRANSDUCER IN NOT OK CONDITION. *	OFF *
○	OK	●		
○	OK	○	MONITOR IN SELF TEST, OR BOTH TRANSDUCERS IN NOT OK CONDITION OR BYPASSED. *	OFF *
◉	OK	◉	FLASHING AT 5 Hz = ERROR ENCOUNTERED DURING CYCLIC TEST. READ ERROR MESSAGE SEE SECTION 12.	ON
◉	OK	◉	FLASHING AT 1 Hz = TRANSDUCER HAS BEEN NOT OK SINCE LAST RESET.	ON
◉	OK	●		
●	OK	◉		

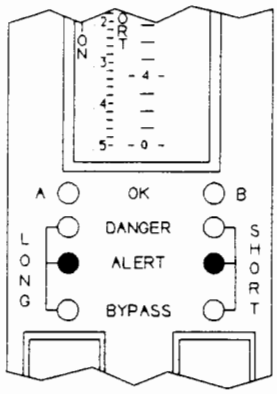
* MONITOR CAN BE BYPASSED TO RESTORE RELAY OK CONDITIONS TO THE REST OF THE RACK

6 BYPASS



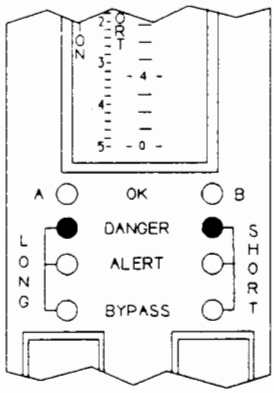
LED DISPLAY			CONDITION
LONG		SHORT	
●	BYPASS	●	MONITOR IN DANGER BYPASS MODE SYSTEM IN POWER-UP MODE USER-INVOKED SELF TEST IN PROGRESS MONITOR BYPASSED CALIBRATION MODE
◉	BYPASS	◉	MONITOR OVERRANGE DURING CALIBRATION

7 ALERT



LED DISPLAY			CONDITION	ALERT RELAY DRIVE
LONG		SHORT		
●	ALERT	○	DIFFERENTIAL EXPANSION SIGNAL HAS EXCEEDED THE LONG ALERT LEVEL. (SEE SECTION 11)	ON
○	ALERT	●	DIFFERENTIAL EXPANSION SIGNAL HAS EXCEEDED THE SHORT ALERT LEVEL. (SEE SECTION 11)	ON
○	ALERT	◉	FIRST OUT CONDITION FOR DIFFERENTIAL EXPANSION SIGNAL WHICH HAS EXCEEDED THE SHORT ALERT LEVEL.	ON
◉	ALERT	○	FIRST OUT CONDITION FOR DIFFERENTIAL EXPANSION SIGNAL WHICH HAS EXCEEDED THE LONG ALERT LEVEL.	ON

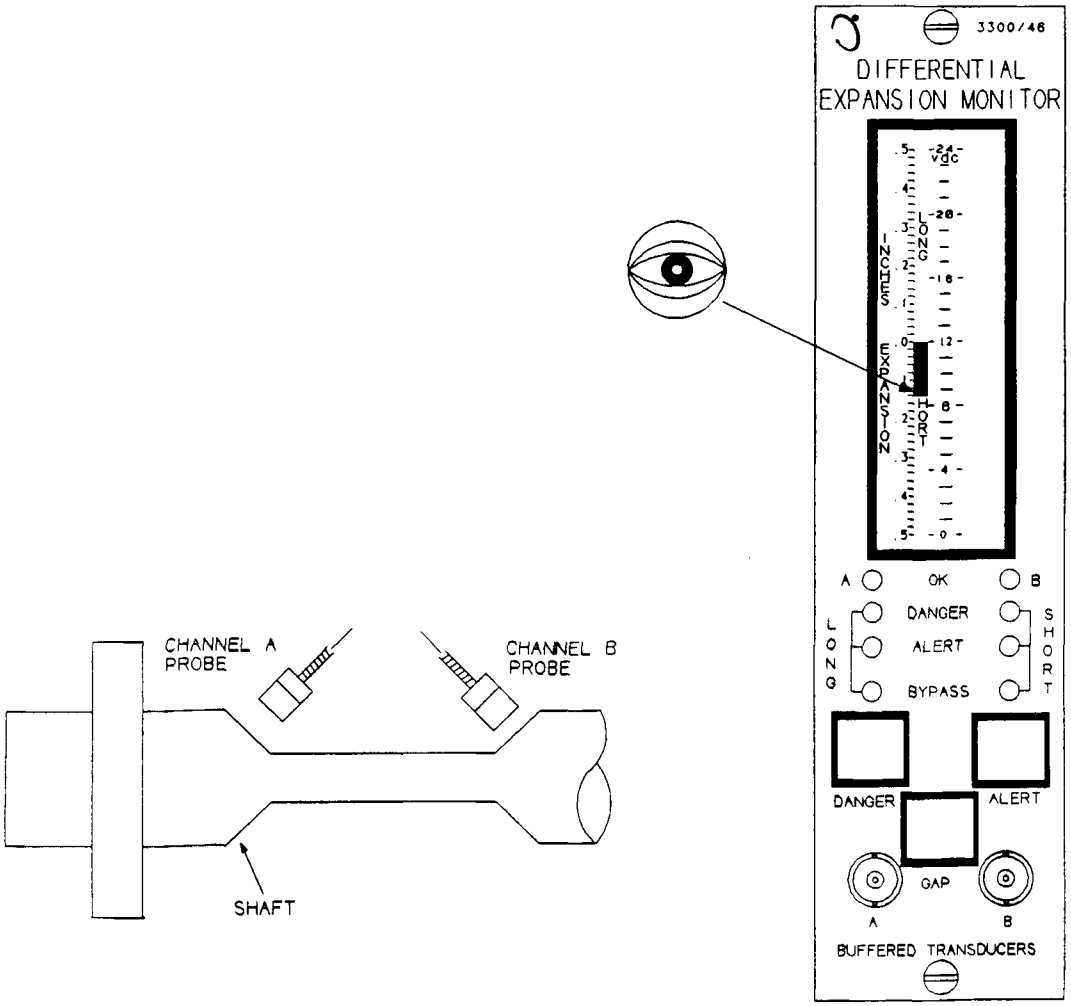
8 DANGER



LED DISPLAY			CONDITION	DANGER RELAY DRIVE
LONG		SHORT		
●	DANGER	○	DIFFERENTIAL EXPANSION SIGNAL HAS EXCEEDED THE LONG DANGER LEVEL. (SEE SECTION 11)	ON
○	DANGER	●	DIFFERENTIAL EXPANSION SIGNAL HAS EXCEEDED THE SHORT DANGER LEVEL. (SEE SECTION 11)	ON
○	DANGER	◉	FIRST OUT CONDITION FOR DIFFERENTIAL EXPANSION SIGNAL WHICH HAS EXCEEDED THE SHORT DANGER LEVEL.	ON
◉	DANGER	○	FIRST OUT CONDITION FOR DIFFERENTIAL EXPANSION SIGNAL WHICH HAS EXCEEDED THE LONG DANGER LEVEL.	ON

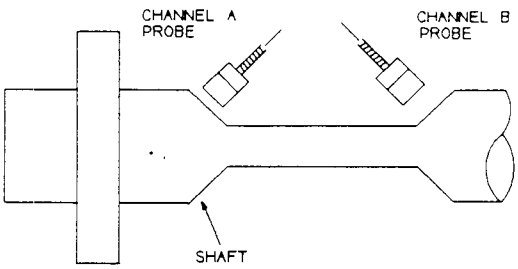
9 READ CHANNEL DIFFERENTIAL EXPANSION

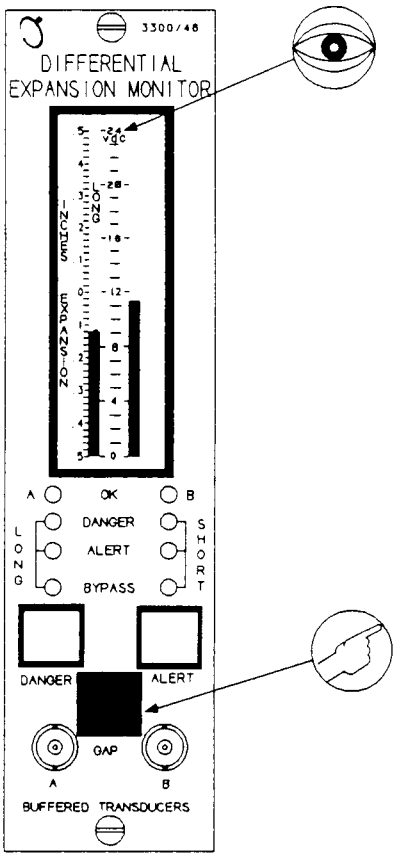
THE MONITOR CONTINUOUSLY INDICATES THE DIFFERENTIAL EXPANSION SIGNAL MEASURED FROM ZERO POSITION TO THE DIFFERENTIAL EXPANSION SIGNAL VALUE ON THE LEFT METER SCALE. THE DIFFERENTIAL EXPANSION SIGNAL IS A COMPOSITE SIGNAL GENERATED FROM BOTH CHANNEL A AND CHANNEL B PROBE INFORMATION.



10 READ GAP VOLTAGE

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

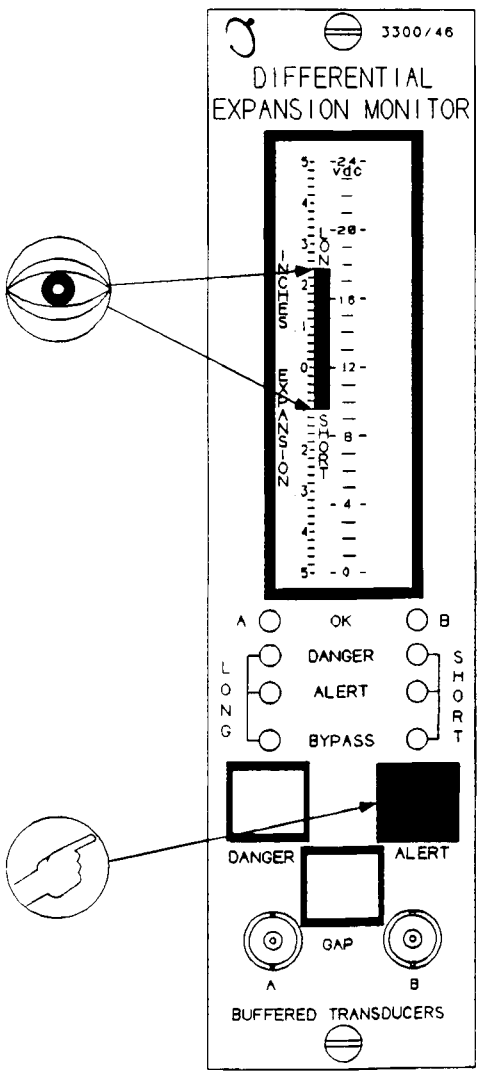


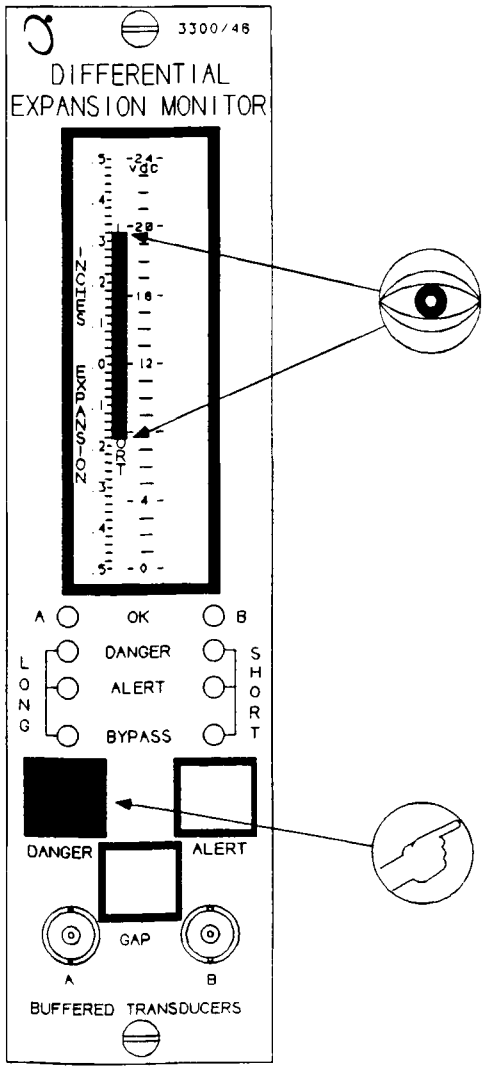


11 READ SETPOINT LEVELS

PRESS **ALERT** SWITCH AND READ ALERT SETPOINTS ON THE METER SCALE. BOTH LONG AND SHORT ROTOR SETPOINTS ARE DISPLAYED.

PRESS **DANGER** SWITCH AND READ DANGER SETPOINTS ON THE METER SCALE. BOTH LONG AND SHORT ROTOR SETPOINTS ARE DISPLAYED.

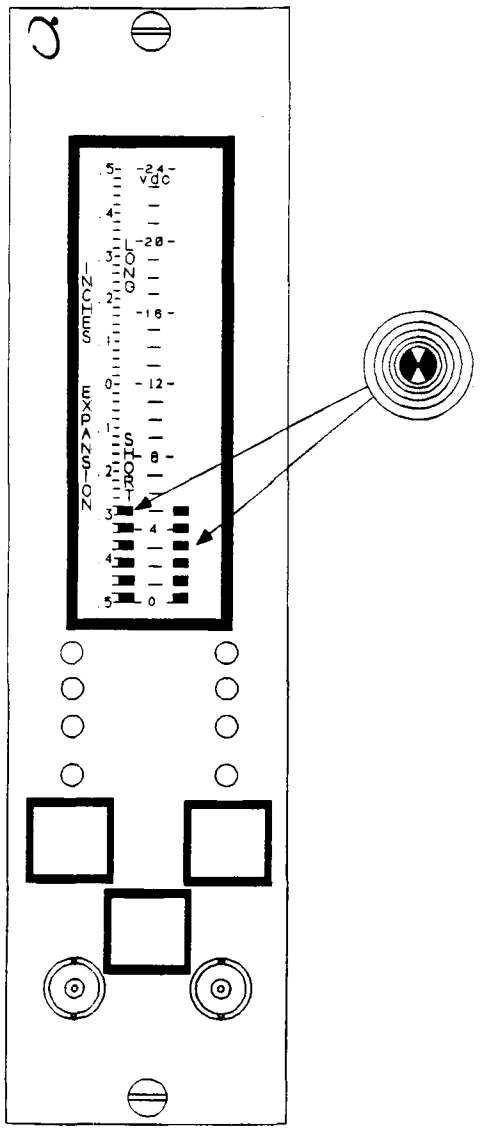




12 SELF TEST

THE MONITOR HAS THREE LEVELS OF SELF TESTS:

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



IF ERRORS ARE DETECTED DURING CYCLIC SELF TESTS:

MONITORING IS ABORTED UNTIL THE ERROR IS RESOLVED.

ERROR CODE IS STORED IN MEMORY AND FLASHED ON THE LCD BARGRAPH DISPLAY.

BYPASS LEDS COME ON AND **OK** LEDS FLASHES AT 5 HZ.

IF ERROR IS INTERMITTENT AND GOES AWAY, MONITORING IS RESUMED AND **OK** LEDS FLASH AT 5 HZ.

ERROR CODE IS STORED. USER-INVOKED TEST DISPLAYS AND CLEARS ERROR.

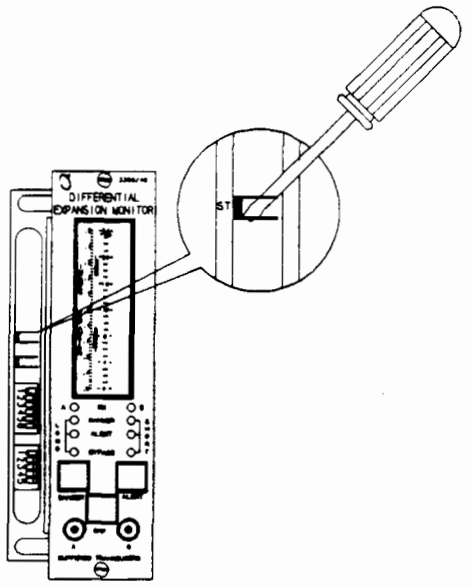
IF ERRORS ARE DETECTED DURING POWER-UP TEST OR USER-INVOKED SELF TEST:

MONITORING IS ABORTED UNTIL USER ACTION RESOLVES PROBLEM.

TEST CAN BE RERUN WITH MONITOR POWER-UP OR USER-INVOKED TEST.

12 SELF TEST [CONT]

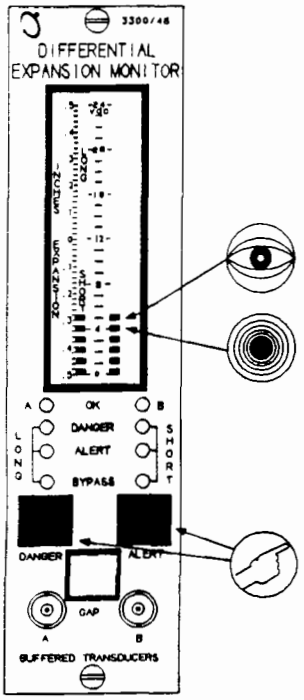
INITIATE USER-INVOKED TEST BY SHORTING ACROSS TWO SELF TEST (ST) PINS.



CAUTION

Machine Protection Will Be Lost For Duration of Test

AT COMPLETION OF USER-INVOKED SELF 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.

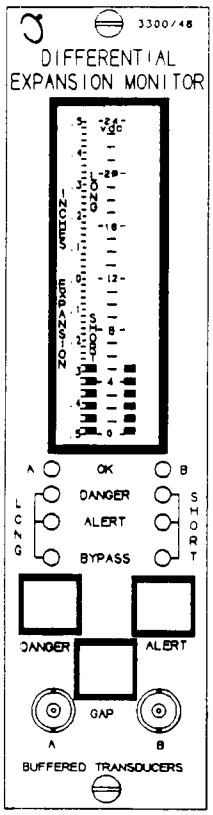


NOTE
ALTHOUGH BOTH COLUMNS ON THE BARGRAPH FLASH, THE ERROR CODE IS ONLY THE SUM OF THE BARGRAPH SEGMENTS DISPLAYED IN ONE COLUMN. EXAMPLE SHOWS ERROR CODE 6.

