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Find the *GE / Bently Nevada 3300/50-02-02-00-00* at our website: *Click HERE*

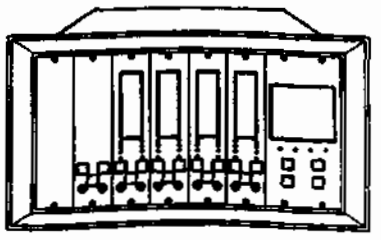
PART NO. 83870-01

3300/50 TACHOMETER

INCLUDES DUAL SETPOINT, ZERO SPEED, AND ROTOR ACCELERATION TACHOMETERS.

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

SYMBOLS

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



NOTICE



WARNING !

Bently Nevada Tachometers are not designed for use independently as, or a component of, a speed control or overspeed protection system.

Bently Nevada Tachometers do not provide protective redundancy and the response speed needed for reliable operation as a speed control or overspeed protection system.

Where provided, the analog proportional output is suitable for data logging or chart recording purposes only. Also, where provided, speed Alert setpoints are suitable for annunciation purposes only.

Failure to take the above warnings into account constitutes a misuse of the product and may result in property damage and/or bodily injury.

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FORWARD

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

RELATED DOCUMENTS

3300 System Overview, 80177

3300 System Installation Instructions, 80172

3300 System Troubleshooting, 80173

3300/10 Power Supply, 80174

3300/01 System Monitor, 80175

3300/50 Tachometer Maintenance, 83871-01

Dynamic Data Manager System, 46390-01

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Document No. 83870-01 First Printing: March 1989 Revision NC: March 1989

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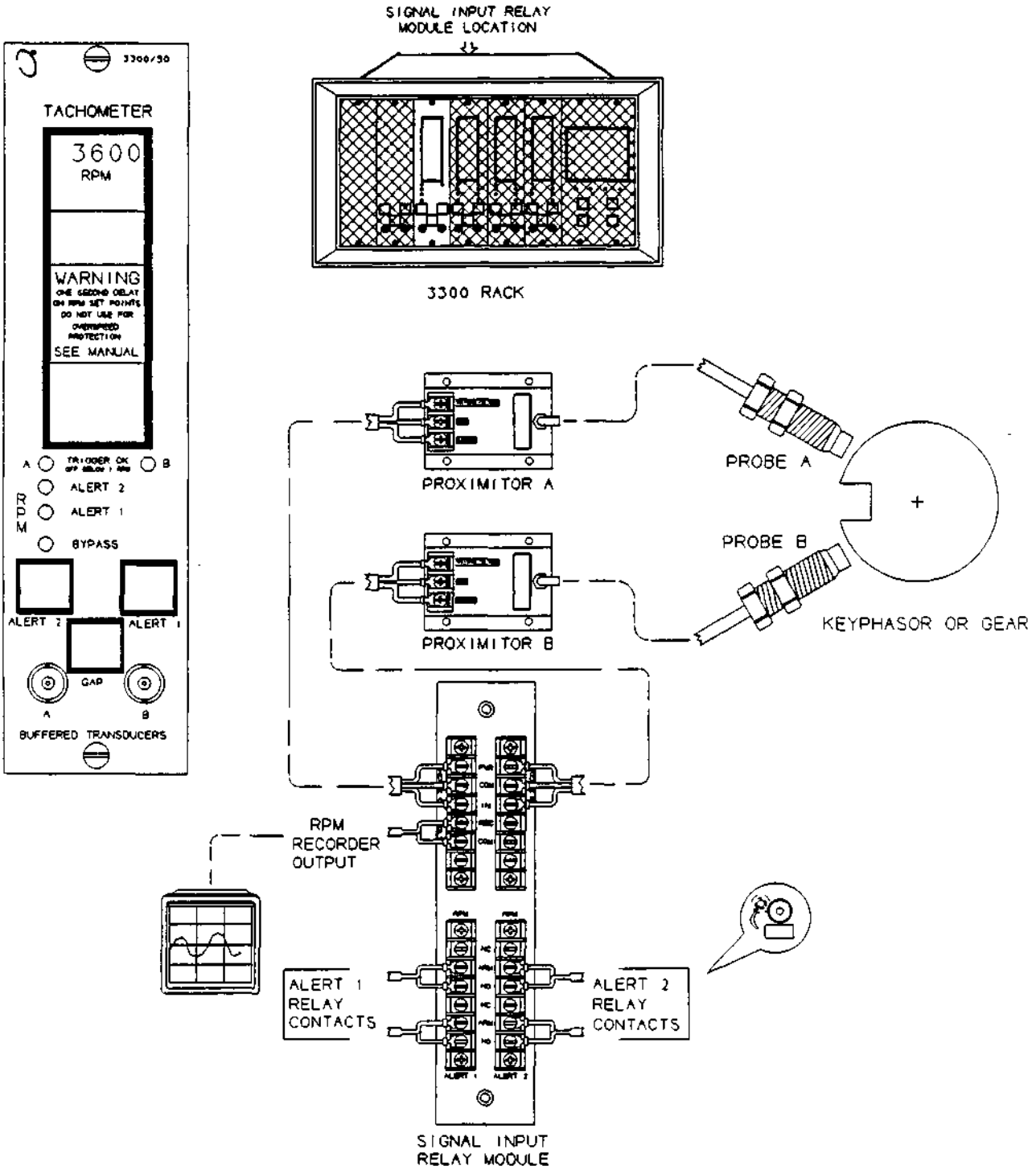
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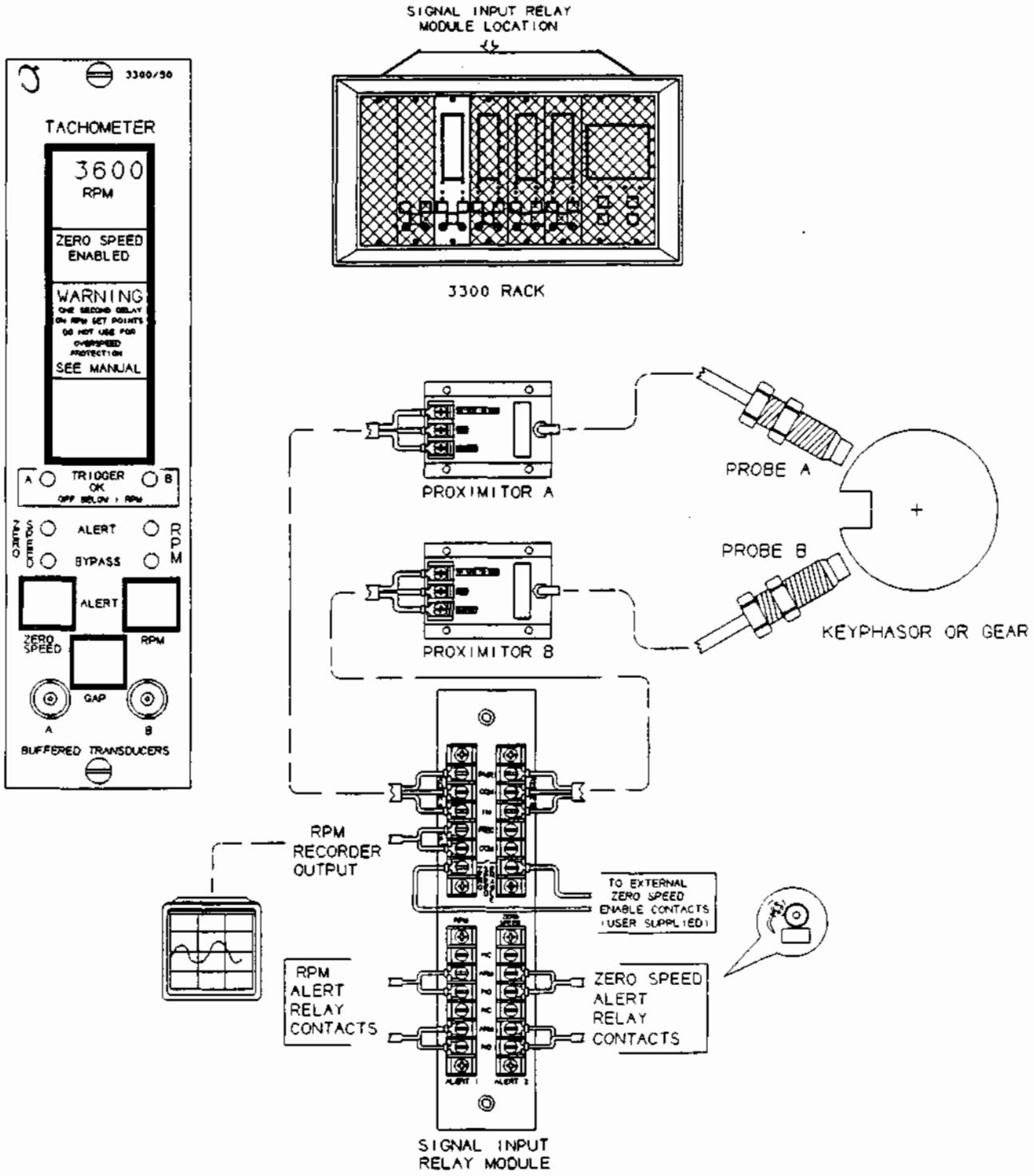
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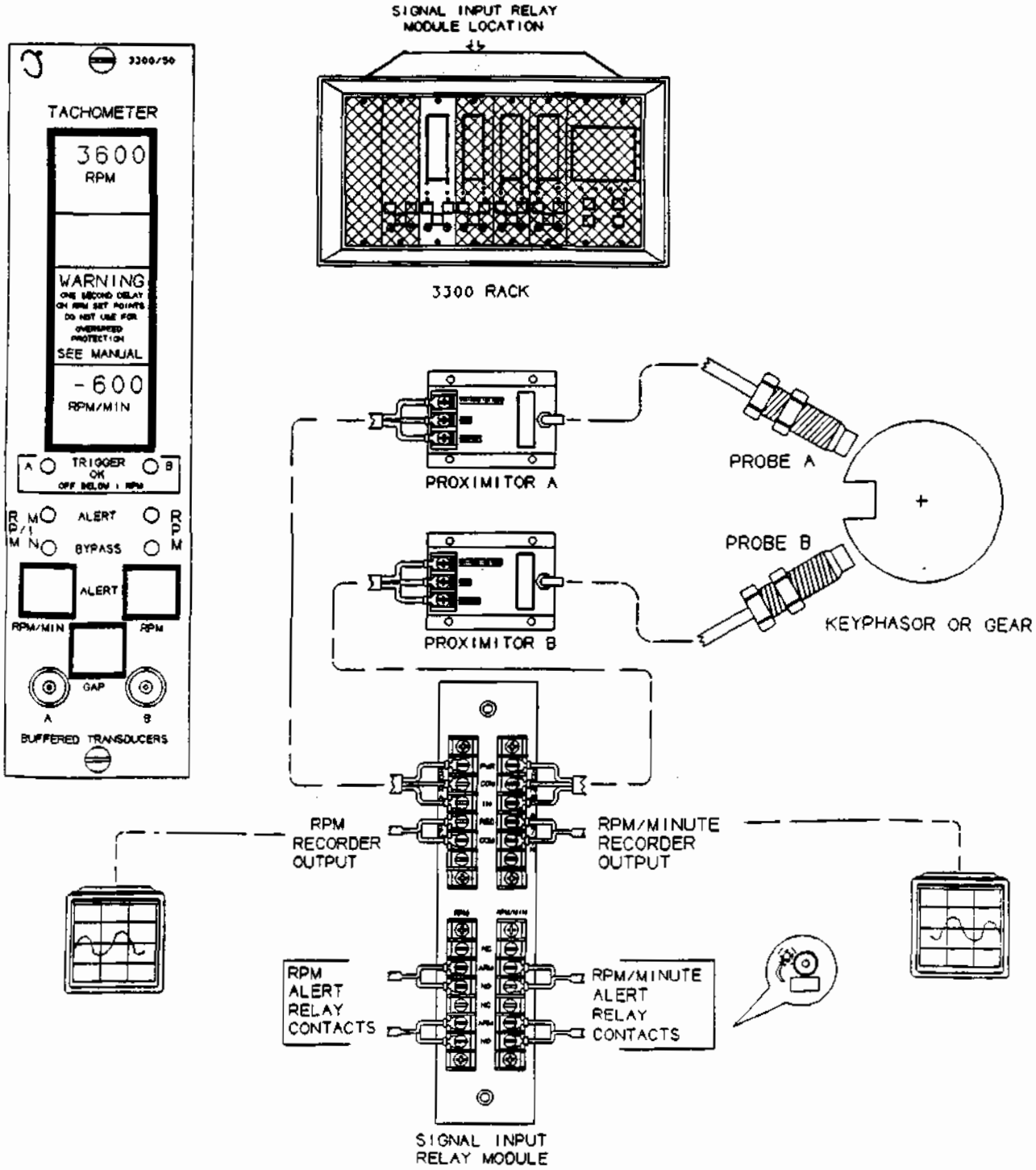
1 DUAL SETPOINT TACHOMETER SYSTEM



2 ZERO SPEED TACHOMETER SYSTEM



3 ROTOR ACCELERATION TACHOMETER SYSTEM



4 MONITOR OPTIONS

TACHOMETER
PART NUMBER

	TACHOMETER TYPE	ALERT RELAYS	AGENCY APPROVAL	BARRIERS
3300/50	AA	BB	CC	DD
	01 = DUAL SETPOINT TACHOMETER 02 = ZERO SPEED TACHOMETER 03 = ROTOR ACCELERATION TACHOMETER	00 = NONE 01 = 5 AMP EPOXY SEALED 02 = 5 AMP HERMETICALLY SEALED	00 = NOT REQ'D 01 = CSA 02 = BASEEFA 03 = FACTORY MUTUAL	00 = NOT REQ'D 01 = WITH BARRIERS

5 PROGRAMMABLE OPTIONS

TRANSDUCER INPUT (NOTE 1)	SYSTEM KEYPHASORS * 7200/3000 PROXIMITOR MAGNETIC PICKUP	TRANSDUCER THRESHOLD MODE (NOTE 3)	MANUAL * AUTOMATIC
TRANSDUCER CONDITIONING HYSTERESIS	0.2 VOLTS * 0.5 VOLTS 1.0 VOLTS 2.0 VOLTS	ALERT MODES	* OVER ALERT UNDER ALERT * LATCHING NON-LATCHING
FIRST OUT ALERT (NOTE 2)	* ENABLED DISABLED	ALERT BYPASS	ENABLED * DISABLED
RECORDER OUTPUTS	* +4 TO +20 mA +1 TO +5 Vdc 0 TO -10 Vdc		

* OPTIONS SHIPPED FROM BENTLY NEVADA

NOTE 1: MAGNETIC PICKUPS ARE NOT ALLOWED FOR ZERO SPEED APPLICATIONS.

NOTE 2: ALL VERSIONS OF THE TACHOMETER DRIVE ONLY THE RACK FIRST OUT ALERT BUS. THIS MONITOR DOES NOT DRIVE THE RACK FIRST OUT DANGER BUS.

NOTE 3: THE ZERO SPEED TACHOMETER IS SHIPPED IN THE MANUAL THRESHOLD MODE. AUTO THRESHOLD IS NOT ALLOWED IN THE ZERO SPEED MONITOR. AUTO THRESHOLD WILL NOT WORK BELOW 5 Hz (300 RPM AT ONE EVENT PER REVOLUTION).

6 MONITOR FUNCTIONS

ROTOR SPEED MONITORING - The Tachometer function provides continuous monitoring of shaft rotative speed. The Tachometer accepts input from either a proximity probe or magnetic pickup (not recommended). The Tachometer measures the time between Keyphasor pulses and calculates the rotor speed in revolutions per minute (RPM). The monitor displays the rotor speed on the front panel and provides a proportional voltage or current recorder output. The Tachometer also outputs Alert status via rear panel relay contacts for external annunciation.

ZERO SPEED - The 3300 Tachometer provides, as a factory installed option, a Zero Speed function. Zero Speed measurements are generally taken on turbines, generators and other rotating machinery with large rotors.

Zero Speed is a preselected shaft rotative speed that allows for proper engagement of the turning gear. Continuous shaft rotation during machine shutdown is imperative to prevent shaft bow that could lead to possible machine damage during startup.

The Zero Speed function requires inputs from two transducers. Voting logic between the two transducers minimizes false Zero Speed indication in the event of a transducer failure. When the Zero Speed function is enabled, and the preselected Zero Speed is reached, an Alert LED indicates the condition. Alert relay contacts are also provided for use with an external indicator such as an annunciator panel.

ROTOR ACCELERATION - The 3300 Tachometer provides, as a factory installed option, a Rotor Acceleration indicator. The Rotor Acceleration function provides an indication of a machine's rotative acceleration. The acceleration/deceleration information is displayed on the front panel. A recorder output, as well as Alert relay outputs are provided.

Rotor Acceleration is used with machinery during startup or shutdown. The original machine manufacturer's recommended ramp up or ramp down rate must be maintained to minimize possible damage.

PROBE GAP VOLTAGE - Probe gap is measured in negative DC voltage and is directly proportional to the gap between the face of a proximity probe and the surface being monitored. Probe gap voltage for each transducer is displayed on the front panel by pressing the GAP switch.

TRIGGER OK - The TRIGGER OK LEDs indicate the status of the transducer input signal, and the monitor. The TRIGGER OK LEDs remain on as long as the Tachometer is receiving valid input signals and the monitor is OK. The LEDs will extinguish when the input is less than 1 RPM or greater than 99,999 RPM. An invalid trigger will not cause the system OK relay to go NOT OK.

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

6 MONITOR FUNCTIONS (CONT)

ALERT - Pressing one of the Alert switches on the front panel of the monitor causes the corresponding Alert setpoint to be displayed on the front panel. When the particular Alert setpoint conditions have been met, the Alert LEDs will illuminate and the Alert relay contacts are activated.

FIRST OUT ALERT - A monitor with the First Out option selected flashes an Alert LED if that Alert was the first in the rack. Pressing the RESET switch acknowledges the First Out.

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

ALERT BYPASS - An Alert can be bypassed using a switch located behind the front panel. When bypassed, an Alert condition no longer causes the Alert LEDs to illuminate or the relay to actuate. Alert bypass can be during maintenance. Alert Bypass is indicated by the front panel BYPASS LED. Other front panel functions are not affected by Alert Bypass. This function can be disabled using a programmable jumper within the monitor.

MONITOR BYPASS - The monitor can be completely bypassed using the Monitor Bypass switch located behind the front panel. When bypassed, the monitor is completely nonfunctional, and can be removed from the system monitoring loop. After this function is activated, the normal system OK operation (OK Relay) will be restored for the remaining active monitors in the rack.

PEAK HOLD - The PEAK HOLD function allows recall of the maximum RPM value obtained since the last PEAK HOLD reset. The PEAK HOLD value is read by pressing both Alert buttons simultaneously. The Tachometer retains the PEAK HOLD value even after loss of monitor power. PEAK HOLD is cleared by shorting two adjacent testpoints located behind the front panel.

BUFFERED OUTPUTS - The BUFFERED TRANSDUCER A and B coaxial cable connectors on the front panel of the monitor provide buffered signals both redundant transducers. These connectors can be used to connect external equipment to the monitor.

RECORDER OUTPUT - Depending on the option selected, the recorder output levels proportional to RPM (and RPM/MIN with the Rotor Accel. Tach.) are either 0 to -10Vdc, +1 to +5Vdc, or +4 to +20mA.

6 MONITOR FUNCTIONS (CONT)

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

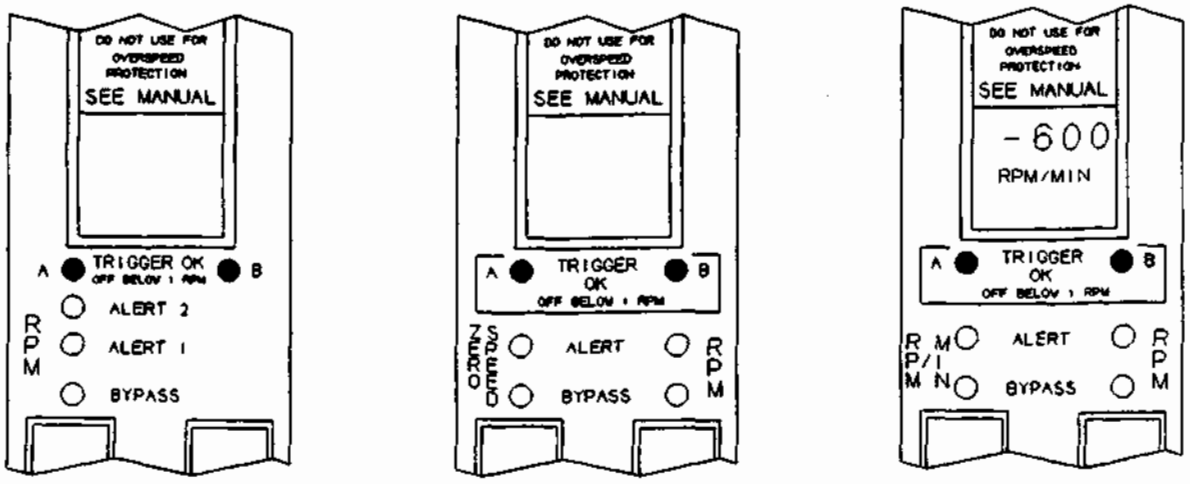
A power-up self test, consisting of a series of basic monitor OK tests, is performed automatically each time the monitor is turned on.

A cyclic self test is performed automatically while the monitor is operating. Errors encountered during cyclic tests disable the monitor and flash an error code on the front panel display. If the error is intermittent, the monitor will begin operating again, and the error codes will be stored for retrieval during user-invoked self tests. Stored error codes are indicated by the TRIGGER OK LEDs flashing at 5 Hz (5 times per second) provided that the monitor (or trigger) is OK.

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

MONITOR OK - A MONITOR NOT OK condition resulting from failing self test will drive the system OK relay into its NOT OK state and extinguish the front panel TRIGGER OK LEDs.

7 OK



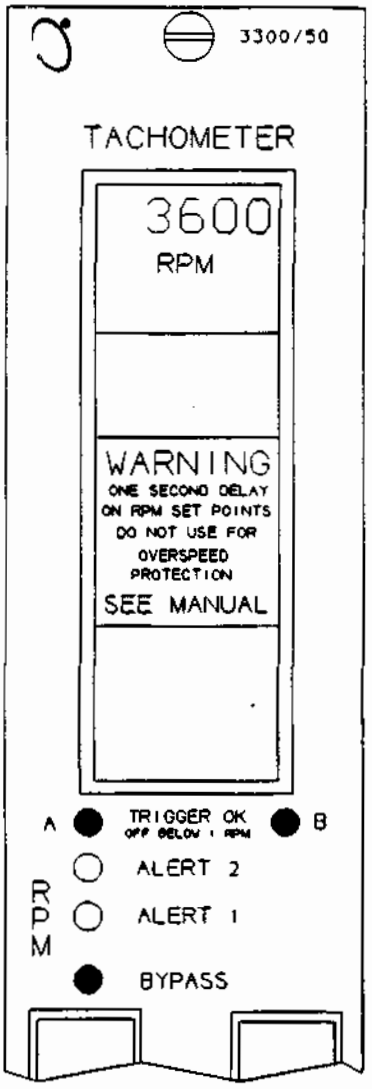
NOTE: EACH MONITOR IN THE SYSTEM CONTROLS THE OK RELAY. THE TACHOMETER CAN CAUSE A NOT OK RELAY CONDITION (DE-ENERGIZED RELAY) ONLY WITH A MONITOR NOT OK. A TRIGGER NOT OK WILL NOT AFFECT THE SYSTEM OK RELAY.

LED DISPLAY A	LED DISPLAY B	CONDITION	OK RELAY DRIVE **
● TRIGGER OK *	●	MONITOR OK AND TRIGGER A AND B OK *	ON
● TRIGGER OK	○	RESPECTIVE TRIGGER A OR B NOT OK, AND MONITOR OK	ON
○ TRIGGER OK	●		
○ TRIGGER OK	○	BOTH TRIGGER A AND B NOT OK, AND/OR MONITOR NOT OK	OFF **
◉ TRIGGER OK	◉	FLASHING AT 5 Hz = ERROR ENCOUNTERED DURING CYCLIC TEST. READ ERROR MESSAGE SEE SECTION ON ERROR CODES	ON

* "TRIGGER OK" MEANS THE RPM VALUE IS BETWEEN 1 AND 100,000 RPM AND THAT THE RPM VALUE HAS NOT CHANGED MORE THAN 50% BETWEEN TWO INPUT TRIGGERS.

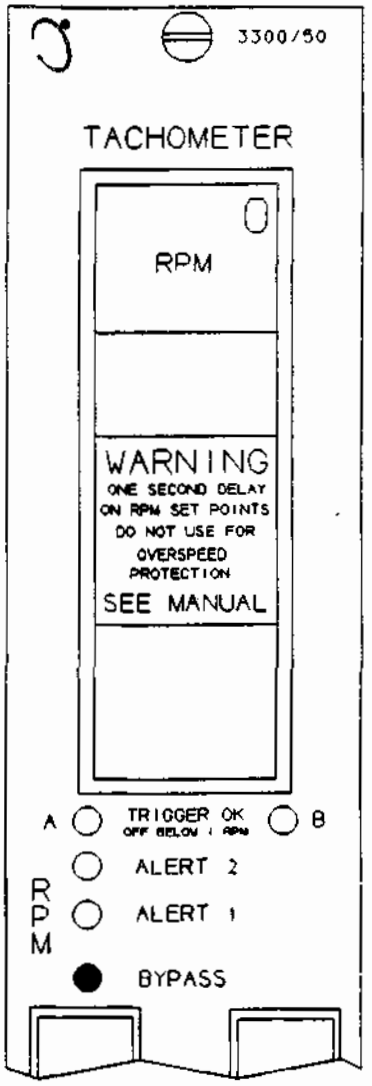
** A NOT OK MONITOR CAN BE BYPASSED TO RESTORE RELAY OK CONDITIONS. IF THE MONITOR IS OK, BUT THE TRIGGERS ARE NOT, THE OK RELAY WILL BE ON (OK).

8 BYPASS (DUAL SETPOINT TACHOMETER)



ALERT 2 RELAY BYPASSED

MONITOR ON LINE
ALERT 1 RELAY FUNCTIONAL

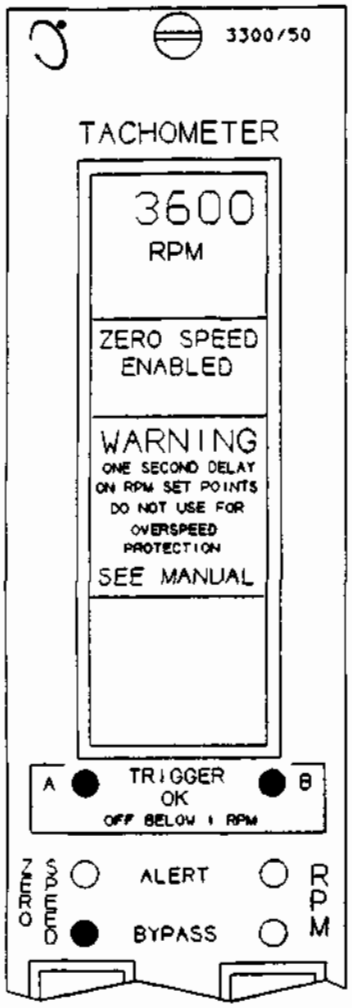


MONITOR BYPASSED

MONITOR OFF LINE
DISPLAY AT ZERO

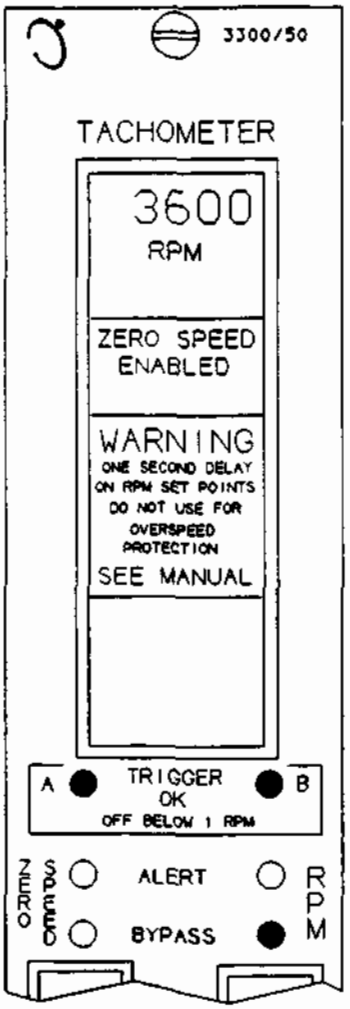
NOTE: THE ALERT 1 RELAY CANNOT BE BYPASSED IN THE DUAL SETPOINT TACHOMETER.