TO READ CODES ON THE LIST, STEP THROUGH EACH ERROR CODE BY PRESSING AND HOLDING THE **ALERT** SWITCH FOR APPROXIMATELY ONE SECOND.

AT THE END OF THE LIST, THE LCD BARGRAPH DISPLAYS ALL SEGMENTS. TO REREAD THE LIST PRESS THE **ALERT** SWITCH. TO CLEAR THE LIST FROM MEMORY, PRESS AND HOLD THE **DANGER** SWITCH FOR APPROXIMATELY ONE SECOND.

12 SELF TEST [CONT]



ERROR CODE	DESCRIPTION
2	ROM CHECKSUM HAS FAILED. *
3	EEPROM FAILURE NO. 1. **
4	EEPROM FAILURE NO. 2. *** ADJUST SETPOINTS
5	+7.5V/-VT NODE OUT OF TOLERANCE. **
6	+VRH NODE OUT OF TOLERANCE. **
7	+5V NODE OUT OF TOLERANCE. **
8	MVREF NODE OUT OF TOLERANCE. **
9	+7.5V NODE OUT OF TOLERANCE. **
10	+VRL NODE OUT OF TOLERANCE. **
12	+5V/-7.5V NODE OUT OF TOLERANCE. **
14	RAM FAILURE. *
17	COP WATCHDOG NOT CONFIGURED
18	+5V/-5V OR +15V NODE OUT OF TOLERANCE. **
21	INCORRECT SWITCH OR SWITCH COMBINATION. ****
22	INCORRECT JUMPER CONFIGURATION. *

* TESTED ONLY AT POWER-UP OR USER-INVOKED SELF TEST. THIS ERROR IS DISPLAYED ON THE FRONT PANEL BUT IS NOT STORED IN MEMORY.

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

*** ERROR 4 IS A SETPOINT FAILURE AND MAY BE CORRECTED BY ADJUSTING ALL SETPOINTS IN THE MONITOR.

**** TESTED ONLY WHEN MONITOR IS IN CALIBRATION MODE.

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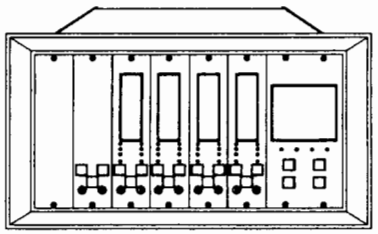
PART NO. 84414-01

Unit 1

3300/46 RAMP DIFFERENTIAL EXPANSION MONITOR

MAINTENANCE 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 Will Be Lost

SYMBOLS

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



Forward

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

RELATED DOCUMENTS

3300 System Overview, 80177

3300 System Installation Instructions, 80172

3300 System Troubleshooting, 80173

3300/10 Power Supply, 80174

3300/01 System Monitor, 80175

3300/46 Ramp Differential Expansion Operation, 84413-01

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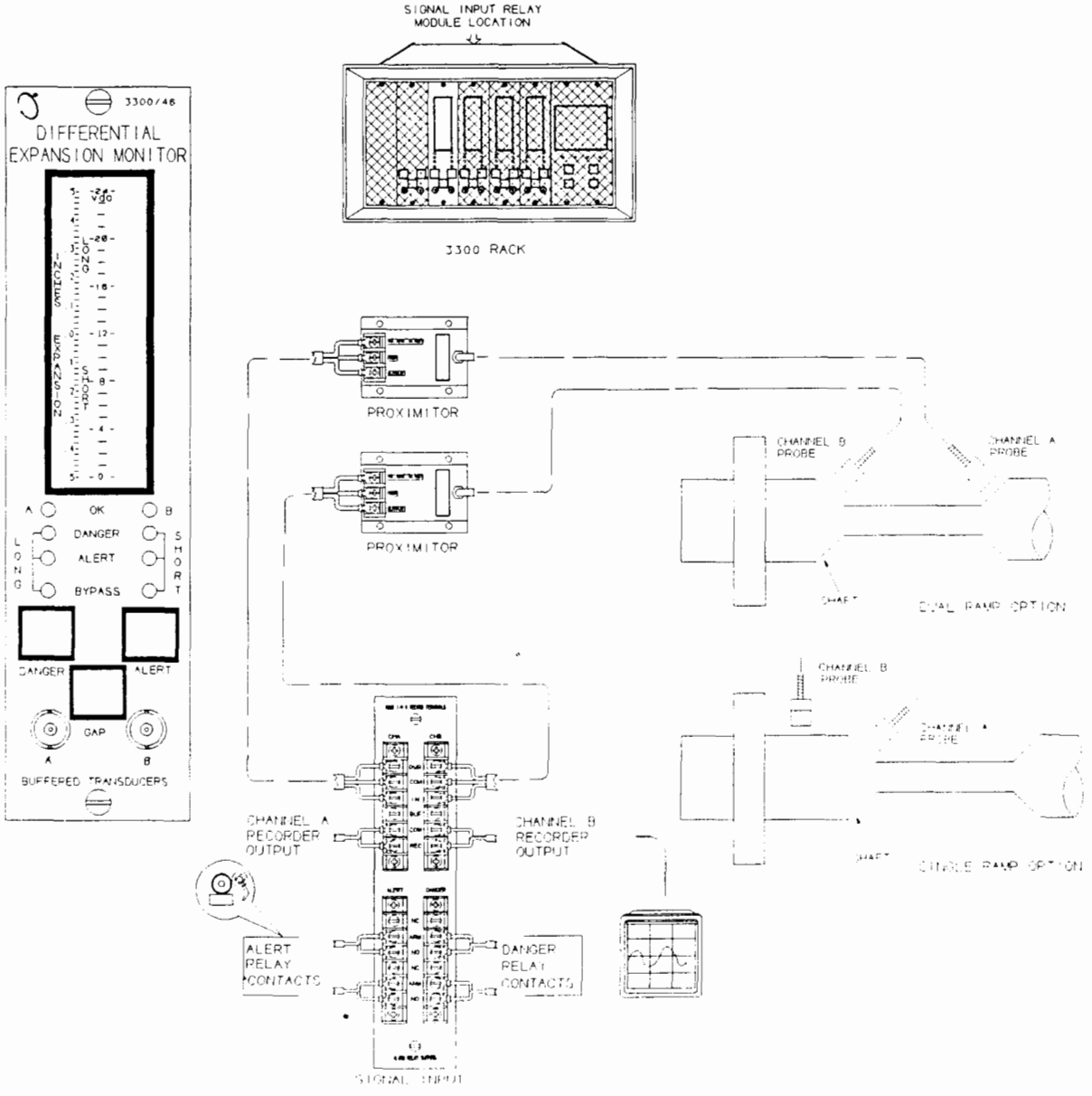
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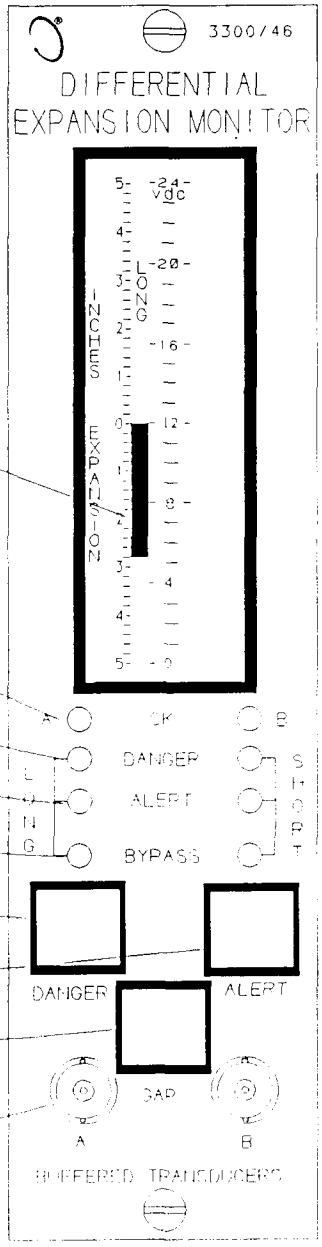
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1 Differential Expansion Monitor System



NOTE - CHANNEL B RECORDER OUTPUT ONLY ACTIVE DURING CALIBRATION

2 Front Panel Features



Bargraph - Indicates Differential Expansion value

Transducer OK LED

Danger Alarm LED

Alert Alarm LED

Bypass LED

Read Monitor Danger Setpoints

Read Monitor Alert Setpoints

Read Transducer Gap Voltages

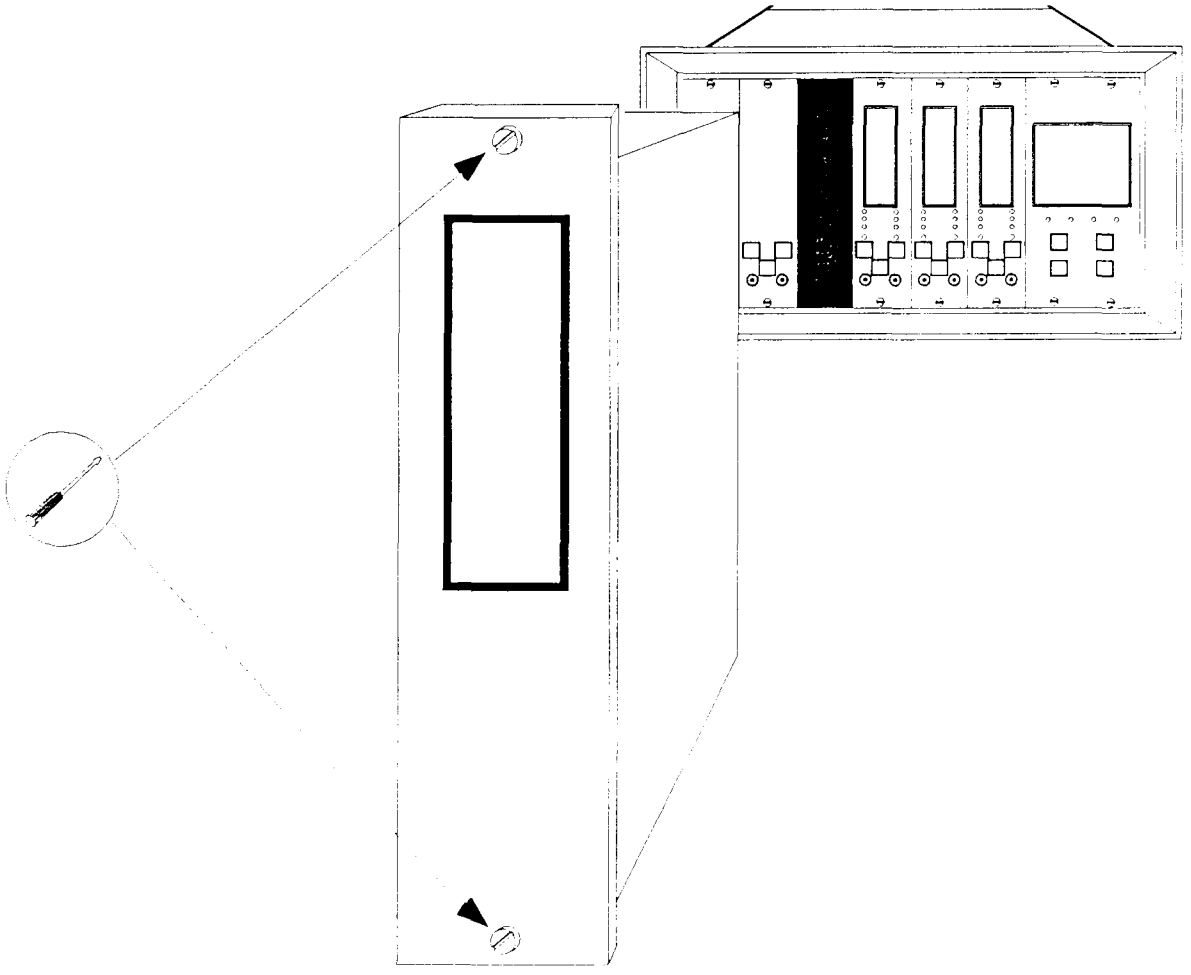
Coaxial Connector for Buffered Transducer Output

3 Monitor Removal

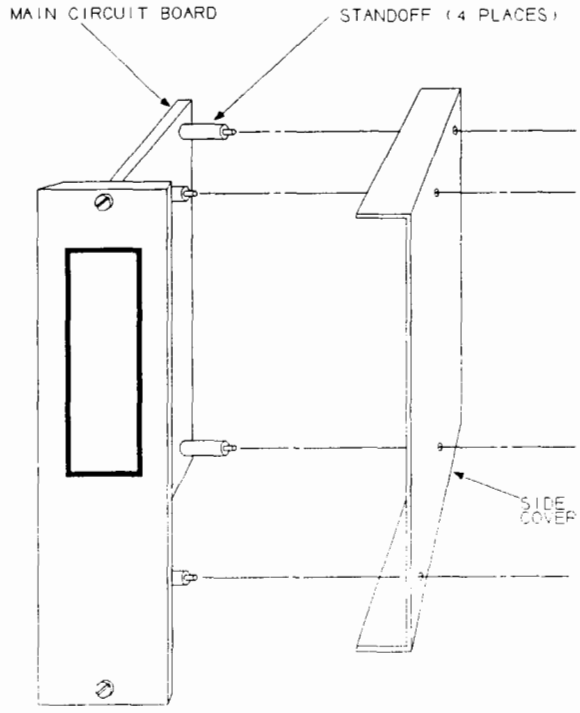
CAUTION

The machine is not protected when the monitor is removed from the rack.

1. Loosen two screws.
2. Pull monitor from rack.



4 Monitor Disassembly

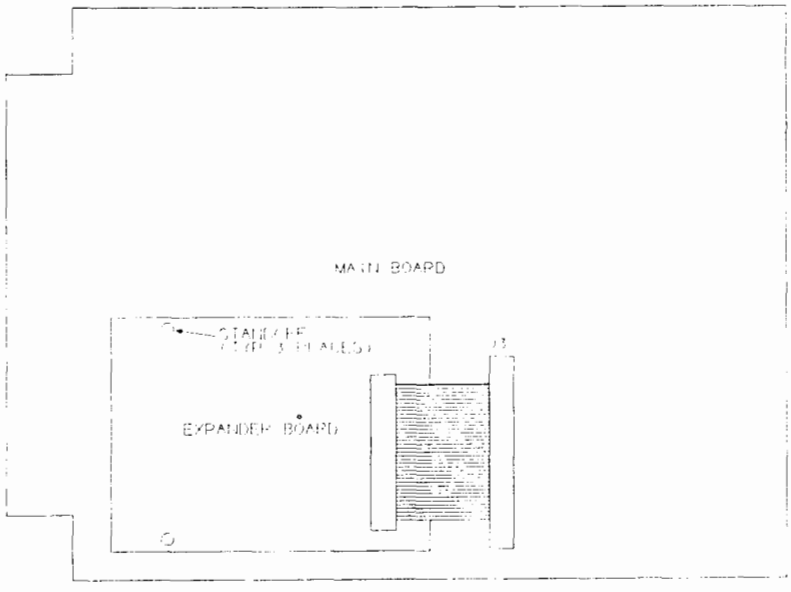


Side Cover Removal

Squeeze the retaining tips on each standoff, and remove the side cover from the monitor.

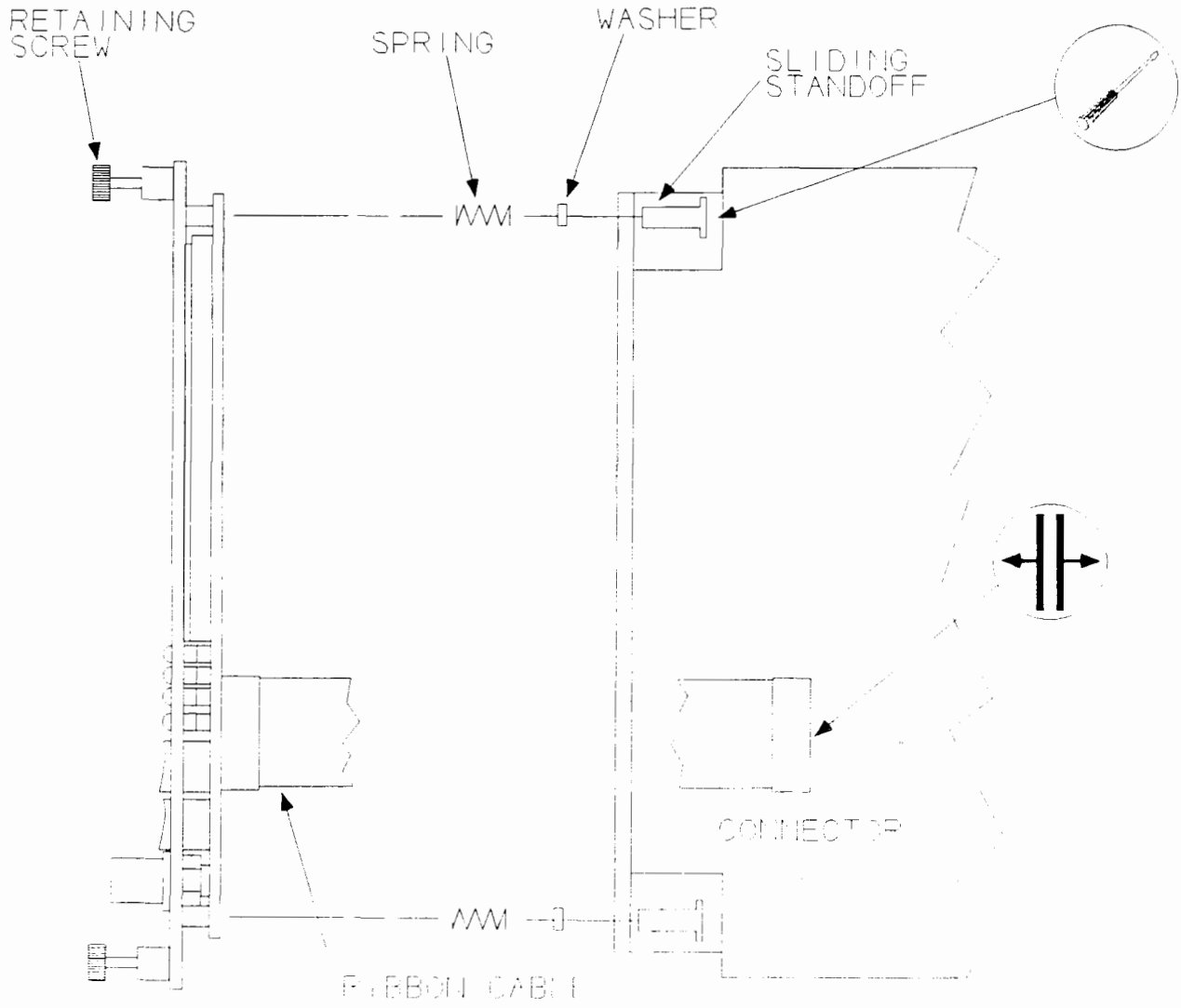
Circuit Board Removal

Squeeze the retaining tips on each standoff, and remove the expander board from the main board.