9 BYPASS (ZERO SPEED TACHOMETER)



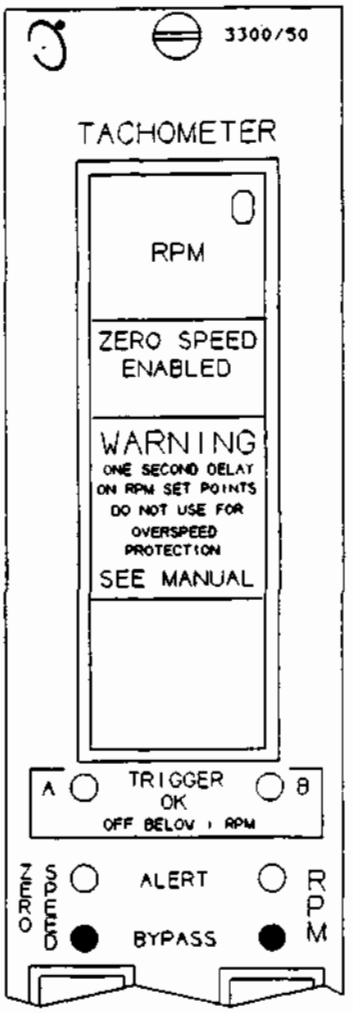
ZERO SPEED ALERT RELAY BYPASSED

MONITOR ON LINE
RPM ALERT RELAY FUNCTIONAL



RPM ALERT RELAY BYPASSED

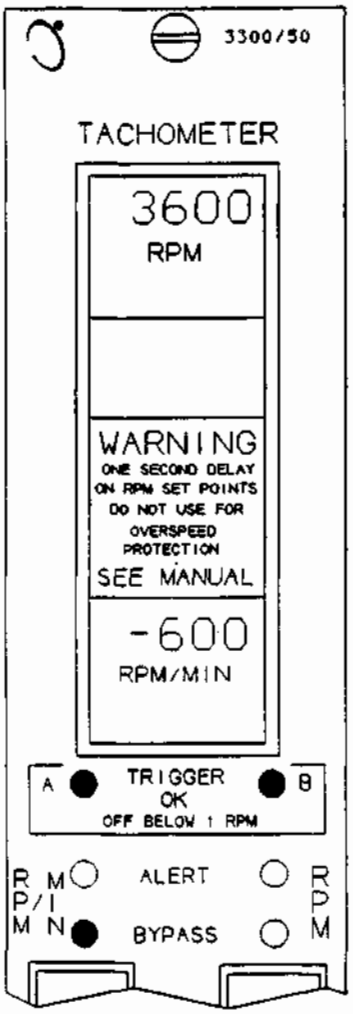
MONITOR ON LINE
ZERO SPEED ALERT RELAY FUNCTIONAL



MONITOR BYPASSED

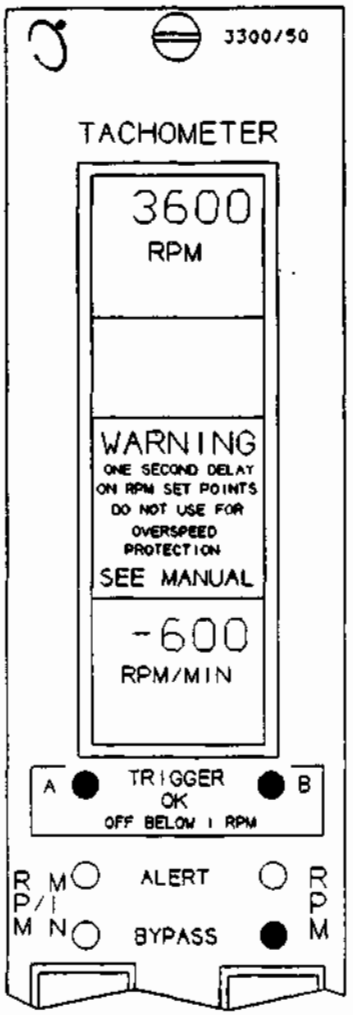
MONITOR OFF LINE
RPM DISPLAY AT ZERO

10 BYPASS (ROTOR ACCEL. TACHOMETER)



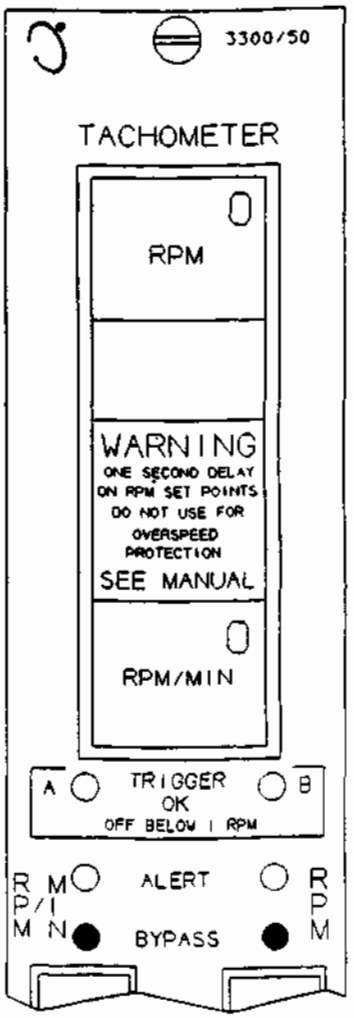
ROTOR ACCEL ALERT RELAY BYPASSED

MONITOR ON LINE
RPM ALERT RELAY
FUNCTIONAL



RPM ALERT RELAY BYPASSED

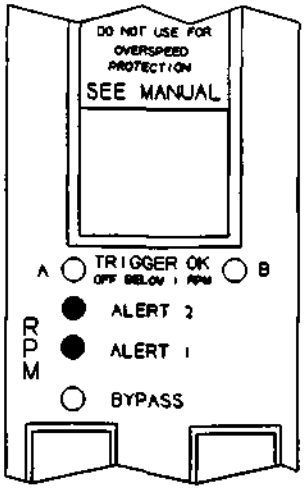
MONITOR ON LINE
ROTOR ACCEL. ALERT
RELAY FUNCTIONAL



MONITOR BYPASSED

MONITOR OFF LINE
DISPLAYS AT ZERO

11 ALERT (DUAL SETPOINT TACHOMETER)

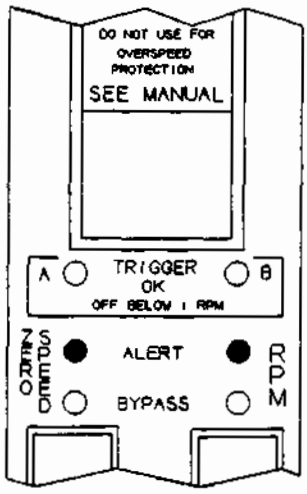


LED DISPLAY	CONDITION	RELAY DRIVE ALERT 1	RELAY DRIVE ALERT 2
● ALERT 1 ○ ALERT 2	THE ALERT 1 SETPOINT HAS BEEN EXCEEDED. *	ON	OFF
○ ALERT 1 ● ALERT 2	THE ALERT 2 SETPOINT HAS BEEN EXCEEDED. *	OFF	ON
● ALERT 1 ● ALERT 2	BOTH ALERT SETPOINTS HAVE BEEN EXCEEDED. *	ON	ON
◉ ALERT 1 ○ ALERT 2	THE ALERT 1 SETPOINT HAS BEEN EXCEEDED. ALERT 1 IS THE FIRST OUT ALERT. **	ON	OFF
○ ALERT 1 ◉ ALERT 2	THE ALERT 2 SETPOINT HAS BEEN EXCEEDED. ALERT 2 IS THE FIRST OUT ALERT. **	OFF	ON

* AN RPM ALERT REQUIRES AT LEAST ONE TRANSDUCER TO OBSERVE THE ROTOR SPEED (RPM) RISE ABOVE AN OVER SPEED SETPOINT OR FALL BELOW AN UNDER SPEED SETPOINT FOR AT LEAST ONE SECOND.

** FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS. IF TWO ALERTS OCCUR WITHIN 50 MILLISECONDS OR LESS, BOTH LEDS COULD FLASH. BOTH ALERTS MAY FLASH TO INDICATE FIRST OUT FOLLOWING SELF TEST.

12 ALERT (ZERO SPEED TACHOMETER)



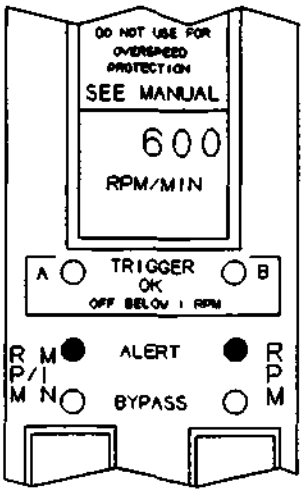
LED DISPLAY ALERT		CONDITION	RELAY DRIVE ALERT	
ZERO SPEED	RPM		ZERO SPEED	RPM
●	○	THE ZERO SPEED ALERT CONDITIONS HAVE BEEN MET. *	ON	OFF
○	●	THE RPM ALERT CONDITIONS HAVE BEEN MET. **	OFF	ON
●	●	BOTH THE ZERO SPEED AND RPM ALERT CONDITIONS HAVE BEEN MET. * **	ON	ON
◉	○	THE ZERO SPEED ALERT CONDITIONS HAVE BEEN MET. ZERO SPEED IS THE FIRST OUT ALERT. ***	ON	OFF
○	◉	THE RPM ALERT CONDITIONS HAVE BEEN MET. THE RPM ALERT IS THE FIRST OUT ALERT. ***	OFF	ON

* THE ZERO SPEED ALERT CONDITIONS ARE AS FOLLOWS:
1. THE TRIGGER OK CONDITIONS (SECTION 7) MUST BE MET FOR BOTH TRANSDUCERS BELOW 500 RPM.
2. BOTH TRANSDUCERS MUST OBSERVE THE ROTOR SPEED (RPM) FALL BELOW THE ZERO SPEED ALERT SETPOINT FOR AT LEAST ONE SECOND.

** AN RPM ALERT REQUIRES AT LEAST ONE TRANSDUCER TO OBSERVE THE ROTOR SPEED (RPM) RISE ABOVE AN OVER SPEED SETPOINT OR FALL BELOW AN UNDER SPEED SETPOINT FOR AT LEAST ONE SECOND.

*** FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS. IF TWO ALERTS OCCUR WITHIN 50 MILLISECONDS OR LESS, BOTH LEDS COULD FLASH. BOTH ALERTS MAY FLASH TO INDICATE FIRST OUT FOLLOWING SELF TEST.

13 ALERT (ROTOR ACCEL. TACHOMETER)



LED DISPLAY ALERT		CONDITION	RELAY DRIVE ALERT	
RPM/MIN	RPM		*RPM/MIN*	*RPM*
●	○	THE RPM/MINUTE ALERT CONDITIONS HAVE BEEN MET. *	ON	OFF
○	●	THE RPM ALERT CONDITIONS HAVE BEEN MET. **	OFF	ON
●	●	BOTH THE RPM/MINUTE AND RPM ALERT CONDITIONS HAVE BEEN MET. * **	ON	ON
◉	○	THE RPM/MINUTE ALERT CONDITIONS HAVE BEEN MET. RPM/MINUTE IS THE FIRST OUT ALERT. ***	ON	OFF
○	◉	THE RPM ALERT CONDITIONS HAVE BEEN MET. THE RPM ALERT IS THE FIRST OUT ALERT. ***	OFF	ON

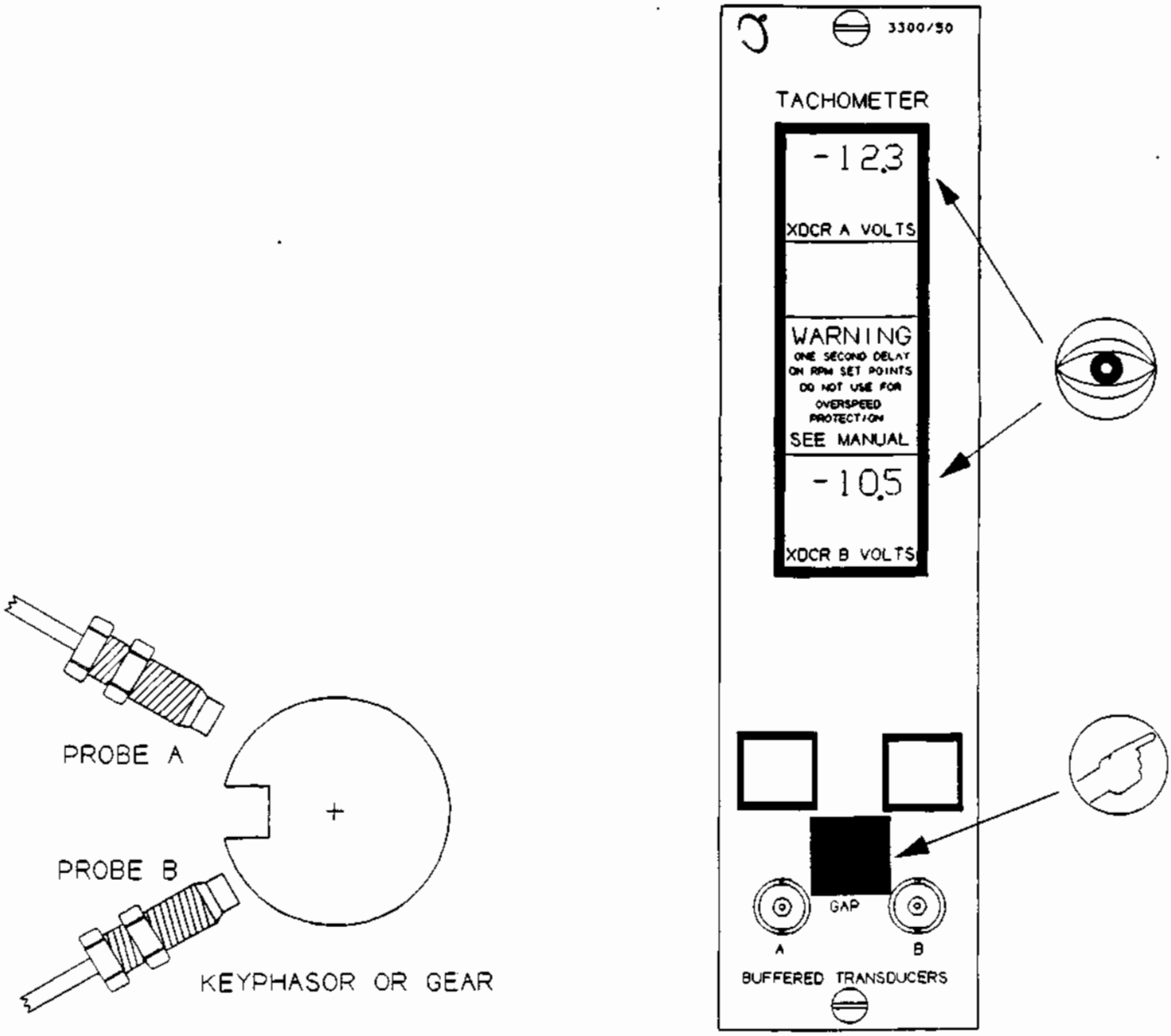
* AN RPM/MIN ALERT REQUIRES AT LEAST ONE TRANSDUCER TO OBSERVE THE ROTOR ACCELERATION (RPM/MIN) VALUE EXCEED THE RPM/MIN SETPOINT FOR AT LEAST ONE SECOND.

** AN RPM ALERT REQUIRES AT LEAST ONE TRANSDUCER TO OBSERVE THE ROTOR SPEED (RPM) RISE ABOVE AN OVER SPEED SETPOINT OR FALL BELOW AN UNDER SPEED SETPOINT FOR AT LEAST ONE SECOND.

*** FIRST OUT RESOLUTION IS BETTER THAN 50 MILLISECONDS. IF TWO ALERTS OCCUR WITHIN 50 MILLISECONDS OR LESS, BOTH LEDS COULD FLASH. BOTH ALERTS MAY FLASH TO INDICATE FIRST OUT FOLLOWING SELF TEST.

14 READ GAP VOLTAGE

PRESS GAP SWITCH AND READ GAP VOLTAGE FOR BOTH TRANSDUCER A AND TRANSDUCER B.

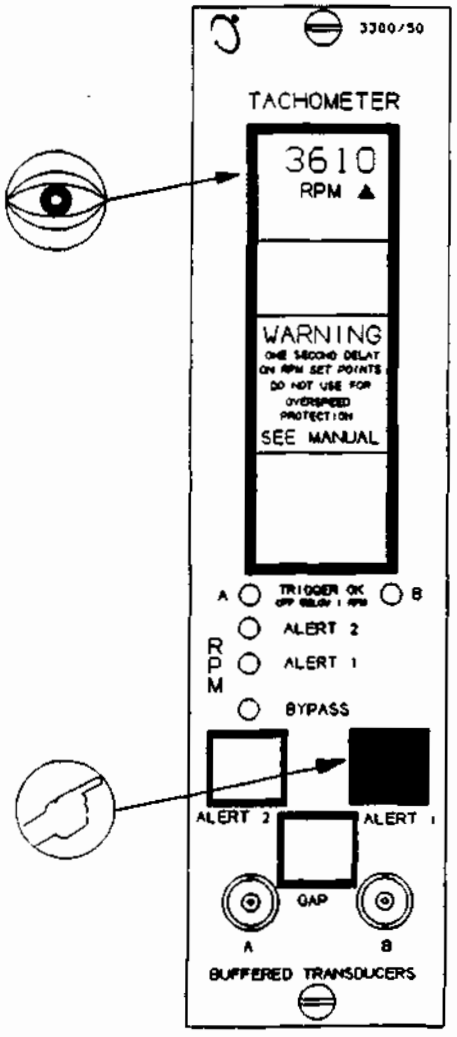


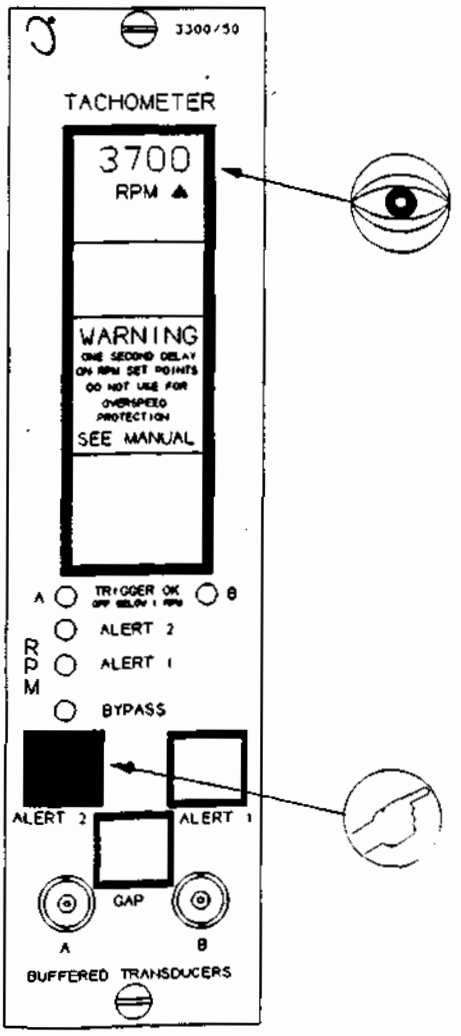
NOTE: THE GAP VOLTAGE IS INTENDED TO BE USED FOR THE INSTALLATION OF PROBES. WHILE A MACHINE IS RUNNING, THE DISPLAYED GAP VOLTAGE MAY VARY SIGNIFICANTLY.

15 READ SETPOINTS (DUAL SETPOINT TACH.)

PRESS THE ALERT 1 SWITCH AND READ THE ALERT 1 SETPOINT ON THE FRONT PANEL DISPLAY. UP ARROW INDICATES OVER SPEED SETPOINT. DOWN ARROW INDICATES UNDER SPEED SETPOINT.

PRESS THE ALERT 2 SWITCH AND READ THE ALERT 2 SETPOINT ON THE FRONT PANEL DISPLAY. UP ARROW INDICATES OVER SPEED SETPOINT. DOWN ARROW INDICATES UNDER SPEED SETPOINT.

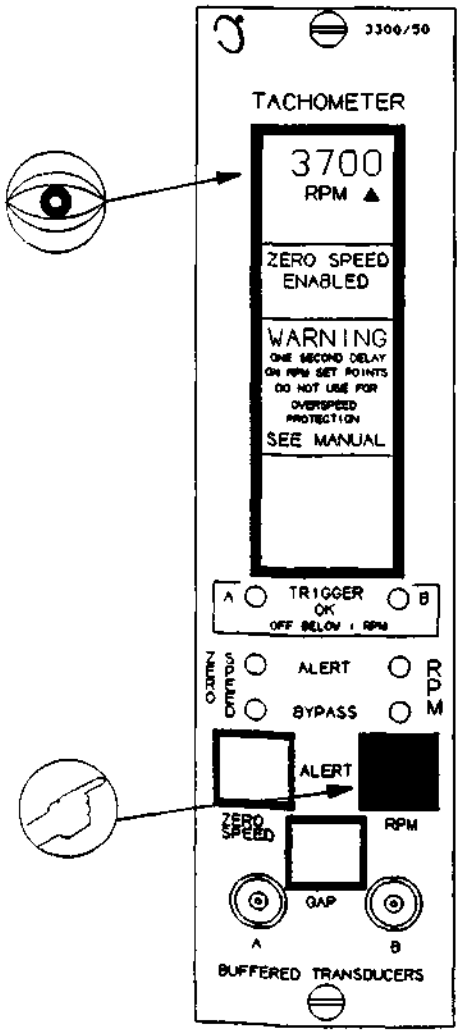


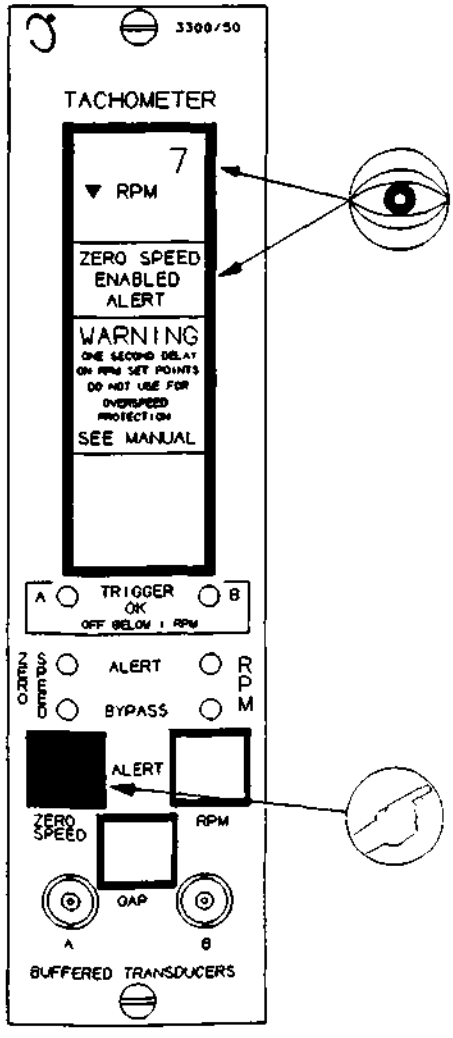


16 READ SETPOINTS (ZERO SPEED TACH.)

PRESS THE RPM ALERT SWITCH AND READ THE RPM ALERT SETPOINT ON THE FRONT PANEL DISPLAY. UP ARROW INDICATES OVER SPEED SETPOINT. DOWN ARROW INDICATES UNDER SPEED SETPOINT.

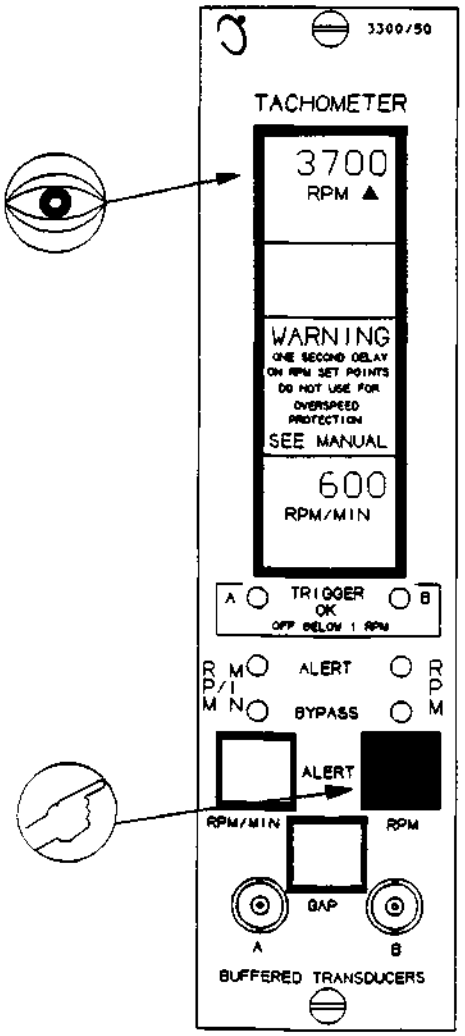
PRESS THE ZERO SPEED ALERT SWITCH AND READ THE ZERO SPEED ALERT SETPOINT ON THE FRONT PANEL DISPLAY. DOWN ARROW INDICATES UNDER SETPOINT. (ZERO SPEED IS ALWAYS AN UNDER SETPOINT.)



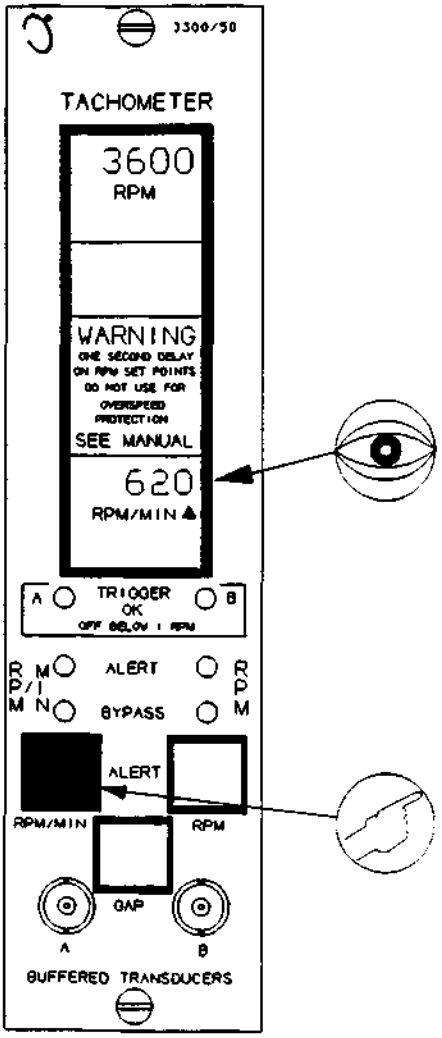


17 READ SETPOINTS (ROTOR ACCEL. TACH.)

PRESS THE RPM ALERT SWITCH AND READ THE RPM ALERT SETPOINT ON THE FRONT PANEL DISPLAY. UP ARROW INDICATES OVER SPEED SETPOINT. DOWN ARROW INDICATES UNDER SPEED SETPOINT.

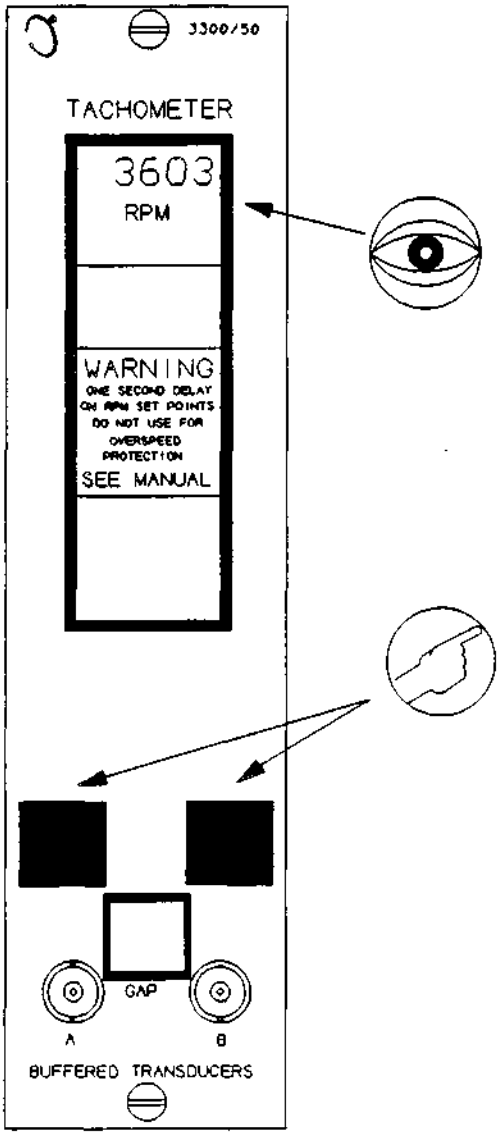


PRESS THE RPM/MIN ALERT SWITCH AND READ THE RPM/MIN ALERT SETPOINT ON THE FRONT PANEL DISPLAY. UP ARROW INDICATES OVER SETPOINT. (ROTOR ACCEL IS ALWAYS AN OVER SETPOINT.)



18 READ PEAK HOLD

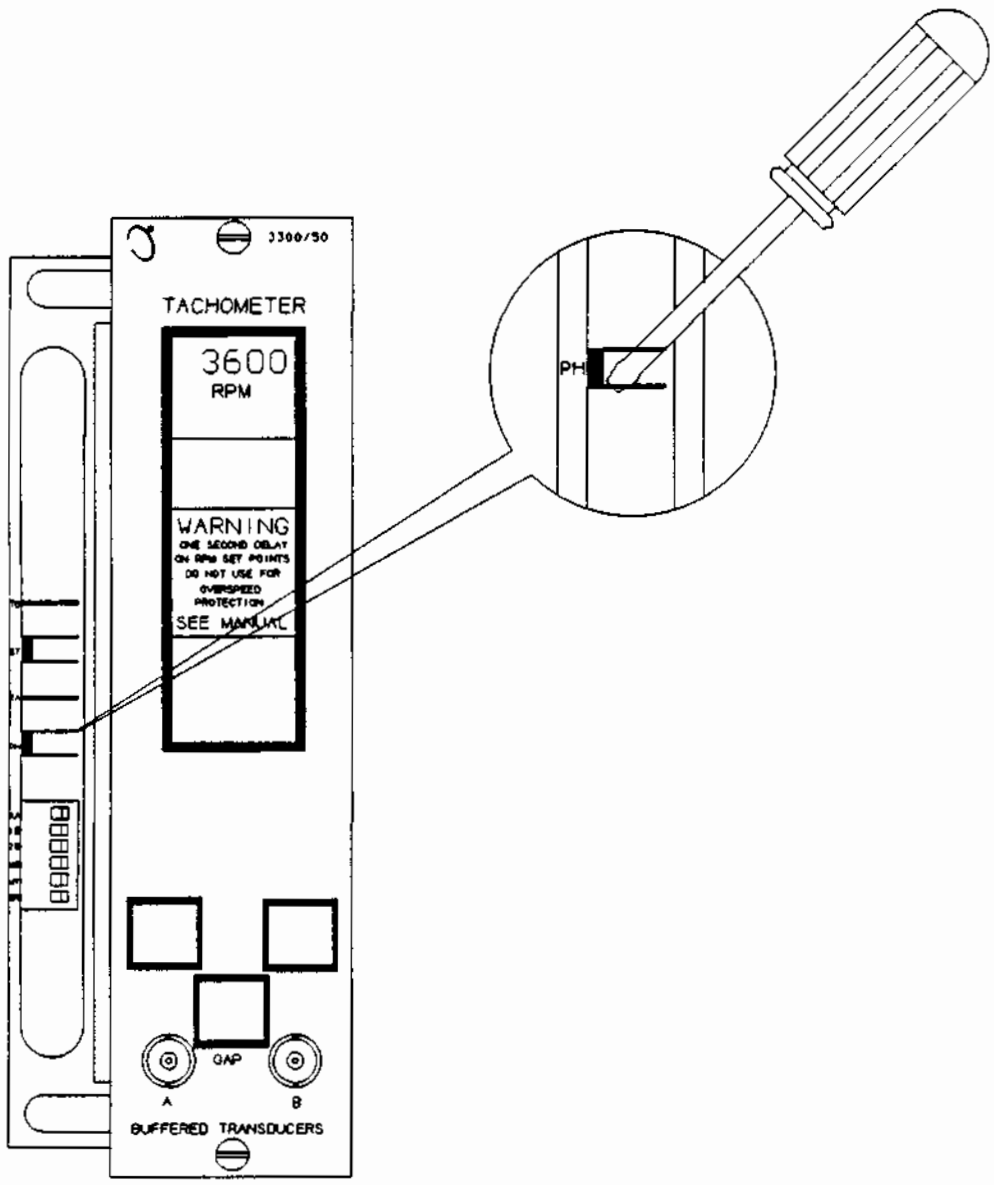
PRESS BOTH ALERT SWITCHES SIMULTANEOUSLY AND READ THE PEAK HOLD VALUE.



PEAK HOLD IS THE MAXIMUM RPM VALUE OBTAINED SINCE THE LAST PEAK HOLD RESET.

19 RESET PEAK HOLD

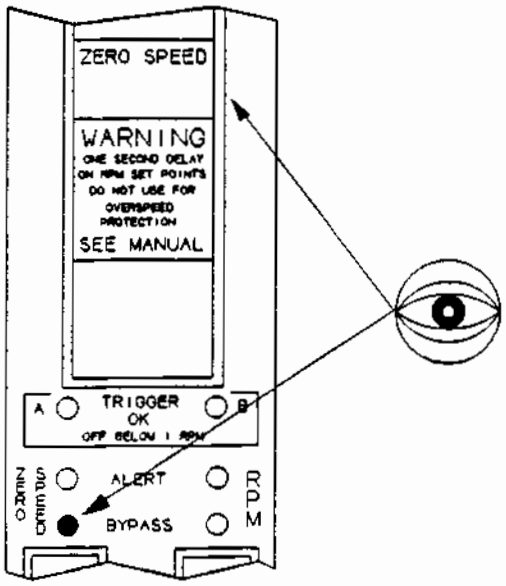
RESET THE VALUE STORED IN **PEAK HOLD** MEMORY BY SHORTING ACROSS **PEAK HOLD** (PH) PINS.

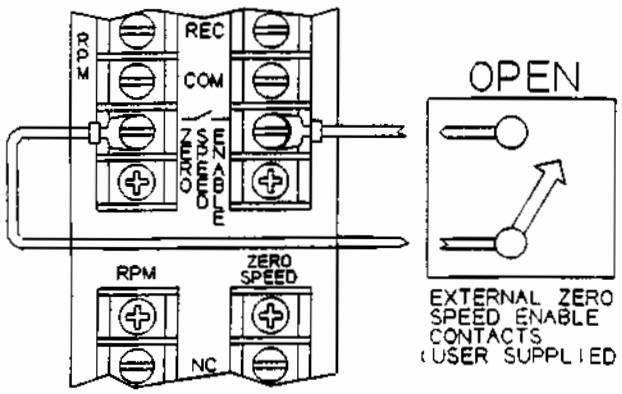


READ PEAK HOLD TO VERIFY THAT IT HAS BEEN CLEARED (SEE PREVIOUS PAGE).

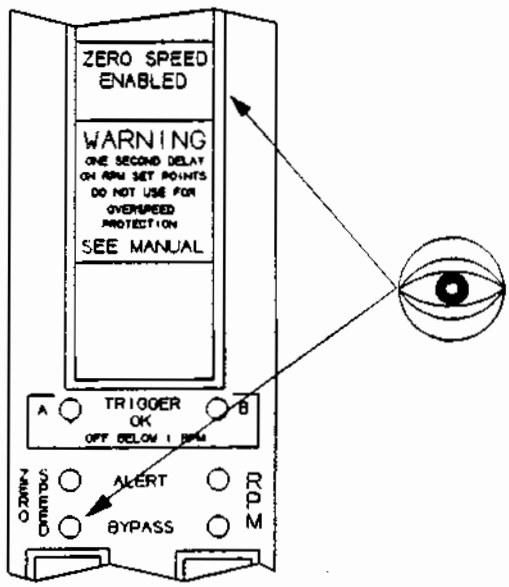
20 ENABLE (ZERO SPEED TACHOMETER)

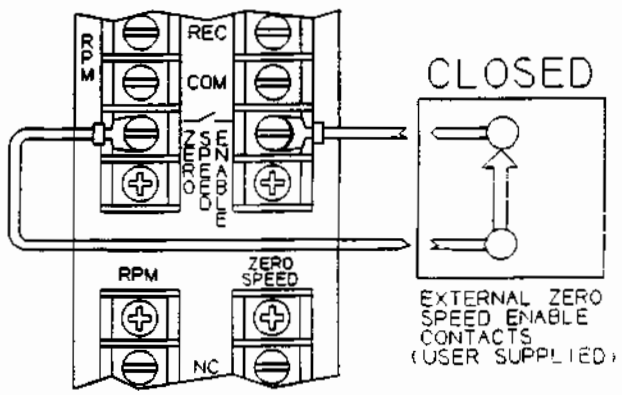
WHEN THE EXTERNAL ZERO SPEED ENABLE CONTACTS ARE OPEN, THE **ENABLE** INDICATOR WILL EXTINGUISH AND THE ZERO SPEED **BYPASS** LED WILL LIGHT. WHILE THESE CONTACTS ARE OPEN, A ZERO SPEED ALERT CANNOT OCCUR.





WHEN THE EXTERNAL ZERO SPEED ENABLE CONTACTS ARE CLOSED, THE **ENABLE** INDICATOR WILL SHOW AND THE **BYPASS** LED WILL EXTINGUISH (IF THE ZERO SPEED FUNCTION HAS NOT BEEN MANUALLY BYPASSED).

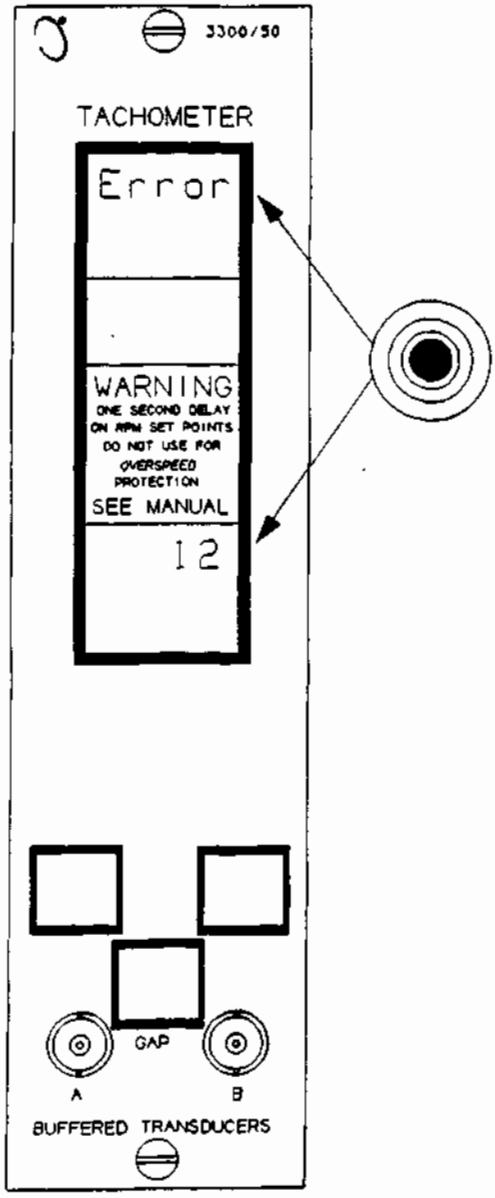




21 SELF TEST

THE MONITOR HAS THREE LEVELS OF SELF TESTS:

POWER-UP TEST: PERFORMED ONLY WHEN THE 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 DISPLAY.

BYPASS LED GOES ON AND OK LED FLASHES AT 5 HZ.

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

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

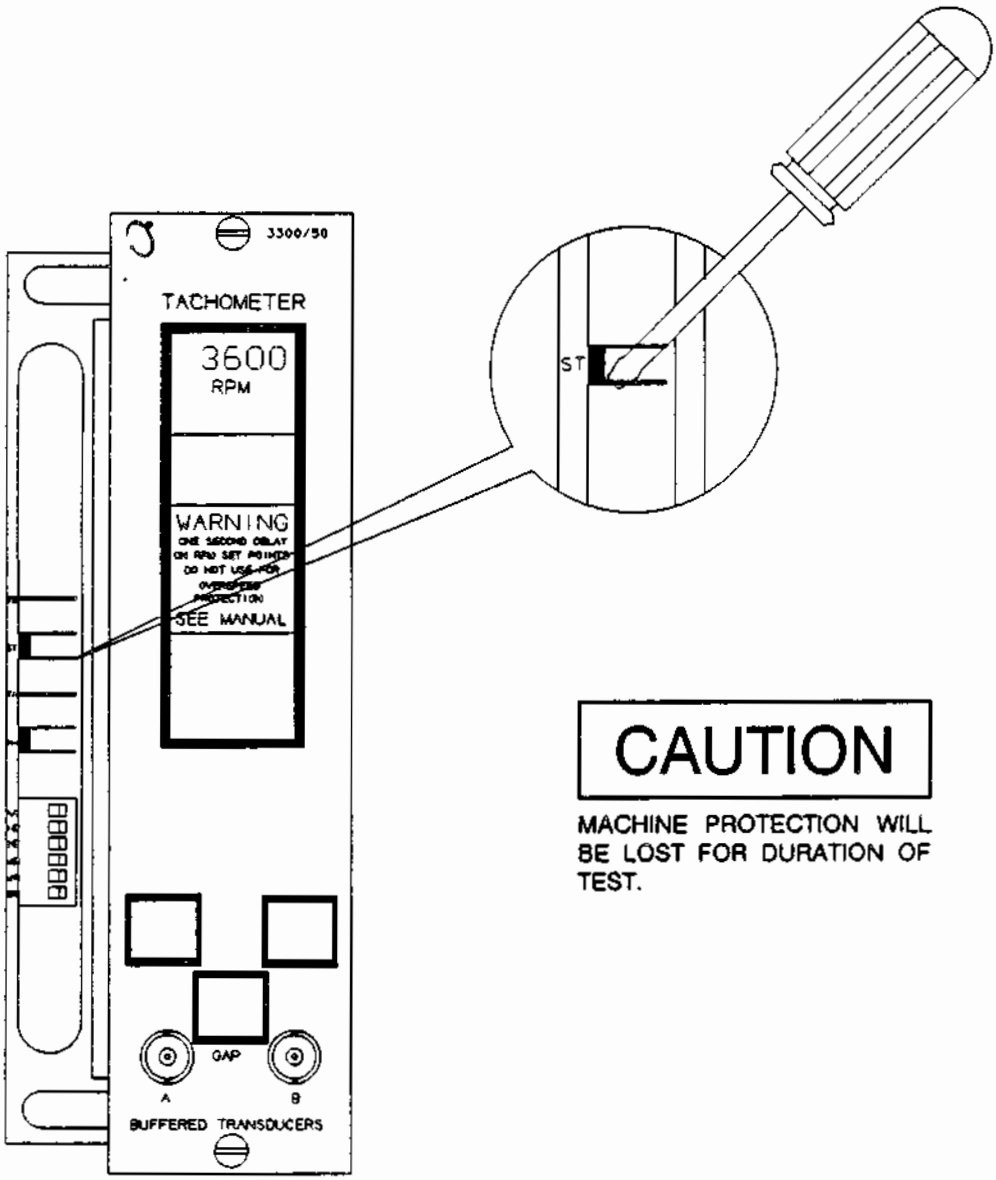
IF ERRORS ARE DETECTED DURING POWER-UP TEST OR USER-INVOKED SELF TEST:

MONITORING IS ABORTED UNTIL USER ACTION RESOLVES PROBLEM.

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

21 SELF TEST (CONT)

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

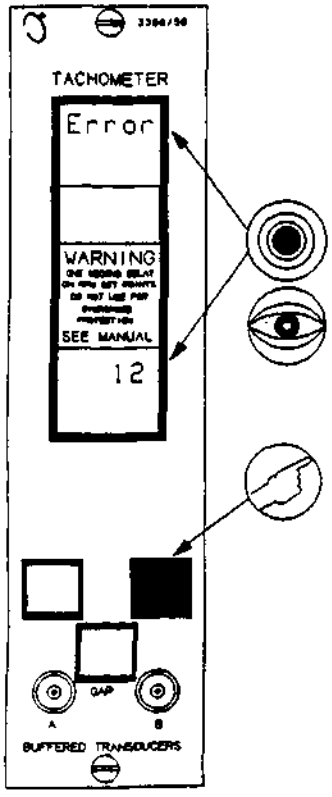


CAUTION

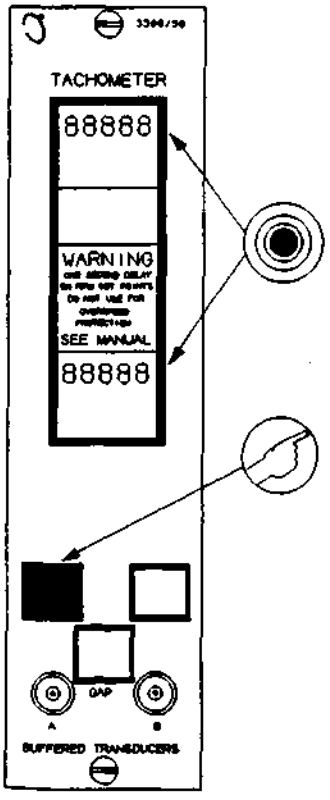
MACHINE PROTECTION WILL BE LOST FOR DURATION OF TEST.

21 SELF TEST (CONT)

AT THE 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.

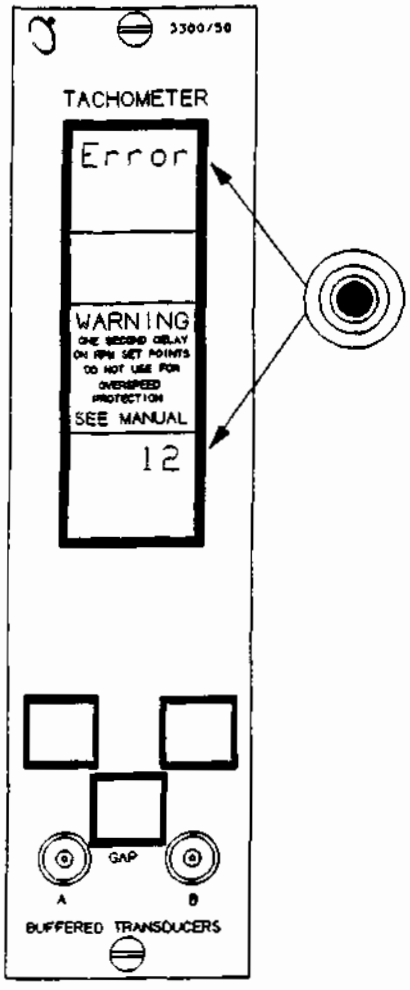


READ CODES ON LIST; STEP THROUGH EACH ERROR CODE ON LIST BY PRESSING AND HOLDING THE RIGHT ALERT SWITCH FOR APPROXIMATELY ONE SECOND.



AT THE END OF THE LIST, THE LCD WILL DISPLAY ALL EIGHTS. TO REREAD THE LIST, PRESS THE RIGHT ALERT SWITCH. TO CLEAR THE LIST FROM MEMORY, PRESS AND HOLD THE LEFT ALERT SWITCH FOR APPROXIMATELY ONE SECOND.

21 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. *
21	INCORRECT SWITCH OR SWITCH COMBINATION. ****
32	AUTO THRESHOLD OR MAGNETIC PICKUP NOT ALLOWED WITH A ZERO SPEED TACHOMETER.
33	THE PROCESSOR HAS NOT BEEN PROGRAMMED FOR THE TACHOMETER TYPE. *
34	THE INPUT FREQUENCY TO THE TACHOMETER IS TOO HIGH FOR PROPER OPERATION.

* 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 12 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 SETUP MODE.

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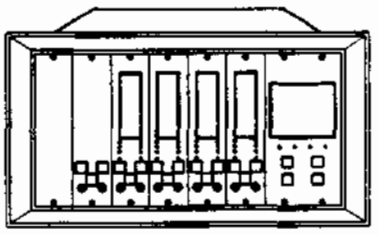
PART NO. 83871-01

3300/50 TACHOMETER

INCLUDES DUAL SETPOINT, ZERO SPEED, AND ROTOR ACCELERATION TACHOMETERS.

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:



NOTICE



WARNING !

Bently Nevada Tachometers are not designed for use independently as, or a component of, a speed control or overspeed protection system.

Bently Nevada Tachometers do not provide protective redundancy and the response speed needed for reliable operation as a speed control or overspeed protection system.

Where provided, the analog proportional output is suitable for data logging or chart recording purposes only. Also, where provided, speed Alert setpoints are suitable for annunciation purposes only.

Failure to take the above warnings into account constitutes a misuse of the product and may result in property damage and/or bodily injury.

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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

3300/50 Tachometer Operation, 83870-01

Dynamic Data Manager System, 46390-01

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Document No. 83871-01 First Printing: March 1989 Revision NC: March 1989

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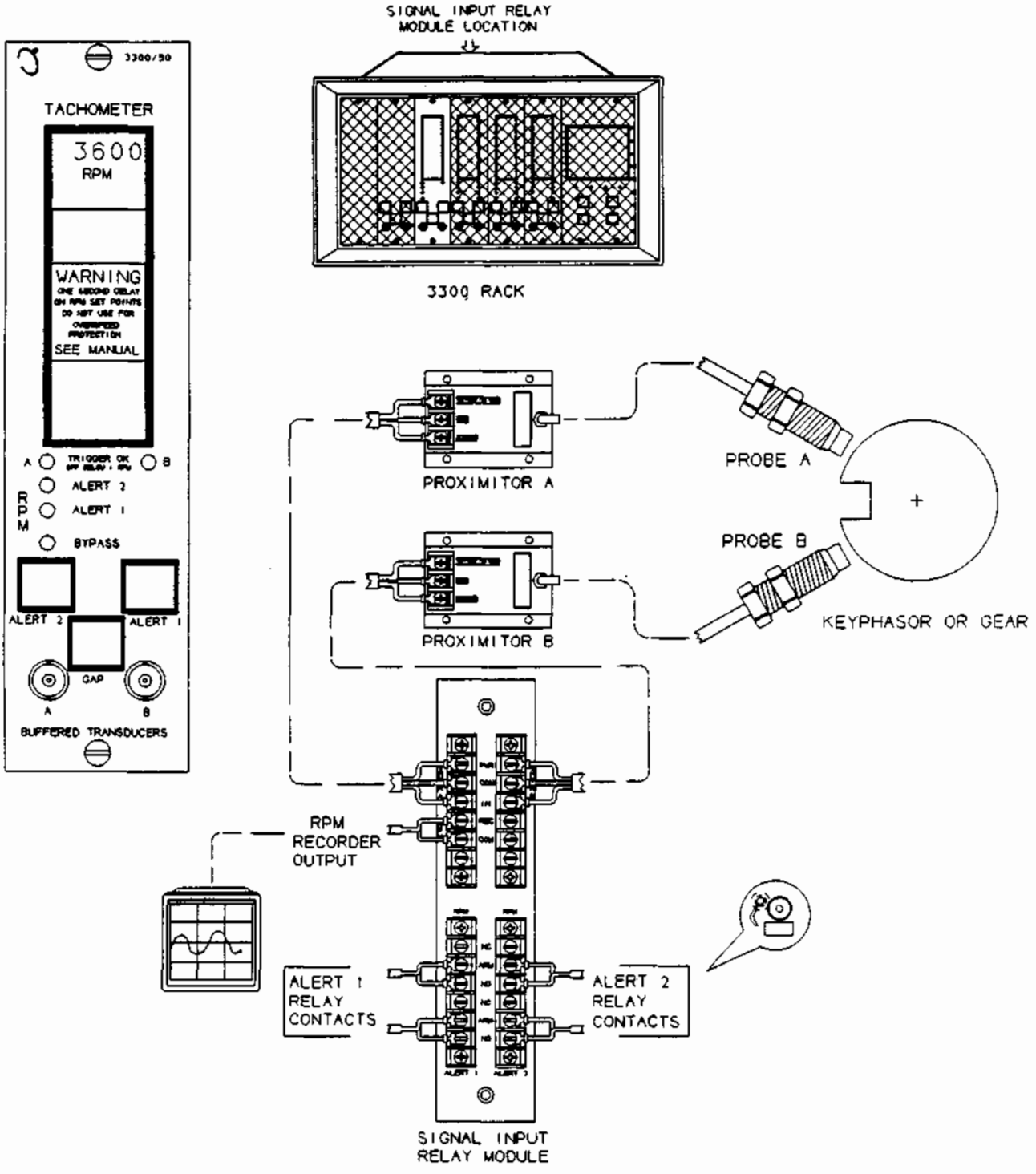
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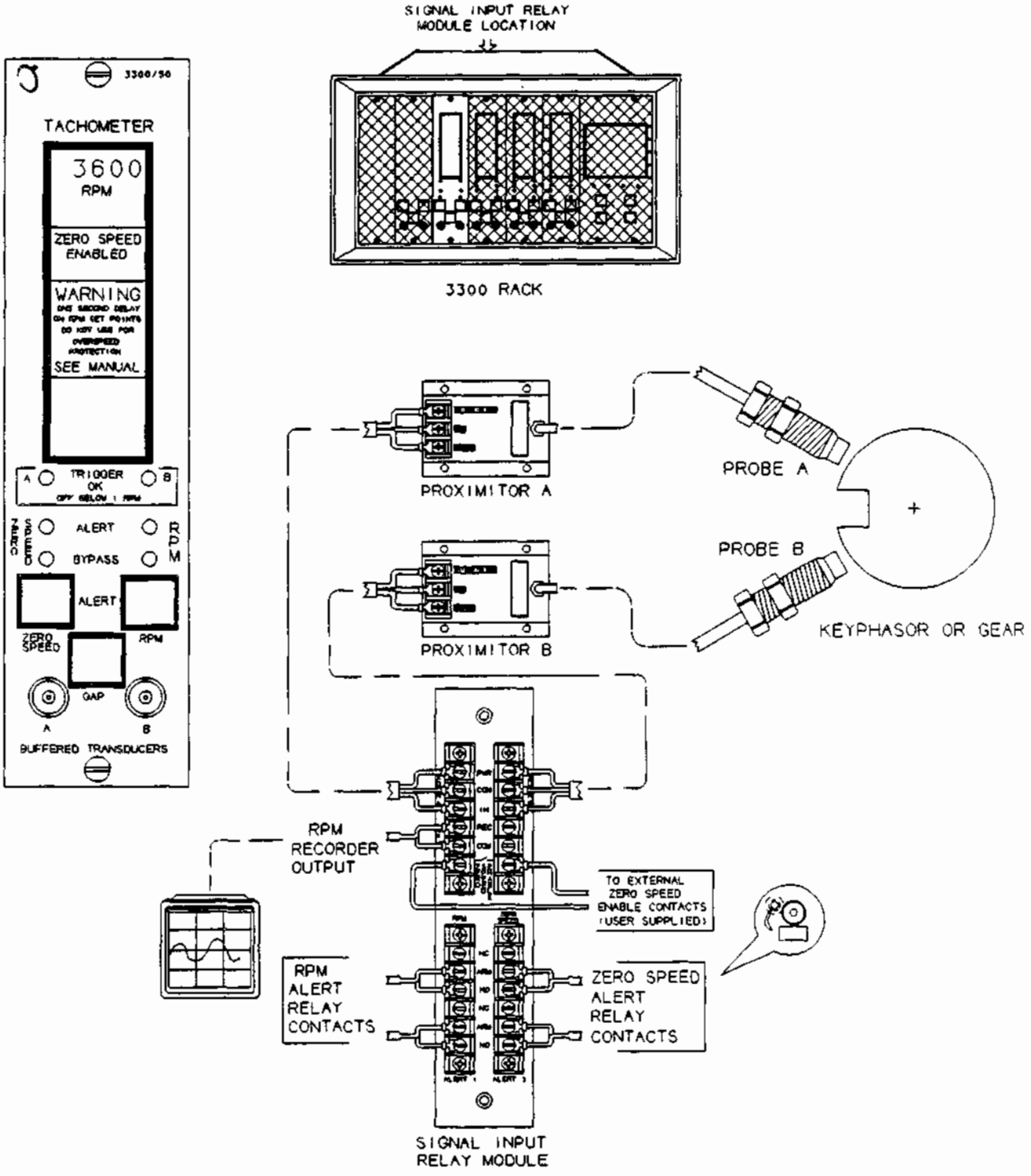
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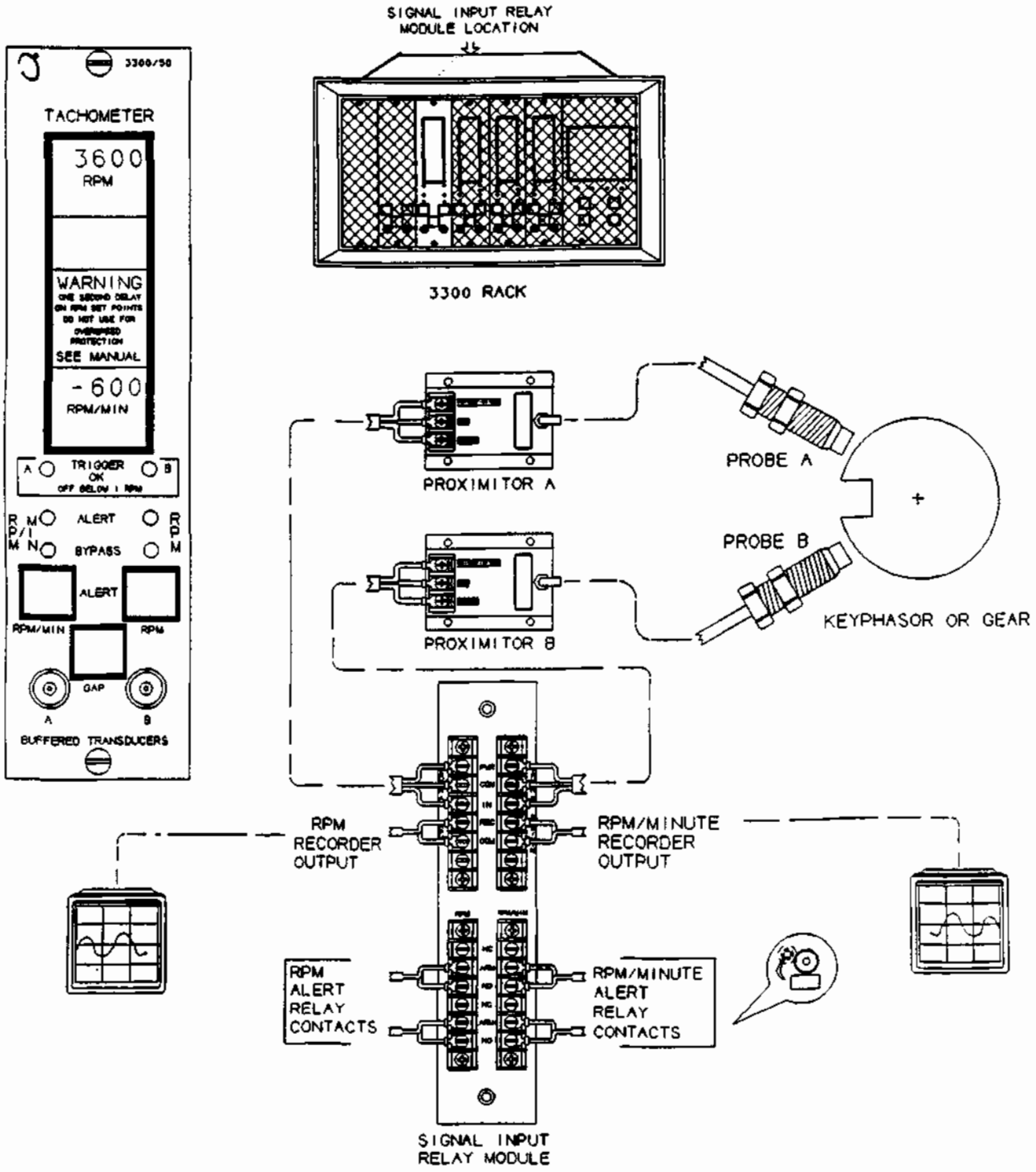
1 DUAL SETPOINT TACHOMETER SYSTEM