4 Monitor Disassembly [Cont]

Front Panel Removal



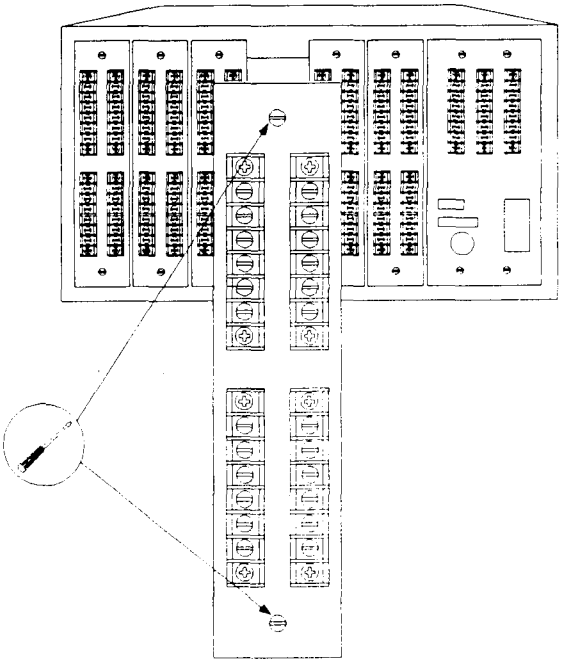
5 Signal Input Relay Module (Dual Relay)

⚠ WARNING

High Voltage present Could cause shock, burns or death.

Do Not touch exposed wires or terminals.

The Signal Input Relay Module is on the back of the rack. For relay configuration, see Installation Manual. For field wiring, see Section 15 (Field Wiring Diagrams).

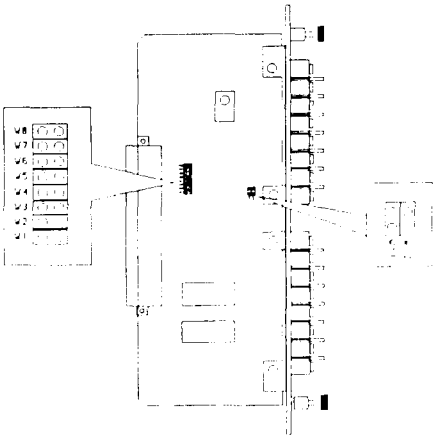


Module Removal

Loosen two screws and remove the module.

Module Options

Alert Relay	Jumper In	Jumper Out
Normally Energized	W3	W4,W11
Normally Deenergized	W4,W11	W3
Danger Relay	**Jumper In**	**Jumper Out**
Normally Energized	W2	W1,W12
Normally Deenergized	W1,W12	W2

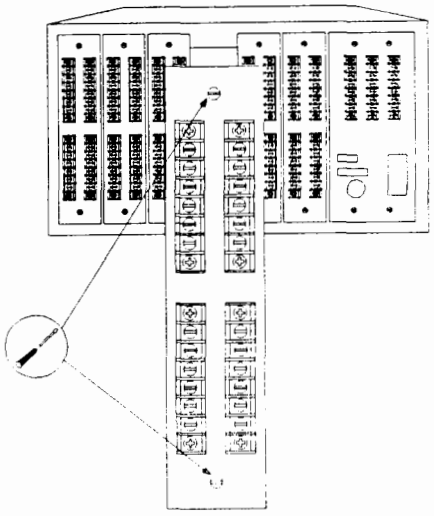


5 Signal Input Relay Module (Quad Relay)

⚠ WARNING

High Voltage present Could cause shock, burns or death.

Do Not touch exposed wires or terminals.



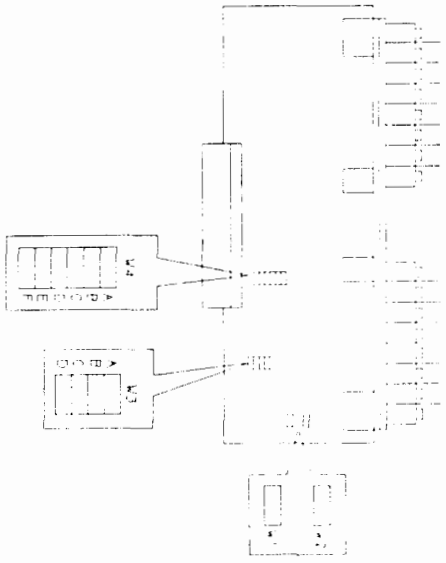
The Signal Input Relay Module is on the back of the rack. For relay configuration, see Installation Manual. For field wiring, see Section 15 (Field Wiring Diagrams).

Module Removal

Loosen two screws and remove the module.

Module Options

Alert Relays	Jumper In	Jumper Out
Normally Energized	W3A,W4C	W2,W3C W3D,W4D
Normally Deenergized	W2,W3C W3D,W4D	W3A,W4C
Danger Relays	**Jumper In**	**Jumper Out**
Normally Energized	W4B,W4F	W1,W3B W4A,W4E
Normally Deenergized	W1,W3B W4A,W4E	W4B,W4F



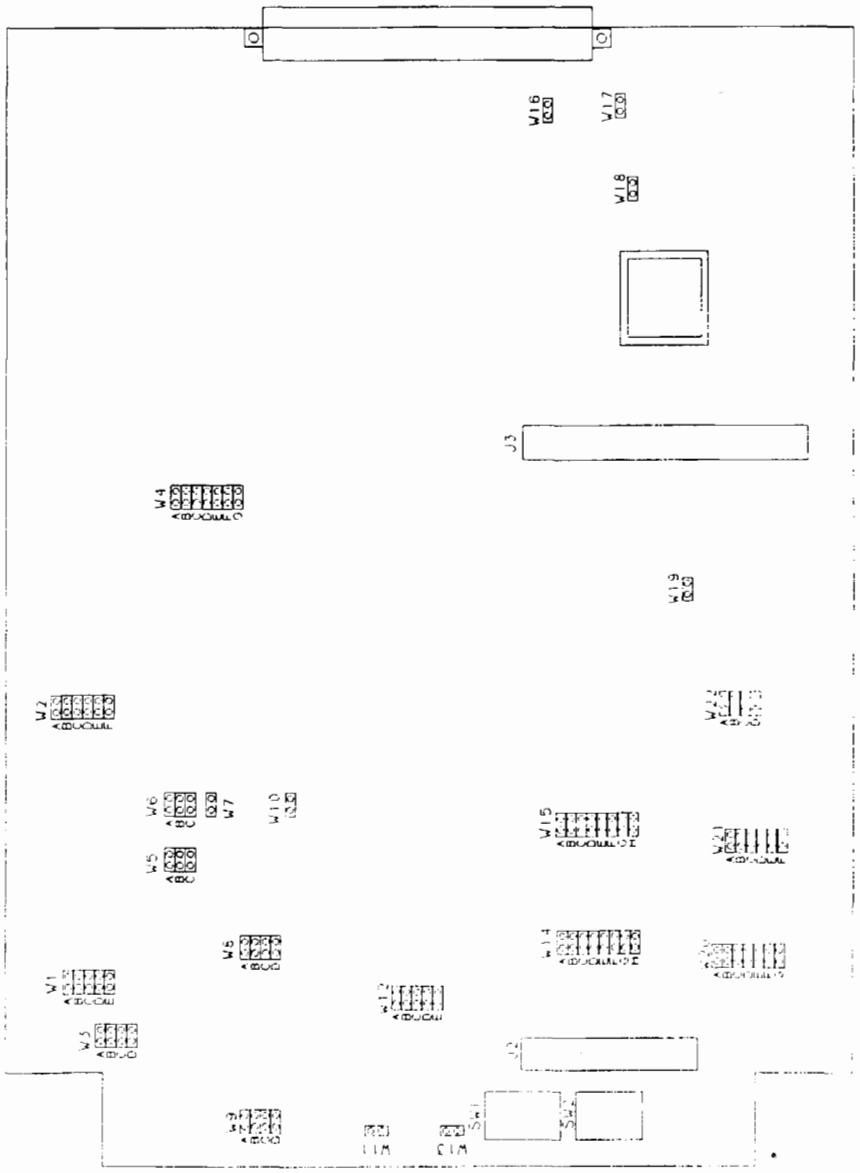
6 Monitor Options

RAMP DIFFERENTIAL EXPANSION
MONITOR PART NUMBER

	FULL SCALE RANGE	TRANSDUCER INPUT	ALARM RELAY	AGENCY APPROVAL
3300/46	AA	BB	CC	DD
	01 = 5-0-5mm 02 = 0 - 10mm 03 = 0.25-0-0.25 INCHES 04 = 0 - 0.5 INCHES 05 = 10-0-10mm 06 = 0 - 20mm 07 = 0.5-0-0.5 INCHES 08 = 0 - 1.0 INCHES 09 = 1.0-0-1.0 INCHES 10 = 0 - 2.0 INCHES 11 = 25-0-25mm 12 = 0 - 50mm	01 = 11mm, 100 mV/mil 02 = 14mm, 100 mV/mil 03 = 25mm, 20 mV/mil 04 = 35mm, 20 mV/mil 05 = 50mm, 10 mV/mil	00 = NONE 01 = EPOXY SEALED 02 = HERMETICALLY SEALED 03 = EPOXY SEALED QUAD	00 = NOT REQUIRED 01 = CSA 02 = BASEEFA 03 = FM

6 Monitor Options [Cont]

The Ramp Differential Expansion Monitor has several user-programmable options. The options can be changed by removing and installing jumpers on the printed circuit boards.



Jumper Locations on the Main Circuit Board

6 Monitor Options [Cont]

Main Board Option Settings

All monitor option jumpers for the Ramp DE Monitor are on the Main Board. Table 1 shows these options and their jumper positions.

Table 1 Option Settings on Main Board

Option	Setting	Jumper	
		Install	Remove
First Out	Enabled *	W14D	----------
	Disabled	----------	W14D
Not OK Mode	Latching	W15G	W21E
	Nonlatching * ----------	W15G	
Alert Mode	Latching *	W14E	----------
	Nonlatching	----------	W14E
Danger Mode	Latching *	W14F	----------
	Nonlatching	----------	W14F
Danger Bypass Switch	Enabled	W12A	----------
	Disabled *	----------	W12A
Not OK Monitor Defeat	Enabled	W21E	W15G
	Disabled *	----------	W21E
Alarm Delay	0.1 Seconds	----------	W14A,B
	1 Seconds	W14B	W14A
	3 Seconds *	W14A	W14B
	6 Seconds	W14A,B	----------
Display Update	Slow	W21B	----------
	Fast *	----------	W21B
Ramp Option	Single	W20G	----------
	Dual *	----------	W20G

* Options shipped from factory

6 Monitor Options [Cont]

Table 1 [continued]

Option	Setting	Jumper Install	Jumper Remove
Upscale Direction	Toward Probe A *	W12C	----------
	Away from Probe A	----------	W12C

* Options shipped from factory

Recorder Output Options

To set the recorder output, remove all jumpers from headers W1A-E, W2A-E, W3A-D, W5A-C, W6A-C, W8A-D, W9A-D, W14G AND W14H. Install jumpers specified in Table 2.

Table 2. Recorder Output Options

Recorder Output	+4 to +20 mA *	+1 to +5 Vdc	0 to -10 Vdc
Jumper Settings	W1B,C,E	W1A,D	W1A,D
	W2B,C,E	W2A,D	W2A,D
	W3A,D	W3A,D	W3B,C
	W5A	W5C	W5B
	W6A	W6C	W6B
	W8B,C	W8D	W8A
	W9B,C	W9D	W9A
		W14H	W14G

* Options shipped from factory

6 Monitor Options [Cont]

Transducer Type Options

To set the monitor for the correct transducer type, remove all jumpers from headers W21C and D, W22B-D, W4A-F, and W16 and W17. Install jumpers specified in Table 3.

Table 3. Transducer Type Options *

Transducer Type	Install Jumpers
11 mm, 100mV/mil	W4A,B,D,E, W16, W17, W21D
14 mm, 100mV/mil	W4A,B,D,E, W16, W17, W21D, W22D
25 mm, 20 mV/mil	W4A,B,D,E, W16, W17, W21D, W22C
35 mm, 20 mV/mil	W4A,B,D,E, W16, W17, W21D, W22C,D
50 mm, 10 mV/mil	W4A,B,D,E, W16, W17, W21D, W22B

Full Scale Range Options

To set the monitor full scale range option, remove jumpers W15A-E. Install jumpers specified in Table 4.

Table 4. Full Scale Range Options *

Full Scale Range	Install Jumpers
5 - 0 - 5 mm	W15A,C
0 - 10 mm	W15A,C,D
0.25 - 0 - 0.25 inches	W15A,B
0 - 0.5 inches	W15A,B,D
10 - 0 - 10 mm	W15A,B,C
0 - 20 mm	W15A,B,C,D
0.5 - 0 - 0.5 inches	W15E
0 - 1.0 inches	W15D,E
1.0 - 0 - 1.0 inches	W15B,C,D,E
0 - 2.0 inches	W15C,D,E
25 - 0 - 25 mm	W15A,E
0 - 50 mm	W15B,E

* Note: Changing the transducer type or full scale range requires recalibration of the monitor. See section 13.

6 Monitor Options [Cont]

Ramp Angle Options

The following table, Table 5, shows the acceptable ramp angle ranges for different meter range and transducer type combinations. If possible, however, avoid using ramp angle combinations specified in Table 6 since accuracy is reduced.

Table 5. Allowable Transducer vs. Meter/Ramp Combinations

Meter Range	Range of Ramp Angles for each Transducer Type (in degrees)		
	11/14 mm	25/35 mm	50 mm
5-0-5 mm/0-10mm	4 - 18	4 - 45	11 - 45
0.25-0-0.25 in/0-0.5 in	4 - 15	4 - 45	11 - 45
10-0-10 mm/0-20 mm	4 - 9	4 - 33	11 - 45
0.5-0-0.5 in/0-1 in	4 - 7	4 - 25	11 - 45
1-0-1 in/0-2 in	NA	4 - 12	11 - 28
25-0-25 mm/0-50 mm	NA	4 - 12	11 - 28
Options shipped from factory	7	12	12

Within the ramp angle ranges specified above, the following option combinations are allowable but are not recommended because of reduced accuracy:

Table 6. Ramp Angles Not Recommended Due to Reduced Accuracy

Meter Range	Ramp Angles Not Recommended (in degrees)	
	25/35mm	50mm
5-0-5 mm/0-10 mm	$\leq$ 11	$\leq$ 23
0.25-0-0.25 in/0-0.5 in	$\leq$ 8	$\leq$ 18
10-0-10 mm/0-20 mm	$\leq$ 5	
0.5-0-0.5 in/0-1 in	$\leq$ 4	

6 Monitor Options [Cont]

Ramp Angle Options (cont.)

To set the monitor for the correct ramp angle, remove jumpers W20A-F. Install jumpers specified in Table 7.

Table 7. Ramp Angle Options

Ramp Angle	Install Jumpers	Ramp Angle	Install Jumpers
4	W20C	25	W20A,B,E
5	W20C,E	26	W20A,B,D
6	W20C,D	27	W20A,B,D,E
7	W20C,D,E	28	W20A,B,C
8	W20B	29	W20A,B,C,E
9	W20B,E	30	W20A,B,C,D
10	W20B,D	31	W20A,B,C,D,E
11	W20B,D,E	32	W20F
12	W20B,C	33	W20E,F
13	W20B,C,E	34	W20D,F
14	W20B,C,D	35	W20D,E,F
15	W20B,C,D,E	36	W20C,F
16	W20A	37	W20C,E,F
17	W20A,E	38	W20C,D,F
18	W20A,D	39	W20C,D,E,F
19	W20A,D,E	40	W20B,F
20	W20A,C	41	W20B,E,F
21	W20A,C,E	42	W20B,D,F
22	W20A,C,D	43	W20B,D,E,F
23	W20A,C,D,E	44	W20B,C,F
24	W20A,B	45	W20B,C,E,F

7 Meter Scale Replacement

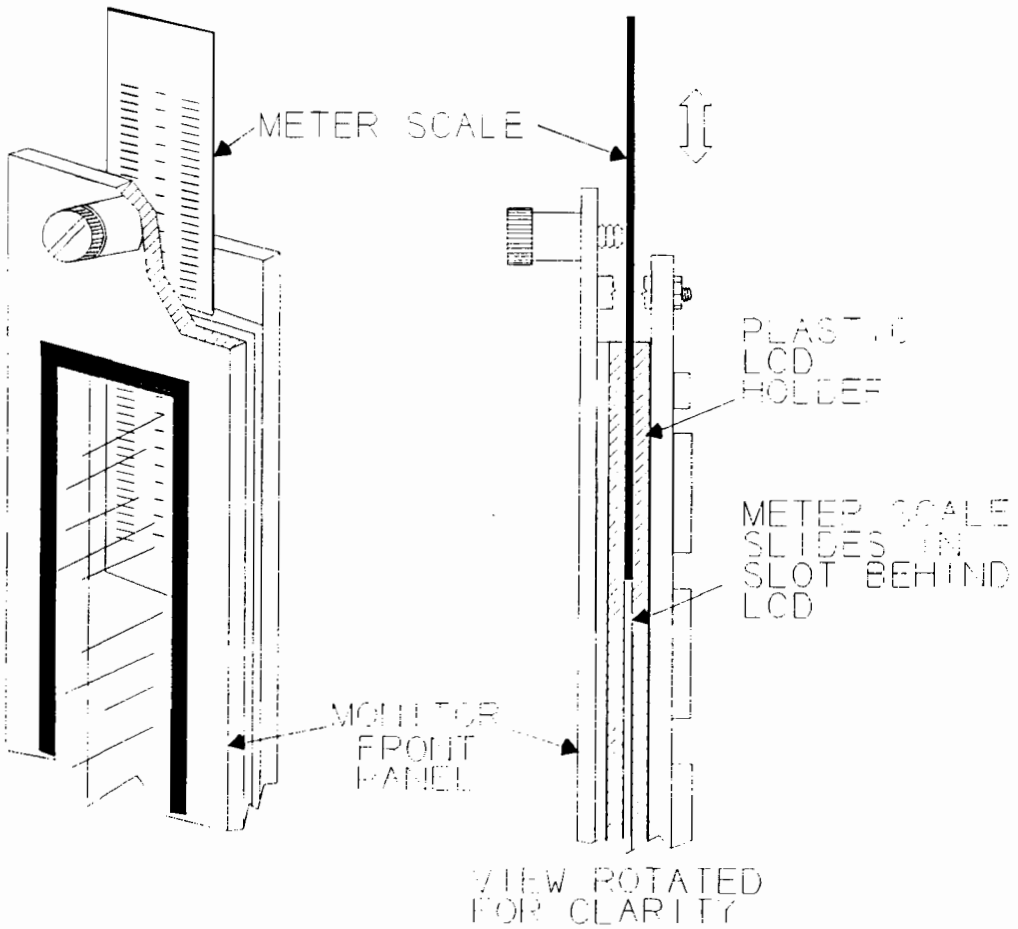
The Monitor meter scales can be replaced for operation with different full scale ranges. The replacement meter scales are located in the back of this manual.

To replace a meter scale :

1. Set the monitor full scale range. (See section 6. Monitor Options)

2. Cut the meter scale from the back of this manual. Be sure to cut along the marked outline so the meter scale will fit properly.

3. Insert the meter scale in the front panel.

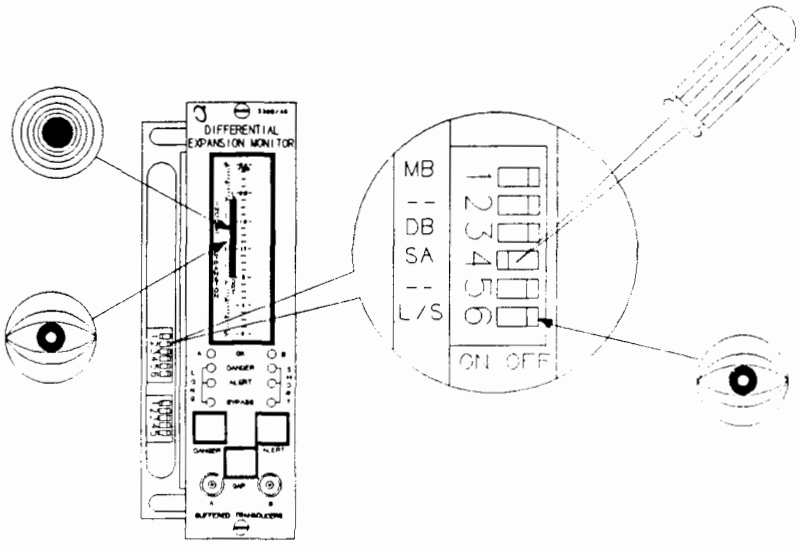


8 Alarm Setpoint Adjust

1. Open front panel.

2. Set switch the Setpoint Adjust switch (SA) to the left (ON).

3. Select Short rotor setpoints by setting the Long/Short (L/S) switch to the right. The left bargraph will start flashing the differential expansion signal.



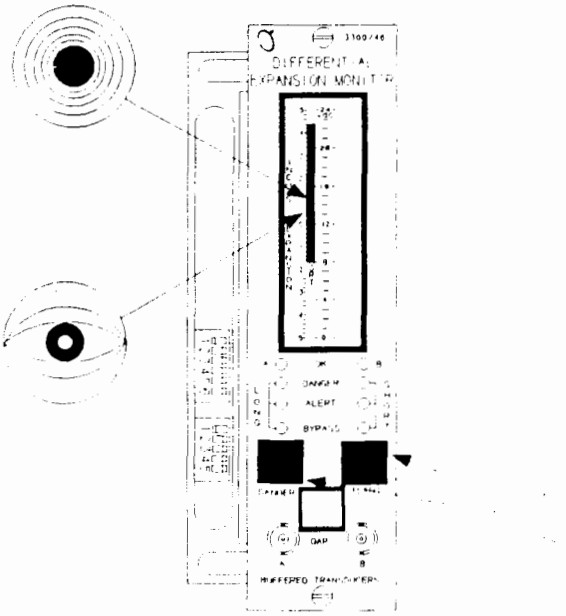
4. To adjust Alert or Danger setpoints, press and hold **ALERT** or **DANGER** switch on the front panel.

5. Use the (↑) or (↓) switches on the System Monitor to adjust the setpoint level up or down.

6. Repeat for Long setpoints by setting the Long/Short (L/S) switch to the left.

7. Reset **SA** to the right (OFF).

8. Close front panel.



9 Monitor Bypass

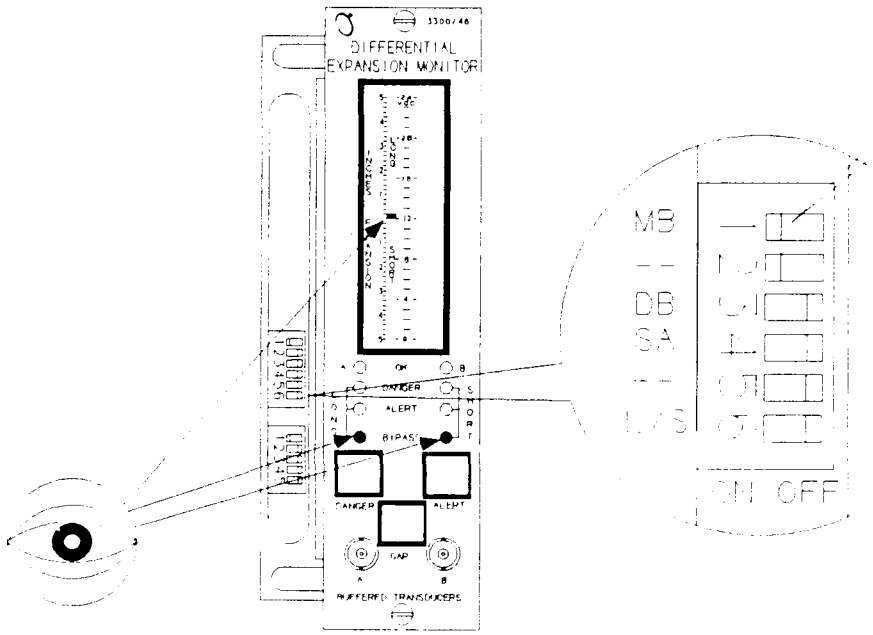
Set **MB** (Monitor Bypass) switch to the left (ON). The **BYPASS** LEDs come on, the **OK** LEDs go off, and the Differential Expansion signal is clamped to Zero Position.

CAUTION

Machine Protection will be lost while Monitor Bypass is on.

NOTE

When Monitor Bypass is switched on, alarms are cleared.

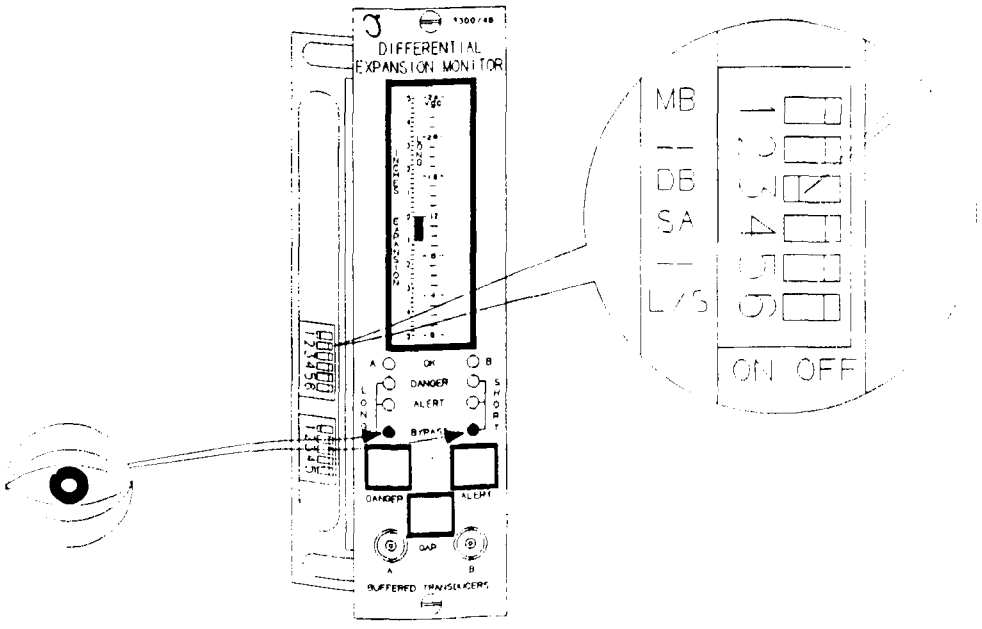


10 Danger Bypass

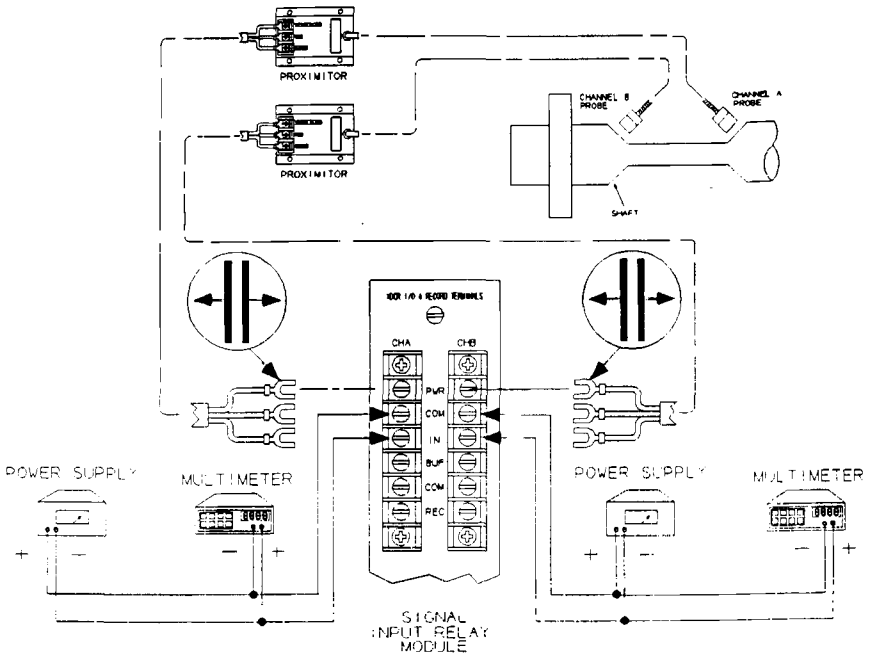
Set **DB** (Danger Bypass) switch to the left (ON). Both **BYPASS** LEDs come on. The **DANGER** alarm LEDs on the front panel can come on but the Danger relay drive will not be activated if a Danger setpoint is exceeded. For this switch to function, the Danger Bypass Enable jumper (W12A) must be installed.

CAUTION

Machine Protection will be lost while Danger Bypass is on.



11 Test Alarms



CAUTION

Tests will exceed alarm setpoint levels causing alarms to activate. This could result in relay contact to change state. See Danger Bypass section 10.

⚠ WARNING

High Voltage present
Could cause shock, burns or death.

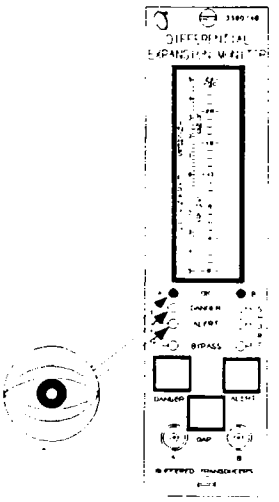
Do Not touch exposed wires or terminals.

1. Disconnect **COM** and **IN** wiring from the channel A and channel B terminals on the Signal Input Relay Module.

2. Connect the multimeters and the power supplies.

3. Adjust the voltages such that the differential expansion signal is between the Long and Short alarm setpoints on the monitor.

4. Press the **RESET** switch and verify that the **OK** LEDs are on, and the **ALERT** and **DANGER** LEDs are off.

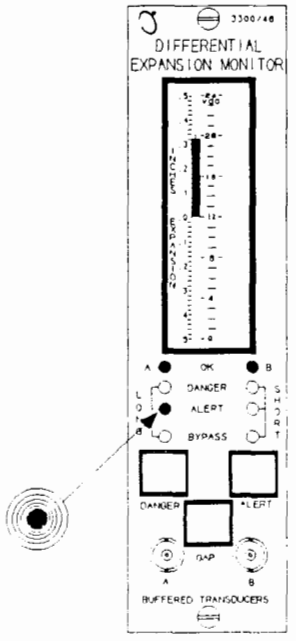


11 Test Alarms [Cont]

5. Adjust the power supply voltages such that the differential expansion signal on the monitor just exceeds the Long Alert setpoint level and verify that the Long **ALERT** LED goes on after the specified delay period has elapsed (Flashing if the first out option is selected).

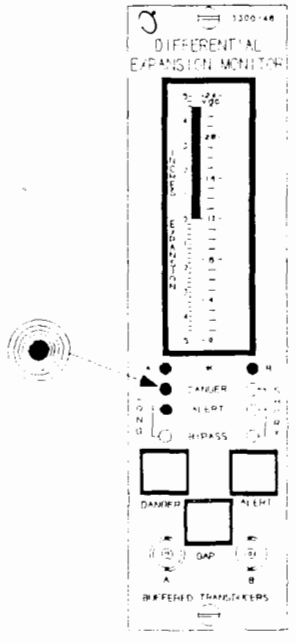
6. Verify that the Alert relay changed state.

7. Press the **RESET** switch on the system monitor and verify that the Long **ALERT** LED remains on steady.



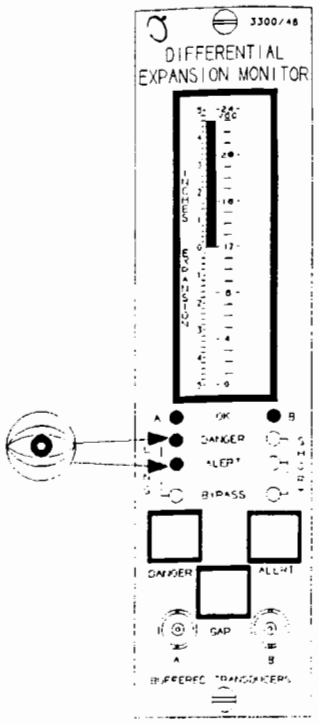
8. Adjust the power supply voltages such that the differential expansion signal on the monitor just exceeds the Long Danger setpoint level and verify that the Long **DANGER** LED goes on after the specified delay period has elapsed (Flashing if first out option is selected).

9. Verify that the Danger relay changed state. The relay will not change state if the Danger Bypass is on.



11 Test Alarms [Cont]

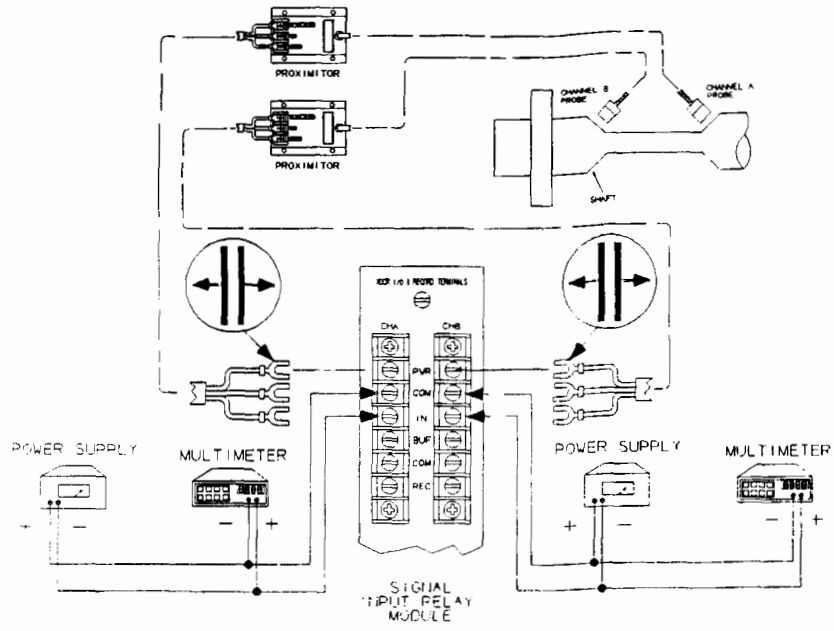
10. Press **RESET** switch on the System Monitor. Verify that Long **ALERT** and **DANGER** LEDs remain on and steady.



11. Reduce the power supply voltages such that the differential expansion signal reads below the Long alarm setpoints and observe that the Long **ALERT** and **DANGER** LEDs go off (if nonlatching alarm jumper is installed). Press the **RESET** switch on the System Monitor to reset latching alarms.

12. Repeat steps 5 through 11 for Short alarms.

12 Test OK Limits



CAUTION

Tests will exceed alarm setpoint levels causing alarms to activate. This could result in relay contact to change state. See Danger Bypass section 10.

⚠ WARNING

High Voltage present Could cause shock, burns or death.

Do Not touch exposed wires or terminals.

Figure 9

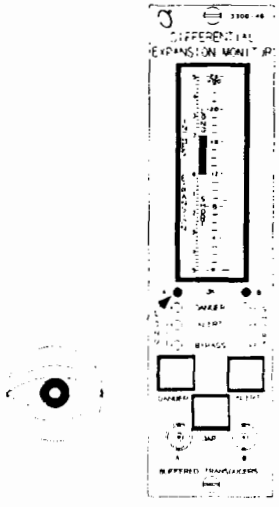
1. Disconnect **COM** and **IN** wiring from the channel A terminals on the Signal Input Relay Module.

2. Connect the multimeter and the power supply.

3. Adjust the power supply voltage for -9 Vdc.

4. Verify that the Channel A **OK** LED is on.

5. Increase the power supply voltage (more negative) until the **OK** LED goes off (upper limit). Verify that the upper OK limit is within the upper OK voltage range (reference Table 8).



12 Test OK Limits [Cont]

6. Verify that the OK relay changes state (deenergized). Note: all other channels in the rack must be OK or bypassed in order for the relay to change state.

7. Decrease the power supply voltage (less negative) to -9 Vdc and verify that the **OK** LED comes back on and the OK relay energizes (if the Nonlatching Not OK jumper is installed). Press the **RESET** switch on the System Monitor to reset latching Not OKs.

8. Gradually decrease the power supply voltage (less negative) until the **OK** LED goes off (lower limit). Verify that the lower OK limit is within the lower OK voltage range (reference Table 8).