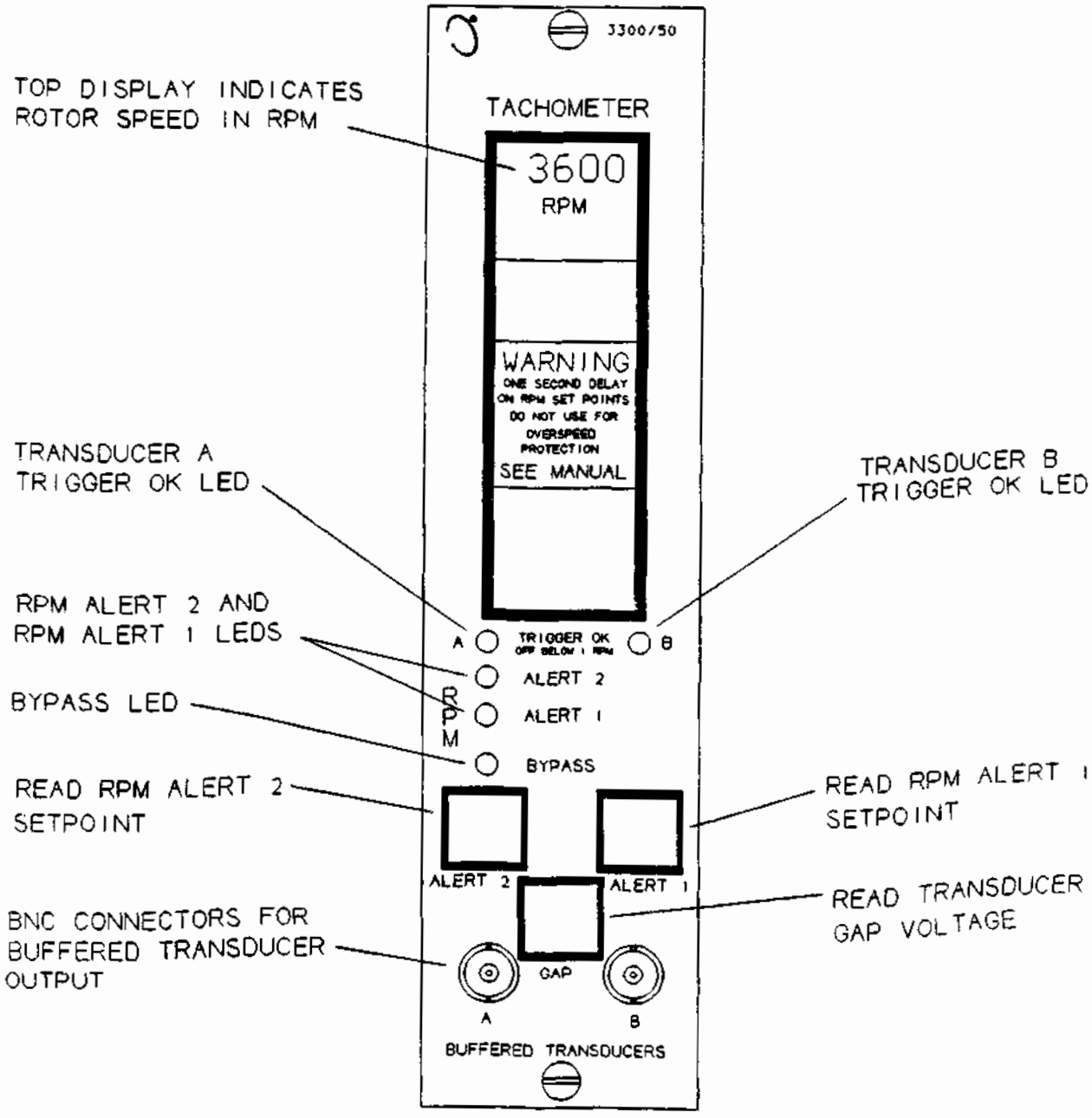
2 ZERO SPEED TACHOMETER SYSTEM



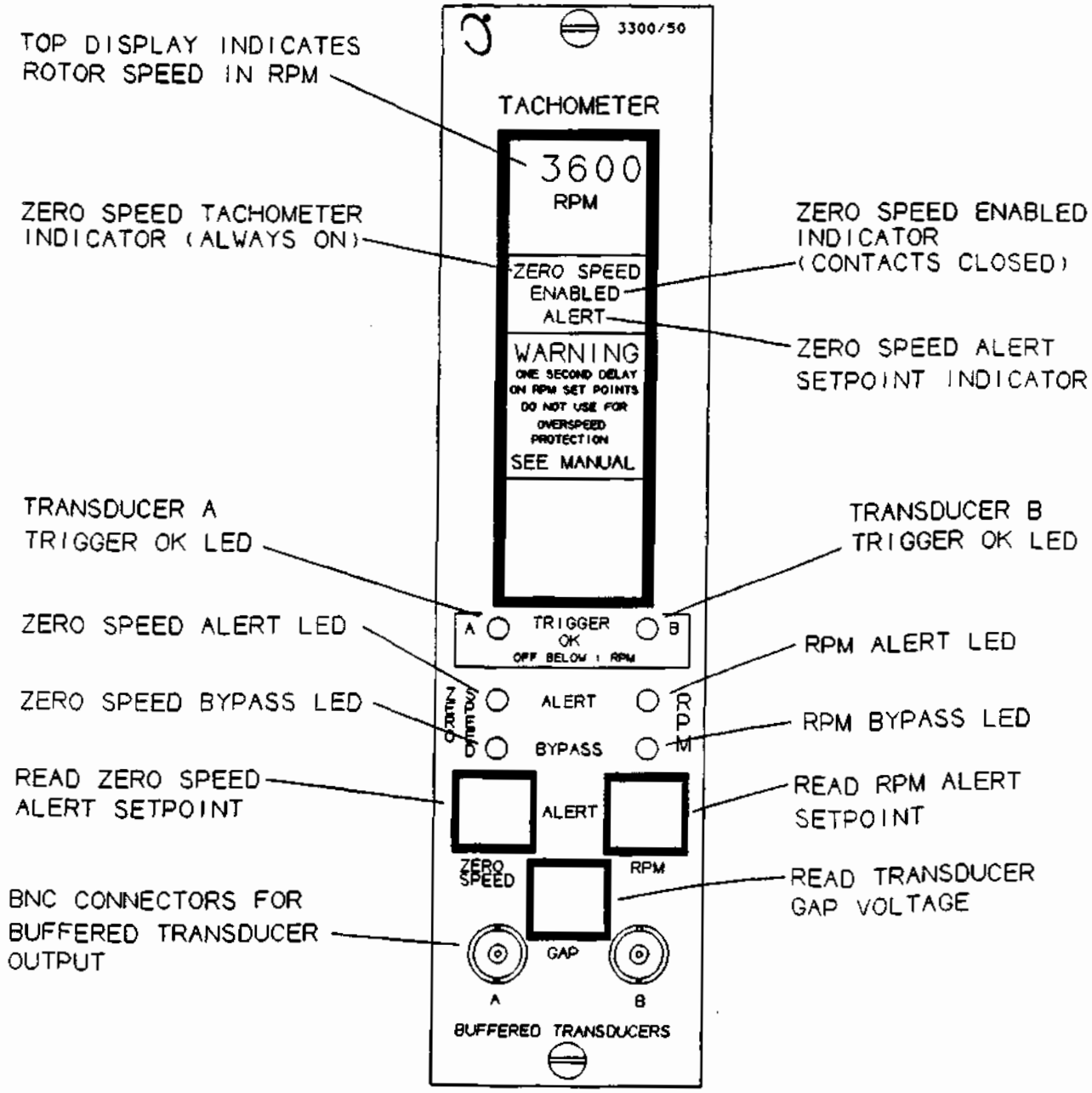
3 ROTOR ACCELERATION TACHOMETER SYSTEM



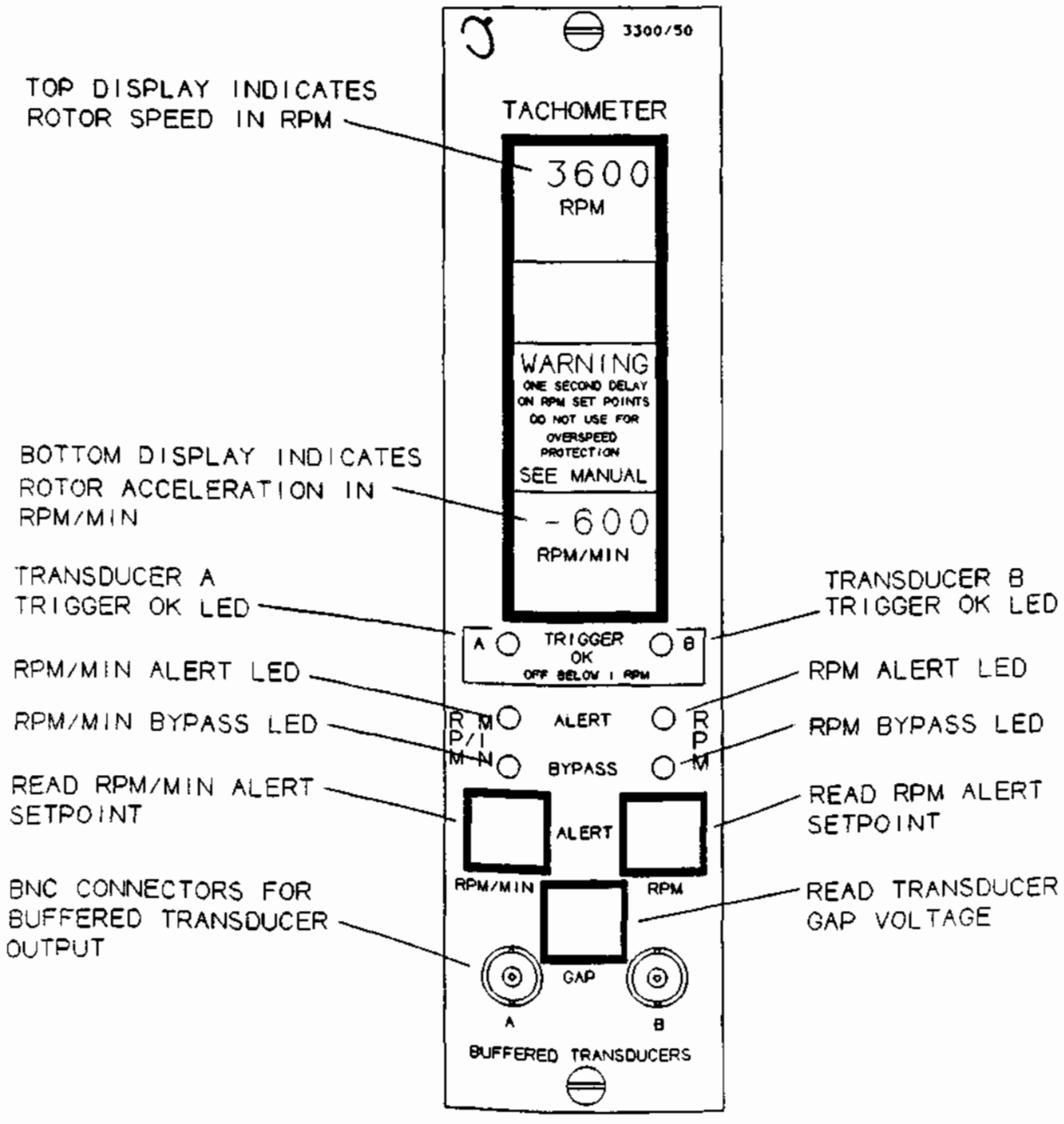
4 FRONT PANEL (DUAL SETPOINT TACHOMETER)



5 FRONT PANEL (ZERO SPEED TACHOMETER)



6 FRONT PANEL (ROTOR ACCEL. TACHOMETER)

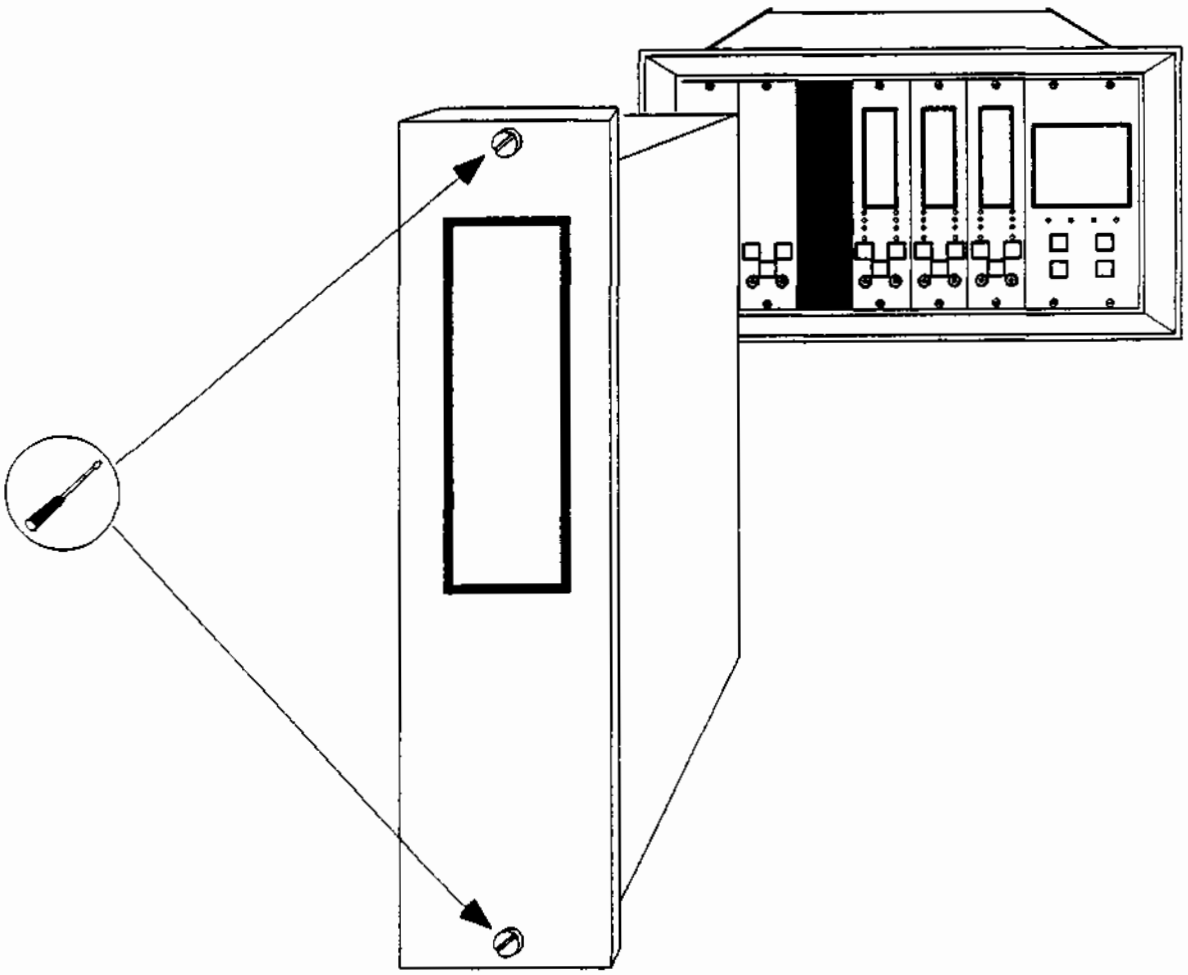


7 Monitor Removal

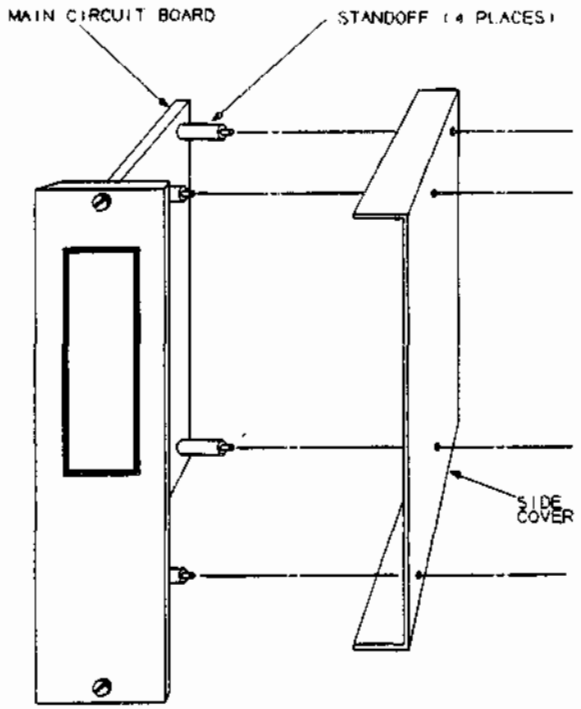
CAUTION

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

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

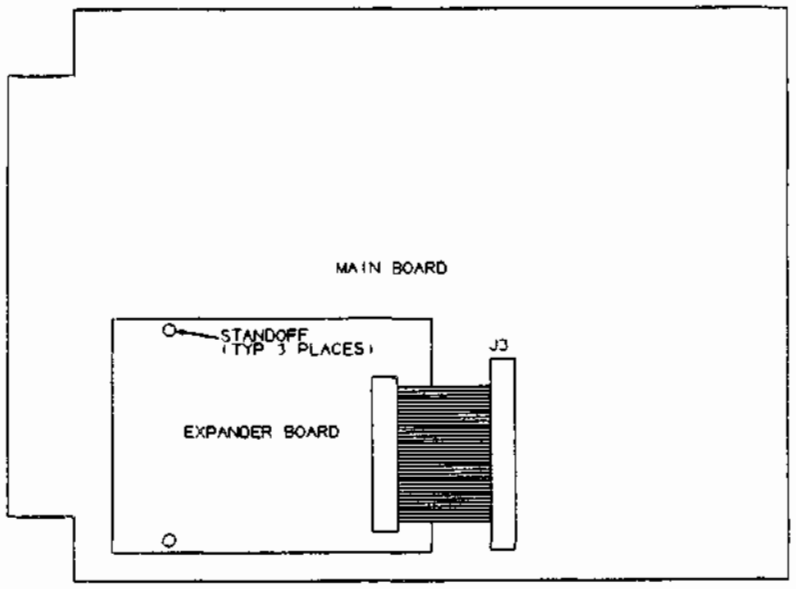


8 Monitor Disassembly



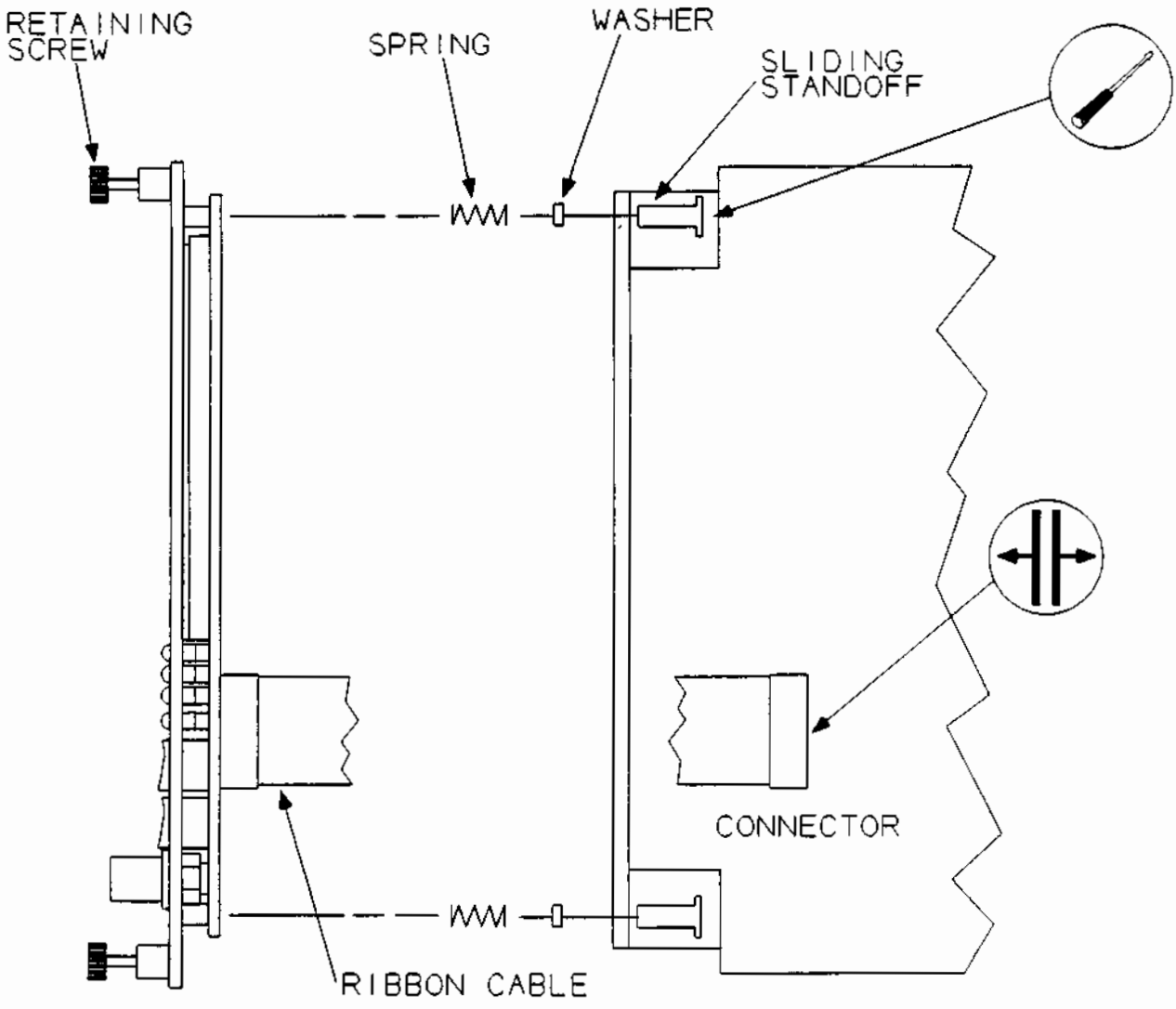
Side Cover Removal
Squeeze the retaining tips on each standoff, and remove the side cover from the monitor.

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



8 Monitor Disassembly [Cont]

Front Panel Removal

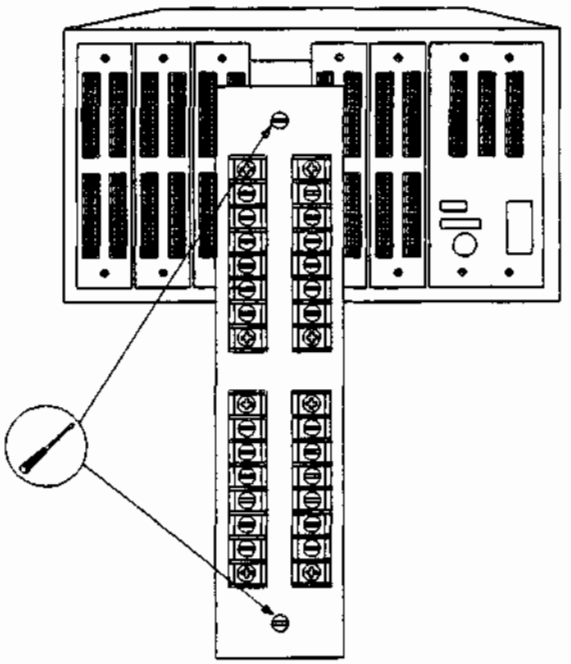


9 Signal Input Relay Module

⚠ WARNING

High Voltage present Could cause shock, burns or death.

Do Not touch exposed wires or terminals.



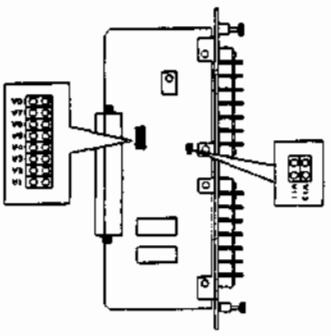
The Signal Input Relay Module is on the back of the rack. For relay configuration, see Installation Manual. For field wiring, see Sections 27,28 and 29 (Field Wiring Diagrams).

Module Removal

Loosen two screws and remove the module.

Module Options

Alert 1 Relay	Jumper	
	In	Out
Normally Energized	W3	W4,W11
Normally De-energized	W4,W11	W3
Alert 2 Relay	**Jumper**	
	In	Out
Normally Energized	W2	W1,W12
Normally De-energized	W1,W12	W2



Alert Relays

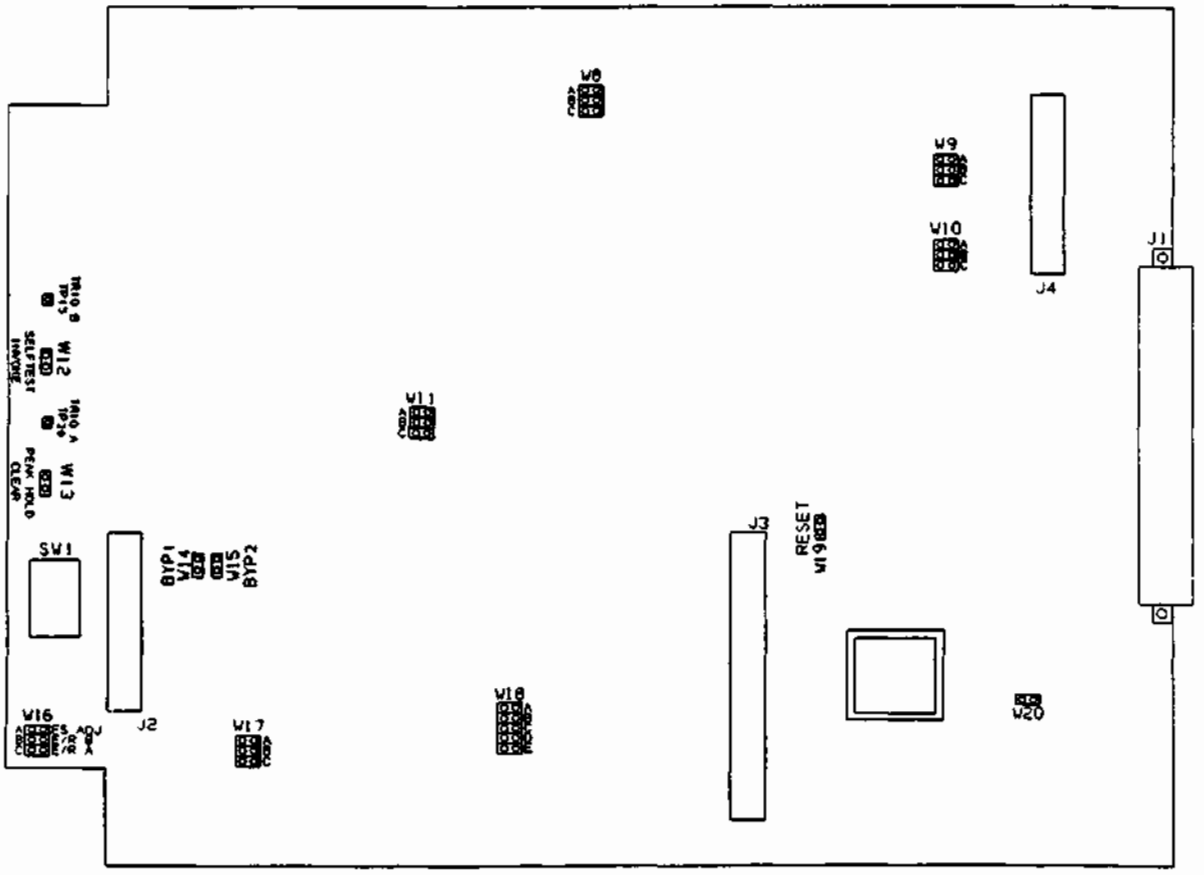
	Tachometer Type		
	Dual Setpoint	Zero Speed	Rotor Accel
Alert 1 Relay	RPM Alert 1	RPM Alert	RPM Alert
Alert 2 Relay	RPM Alert 2	Zero Speed Alert	RPM/MIN Alert

10 Monitor Options

TACHOMETER
PART NUMBER

	TACHOMETER TYPE	ALERT RELAYS	AGENCY APPROVAL	BARRIERS
3300/50	AA	BB	CC	DD
	01 = DUAL SETPOINT TACHOMETER 02 = ZERO SPEED TACHOMETER 03 = ROTOR ACCELERATION TACHOMETER	00 = NONE 01 = 5 AMP EPOXY SEALED 02 = 5 AMP HERMETICALLY SEALED	00 = NOT REQ'D 01 = CSA 02 = BASEEFA 03 = FACTORY MUTUAL	00 = NOT REQ'D 01 = WITH BARRIERS

The Tachometer has several user-programmable options. The options can be changed by removing and installing jumpers.



Jumper Locations on the Main Circuit Board

10 Monitor Options (Cont)

Main Board Option Settings
All monitor options, except for the Recorder options, are located on the Tachometer Main Board. Table 1 shows these options and their jumper positions.

Table 1 Option Settings on the Main Board

Option	Jumper Install	Jumper Remove
Transducer Input:		
Transducer A		
System, Rack Keyphasor 1	W10C	W10A,B, 18A
* Monitor Signals, 7200 or 3000 Proximitor	W10A	W10B,C, 18A
Monitor Signals, Magnetic Pickup (Note 1)	W10A,B, 18A	W10C
Transducer B		
System, Rack Keyphasor 2	W9C	W9A,B, 18A
* Monitor Signals, 7200 or 3000 Proximitor	W9A	W9B,C, 18A
Monitor Signals, Magnetic Pickup (Note 1)	W9A,B, 18A	W9C
Transducer Conditioning:		
Threshold Mode (Note 2)		
Manual	-------	W17C
* Auto	W17C	-------
Hysteresis Transducer A		
0.2 Volts	W11B	W11A,C
* 0.5 Volts	W11C	W11A,B
1.0 Volts	W11A	W11B,C
2.0 Volts	-------	W11A,B,C
Hysteresis Transducer B		
0.2 Volts	W8B	W8A,C
* 0.5 Volts	W8C	W8A,B
1.0 Volts	W8A	W8B,C
2.0 Volts	-------	W8A,B,C

* Options as shipped from factory
Note 1: Magnetic Pickups are not Recommended for Zero Speed Applications.
Note 2: The Zero Speed Tachometer is Shipped in the Manual Threshold Mode.