9. Verify that the OK relay deenergizes.

10. When finished, disconnect the power supply and multimeter and reconnect **COM** and **IN** wiring to the channel A terminals on the Signal Input Relay Module. Verify that the OK LED comes on and the OK relay energizes (if the Nonlatching Not OK jumper is installed). Press the **RESET** switch on the System Monitor to reset latching Not OKs.

11. Repeat steps 1 through 10 for Channel B.

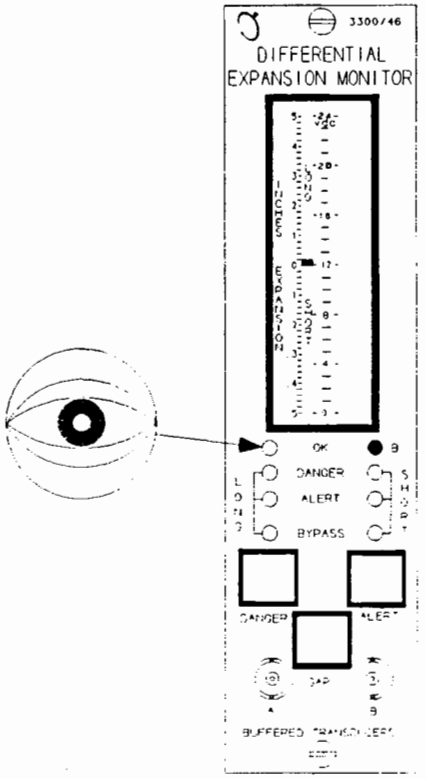
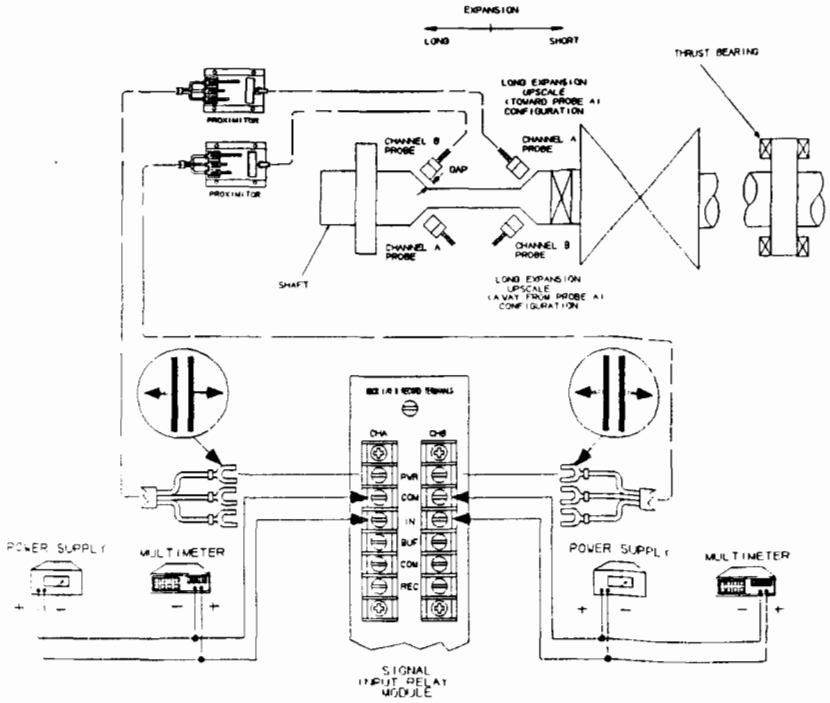


TABLE 8. OK Voltage Limits

Transducer Type	Lower OK Voltage Limits	Upper OK Voltage Limits
11 mm	-3.25 Vdc to -3.35 Vdc	-19.68 Vdc to -19.88 Vdc
14 mm	-1.65 Vdc to -1.75 Vdc	-18.20 Vdc to -18.40 Vdc
25, 35, and 50 mm	-1.30 Vdc to -1.40 Vdc	-12.40 Vdc to -12.60 Vdc

13 Calibrate Channels

Figure 1



CAUTION

Monitoring will be bypassed automatically during calibration. Machine Protection will be lost during calibration. See Danger Bypass section 10.

⚠ WARNING

High Voltage present Could cause shock, burns or death.

Do Not touch exposed wires or terminals.

Calibration Terminology :

TSF is defined as Transducer Scale Factor. 11mm and 14mm = 100 mV/mil (3.937 V/mm), 25mm and 35mm = 20 mV/mil (0.7874 V/mm), 50mm = 10 mV/mil (0.3937 V/mm).
MR is the range from the bottom of the meter to the top of the meter (in inches).
FUSV is the full upscale voltage.
ZPV is the zero position voltage.
θ is the ramp angle (see figure below and Section 6 for ramp angle options).

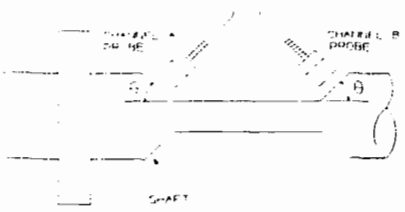


TABLE 9. Zero Position Voltage

Transducer Type	Zero Position Voltage (ZPV)
01 (11mm)	-11.6 ± 0.65 Vdc
02 (14mm)	-10.0 ± 0.65 Vdc
03 (25mm) 04 (35mm) 05 (50mm)	- 6.5 ± 0.30 Vdc

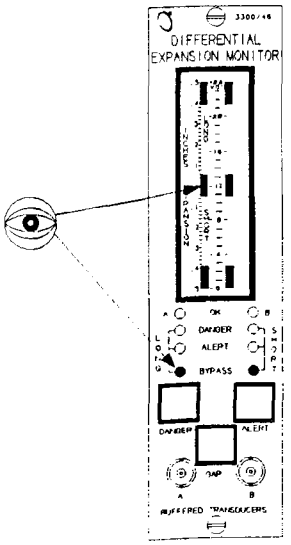
13 Calibrate Channels [Cont]

1. Disconnect **COM** and **IN** wiring from the channel A terminals on the Signal Input Relay Module.

2. Connect a power supply and a multimeter to **COM** and **IN** with polarity as shown in Figure 1 on page 24.

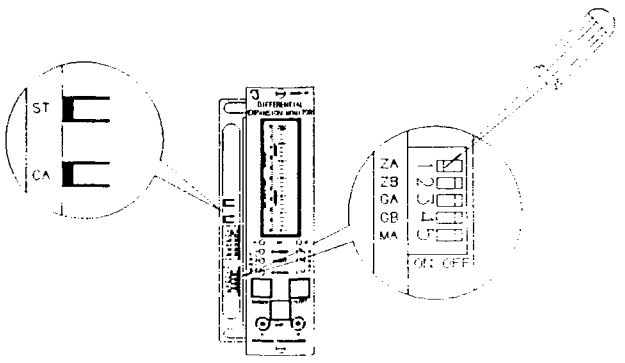
3. Open front panel.

4. Short calibration terminals (**CA**) using a clip lead (a jumper may be used if the monitor is on an extender card). A test pattern will appear on the display when the calibration terminals are shorted and no calibration dip switches are set. Both BYPASS LEDs will come on.



5. Activate the channel A zero adjust dipswitch (**ZA**) by moving it to the left. Measure the voltage at test point channel A (**TA**) using the multimeter. Adjust the power supply to ZPV (reference Table 9). Press the **GAP** switch and use the (↑) and (↓) switches on the System Monitor to adjust the voltage at **TA** to get +2.5 ±0.03Vdc.

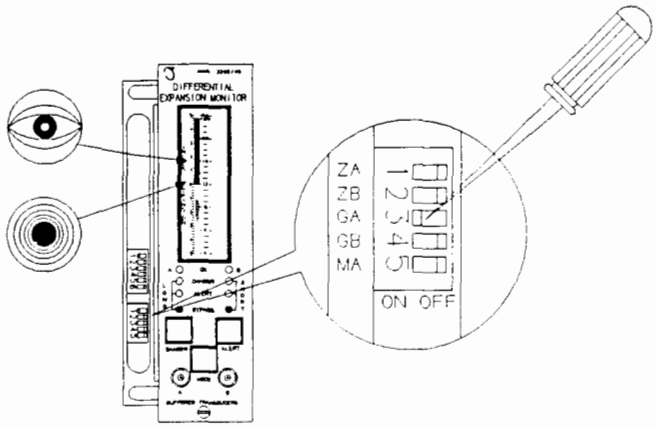
6. Deactivate the channel A zero adjust dipswitch (**ZA**) by moving it to the right. If the short is removed from the calibration terminals before the dipswitch is deactivated, the adjustment will not be stored.



7. Repeat steps 1-6 for channel B substituting ZB and TB

13 Calibrate Channels [Cont]

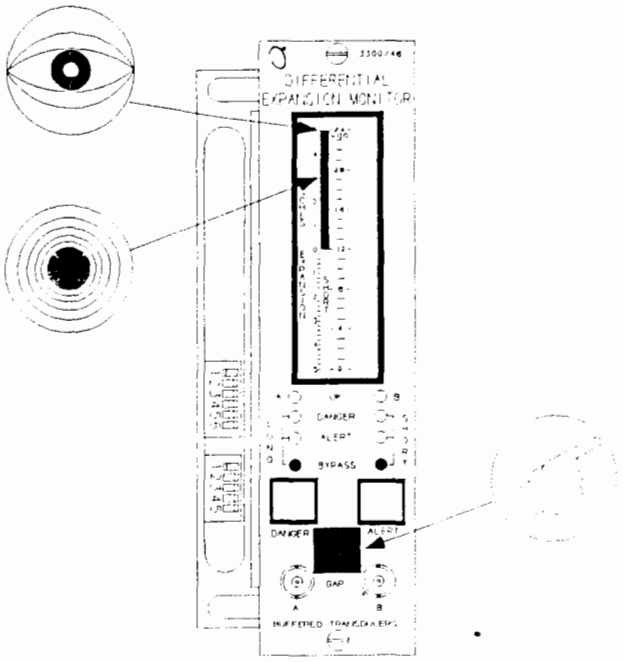
8. Activate the channel A gain adjust dip switch (**GA**) by moving it to the left. The channel A bargraph will begin to flash. Measure the voltage at Test point channel A (TA) using the multimeter. Adjust the power supply to the Full Upscale Voltage (FUSV) (reference Table 10).



9. Press the **GAP** switch and use the System Monitor (↑) and (↓) switches to adjust the gain until the Test point channel A (**TA**) is at +5.0 ±0.05 Vdc and the **BYPASS** LED is on steady (not flashing). The flashing **BYPASS** LED indicates an overrange condition. If this occurs, reduce the gain using the System Monitor (↓) switch.

10. Deactivate the channel A gain adjust dip switch (**GA**) by moving it to the right. If the short is removed from the calibration terminals (**CA**) before the dip switch is deactivated, the adjustment will not be stored.

11. Repeat steps 8 through 10 for channel B substituting **GB** and **TB**.



13 Calibrate Channels [Cont]

12. Activate the meter adjust dip switch (**MA**) by moving it to the left. The differential expansion signal will begin to flash on the left LCD display.

13. Measure the voltage at test point channel A (**TA**) using the multimeter. Adjust both power supplies to ZPV (reference Table 9). Press the **GAP** switch and use the System Monitor (↑) and (↓) switches to adjust the voltage at **TA** to +2.5 ±0.03Vdc.

14. Deactivate the meter adjust dip switch (**MA**) by moving it to the right. If the short is removed from the calibration terminals (**CA**) before the dip switch is deactivated, the adjustment will not be stored.

15. Remove the clip lead (jumper) from the calibration terminals (**CA**).

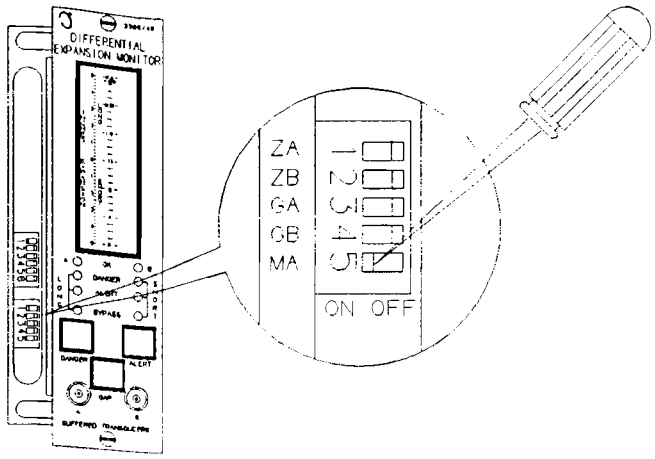


TABLE 10. Formulas for Full Upscale Volts

Direction	Single Ramp Option Dual Ramp Option	Full Upscale Volts (FUSV) Vdc Probe A Probe A or B	Probe B
Upscale Toward Probe A	$-4.08 =$	ZPV + (0.5 sin θ)(TSF)(MR)	ZPV + (0.5 tan θ)(TSF)(MR)
Upscale Away from Probe A		ZPV - (0.5 sin θ)(TSF)(MR)	ZPV -(0.5 tan θ)(TSF)(MR)

13 Calibrate Channels [Cont]

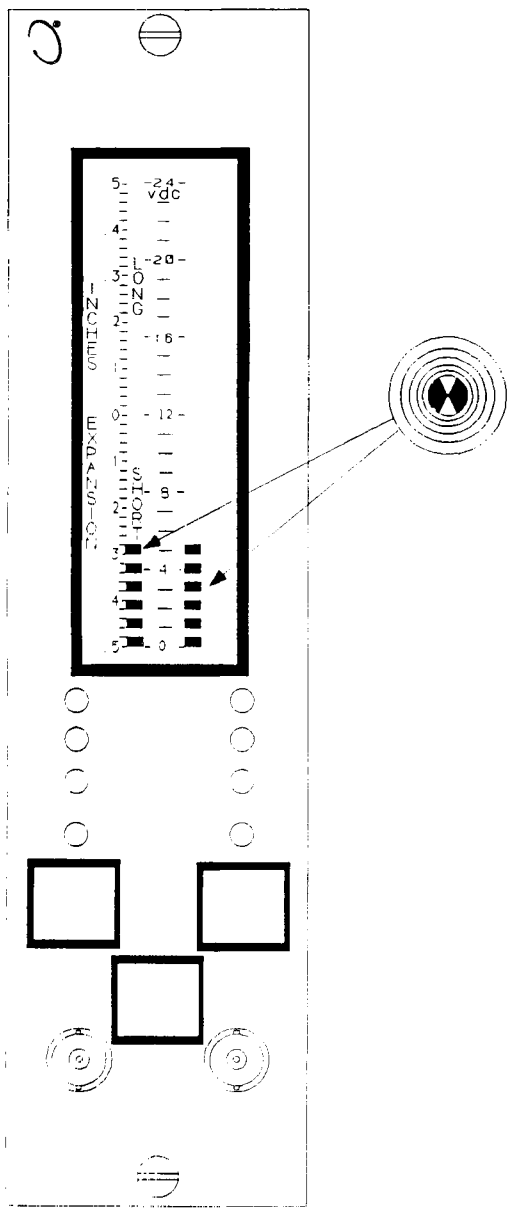
Example: A user has a 25mm probe and a 0.25-0-0.25 inch full scale range. The monitor is configured for upscale toward probe A with dual ramp angles of 14 degrees. (1 inch = 1000 mils, 1V = 1000 mV)

TSF = 20mv/mil
MR = 0.5 inches
FUSV = -6.5Vdc + (0.5 sin 14)(20mV/mil)(1V/1000mV)(1000mils/inch)(0.5 inches) = -5.29 Vdc

14 Self Test

THE MONITOR HAS THREE LEVELS OF SELF TESTS:

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



IF ERRORS ARE DETECTED DURING CYCLIC SELF TESTS:

MONITORING IS ABORTED UNTIL THE ERROR IS RESOLVED.

ERROR CODE IS STORED IN MEMORY AND FLASHED ON THE LCD BARGRAPH DISPLAY.

BYPASS LEDS COME ON AND **OK** LEDS FLASH AT 5 HZ.

IF ERROR IS INTERMITTENT AND GOES AWAY, MONITORING IS RESUMED AND **OK** LEDS FLASH AT 5 HZ.

ERROR CODE IS STORED. USER-INVOKED TEST DISPLAYS AND CLEARS ERROR.

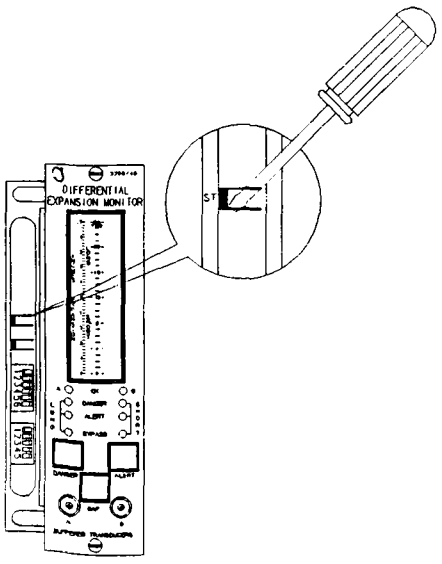
IF ERRORS ARE DETECTED DURING POWER-UP TEST OR USER-INVOKED SELF TEST:

MONITORING IS ABORTED UNTIL USER ACTION RESOLVES PROBLEM.

TEST CAN BE RERUN WITH MONITOR POWER-UP OR USER-INVOKED TEST.

14 Self Test [Cont]

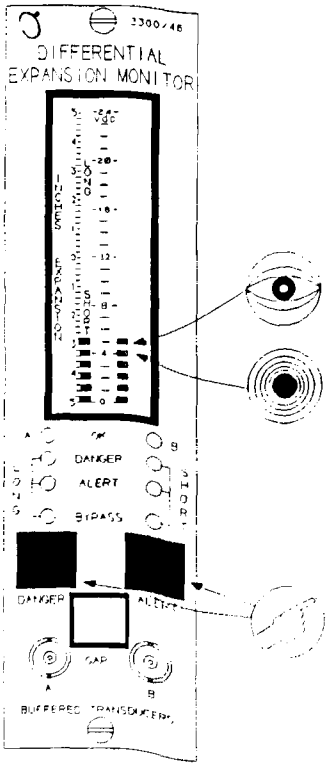
INITIATE USER-INVOKED TEST BY SHORTING ACROSS TWO SELF TEST (ST) PINS.



CAUTION

Machine ProtectionWill Be Lost For Duration of Test

AT COMPLETION OF USER-INVOKED SELF TEST, THE MONITOR WILL RECALL STORED ERROR CODES, IF ANY. THESE ERROR CODES MUST BE READ AND CLEARED WITH USER INTERACTION TO ALLOW MONITORING TO CONTINUE.