10 Monitor Options (Cont)

Table 1 Option Settings on the Main Board (Continued)

Option	Jumper Install	Jumper Remove
Alert Modes:		
Alert 1 (See Table 2)		
* Over Alert	W18B	-------
Under Alert	-------	W18B
* Latching Alert	W18C	-------
Nonlatching Alert	-------	W18C
Alert 2 (See Table 2)		
* Over Alert (Note 3)	W18D	-------
Under Alert	-------	W18D
* Latching Alert	W18E	-------
Nonlatching Alert	-------	W18E
First Out Alert Option: (Note 4)		
* First Out Alert Enable	W17A	-------
First Out Alert Disable	-------	W17A
Monitor Options: (Note 5)		
Alert 1 (See Table 2)		
Bypass Switch Enable	W14	-------
* Bypass Switch Disable	-------	W14
Alert 2 (See Table 2)		
Bypass Switch Enable	W15	-------
* Bypass Switch Disable	-------	W15

* Options as shipped from factory

Note 3: W18D has no affect on the **Zero Speed Alert**. Zero Speed is always an **Under Alert**.

Note 4: All Alerts drive the rack **First Out Alert** Bus. The Tachometers do not drive the rack First out Danger Bus.

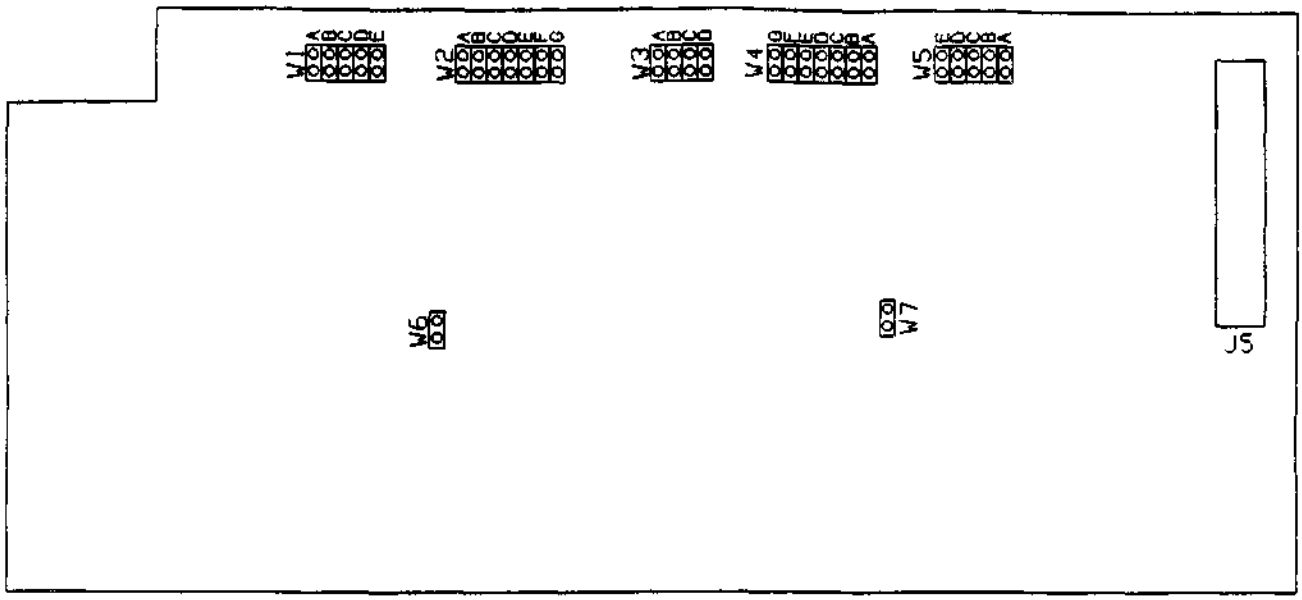
Note 5: W14 has no affect on the **Dual Setpoint Tachometer**. Only the **RPM Alert 2** Relay may be Bypassed on the **Dual Setpoint Tachometer**.

Note 6: W18D has no affect on the **Rotor Accel Tachometer**. Rotor Accel is always an **Over Alert**.

Table 2, Alerts

	Tachometer Type		
	Dual Setpoint	Zero Speed	Rotor Accel
Alert 1	RPM Alert 1	RPM Alert	RPM Alert
Alert 2	RPM Alert 2	Zero Speed Alert	RPM/MIN Alert

10 Monitor Options (Cont)



Jumper Locations on the Recorder Piggy Board

Table 3 Option Settings on the Recorder Piggy Board

Recorder Option	Jumper	
	Install	Remove
+4 to +20 mA	W1B,C,D W2B,D,E W3A,C W4B,D,E W5B,C,D	W1A,E W2A,C,F,G W3B,D W4A,C,F,G W5A,E W6 W7
+1 to +5 Vdc	W1A,E W2C,F W3A,C W4C,F W5A,E	W1B,C,D W2A,B,D,E,G W3B,D W4A,B,D,E,G W5B,C,D W6 W7
0 to -10 Vdc	W1A,E W2A,G W3B,D W4A,G W5A,E	W1B,C,D W2B,C,D,E,F W3A,C W4B,C,D,E,F W5B,C,D W6 W7

11 Monitor Full Scale Range Adjustment

NOTE: Information in [brackets] applies to the Rotor Acceleration (RPM/MIN) Tachometer only.

The Tachometer RPM [and RPM/MIN] Full Scale Range Adjustment allows the RPM [and RPM/MIN] Recorder outputs to be properly scaled to the expected operating range of the shaft being monitored. The Tachometer is shipped with a Full Scale Range of 5000 RPM [500 RPM/MIN]. The Tachometer may be adjusted to any of the following RPM [RPM/MIN] Full Scale Ranges.

Selectable RPM Full Scale Ranges:

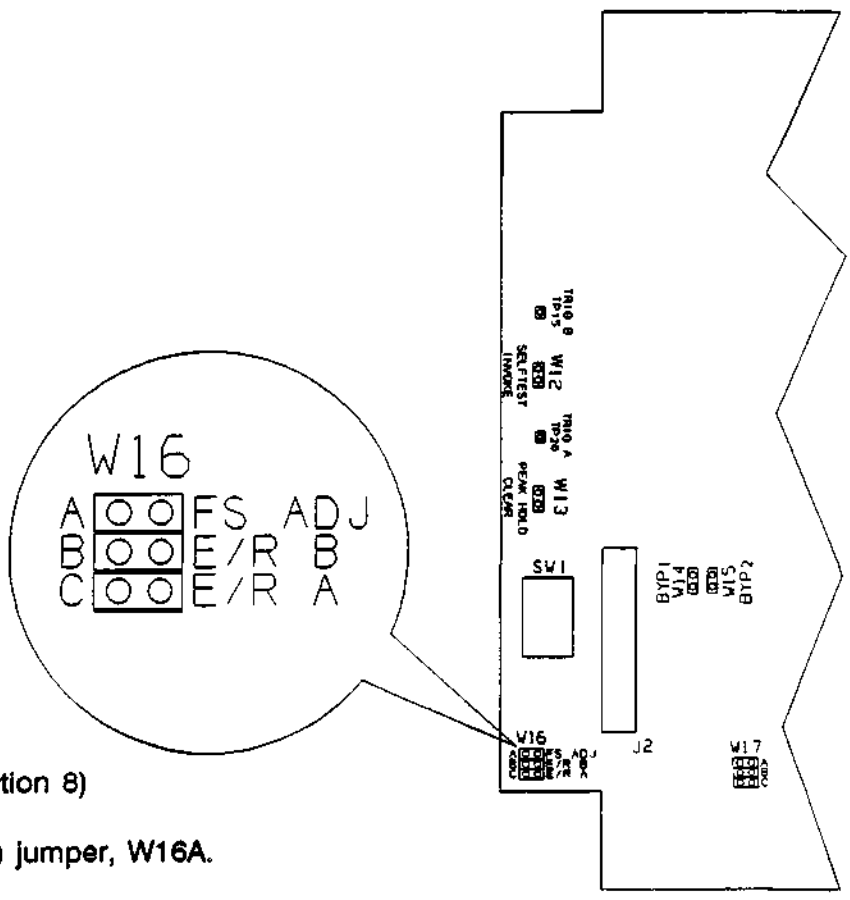
100 200 500 1000 2000 5000 10,000 20,000 50,000 99,999

[Selectable RPM/MIN Full Scale Ranges:]

100 200 500 1000 9999

CAUTION

Machine Protection Will be lost during the Full Scale Adjust Procedure.

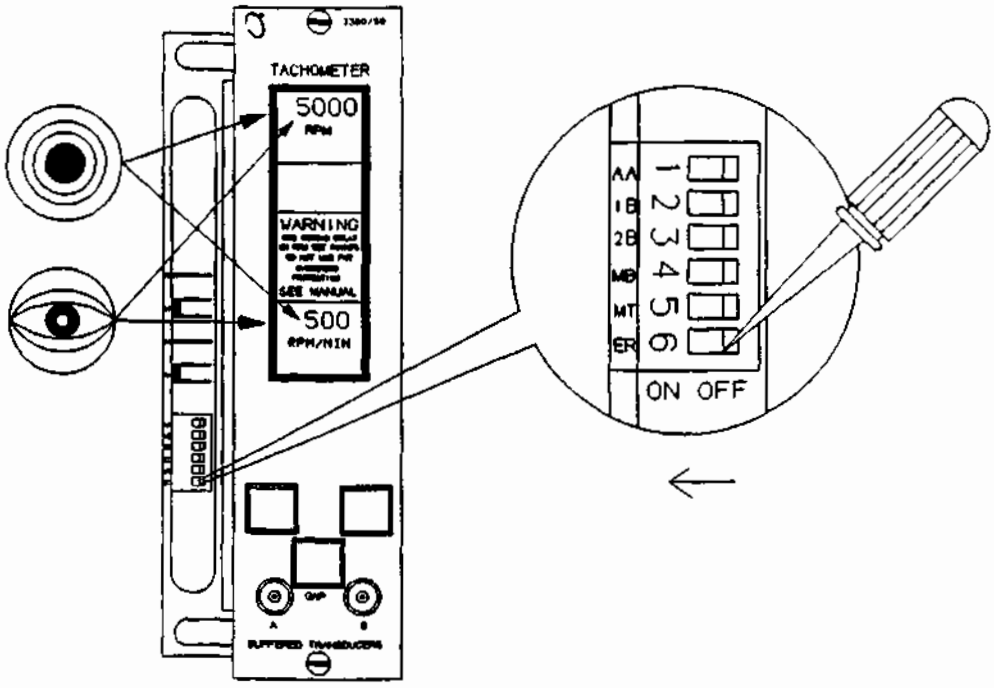


1. Remove Monitor (Section 7)
2. Remove Monitor side cover (Section 8)
3. Install Full Scale Adjust (FS ADJ) jumper, W16A.

11 Monitor Full Scale Range Adjustment (Cont)

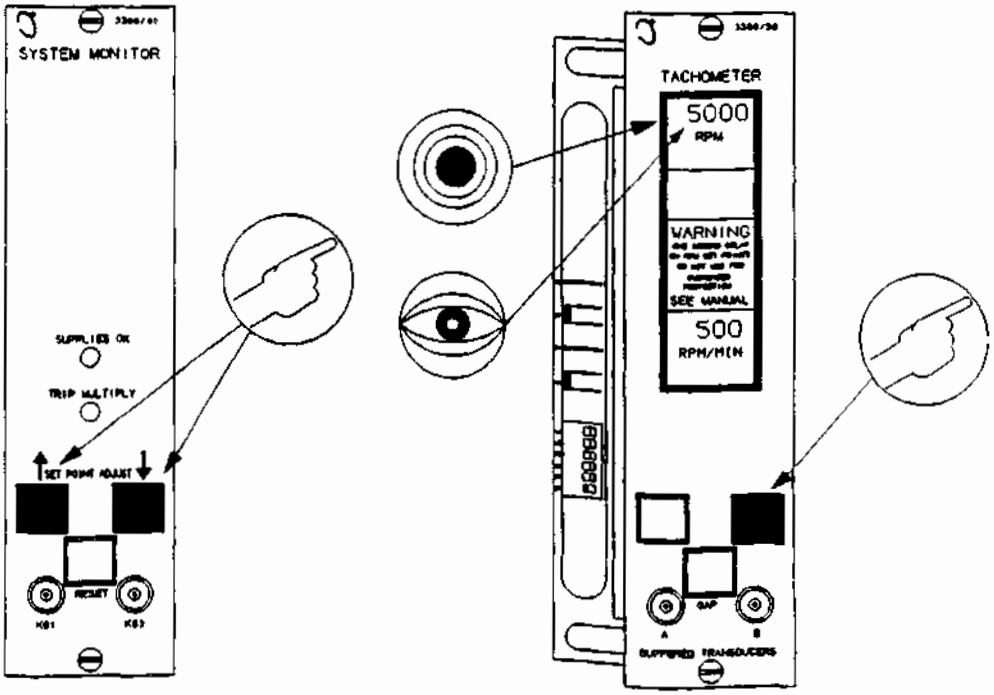
4. Install Monitor in Rack. The RPM [and RPM/MIN] display will show the current RPM [and RPM/MIN] Full Scale Range.

5. Set Switch 6 (ER) to the "ON" position. The RPM [and RPM/MIN] display **flash** the current RPM [and RPM/MIN] Full Scale Range.



6. To adjust the RPM Full Scale Range, press and hold the right Alert switch on the front panel. The RPM Full Scale Range will remain flashing.

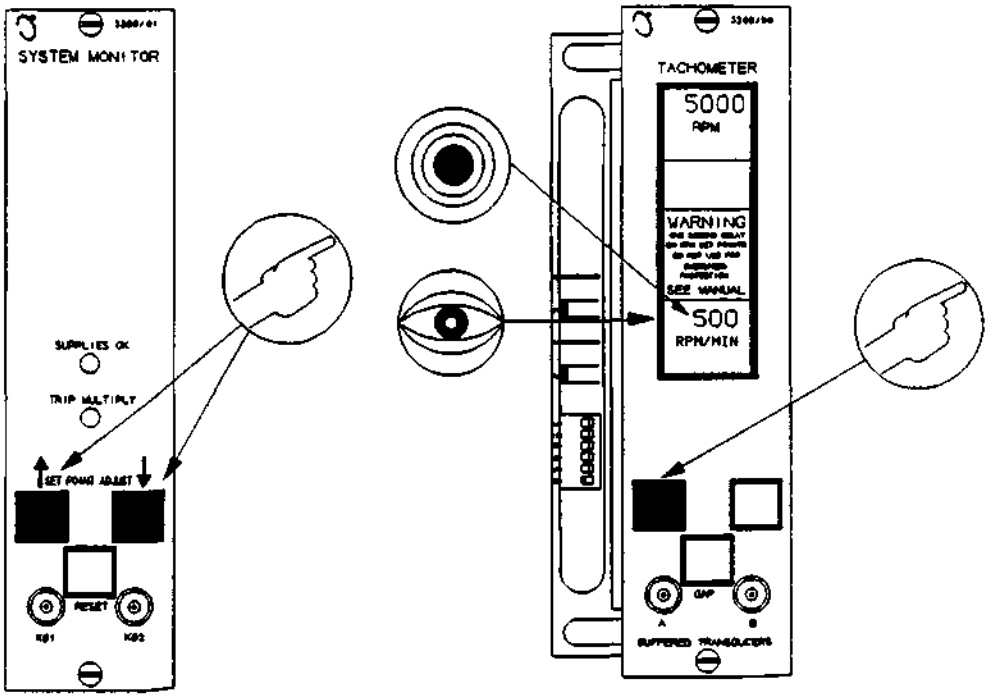
7. Use the (↑) or (↓) switches on the System Monitor to adjust the RPM Full Scale Range.



11 Monitor Full Scale Range Adjustment (Cont)

[8.] To adjust the RPM/MIN Full Scale Range, press and hold the left Alert switch on the front panel. The RPM/MIN Full Scale Range will remain flashing.

[9.] Use the (↑) or (↓) switches on the System Monitor to adjust the RPM/MIN Full Scale Range.



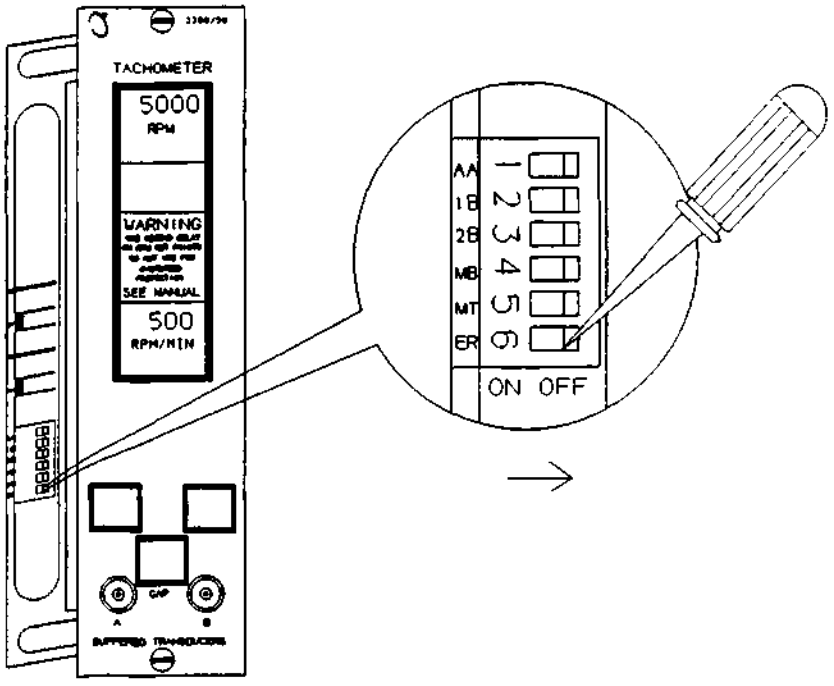
10. When the correct Full Scale Range has been selected, reset Switch 6 (ER) to the OFF position. This will lock the Full Scale Range into permanent memory.

11. Remove Monitor from Rack.

12. Remove the Full Scale Adjust Jumper, W16A.

13. Install Monitor side cover.

14. Install Monitor in Rack.



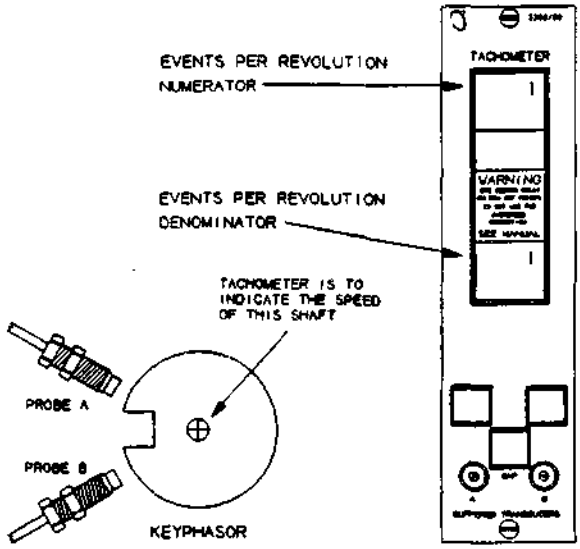
12 Events Per Revolution Adjustment

The Events Per Revolution Adjustment allows the Tachometer to observe a rotating shaft at other than one Event per Revolution. This is the case when observing a multi-tooth gear or when observing a shaft driven at some ratio of the actual rotor speed.

Events per Revolution Examples:

Example 1:

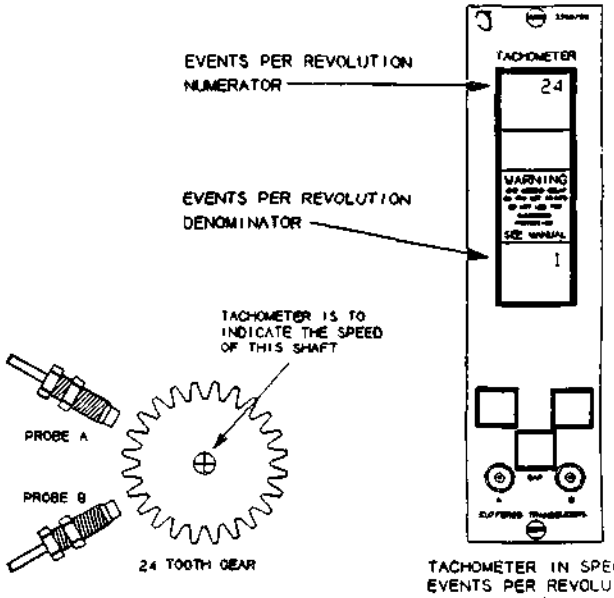
This example shows both probes observing a one event per revolution Keyphasor. The Tachometer is to indicate the speed of the shaft on the Keyphasor. In this case, the events per revolution (E/R) is set to 1. The E/R numerator and denominator are both 1. (1/1 = 1)



TACHOMETER IN SPECIAL EVENTS PER REVOLUTION ADJUST MODE

Example 2:

In this example both probes are observing a 24 tooth gear. The Tachometer is to indicate the speed of the shaft on the 24 tooth gear. In this case, the Events per Revolution (E/R) is set to 24. The E/R numerator is 24 and the denominator is 1. (24/1 = 24)

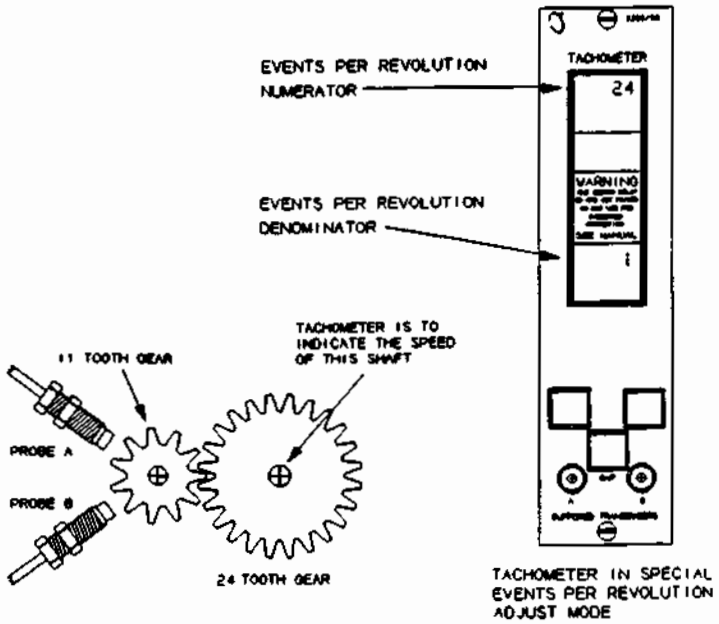


TACHOMETER IN SPECIAL EVENTS PER REVOLUTION ADJUST MODE

12 Events Per Revolution Adjustment (Cont)

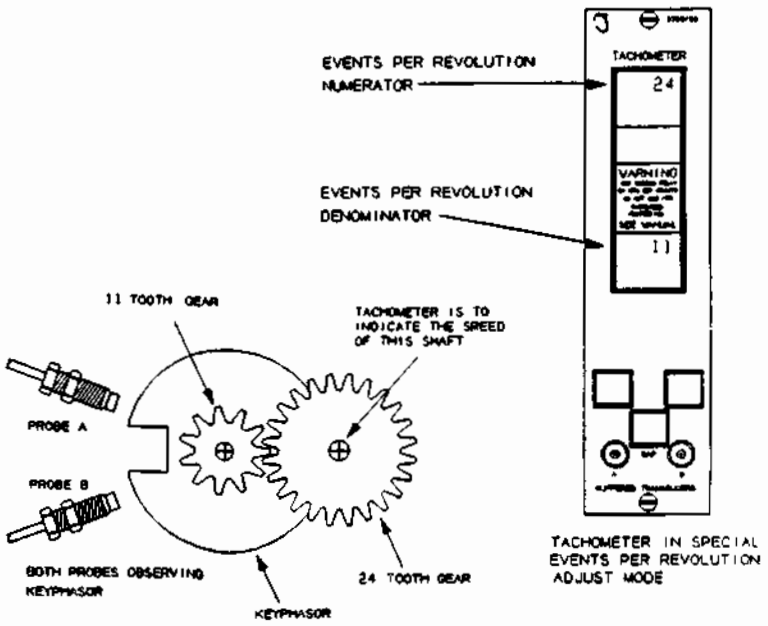
Example 3:

In this example, both probes are observing an eleven tooth gear being driven from a 24 tooth gear. The Tachometer is to indicate the speed of the shaft on the 24 tooth gear. In this case, the Events per Revolution (E/R) is set to 24. Although the probes are observing the eleven tooth gear, they still detect 24 events per one turn of the indicated shaft. The E/R numerator is set to 24 and the denominator is set to 1. (24/1 = 24)



Example 4:

In this example, both probes are observing a one event per revolution Keyphasor on the same shaft with an eleven tooth gear. The eleven tooth gear is driven from a 24 tooth gear. The Tachometer is to indicate the speed of the shaft on the 24 tooth gear. In this case, the Events per Revolution (E/R) is 24/11. For each revolution of the indicated shaft, the Keyphasor will rotate 24/11 revolutions. The E/R numerator is set to 24 and the denominator is set to 11.

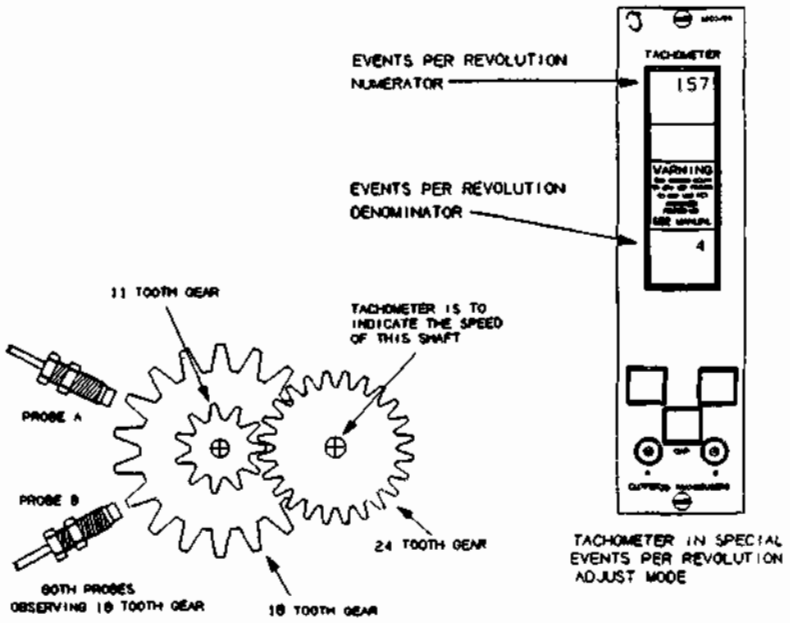


12 Events Per Revolution Adjustment (Cont)

Example 5:

In this example, both probes are observing an eighteen tooth gear on the same shaft with an eleven tooth gear. The eleven tooth gear is driven from a 24 tooth gear. The Tachometer is to indicate the speed of the shaft on the 24 tooth gear. In this case, the Events per Revolution (E/R) must be calculated:

E/R = (24 / 11) x 18 ; E/R = 39.2727



To set the Tachometer to the proper E/R, the closest fraction must be found. The maximum E/R numerator allowed is 255. The maximum denominator allowed is also 255. The closest fraction found which is within these limits is E/R = 157/4. The E/R numerator is 157 and the denominator is 4. (157/4 = 39.25) Since 157/4 equals 39.25 and not 39.2727, a slight error will result. In this particular example, the error is 0.06 %, or 2 RPM at 3600 RPM.

Notes on Events per Revolution

Depending on the operating speed, the Tachometer is limited to certain maximum values for the Events per Revolution. The table below must be adhered to for +/- 1 RPM accuracy.

RPM Full Scale Range	Maximum Allowed Events per Revolution
100 RPM	255
200 RPM	255
500 RPM	255
1000 RPM	255
2000 RPM	255
5000 RPM	120
10,000 RPM	60
20,000 RPM	30
50,000 RPM	6
100,000 RPM	1

When operating at speeds below 100 RPM with one Event per Revolution, the update rate and Alert response time can be extremely slow. Increasing the number of Events per Revolution observed will speed up the update rate and the Alert response time.

12 Events Per Revolution Adjustment (Cont)

Events per Revolution Adjustment Procedure:

CAUTION

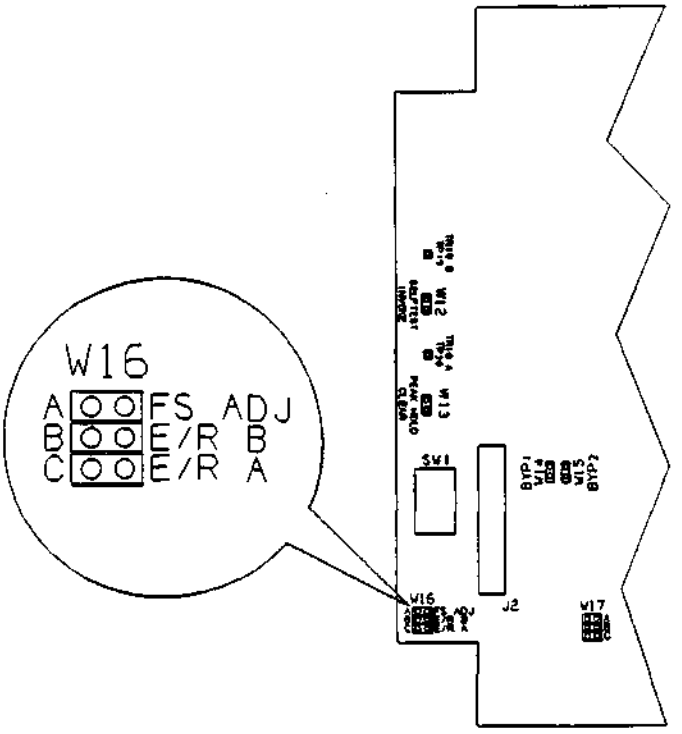
Machine Protection Will be lost during the Events per Revolution Adjust Procedure.

1. Remove Monitor (Section 7)

2. Remove Monitor side cover (Section 8)

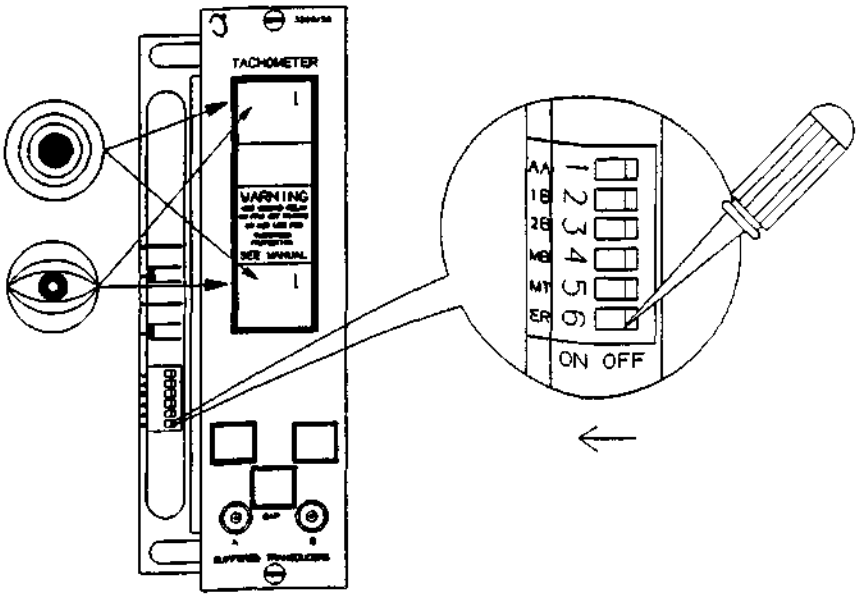
3. Install Events per Revolution jumper, W16C.

NOTE: Jumper W16C (E/R A) adjusts the Events per Revolution for both Transducer A and B. W16B (E/R B) is for future enhancements, and has no effect in this monitor. Both transducers must observe the same number of Events per Revolution.



4. Install Monitor in Rack. The front panel display will show the current Events per Revolution (E/R) numerator and denominator.

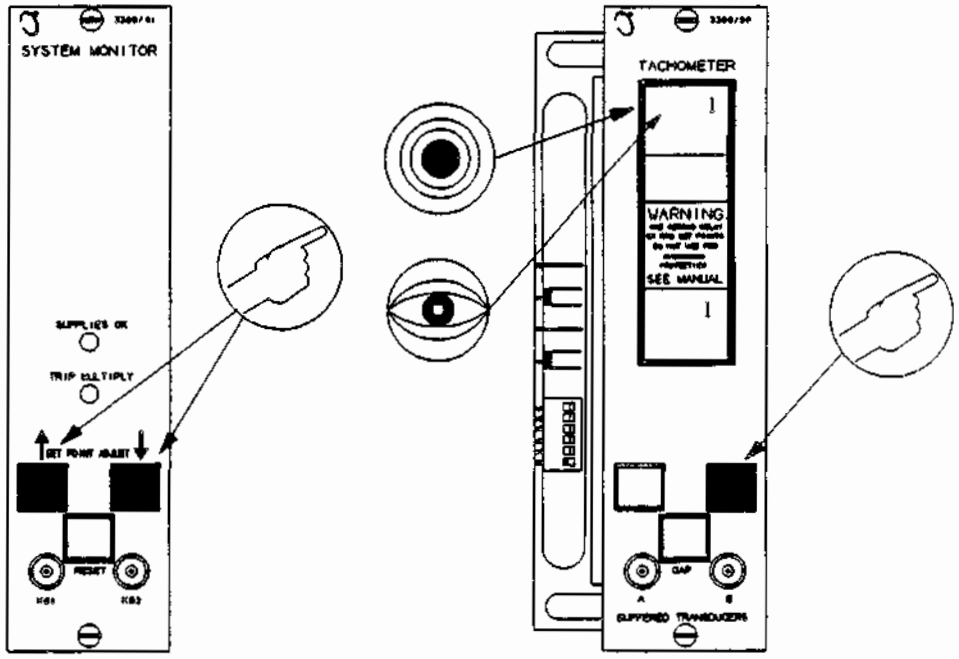
5. Set Switch 6 (ER) to the "ON" position. The front panel display will flash the current E/R numerator and denominator.



12 Events Per Revolution Adjustment (Cont)

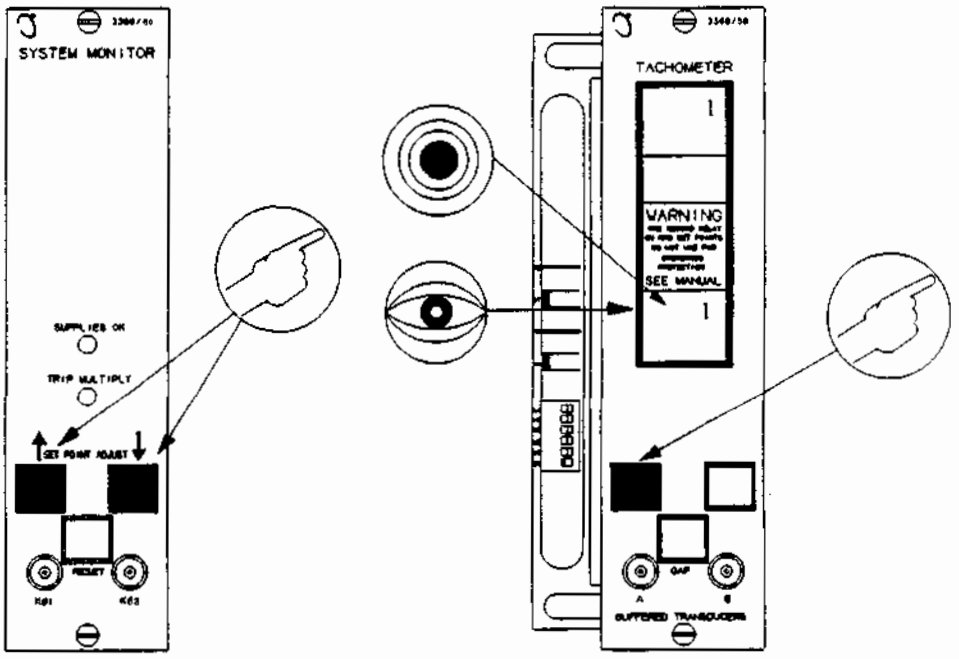
6. To adjust the E/R numerator, press and hold the right Alert switch on the front panel. The E/R numerator will remain flashing.

7. Use the (↑) and (↓) switches on the System Monitor to adjust the E/R numerator.



8. To adjust the E/R denominator, press and hold the left Alert switch on the front panel. The E/R denominator will remain flashing.

9. Use the (↑) and (↓) switches on the System Monitor to adjust the E/R denominator.



12 Events Per Revolution Adjustment (Cont)

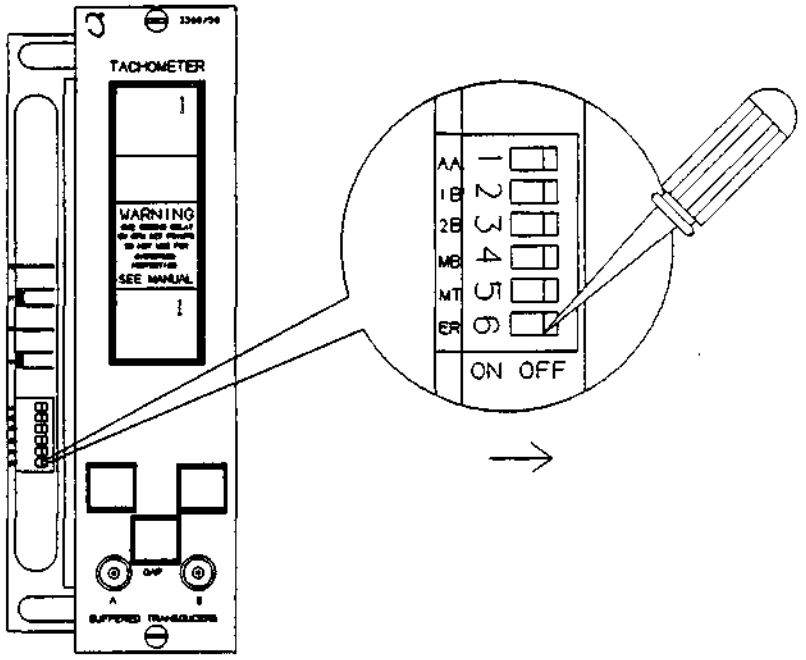
10. When the correct Events per Revolution numerator and denominator have been selected, reset Switch 6 (ER) to the OFF position. This will lock the E/R into permanent memory.

11. Remove Monitor from Rack.

12. Remove the E/R Jumper, W16C.

13. Install Monitor side cover.

14. Install Monitor in Rack.



13 Threshold and Hysteresis Adjustments

The Tachometer has both **Manual** and **Automatic** Threshold modes. The Threshold mode is selected using option jumper W17C. The Dual Setpoint and Rotor Accel Tachometers are shipped in the Auto Threshold mode. The Zero Speed Tachometer is shipped in the Manual Threshold mode. The events per revolution into the monitor will determine the minimum RPM which can be used with Auto Threshold. **The Auto Threshold's minimum frequency response is 5 Hertz or 300 RPM at one event per revolution. The input frequency must be greater than 5 Hertz for the Auto Threshold circuit to function properly.** If the number of events per revolution is increased from 1 to 50, the minimum Auto Threshold frequency would be 6 RPM. **See section 10 (Monitor Options) for Threshold jumper configuration.**

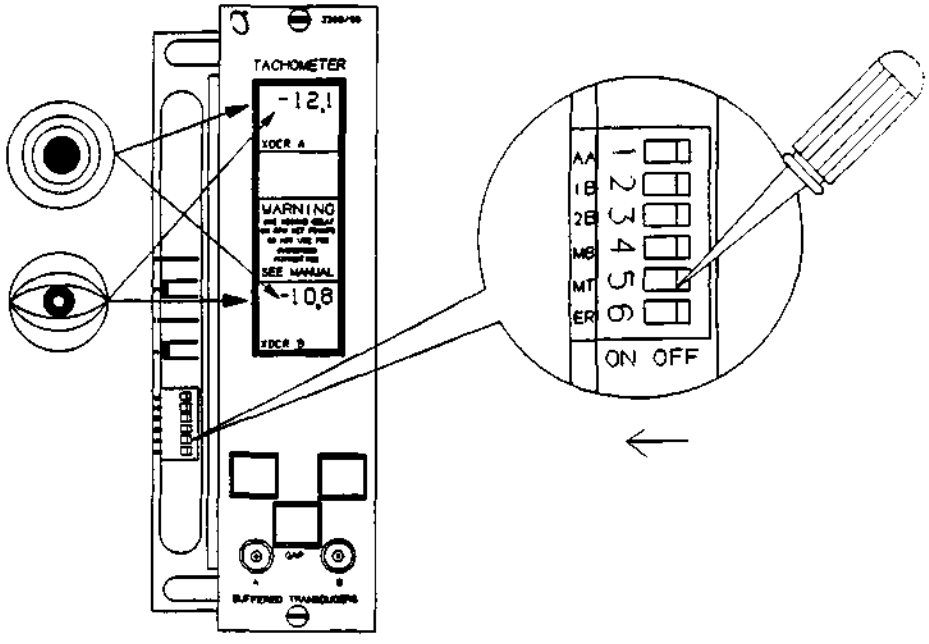
Do not use Auto Threshold if the expected operating range is less than 5 Hertz (300 RPM at one event per revolution).

The Hysteresis can be selected from 0.2 to 2.0 Volts using option jumpers W8A through W8C and W11A through W11C. The Tachometer is shipped with a Hysteresis of 0.5 Volts. **See section 10 (Monitor Options) for Hysteresis jumper configuration.**

NOTE: If Auto Threshold is used, the following procedure need not be performed.

CAUTION

Machine Protection may be lost during the Manual Threshold Adjust Procedure.



Threshold Adjust Procedure:

1. Open and slide over the monitor front panel.

2. Set Switch 5, Manual Threshold (MT), to the ON position. The front panel display **flashes** the Threshold voltages for Transducers A and B.

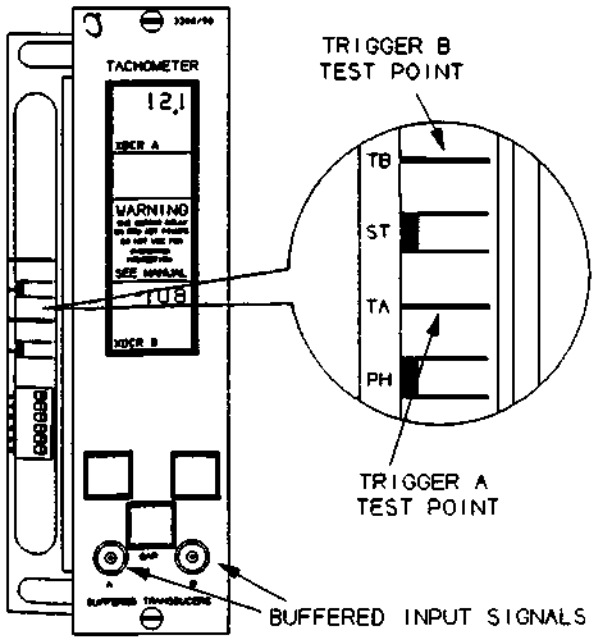
13 Threshold and Hysteresis Adjustments (Cont)

3. When adjusting the Transducer A Manual Threshold, connect an oscilloscope to the TRIGGER A Test Point (TA) located behind the front panel. When adjusting the Transducer B Manual Threshold, connect the oscilloscope to the TRIGGER B Test Point (TB).

NOTE: An oscilloscope is helpful, but not necessary.

NOTE: The buffered transducer input signals can be observed by connecting the oscilloscope to the coaxial connecters on the front panel.

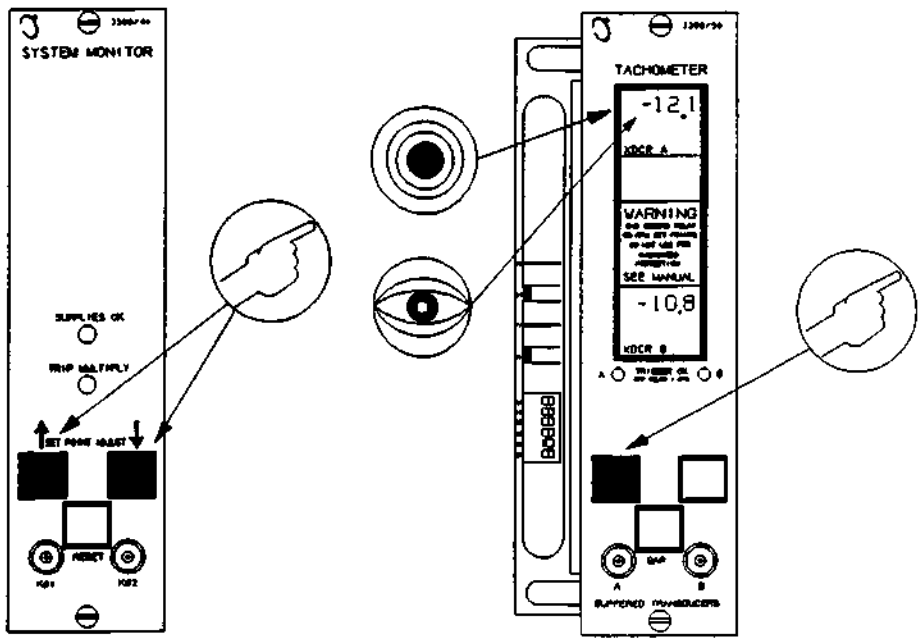
4. The machinery should be running and the transducers should be properly connected to the Signal Input Module (Section 27,28, or 29).



5. To adjust Threshold A, press and hold the left Alert switch on the front panel. The Threshold A value remains flashing.

6. Use the (↑) or (↓) switches on the System Monitor to adjust the Threshold.

7. Adjust Threshold A up or down until the oscilloscope displays the TRIGGER A square wave (approximately 0 to 5 volts) and the TRIGGER OK A LED comes on.



13 Threshold and Hysteresis Adjustments (Cont)

8. Adjust Threshold A **UP** until the TRIGGER OK A LED extinguishes and the oscilloscope shows no square wave. Note the Threshold A value at which this occurs.

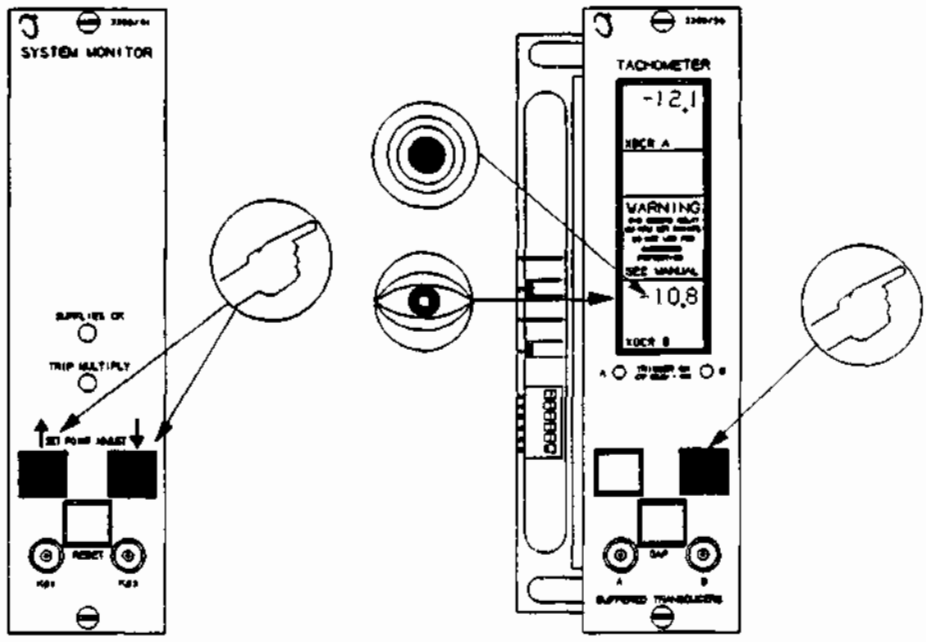
9. Adjust Threshold A **DOWN** until the TRIGGER OK A LED comes back on, and the oscilloscope shows the TRIGGER A square wave. Continue adjusting Threshold A **DOWN** until the TRIGGER OK A LED extinguishes and the oscilloscope shows no square wave. Note The Threshold A value at which this occurs.

10. Adjust Threshold A to a value midway between the values obtained in steps 8 and 9 above.

11. To adjust Threshold B, press and hold the right Alert switch on the front panel. The Threshold B value should remain flashing.

12. Use the (↑) or (↓) switches on the System Monitor to adjust the Threshold.

13. Adjust Threshold B up or down until the oscilloscope displays the TRIGGER B square wave (approximately 0 to 5 volts) and the TRIGGER OK B LED comes on.



14. Adjust Threshold B **UP** until the TRIGGER OK B LED extinguishes and the oscilloscope shows no square wave. Note the Threshold B value at which this occurs.

15. Adjust Threshold B **DOWN** until the TRIGGER OK B LED comes back on, and the oscilloscope shows the TRIGGER B square wave. Continue adjusting Threshold B **DOWN** until the TRIGGER OK B LED extinguishes and the oscilloscope shows no square wave. Note The Threshold B value at which this occurs.

16. Adjust Threshold B to a value midway between the values obtained in steps 14 and 15 above.

17. Upon completion of the Manual Threshold procedure, reset Dip Switch SW1-5 (MT) to the "OFF" position. This will lock the Manual Threshold values into permanent memory.

13 Threshold and Hysteresis Adjustments (Cont)

18. Close the monitor front panel.

Hysteresis Adjustment:

The Tachometer is shipped with a Hysteresis of 0.5 Volts. This should work well in most installations. However, if the above Manual Threshold Adjust Procedure cannot be completed successfully, or the Auto Threshold does not function in a certain application, then the Hysteresis may require adjustment. See section 10 (Monitor Options) for the Hysteresis jumper configurations.

Threshold and Hysteresis Adjustment Considerations:

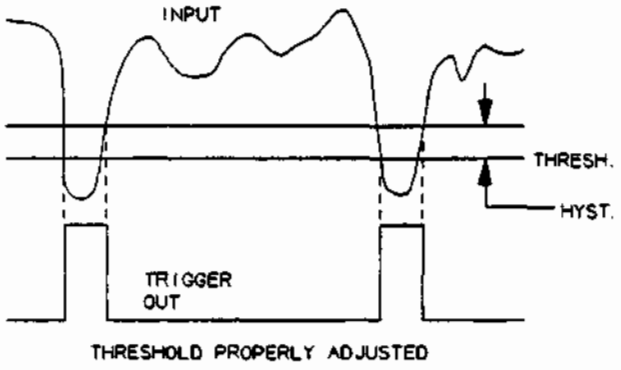


FIGURE 1

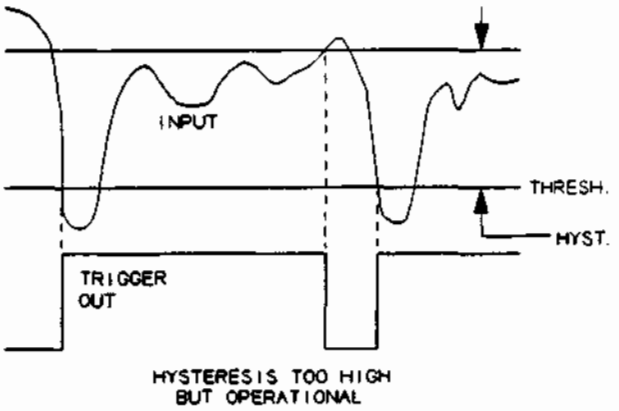


FIGURE 2

Figure 1 shows proper adjustment of Threshold and Hysteresis, resulting in one pulse for each Transducer input.

Threshold is the point where the Trigger Out pulse is turned on. Hysteresis is the difference between the level the Trigger Out pulse turns on and the level it turns off.

Figure 2 shows improper selection of Hysteresis, but still one pulse for each Transducer input.

Figure 3 shows improper Threshold adjustment and improper Hysteresis selection. There is more than one pulse for each Transducer input.

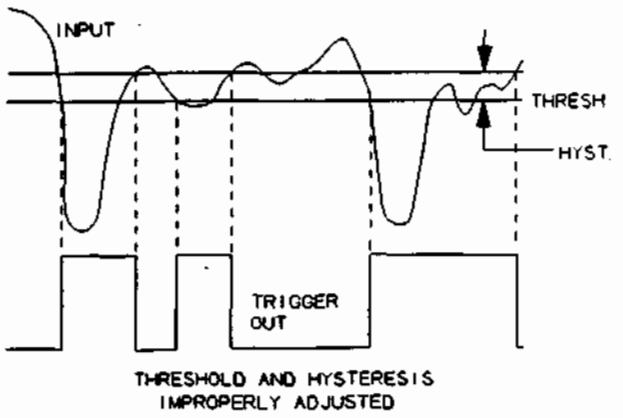
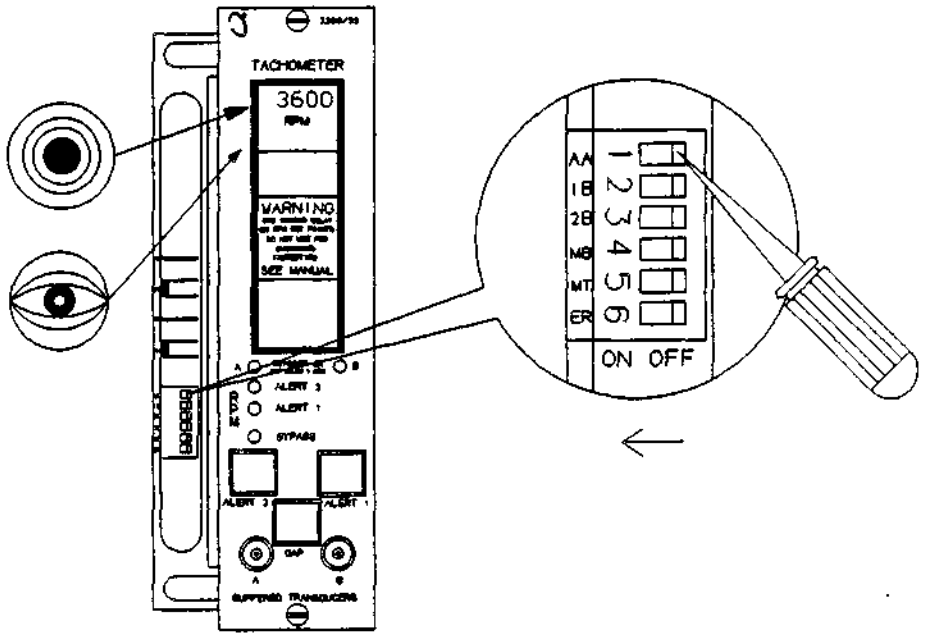


FIGURE 3

14 Adjust Alert Setpoints (Dual Setpoint Tach.)

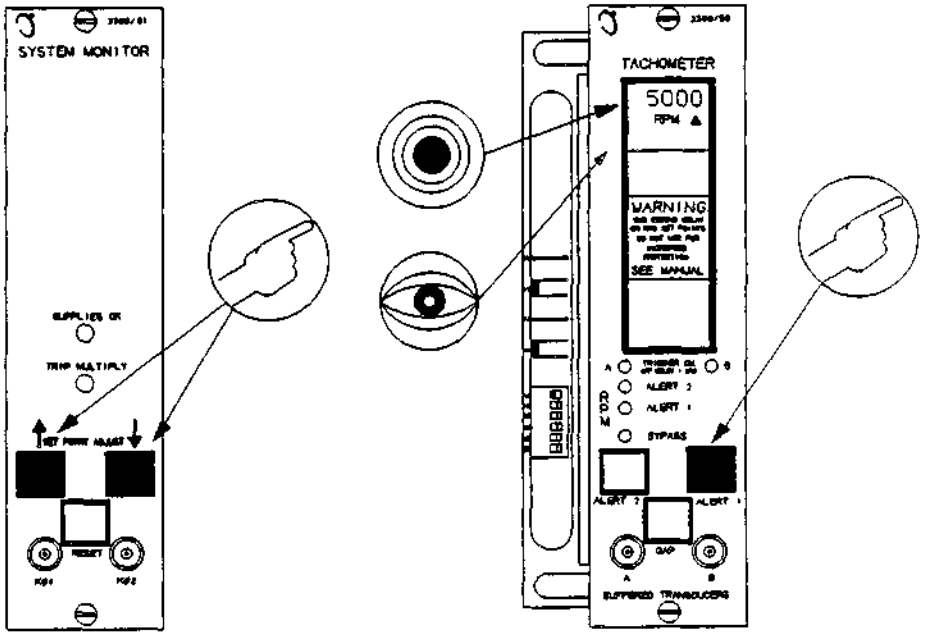
1. Open and slide over the front panel.

2. Set Switch 1, Alert Adjust (AA) to the ON position. The RPM display flashes to indicate Alert Adjust Mode.



3. Press and hold the RPM Alert 1 switch (right), to adjust the RPM Alert 1 setpoint. The current RPM Alert 1 setpoint now flashes on the display. The upward pointing arrow indicates an over Alert setpoint. (A downward pointing arrow indicates an under Alert setpoint).

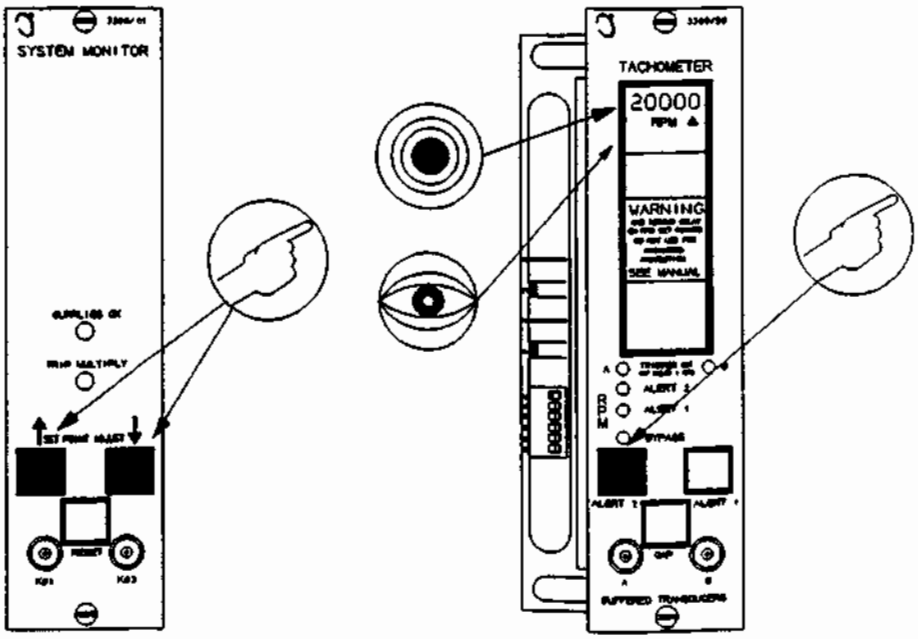
4. Use the (↑) or (↓) switches on the System Monitor to adjust the RPM Alert 1 setpoint.