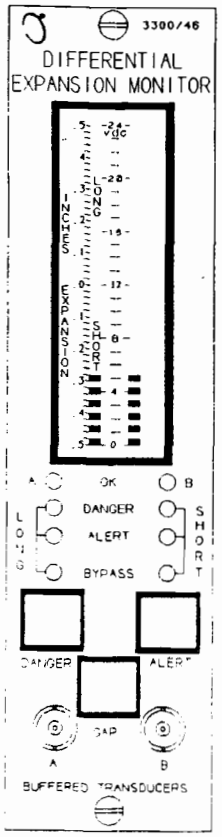


NOTE
ALTHOUGH BOTH COLUMNS ON THE BARGRAPH FLASH, THE ERROR CODE IS ONLY THE SUM OF THE BARGRAPH SEGMENTS DISPLAYED IN ONE COLUMN. EXAMPLE SHOWS ERROR CODE 6.

TO READ CODES ON THE LIST, STEP THROUGH EACH ERROR CODE BY PRESSING AND HOLDING THE **ALERT** SWITCH FOR APPROXIMATELY 1 SECOND.

AT THE END OF THE LIST, THE LCD BARGRAPH DISPLAYS ALL SEGMENTS. TO REREAD THE LIST PRESS THE **ALERT** SWITCH. TO CLEAR THE LIST FROM MEMORY, PRESS AND HOLD THE **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 SETPOINTS
5	+7.5V/-VT NODE OUT OF TOLERANCE. **
6	+VRH NODE OUT OF TOLERANCE. **
7	+5V NODE OUT OF TOLERANCE. **
8	MVREF NODE OUT OF TOLERANCE. **
9	+7.5V NODE OUT OF TOLERANCE. **
10	+VRL NODE OUT OF TOLERANCE. **
12	+5V/-7.5V NODE OUT OF TOLERANCE. **
14	RAM FAILURE. *
17	COP WATCHDOG NOT CONFIGURED
18	+5V/-5V OR +15V NODE OUT OF TOLERANCE. **
21	INCORRECT SWITCH OR SWITCH COMBINATION. ****
22	INCORRECT JUMPER CONFIGURATION. *

* TESTED ONLY AT POWER-UP OR USER-INVOKED SELF TEST. THIS ERROR IS DISPLAYED ON THE FRONT PANEL BUT IS NOT STORED IN MEMORY.

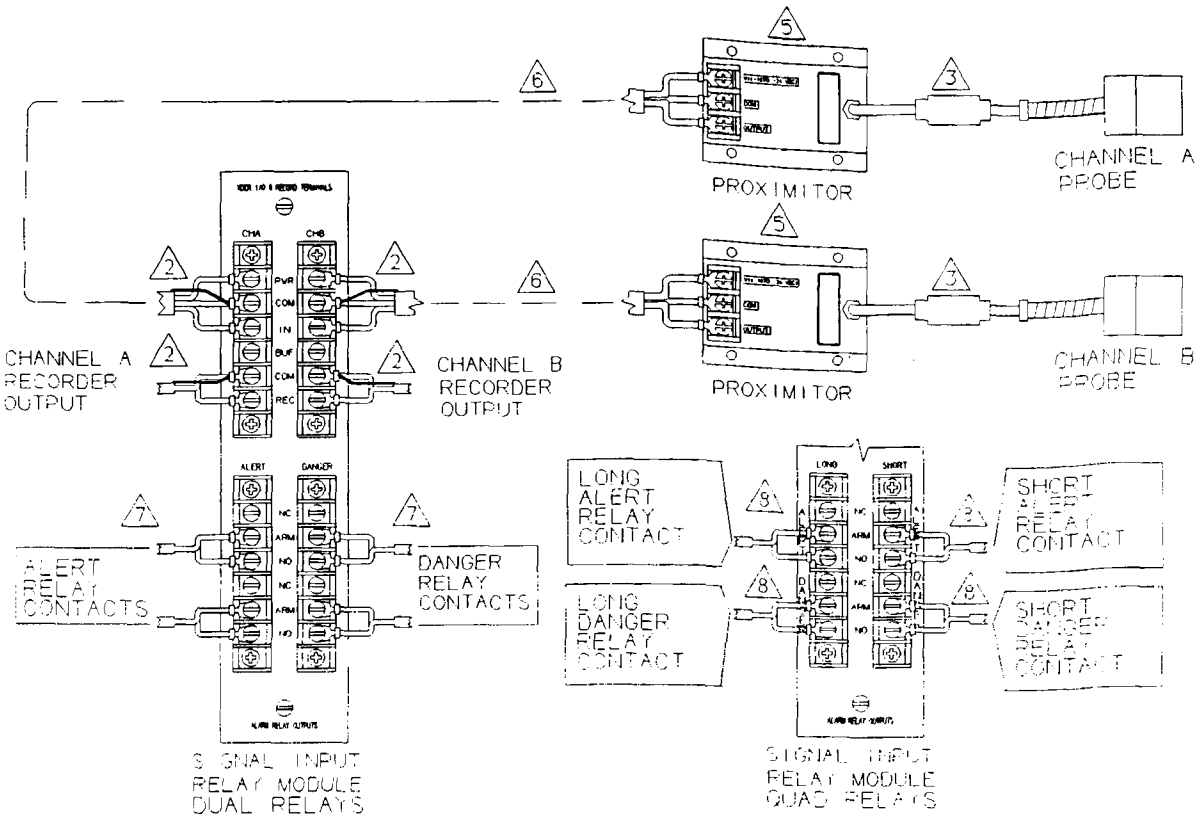
** TESTED ONLY AT CYCLIC SELF TEST. ERRORS 2, 3 AND 14 ARE NONRECOVERABLE AND ERRORS 5 THROUGH 13 COULD BE INTERMITTENT AND RECOVERABLE.

*** ERROR 4 IS A SETPOINT FAILURE AND MAY BE CORRECTED BY ADJUSTING ALL SETPOINTS IN THE MONITOR.

**** TESTED ONLY WHEN MONITOR IS IN CALIBRATION MODE.

15 Field Wiring Diagram

3300/46 FIELD WIRING



NOTE: CHANNEL B RECORDER OUTPUT ONLY ACTIVE DURING CALIBRATION

1. Wiring Recommendations:

   a. Signal Module to Proximitor, 18 to 22 AWG solid or stranded 3 - wire shielded with insulating sheath. 1000 feet (305 metres) maximum.

   b. Signal Module to Recorder, 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 connection, use protector kit part number 40113-02.

15 Field Wiring Diagram [Cont]

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) minimum. Isolation kit part number 19094-01 may be used to satisfy isolation requirement.

6. Maximum cable length between Signal Input Relay Module and Proximitor must not to exceed 1000 feet (305 metres).

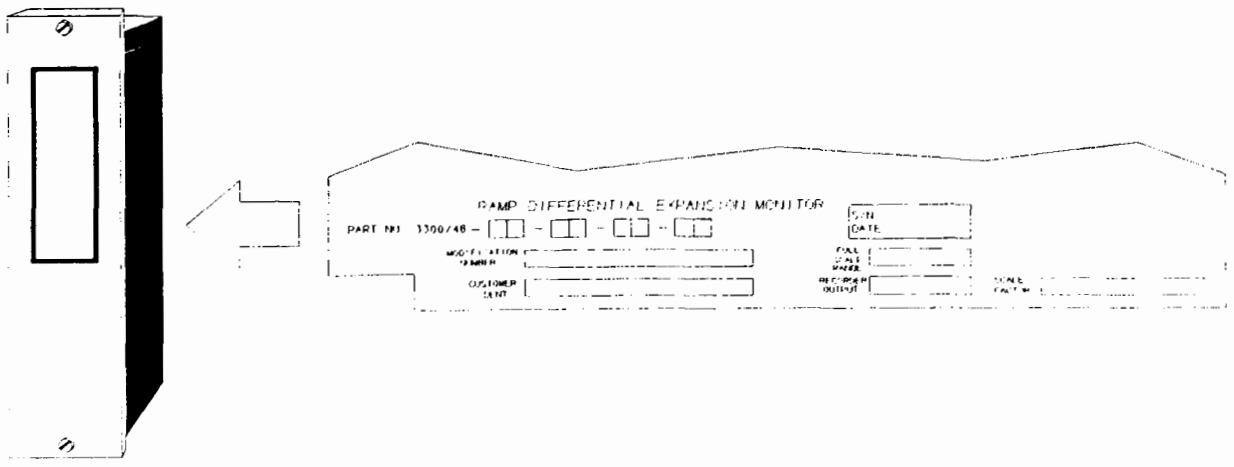
7. Connections shown for standard relay module option. This option has two DPDT relays common to the monitor.

8. Connections shown for quad relay module option. This option has two SPDT relays common to both Long and Short alarms, four relays total.

16 Recommended Spare Parts

Qty	Description	Part Number
	Differential Expansion Monitor	3300/46 - [ ][ ] - [ ][ ] - [ ][ ] - [ ][ ]
1	Front Panel Assembly	84130-01
1	Monitor Circuit Assembly	82803-01 [00] [01] [02]
1	Expander Board PWA	81410-01
1	Signal Input Relay Module	
	No Relays	81544-01 [00]
	Epoxy Sealed Relays	81545-01 [01]
	Hermetically Sealed Relays	81546-01 [02]
	Quad Relays Epoxy Sealed	85119-01 [03]

To order replacement parts, specify the complete part number according to this table as indicated on the identification decal. If the monitor has been modified, specify the modification number on the parts order. User must set programmable options (Reference section 6 of this manual). If in doubt about the part number, call your local sales representative before ordering.



17 Specifications

INPUTS

Signal Inputs:	Two channels proximity input, 10 kohm input impedance.
Signal Scale Factors:	100mV/mil (4.0V/mm) - 11 and 14 mm proximity probes. 20mV/mil (0.8V/mm) - 25 and 35 mm proximity probes. 10mV/mil (0.4V/mm) - 50 mm proximity probe.

SIGNAL CONDITIONING

Monitor Range:	Full scale meter range selected per Option Table.
Accuracy:	± 0.33% of full scale error typical at 77°F (25°C). ± 1% of full scale error maximum at 77°F (25°C).

ALARMS

Alarm Setpoints:	Alert/Danger alarm levels (adjustable from 0 to 100% of full scale).
Alarm Delay:	Alarm delay times are user-programmable per options.

DISPLAYS

Meter:	LCD bargraph, dual scale with outside scales marked per monitor full scale range. Bargraph resolution is 1.6% of full scale. Center scale marked for probe Gap voltage.
LEDs:	Green LEDs annunciate transducer OK condition, red LEDs annunciate Danger, Alert, and Bypass conditions.

CONTROLS

Front Panel:	Front panel switches (3) for reading Alert and Danger setpoint levels, and for reading probe Gap voltage.
Internal:	Switches on circuit board for setpoint adjustment, Danger Bypass, Monitor Bypass, and calibration functions.
External:	External remote controls: Reset, inhibit, and setpoint and calibration adjust (↑ and ↓).

OUTPUT

Recorder:	Output proportional to selected full scale monitor range and protected against continuous short circuit to ground: +4 mA to +20 mA, +12 Vdc compliance. +1 Vdc to +5 Vdc, 100 ohm output impedance. 0 Vdc to -10 Vdc, 100 ohm output impedance.
Transducer Power:	-24 Vdc or -18 Vdc per option selected in power supply. Output is short circuit protected.
Alarms and OK:	Relay drives for Alert, Danger, and system OK.

17 Specifications [Cont]

RELAY CONTACT RATINGS

Dual Relays:	5 A @ 120 Vac 50/60 Hz. 5 A @ 28 Vdc.
Quad Relays:	0.6 A @ 120 Vac 50/60 Hz. 2 A @ 30 Vdc.

ENVIRONMENTAL

Temperature:	Operating +32°F to +149°F (0°C to +65°C). Storage -40°F to +185°F (-40°C to +85°C).
Humidity:	0 to 95%, noncondensing.