14 Adjust Alert Setpoints (Dual Setpoint Tach.) (Cont.)

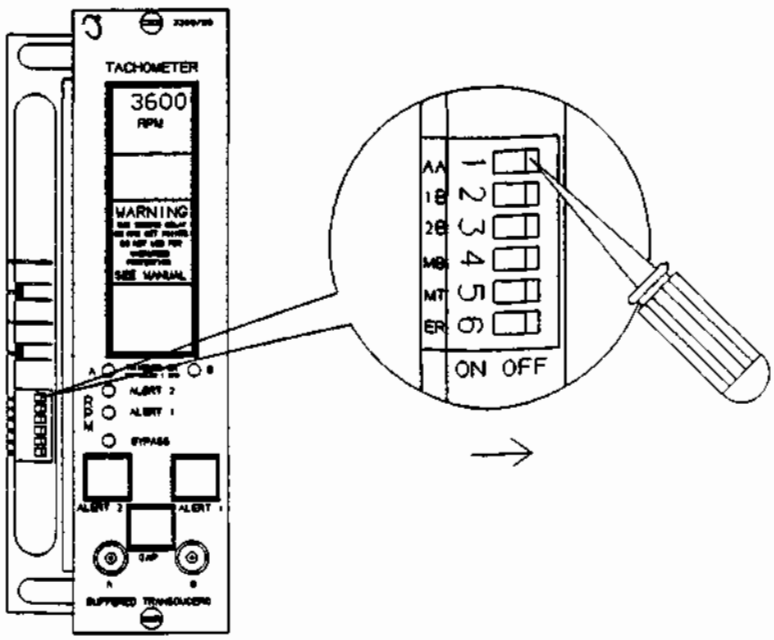
5. Press and hold the RPM Alert 2 switch (left), to adjust the RPM Alert 2 setpoint. The current RPM Alert 2 setpoint now flashes on the display. The upward pointing arrow indicates an over Alert setpoint. (A downward pointing arrow indicates an under Alert setpoint).

6. Use the (↑) or (↓) switches on the System Monitor to adjust the RPM Alert 2 setpoint.



7. Reset Switch 1, Alert Adjust (AA) to the OFF position to lock the Alert setpoints into permanent memory.

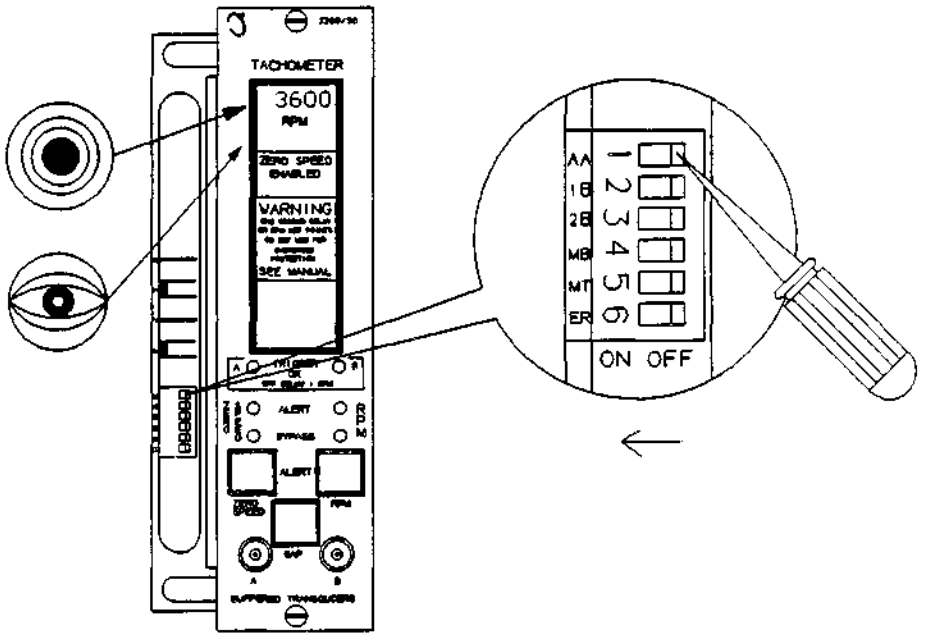
8. Close the monitor front panel.



15 Adjust Alert Setpoints (Zero Speed Tach.)

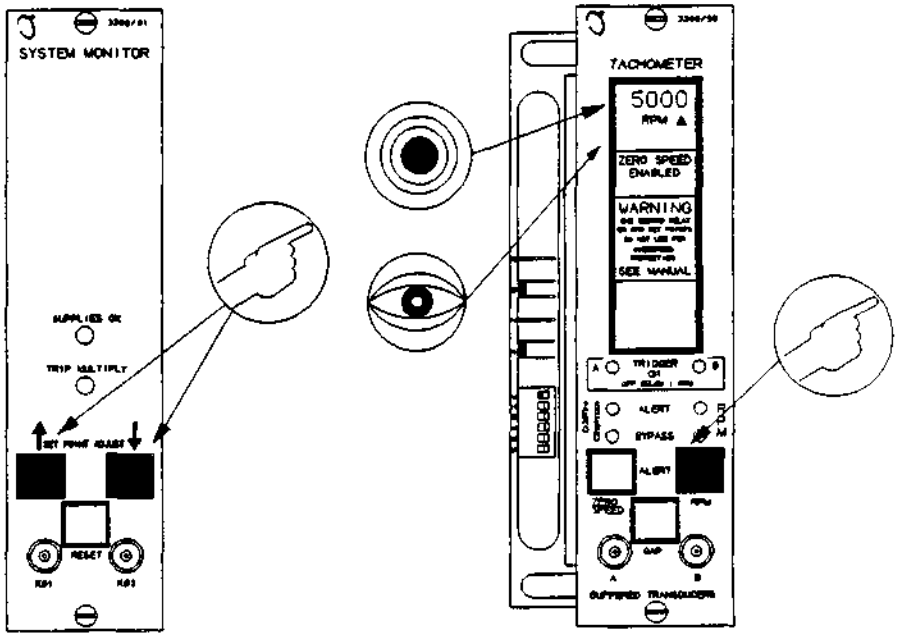
1. Open and slide over the front panel.

2. Set Switch 1, Alert Adjust (AA) to the ON position. The RPM display flashes to indicate Alert Adjust Mode.



3. Press and hold the RPM Alert switch (right), to adjust the RPM Alert setpoint. The current RPM Alert setpoint now flashes on the display. The upward pointing arrow indicates an over Alert setpoint. (A downward pointing arrow indicates an under Alert setpoint).

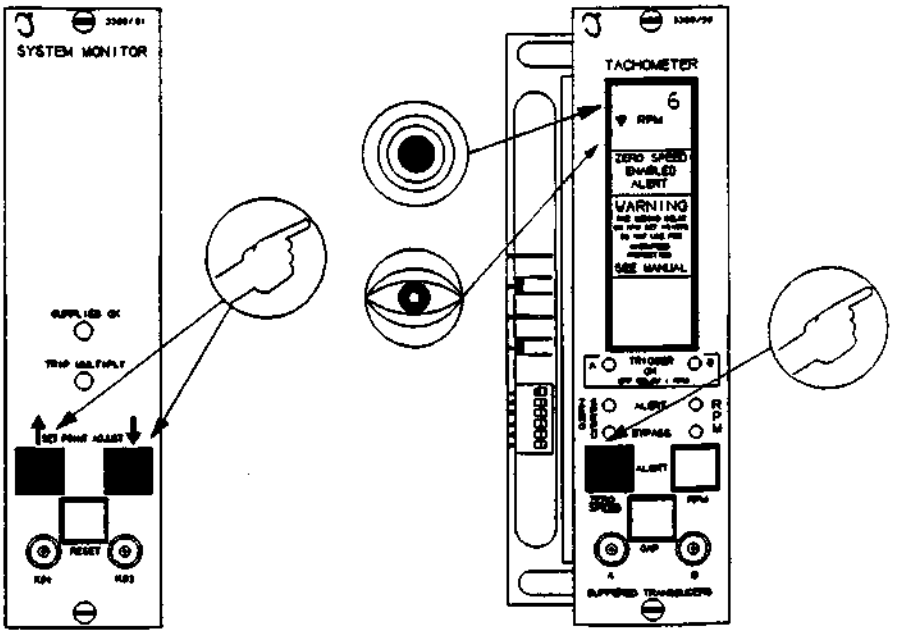
4. Use the (↑) or (↓) switches on the System Monitor to adjust the RPM Alert setpoint.



15 Adjust Alert Setpoints (Zero Speed Tach.) (Cont.)

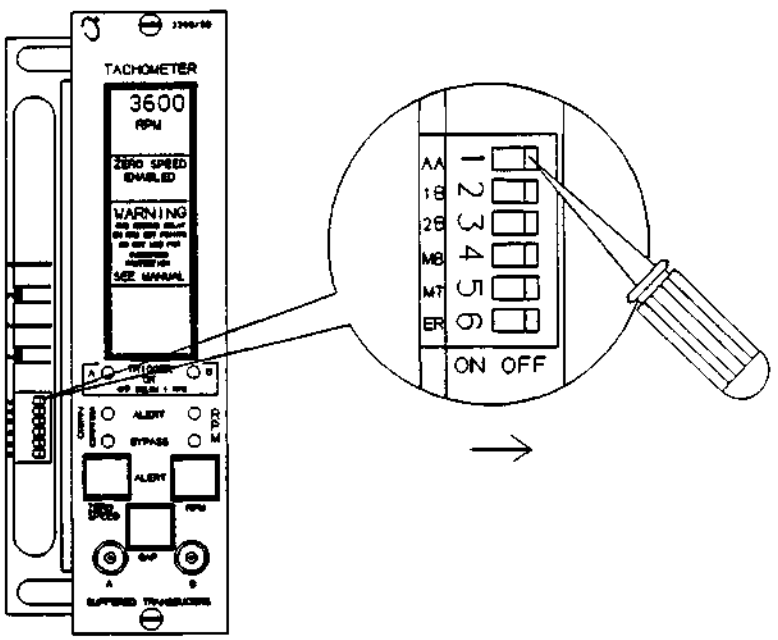
5. Press and hold the Zero Speed Alert switch (left), to adjust the Zero Speed Alert setpoint. The current Zero Speed Alert setpoint now flashes on the display. The downward pointing arrow indicates an under Alert setpoint. (Zero Speed is always an under Alert setpoint).

6. Use the (↑) or (↓) switches on the System Monitor to adjust the Zero Speed Alert setpoint.



7. Reset Switch 1, Alert Adjust (AA) to the OFF position to lock the Alert setpoints into permanent memory.

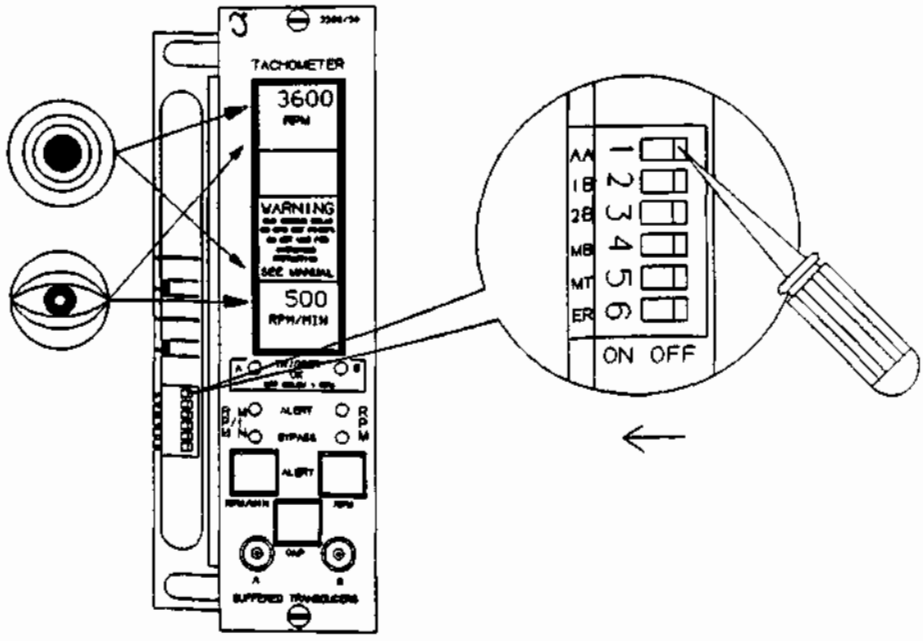
8. Close the monitor front panel.



16 Adjust Alert Setpoints (Rotor Accel Tach)

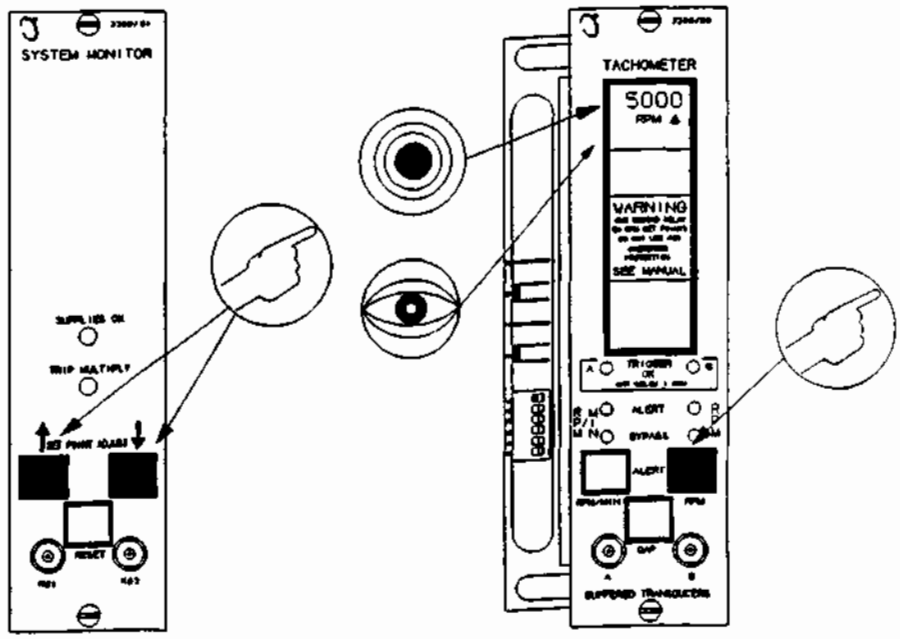
1. Open and slide over the front panel.

2. Set Switch 1, Alert Adjust (AA) to the ON position. The RPM and RPM/MIN display flashes to indicate Alert Adjust Mode.



3. Press and hold the RPM Alert switch (right), to adjust the RPM Alert setpoint. The current RPM Alert setpoint now flashes on the display. The upward pointing arrow indicates an over Alert setpoint. (A downward pointing arrow indicates an under Alert setpoint).

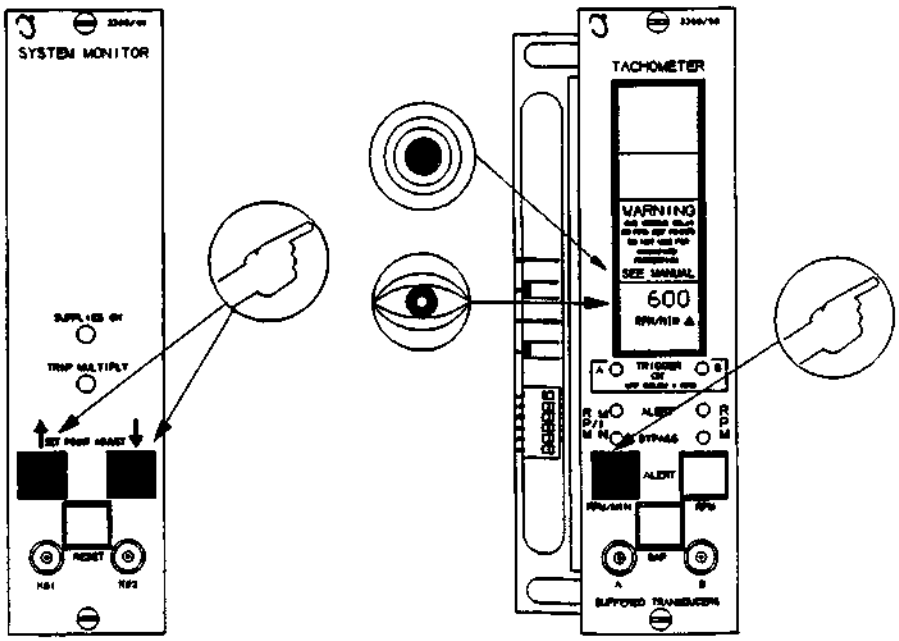
4. Use the (↑) or (↓) switches on the System Monitor to adjust the RPM Alert setpoint.



16 Adjust Alert Setpoints (Rotor Accel Tach) (Cont)

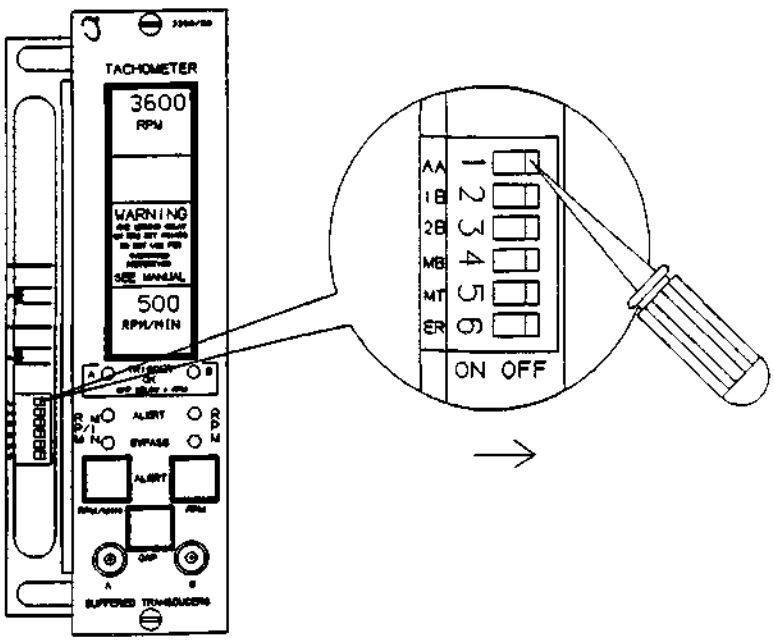
5. Press and hold the RPM/MIN Alert switch (left), to adjust the RPM/MIN Alert setpoint. The current RPM/MIN Alert setpoint now flashes on the display. The upward pointing arrow indicates an over Alert setpoint. (RPM/MIN is always an over Alert setpoint).

6. Use the (↑) or (↓) switches on the System Monitor to adjust the RPM/MIN Alert setpoint.



7. Reset Switch 1, Alert Adjust (AA) to the OFF position to lock the Alert setpoints into permanent memory.

8. Close the monitor front panel.



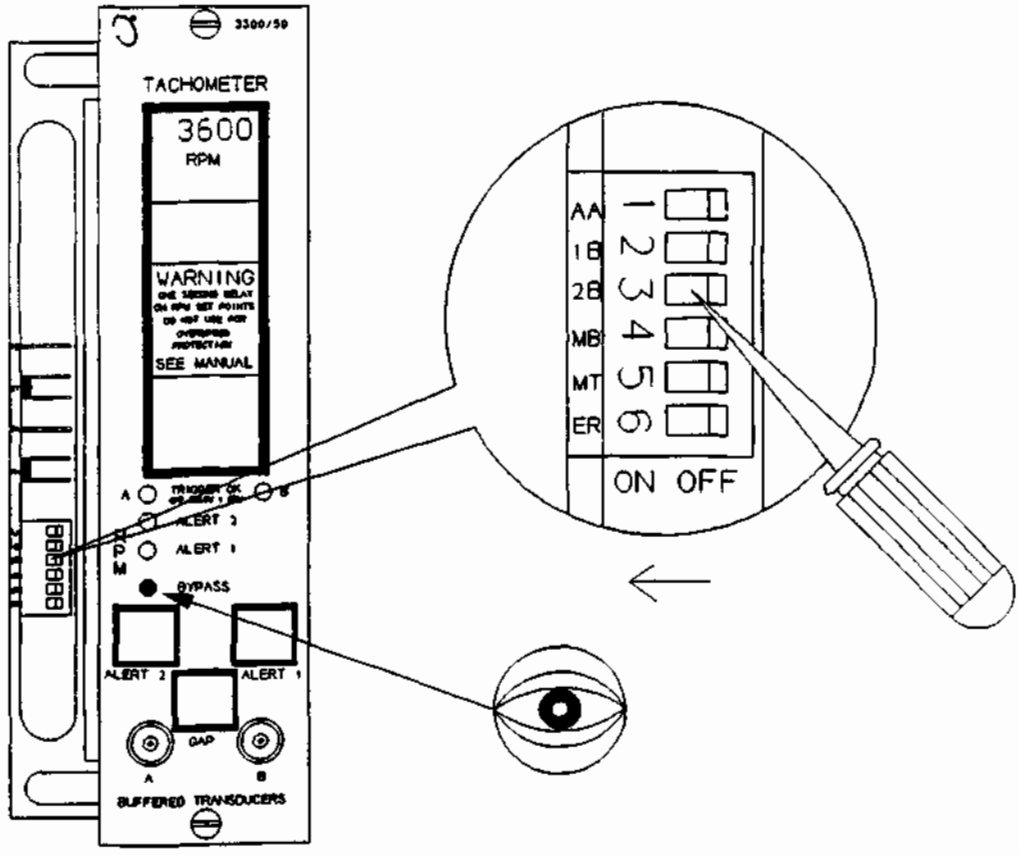
17 Bypass (Dual Setpoint Tach.)

CAUTION

Machine Protection will be lost while Bypass is on.

Set the 2B (Bypass Alert 2 Relay) Switch to the ON position to bypass the Alert 2 relay. The Bypass LED will turn on. The monitor will otherwise function normally.

The RPM Alert 1 relay cannot be Bypassed. Switch (1B) has no affect in the Dual Setpoint Tach.



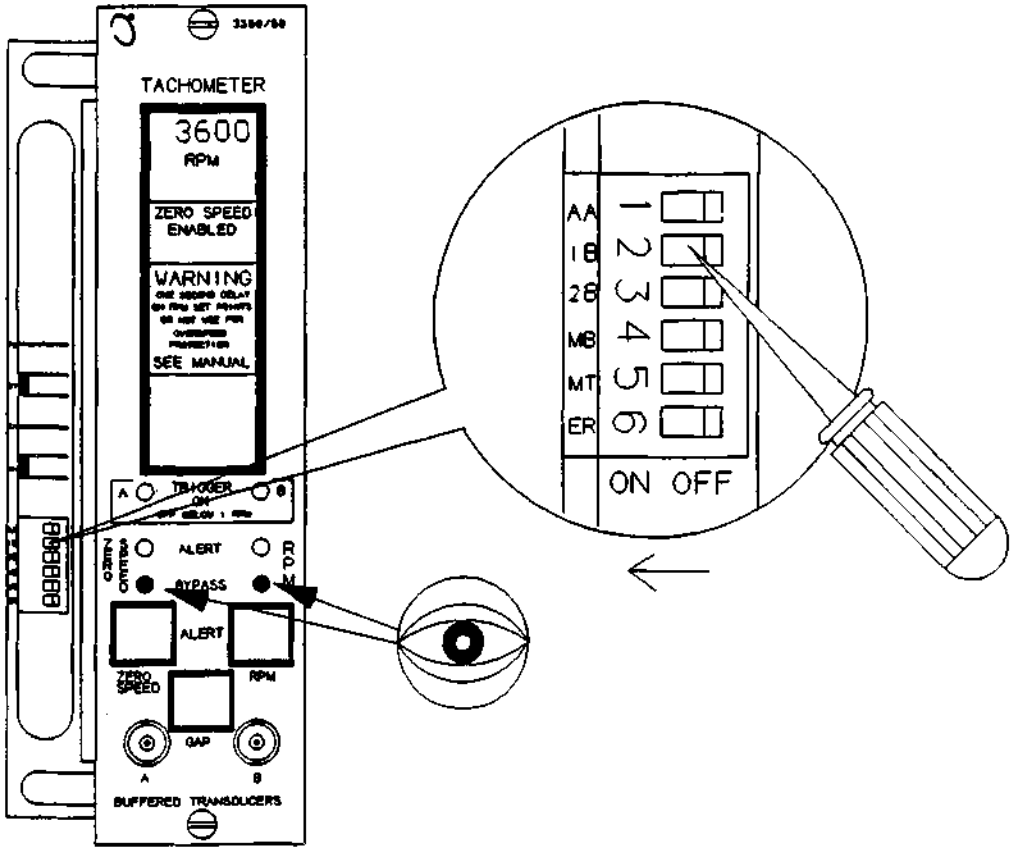
18 Bypass (Zero Speed Tach.)

CAUTION

Machine Protection will be lost while Bypass is on.

Set the 1B (Bypass RPM Alert Relay) Switch to the ON position to bypass the RPM Alert relay. The RPM Bypass LED will turn on. The monitor will otherwise function normally.

Set the 2B (Bypass Zero Speed Alert Relay) Switch to the ON position to bypass the Zero Speed Alert relay. The Zero Speed Bypass LED will turn on. The monitor will otherwise function normally.



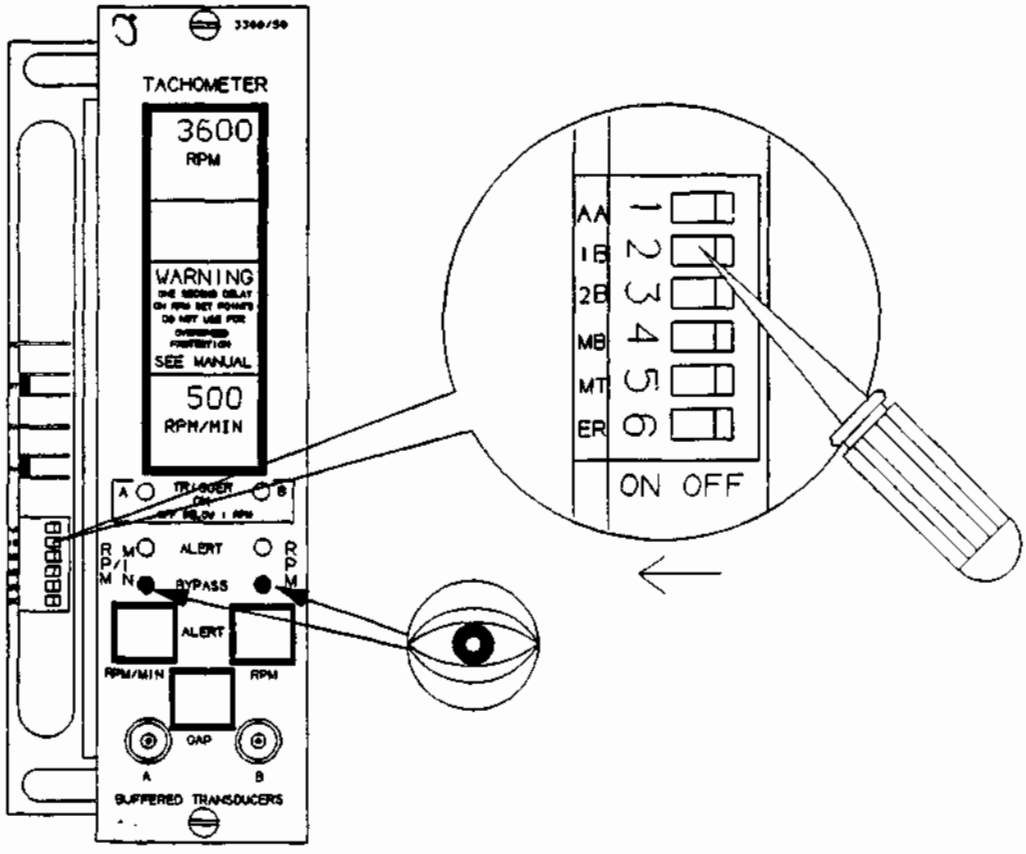
19 Bypass (Rotor Accel Tach.)

CAUTION

Machine Protection will be lost while Bypass is on.

Set the **1B** (Bypass RPM Alert Relay) Switch to the ON position to bypass the RPM Alert relay. The RPM Bypass LED will turn on. The monitor will otherwise function normally.

Set the **2B** (Bypass RPM/MIN Alert Relay) Switch to the ON position to bypass the RPM/MIN Alert relay. The RPM/MIN Bypass LED will turn on. The monitor will otherwise function normally.

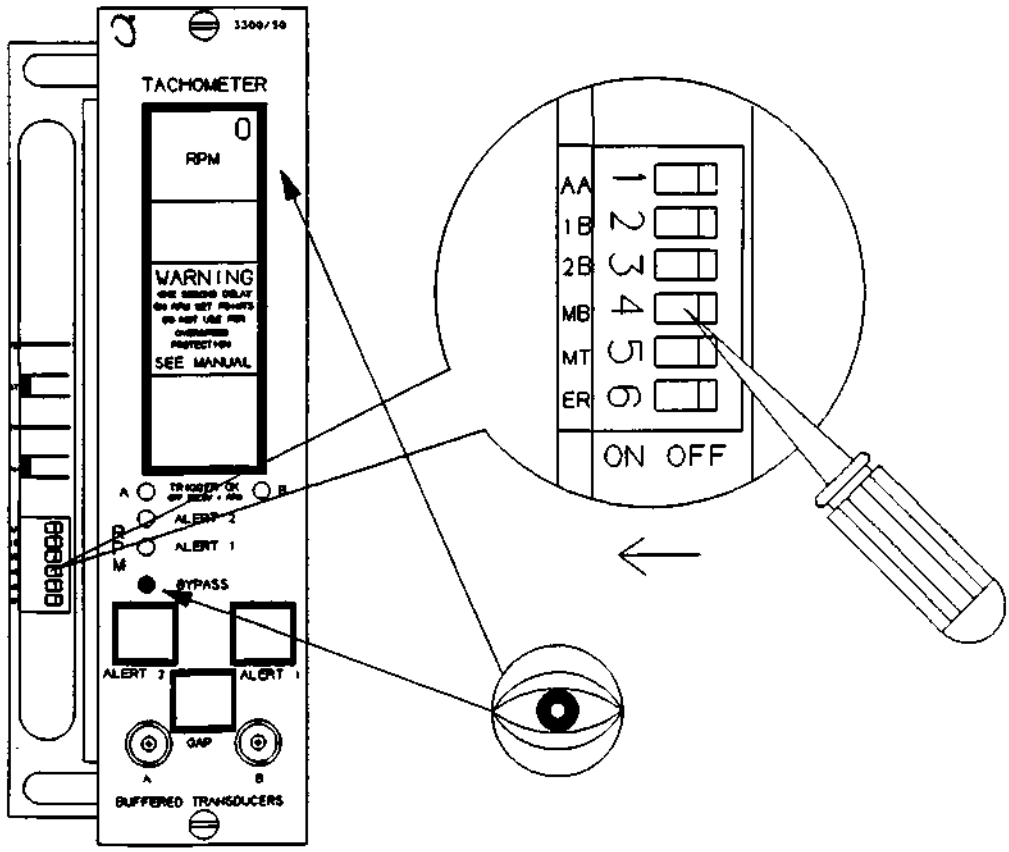


20 Monitor Bypass (Dual Setpoint Tach.)

CAUTION

Machine Protection will be lost while Monitor Bypass is on.