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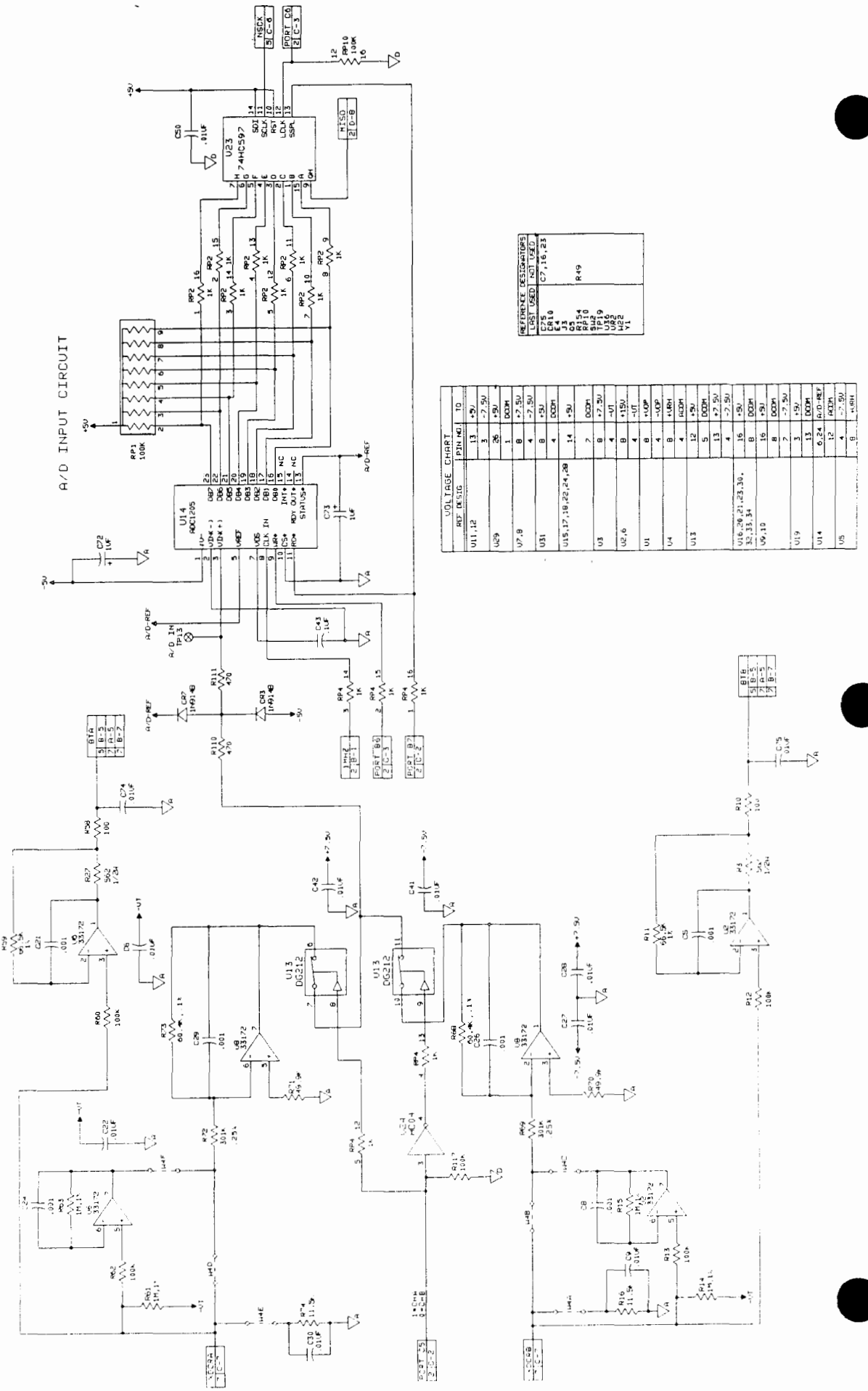
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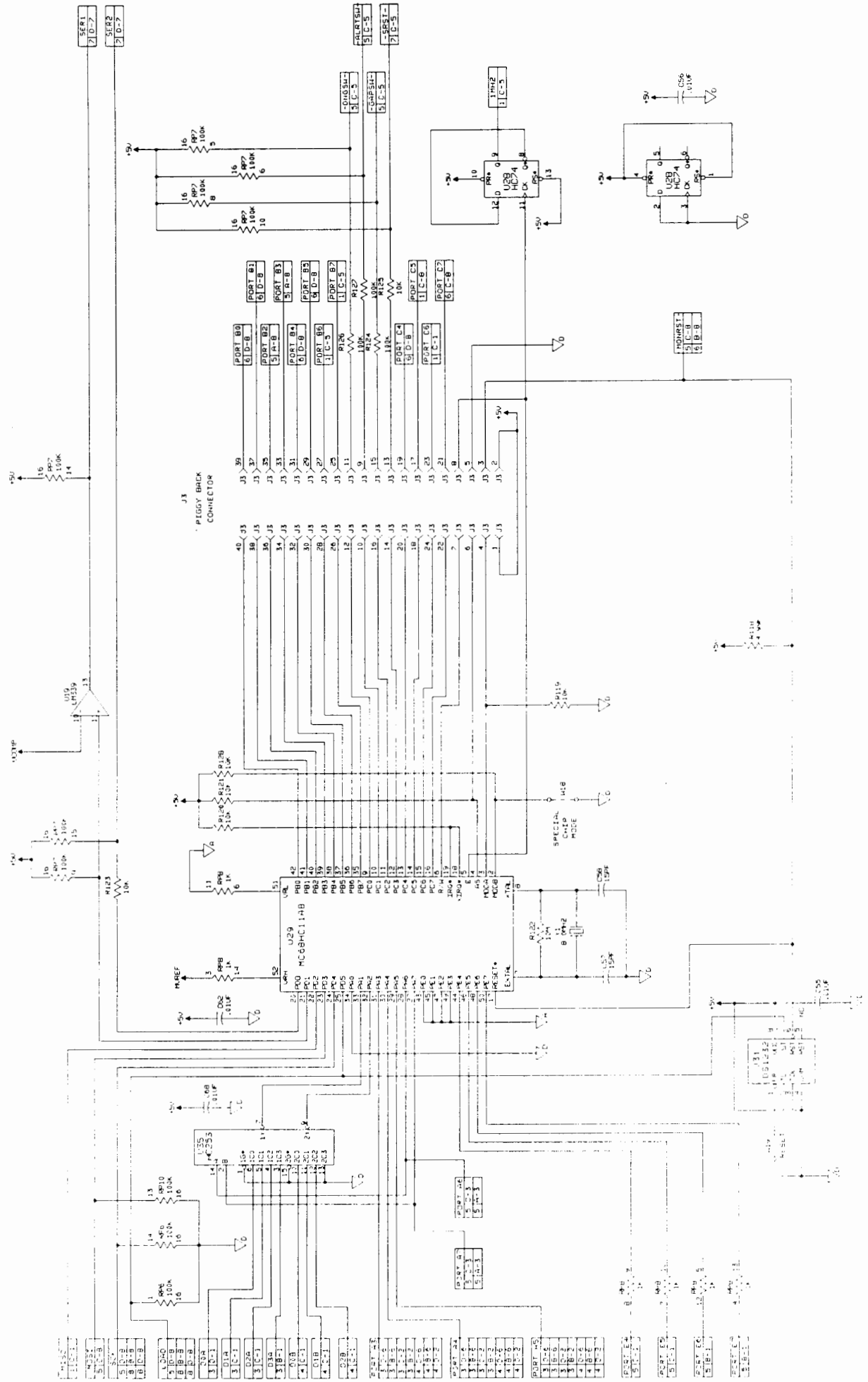
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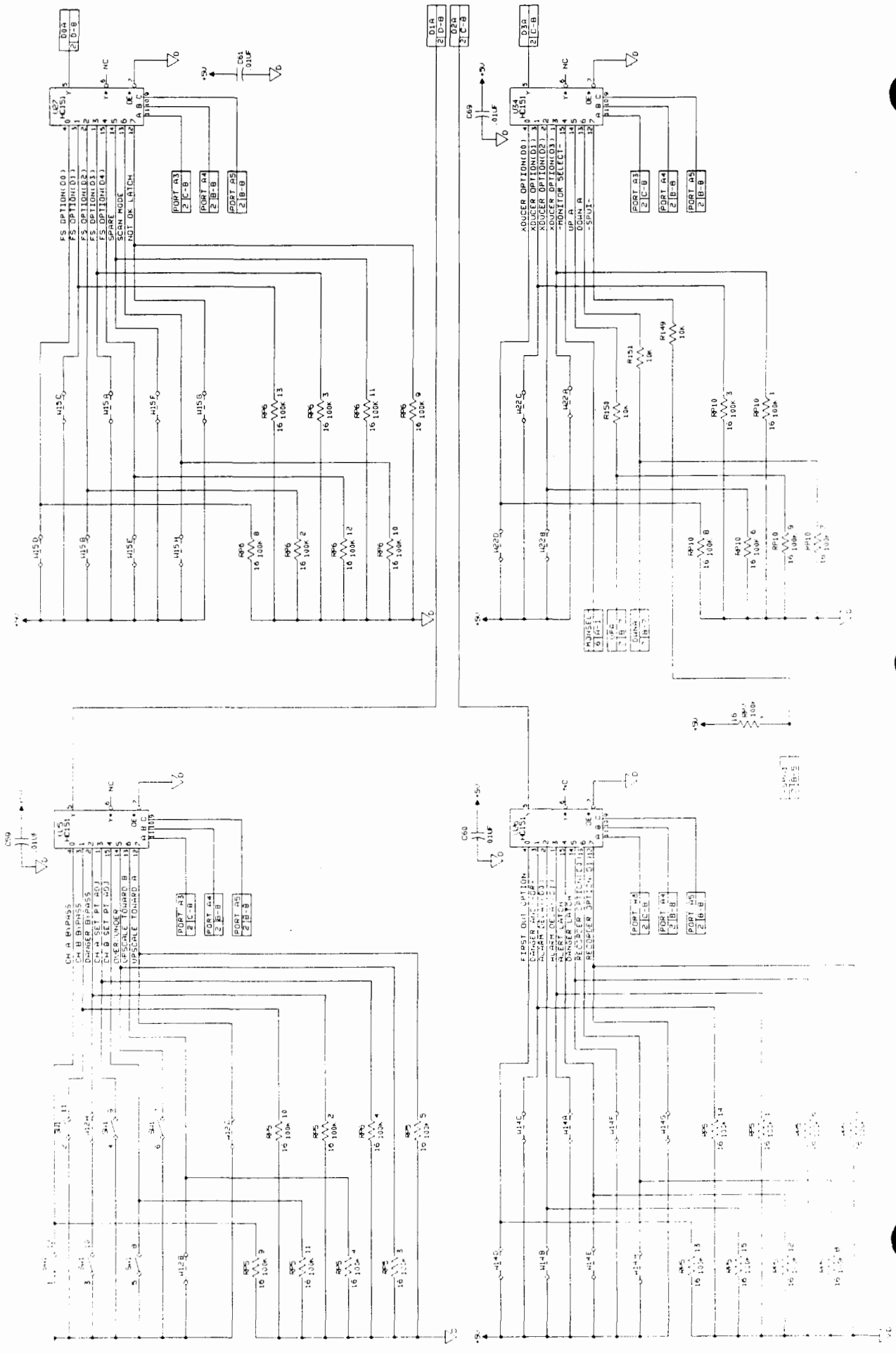
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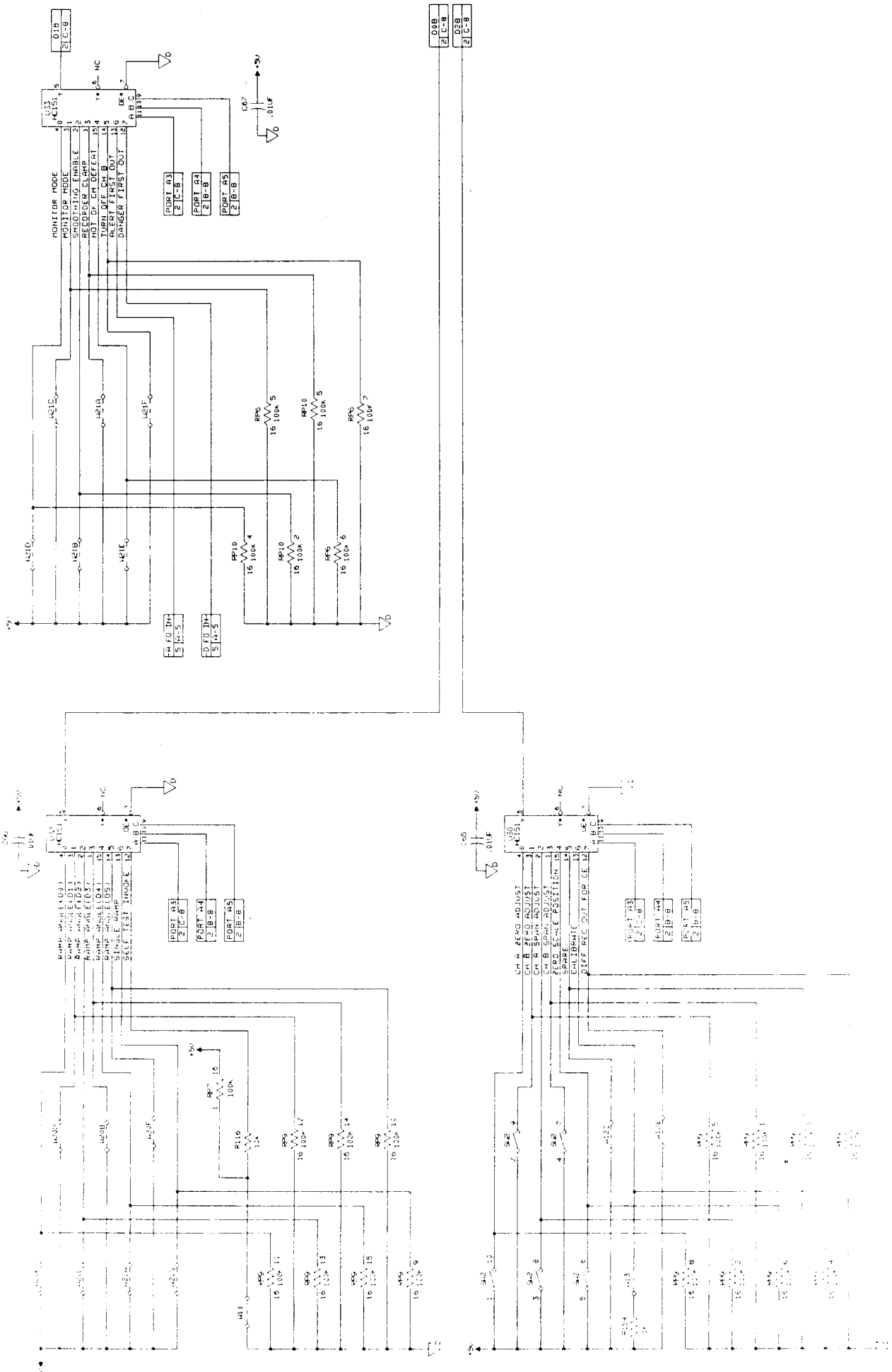
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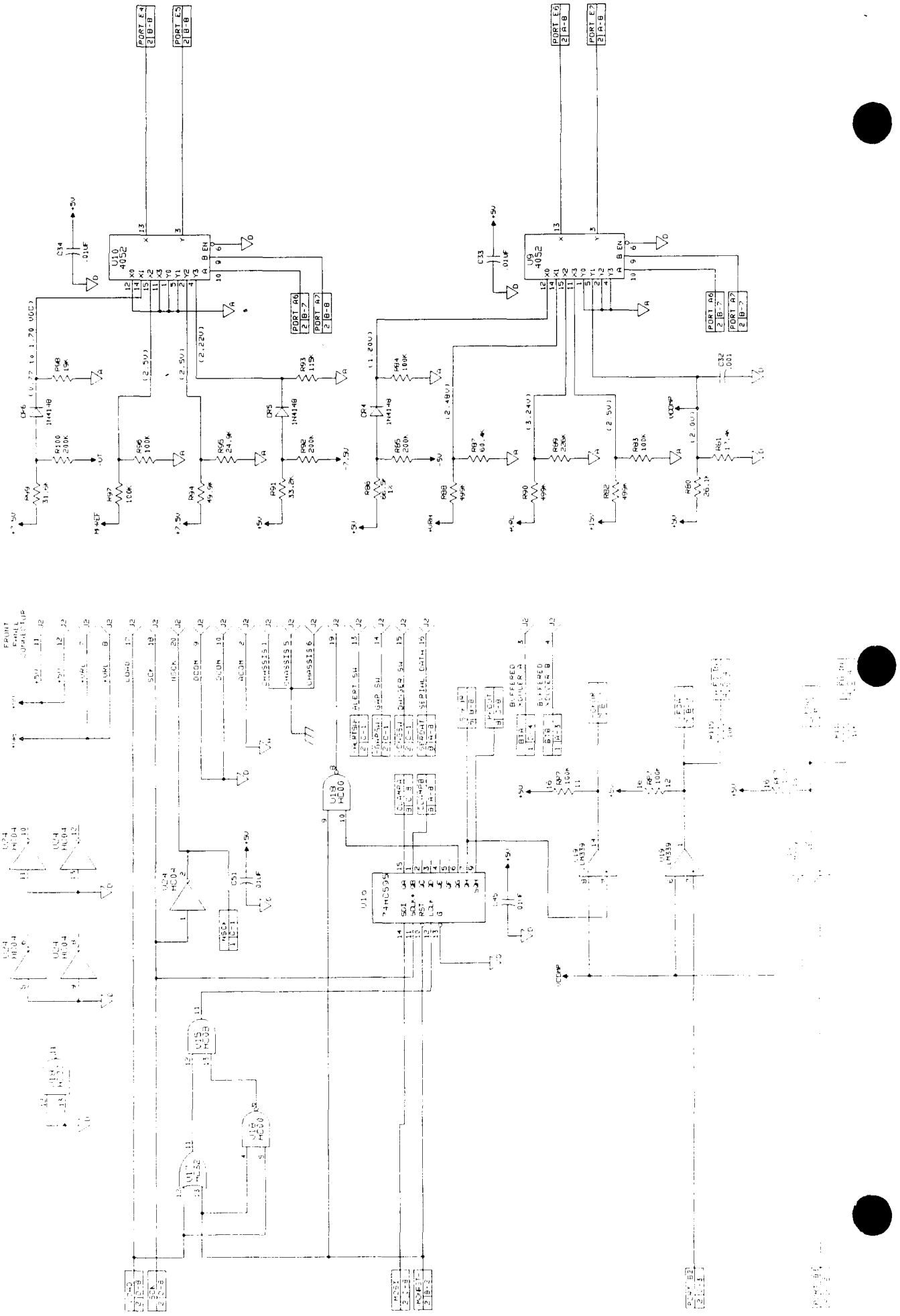
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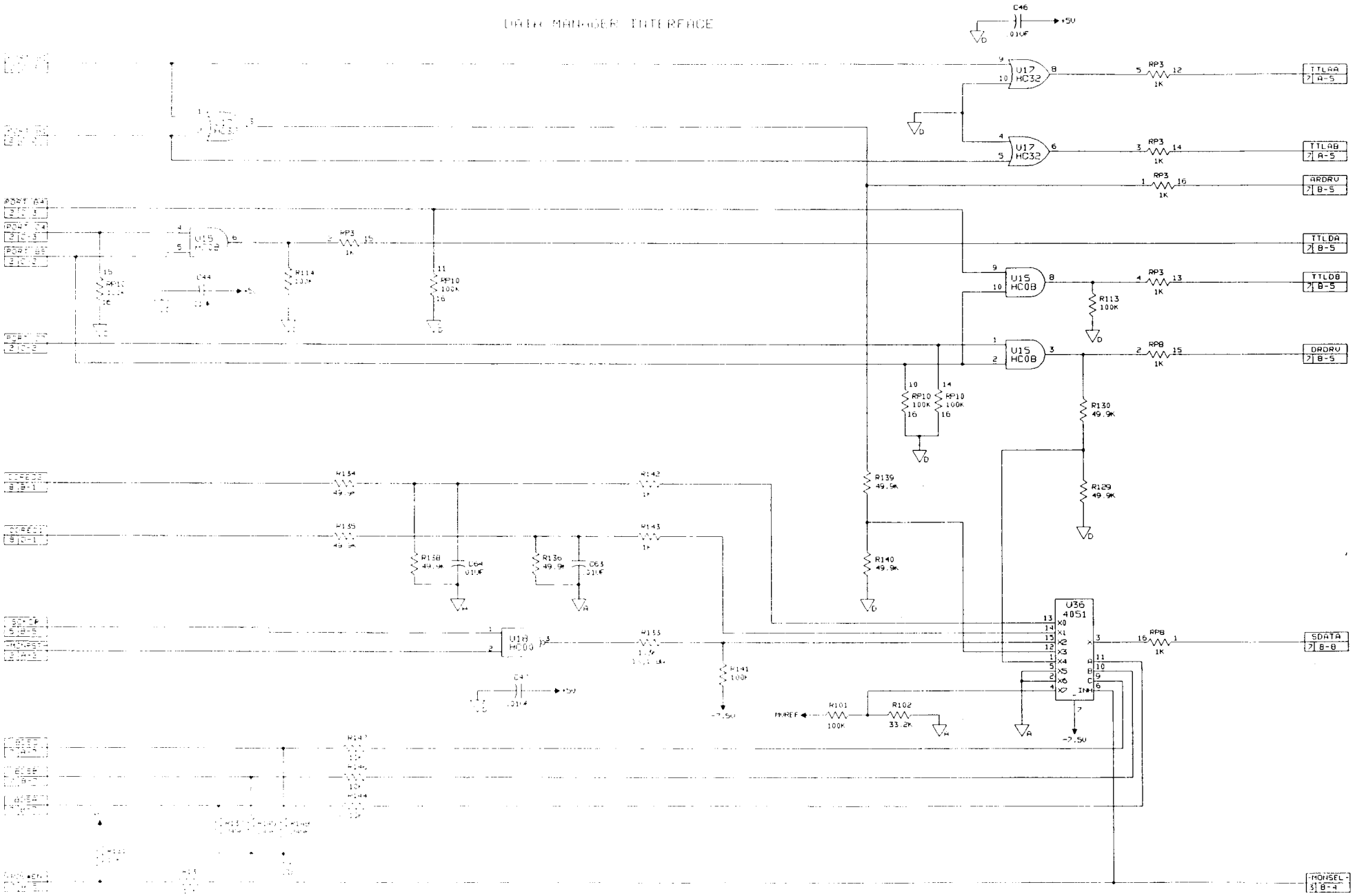


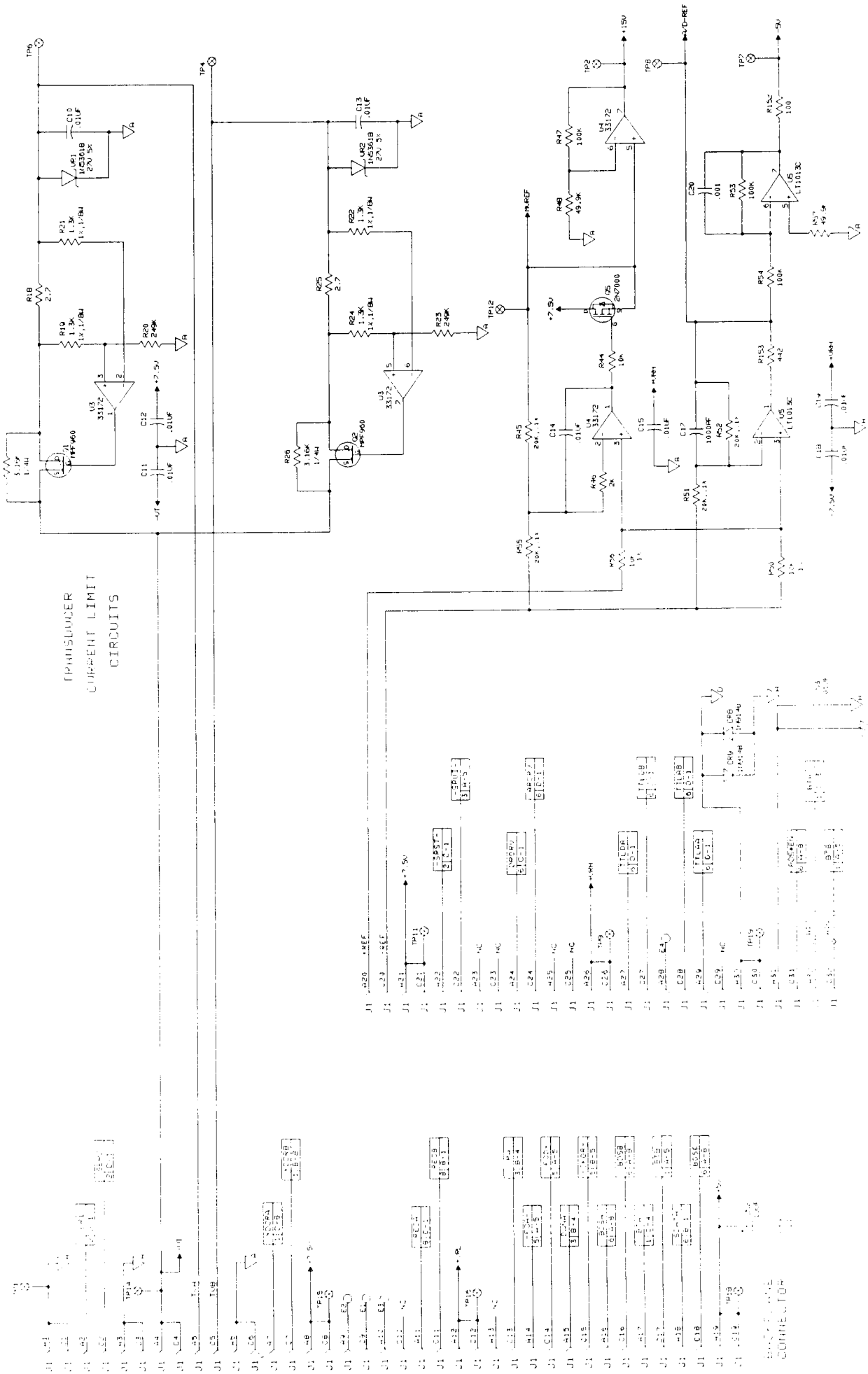
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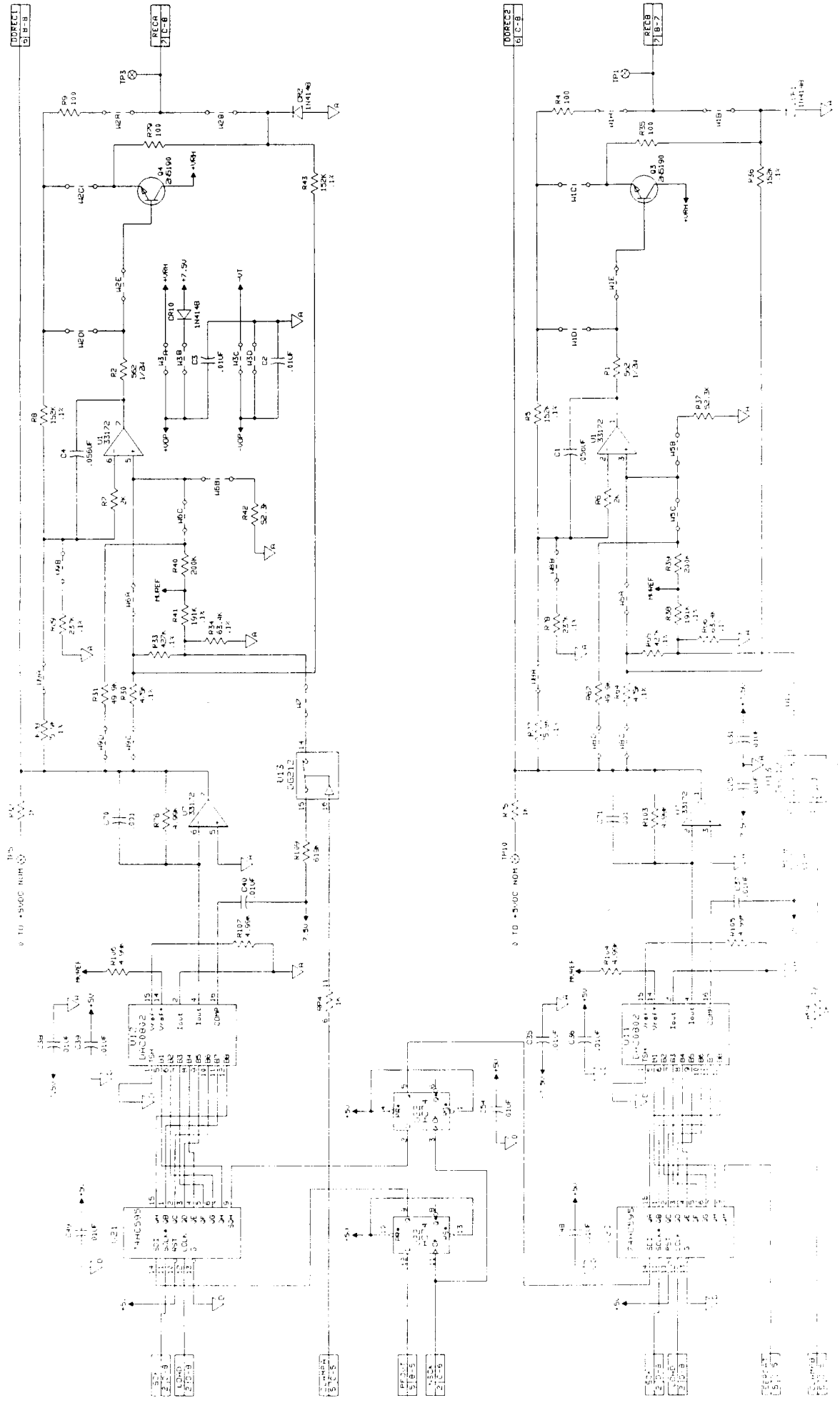
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Ramp Differential Expansion Monitor Schematic
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Ramp Differential Expansion Monitor Schematic
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RAMP DIFFERENTIAL EXPANSION MONITOR

[A|A] — [B|B] — [C|C] — [D|D]

FULL SCALE OPTION		
OPTION CODE	DESCRIPTION	JUMPERS
01	5 - 0 - 5 mm	W15A,C
02	0 - 10 mm	W15A,C,D
03	0.25 - 0 - 0.25 INCHES	W15A,B
04	0 - 0.5 INCHES	W15A,B,D
05	10 - 0 - 10 mm	W15A,B,C
06	0 - 20 mm	W15A,B,C,D
07	0.5 - 0 - 0.5 INCHES	W15E
08	0 - 1.0 INCHES	W15E,D
09	1.0 - 0 - 1.0 INCHES	W15E,B,C,D
10	0 - 2.0 INCHES	W15E,C,D
11	25 - 0 - 25mm	W15E,A
12	0 - 50 mm	W15E,B
⚠1 JUMPERS USED FOR FULL SCALE OPTIONS		W15A,B,C,D,E

TRANSDUCER OPTION		
OPTION CODE	DESCRIPTION	JUMPERS
01	11 mm, 100mV/mil	W16,W17,W21D W4A,B,D,E
02	14 mm, 100mV/mil	W22D,W16,W17,W21D W4A,B,D,E
03	25 mm, 20mV/mil	W22C,W16,W17,W21D W4A,B,D,E
04	35 mm, 20mV/mil	W22C,D,W16,W17,W21D W4A,B,D,E
05	50 mm, 10mV/mil	W22B,W16,W17,W21D W4A,B,D,E
⚠1 JUMPERS USED FOR TRANSDUCER OPTIONS		W22A,B,C,D W4A,B,C,D,E,F W16,W17,W21C,D

ALARM RELAY OPTION	
OPTION CODE	DESCRIPTION
00	NONE
01	EPOXY SEALED RELAY
02	HERMETIC SEALED RELAY
03	DUAD EPOXY SEALED RELAY

APPROVALS OPTION	
OPTION CODE	DESCRIPTION
00	NOT REQUIRED
01	CSA
02	BASEEFA
03	FACTORY MUTUAL

SHIPPED AS OPTION	FIRST OUT		NOT OK MODE		ALERT MODE		DANGER MODE		DANGER BYPASS		NOT OK MONITOR DEFEAT	
	ENABLED		NON-LATCHING		LATCHING		LATCHING		DISABLED		DISABLED	
	ENABLED	W14D	LATCHING	W15C	LATCHING	W14E	LATCHING	W14F	ENABLED	W12A	ENABLED	W21E
	DISABLED	NU	NON-LATCHING	NU	NON-LATCHING	NU	NON-LATCHING	NU	DISABLED	NU	DISABLED	NU
	⚠1	W14D	⚠1	W15C	⚠1	W14E	⚠1	W14F	⚠1	W12A	⚠1	W21E

SHIPPED AS OPTION	RAMP MODE		UPSCALE CH A	
	DUAL RAMP		TOWARD A	
	SINGLE RAMP	W20C	TOWARD A	W12C
	DUAL RAMP	NU	AWAY FROM A	NU
	⚠1	W20C	⚠1	W12C

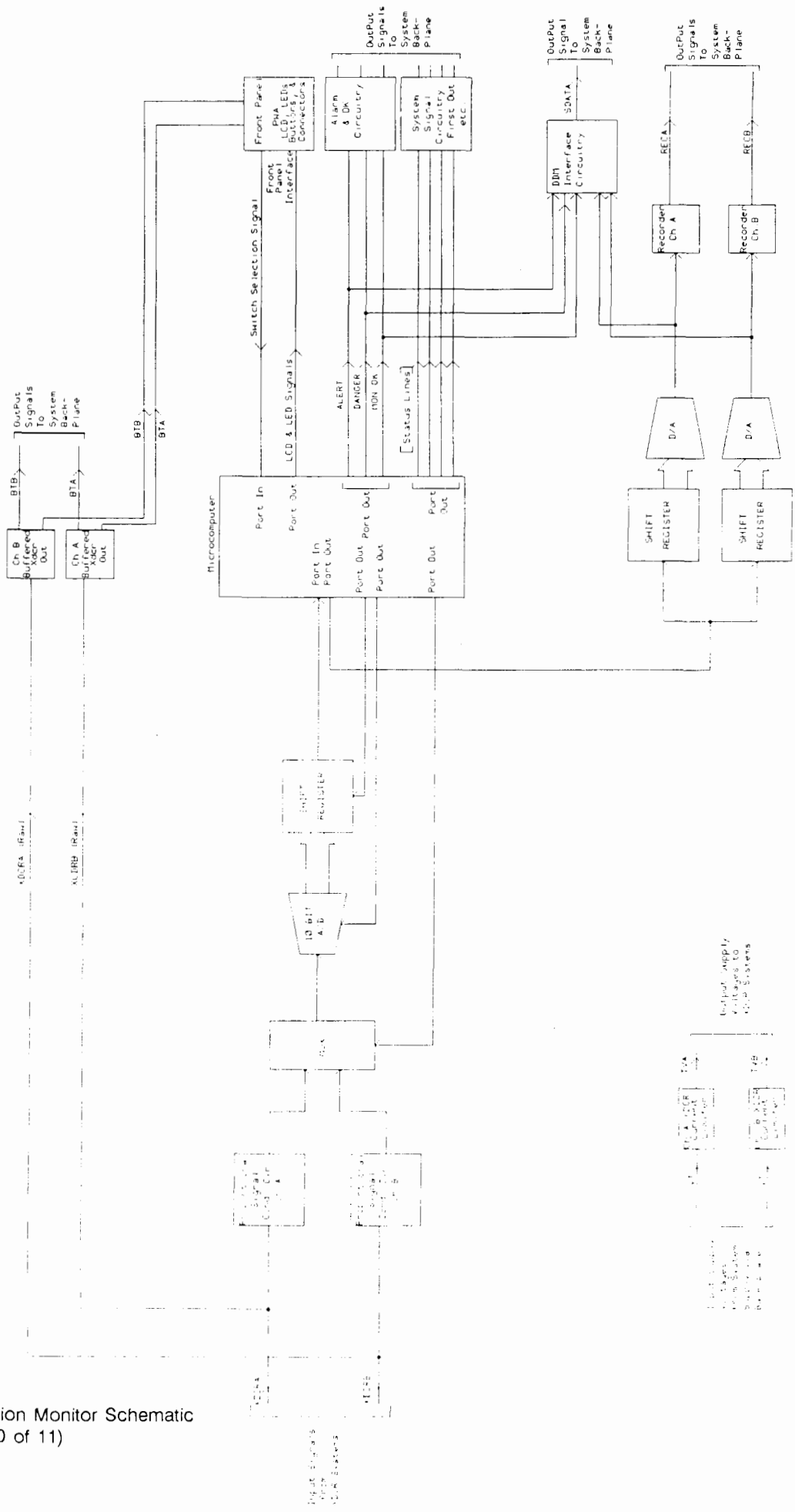
RAMP ANGLE					
7° FOR 11 AND 14mm TRANSDUCERS				12° FOR 25,35 AND 50mm TRANSDUCERS	
4°	W20C	16°	W20A,D	32°	W20F
5°	W20C,E	17°	W20A,D,E	33°	W20F,E
6°	W20C,D	18°	W20A,C	34°	W20F,D
7°	W20C,D,E	21°	W20A,C,E	35°	W20F,D,E
8°	W20B	22°	W20A,C,D	36°	W20F,C
9°	W20B,E	23°	W20A,C,D,E	37°	W20F,C,E
10°	W20B,D	24°	W20A,B	38°	W20F,C,D
11°	W20B,D,E	25°	W20A,B,E	39°	W20F,C,D,E
12°	W20B,C	26°	W20A,B,D	40°	W20F,B
13°	W20B,C,E	27°	W20A,B,D,E	41°	W20F,B,E
14°	W20B,C,D	28°	W20A,B,C	42°	W20F,B,D
15°	W20B,C,D,E	29°	W20A,B,C,E	43°	W20F,B,D,E
16°	W20A	30°	W20A,B,C,D	44°	W20F,B,C
17°	W20A,E	31°	W20A,B,C,D,E	45°	W20F,B,C,E
⚠1 JUMPERS		W20A,B,C,D,E,F			

RECORDER OUTPUTS	
+4 TO +20 mA	
+4 TO +20 mA	W9B,C W2B,C,E W6A W3A,D W8B,C W1B,C,E W5A
0 TO -10 Vdc	W14G W9A W6B W2A,D W3B,C W8A W5B W1A,D
+1 TO +5 Vdc	W14H W9D W6C W2A,D W3A,D W8D W5C W1A,D
⚠1	W1A,B,C,D,E W2A,B,C,D,E W3A,B,C,D W5A,B,C W6A,B,C W8A,B,C,D W9A,B,C,D W14G,H

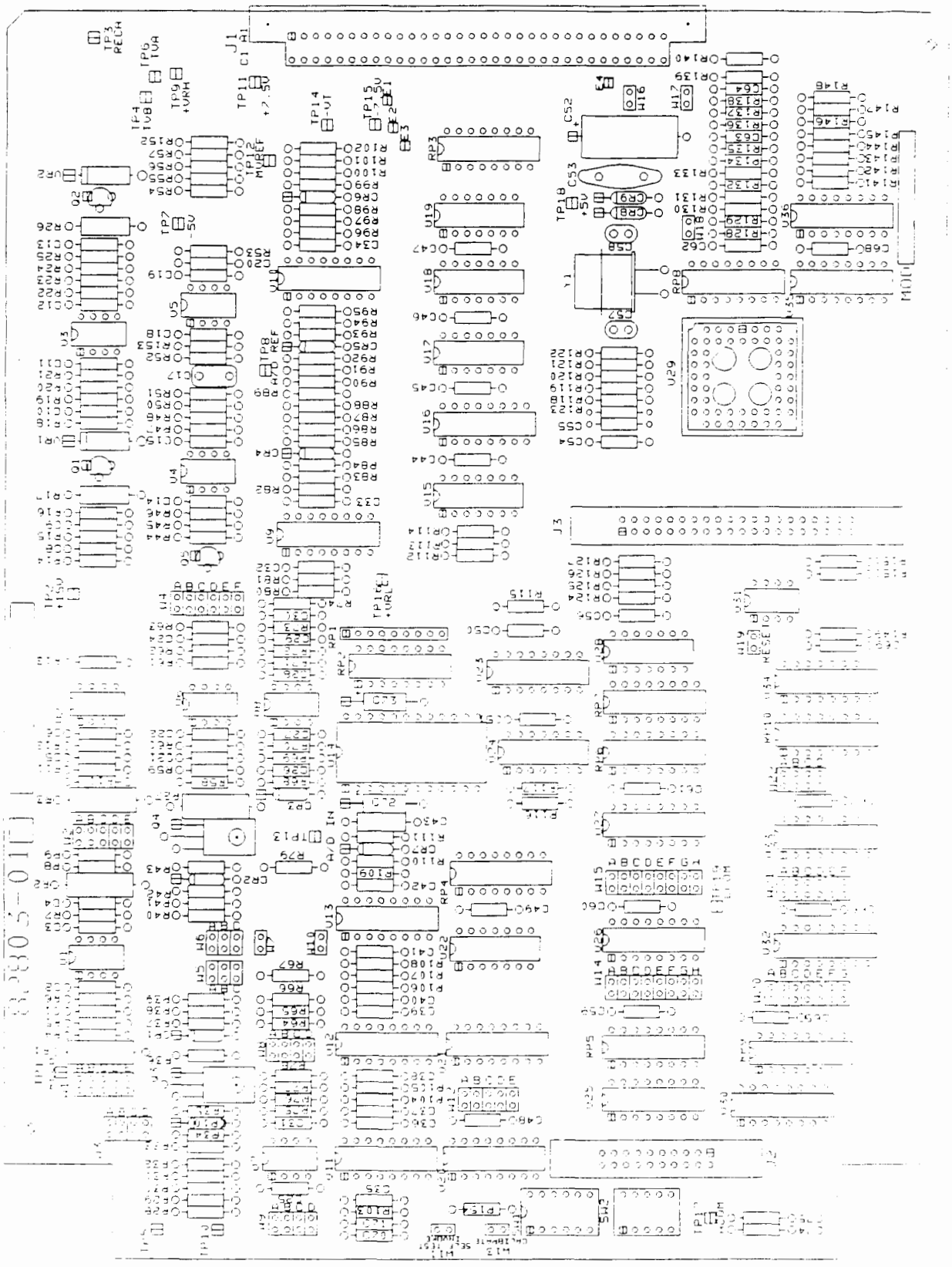
ALARM DELAY		
3 SEC.		
0.1 SEC.	NU	
1 SEC.	W14B	
3 SEC.	W14A	
6 SEC	W14A,B	
⚠1	W14A,B	

DISPLAY	
FAST	
SLOW	W21B
FAST	NU
⚠1	W21B

⚠1 TO CHANGE AN OPTION, REMOVE ALL JUMPERS ASSOCIATED WITH THAT OPTION THEN INSTALL SPECIFIED JUMPERS



Ramp Differential Expansion Monitor Schematic Block Diagram, Sheet (10 of 11)



Ramp Differential Expansion Monitor Schematic
(Printed Wiring Assembly), Sheet (11 of 11)

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