Set the **MB** (Monitor Bypass) Switch to the ON position. The Bypass LED will turn on, the Trigger OK LEDs will turn off, and the RPM display will go to zero.

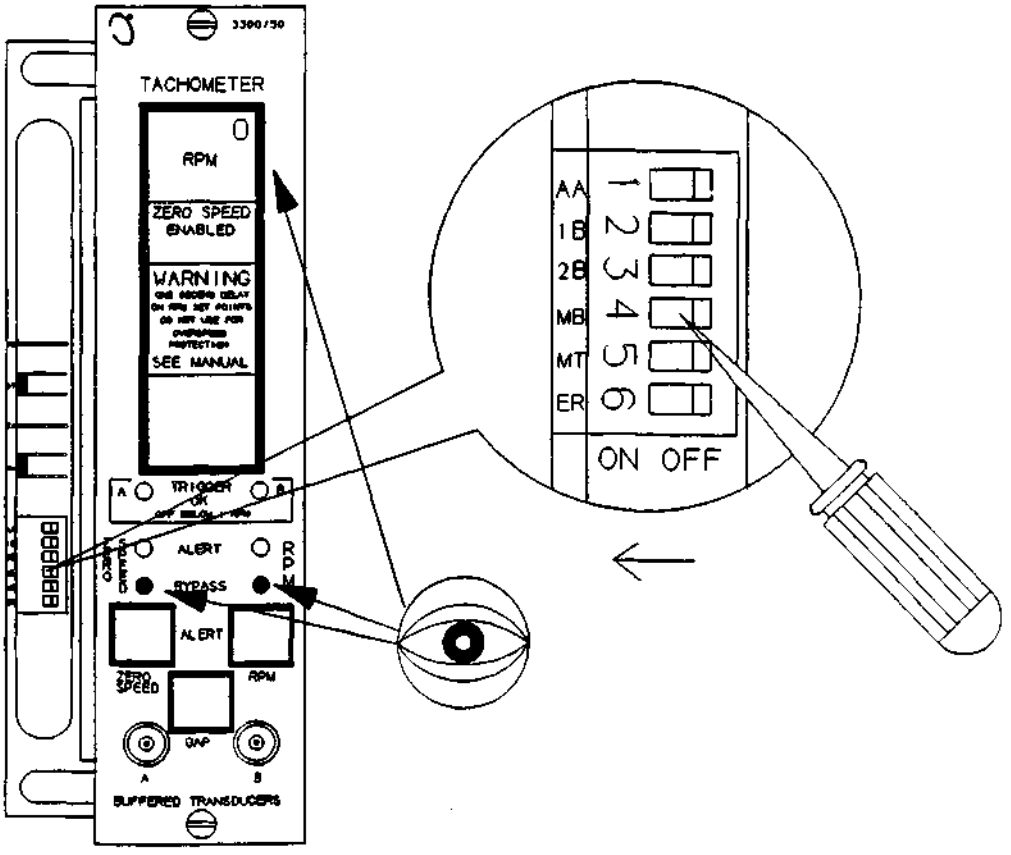


21 Monitor Bypass (Zero Speed Tach.)

CAUTION

Machine Protection will be lost while Monitor Bypass is on.

Set the **MB** (Monitor Bypass) Switch to the ON position. The Bypass LEDs will turn on, the Trigger OK LEDs will turn off, and the RPM display will go to zero.

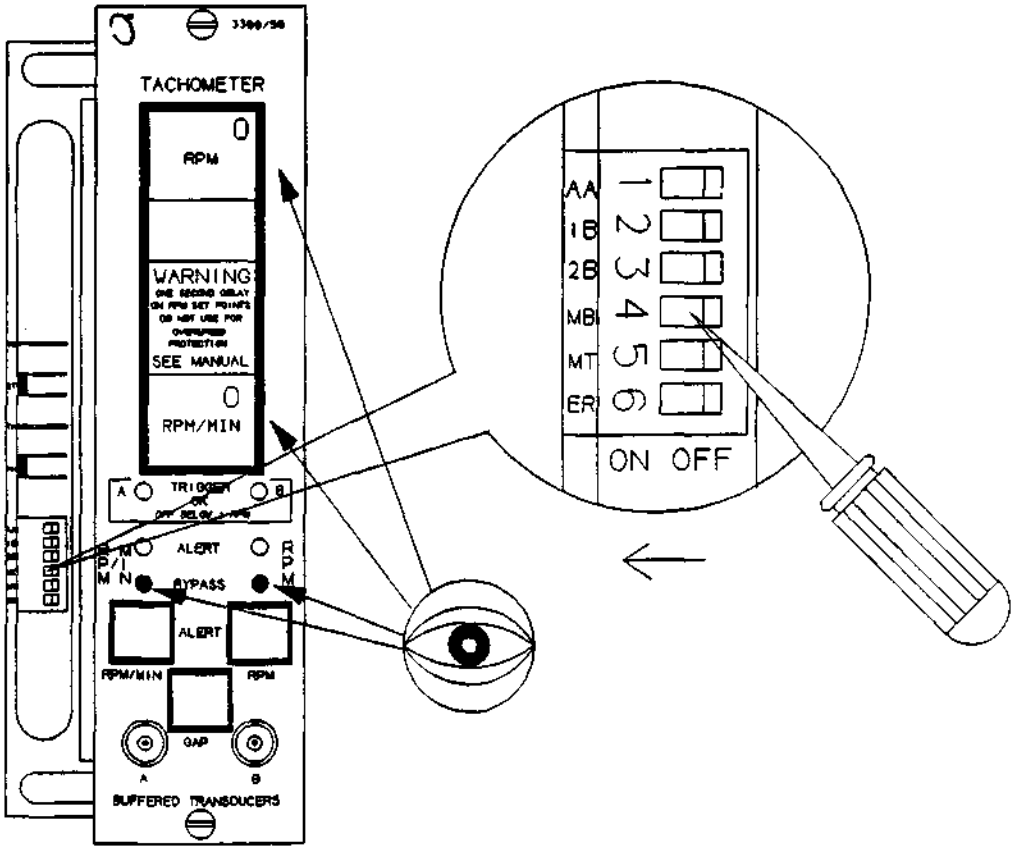


22 Monitor Bypass (Rotor Accel Tach.)

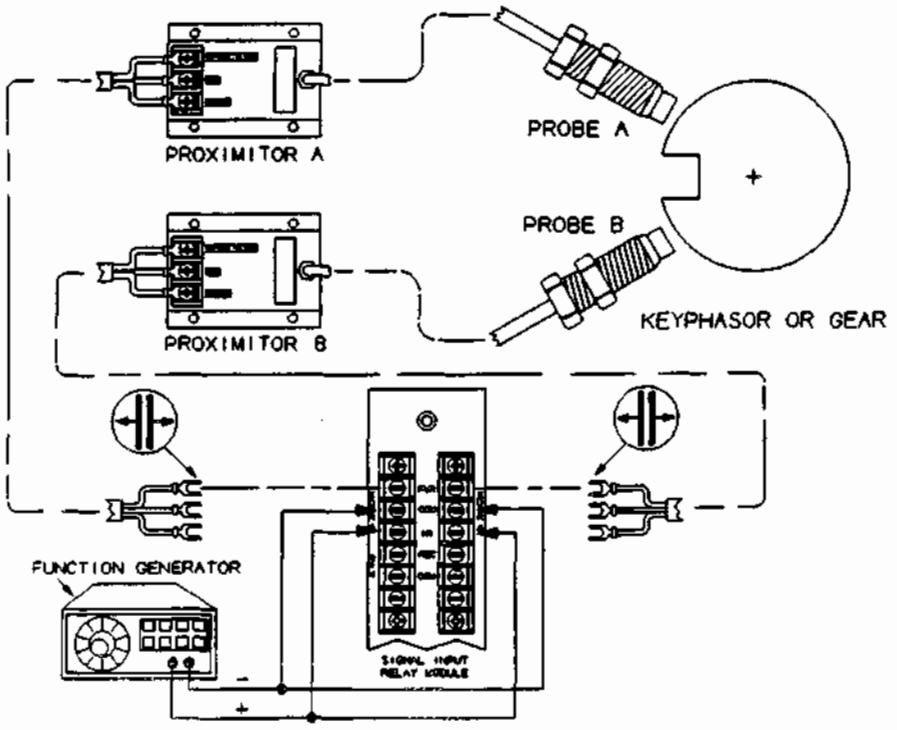
CAUTION

Machine Protection will be lost while Monitor Bypass is on.

Set the **MB** (Monitor Bypass) Switch to the ON position. The Bypass LEDs will turn on, the Trigger OK LEDs will turn off, and the RPM and RPM/MIN displays will go to zero.



23 Test Alerts (Dual Setpoint Tach.)



CAUTION

Tests will exceed Alert set point levels causing Alerts to activate. This could result in relay contact state change. See Bypass Section 17.

⚠ WARNING

High Voltage present could cause shock, burns or death.

Do Not touch exposed wires or terminals.

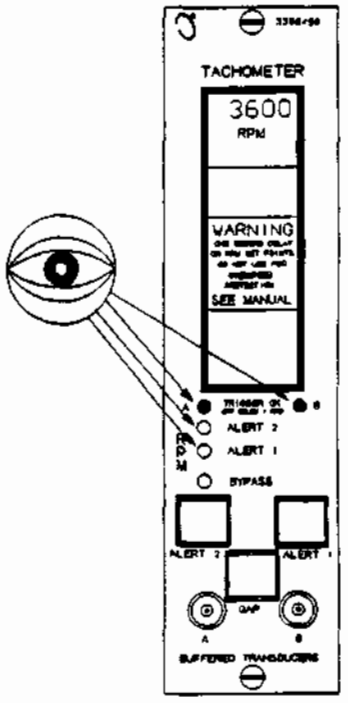
1. Disconnect the COM and IN wiring from the Transducer A and B terminals on the Signal Input Module.

2. Connect a function generator output to an oscilloscope input. Adjust the function generator output until a sine or square wave having sufficient amplitude to trigger the tachometer is displayed.

3. Disconnect the function generator from the oscilloscope. Connect the function generator to the XDCR A and B terminals on the Signal Input Module.

4. Adjust the function generator frequency until the Tachometer displays an RPM reading below the over speed setpoint(s) and/or above the under speed setpoint(s).

5. Press the RESET switch on the System Monitor and verify that the TRIGGER OK LEDs are on, and the ALERT 1 and ALERT 2 LEDs are off.



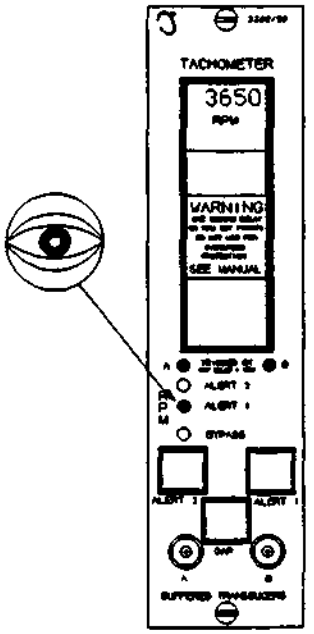
23 Test Alerts (Dual Setpoint Tach.) (Cont.)

6. Adjust the function generator frequency until the Tachometer displays an RPM reading above the ALERT 1 over speed setpoint or below the ALERT 1 under speed setpoint.

7. Verify that the ALERT 1 LED turns on (Flashing if the first out option is selected).

8. Verify that the ALERT 1 relay has changed state.

9. Press the RESET switch on the System Monitor and verify that the ALERT 1 LED remains on steady.

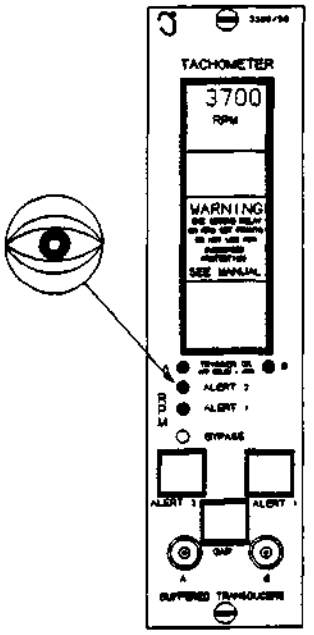


10. Adjust the function generator frequency until the Tachometer displays an RPM reading above the ALERT 2 over speed setpoint or below the ALERT 2 under speed setpoint.

11. Verify that the ALERT 2 LED turns on (Flashing if the first out option is selected).

12. Verify that the ALERT 2 relay has changed state. (The Relay will not change state if the Alert 2 Relay has been Bypassed. See section 17)

13. Press the RESET switch on the System Monitor and verify that the ALERT 2 LED remains on steady.

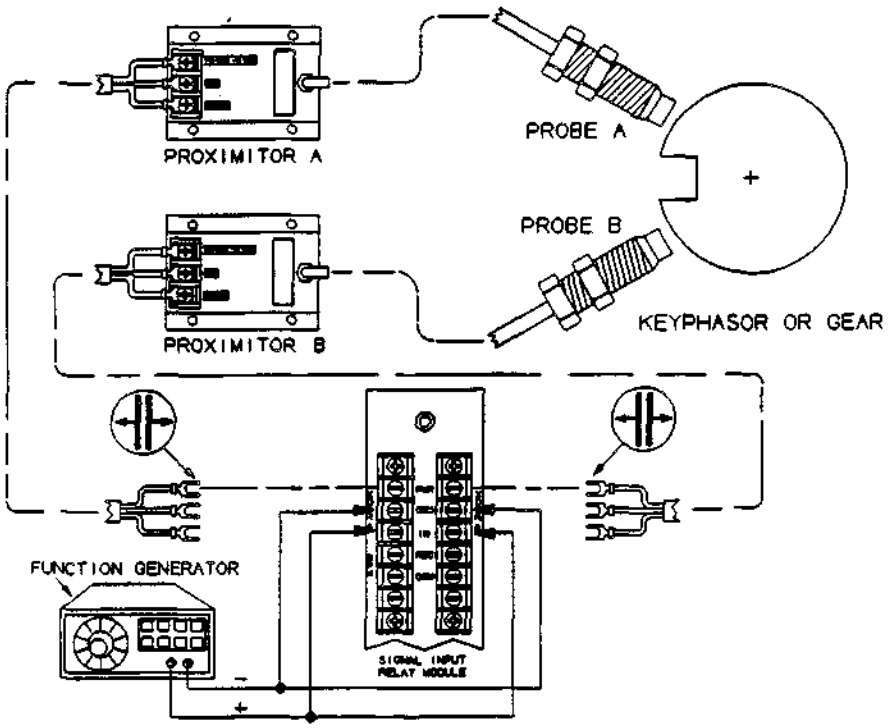


14. Adjust the function generator frequency until the Tachometer displays an RPM reading below the Alert 1 and 2 over speed setpoints or above the Alert 1 and 2 under speed setpoints.

15. Press the Reset switch on the System Monitor and verify that the Alert 1 and 2 LEDs go off.

16. Connect all field wiring.

24 Test Alerts (Zero Speed Tach.)



CAUTION

Tests will exceed Alert set point levels causing Alerts to activate. This could result in relay contact state change. See Bypass Section 18.

⚠ WARNING

High Voltage present could cause shock, burns or death.

Do Not touch exposed wires or terminals.

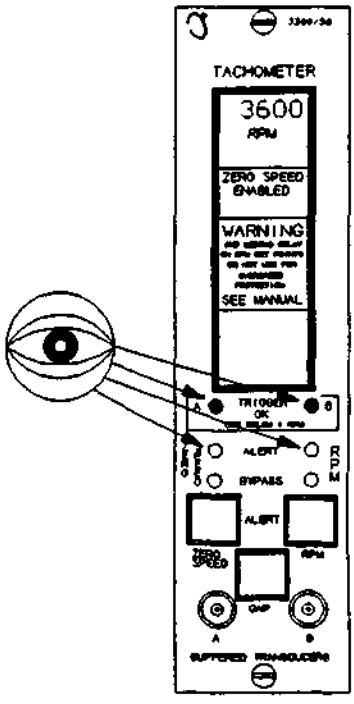
1. Disconnect the COM and IN wiring from the Transducer A and B terminals on the Signal Input Module.

2. Connect a function generator output to an oscilloscope input. Adjust the function generator output until a sine or square wave having sufficient amplitude to trigger the tachometer is displayed.

3. Disconnect the function generator from the oscilloscope input and connect it to the XDCR A and B terminals on the Signal Input Module.

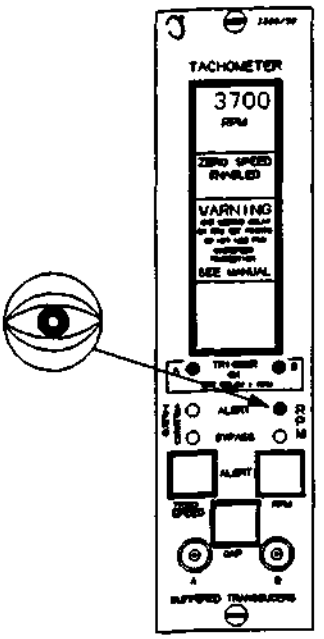
4. Adjust the function generator frequency until the Tachometer displays an RPM reading below the over speed setpoint or above the under speed setpoint and over the Zero Speed setpoint.

5. Press the RESET switch and verify that the TRIGGER OK LEDs are on, and the RPM Alert and Zero Speed Alert LEDs are off.



24 Test Alerts (Zero Speed Tach.) (Cont.)

6. Adjust the function generator frequency until the Tachometer displays an RPM reading above the RPM Alert over speed setpoint or below the RPM Alert under speed set point.

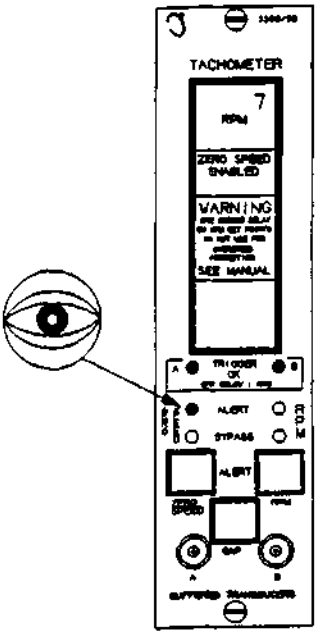


7. Verify that the RPM Alert LED turns on (Flashing if the first out option is selected), and that the RPM Alert relay has changed state. (The Relay will not change state if the Alert 1 Relay has been Bypassed. See section 18.)

8. Press the RESET switch on the System Monitor and verify that the RPM Alert LED remains on steady.

9. Short the Zero Speed Enable contacts on the Signal Input Module.

10. **Slowly** adjust the function generator frequency until the Tachometer displays an RPM reading below the Zero Speed Alert setpoint. (The Zero Speed Alert provides protection against rapid ramp-down. A Zero Speed Alert will not occur if the RPM value is bought down too fast. If this occurs, the TRIGGER OK LED(s) will go out to indicate this condition.)



11. Verify that the Zero Speed Alert LED turns on (Flashing if the first out option is selected).

12. Verify that the Zero Speed Alert relay has changed state. (The Relay will not change state if the Alert 2 Relay has been Bypassed. See section 18.)

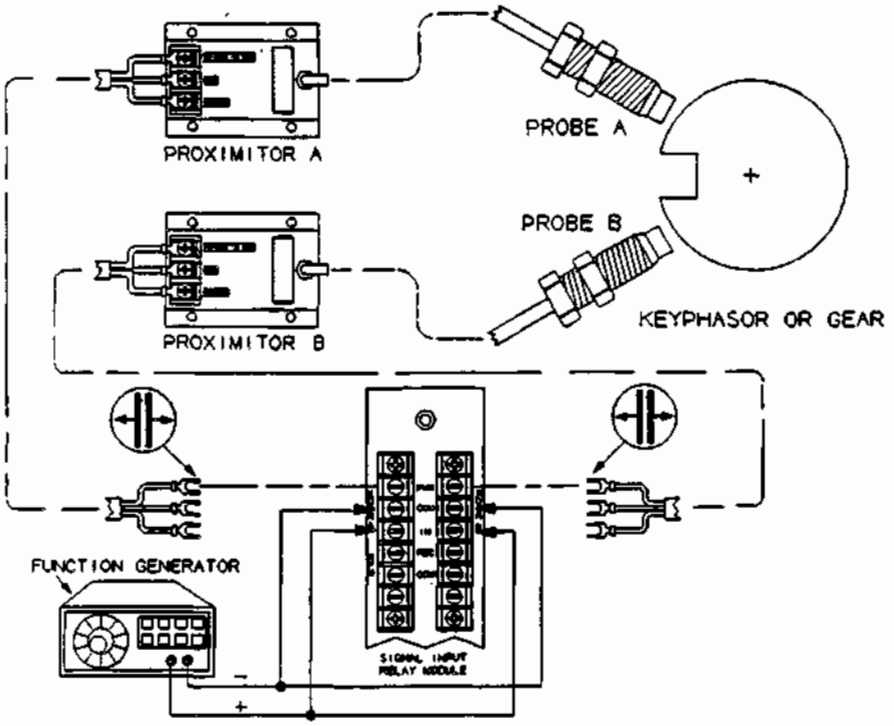
13. Press the RESET switch on the System Monitor and verify that the Zero Speed Alert LED remains on steady.

14. Adjust the function generator frequency until the Tachometer displays an RPM reading below the RPM Alert over speed setpoint or above the RPM Alert under speed setpoint and above the Zero Speed Alert setpoint.

15. Press the Reset switch on the System Monitor and verify that the RPM and Zero Speed Alert LEDs go off.

16. Connect all field wiring.

25 Test Alerts (Rotor Accel Tach.)



CAUTION

Tests will exceed Alert setpoint levels causing Alerts to activate. This could result in relay contact state change. See Bypass Section 19.

⚠ WARNING

High Voltage present could cause shock, burns or death.

Do Not touch exposed wires or terminals.

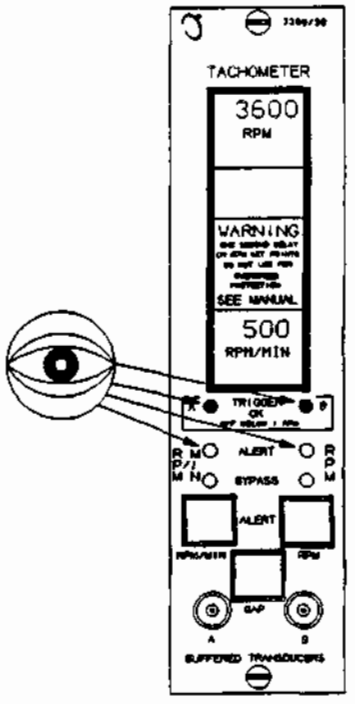
1. Disconnect the COM and IN wiring from the Transducer A and B terminals on the Signal Input Module.

2. Connect a function generator output to an oscilloscope input. Adjust the function generator output until a sine or square wave having sufficient amplitude to trigger the tachometer is displayed.

3. Disconnect the function generator from the oscilloscope input and connect it to the XDCR A and B terminals on the Signal Input Module.

4. Adjust the function generator frequency until the Tachometer displays an RPM reading below the over speed setpoint or above the under speed setpoint.

5. Press the RESET switch and verify that the TRIGGER OK LEDs are on, and the RPM Alert and RPM/MIN Alert LEDs are off.



25 Test Alerts (Rotor Accel Tach.) (Cont.)

6. Adjust the function generator frequency until the Tachometer displays an RPM reading above the RPM Alert over speed setpoint or below the RPM Alert under speed setpoint.

7. Verify that the RPM Alert LED turns on (Flashing if the first out option is selected), and that the RPM Alert relay has changed state.(The Relay will not change state if the Alert 1 Relay has been Bypassed. See section 19.)

8. Press the RESET switch on the System Monitor and verify that the RPM Alert LED remains on steady.

9. Adjust the function generator frequency until the Tachometer displays an RPM/MIN reading above the RPM/MIN Alert setpoint.

NOTE: Rotor Acceleration (RPM/MIN) is the rate of change of Rotor Speed (RPM). Therefore, the RPM/MIN display increases as the function generator frequency is increased. The RPM/MIN display returns to Zero if the function generator frequency remains constant.

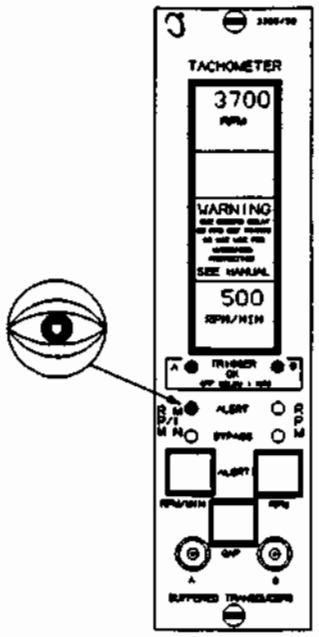
10. Verify that the RPM/MIN Alert LED turns on (Flashing if the first out option is selected).

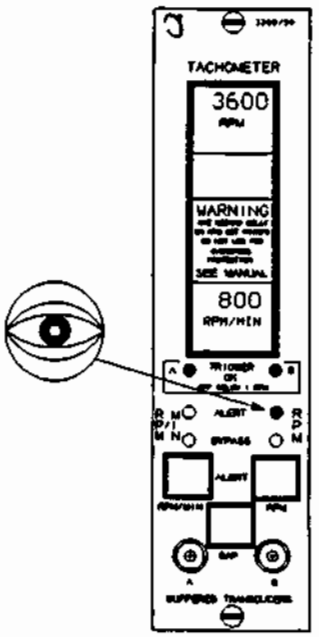
11. Verify that the RPM/MIN Alert relay has changed state.(The Relay will not change state if the Alert 2 Relay has been Bypassed. See section 19.)

12. Adjust the function generator until the Tachometer displays an RPM reading below the RPM Alert over speed setpoint or above the RPM Alert under speed setpoint. Leave the generator at this frequency long enough for the RPM/MIN display to settle back to zero.

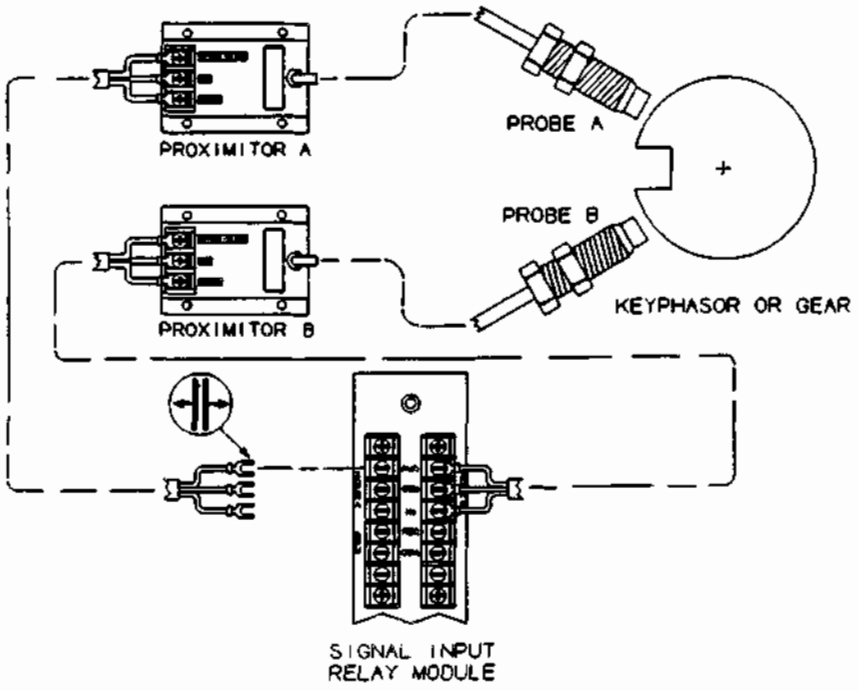
13. Press the Reset switch on the System Monitor and Verify that the RPM and RPM/MIN LEDs go out.

14. Connect all field wiring.





26 Test Trigger OKs



CAUTION

Machine Protection could be lost during the Test Trigger OKs Procedure.

⚠ WARNING

High Voltage present could cause shock, burns or death.

Do Not touch exposed wires or terminals.

1. Disconnect the COM and IN wiring from the Transducer A terminals on the Signal Input Module.

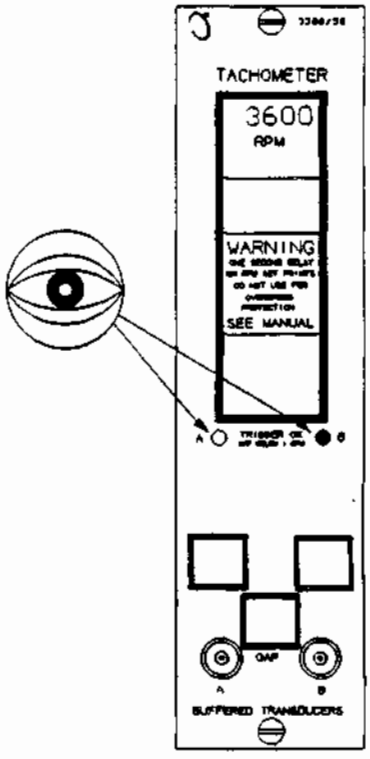
2. Verify that the TRIGGER OK A LED turns off.

NOTE: With low RPMs at one event per revolution, it may take up to one minute for the TRIGGER OK LED to indicate NOT OK.

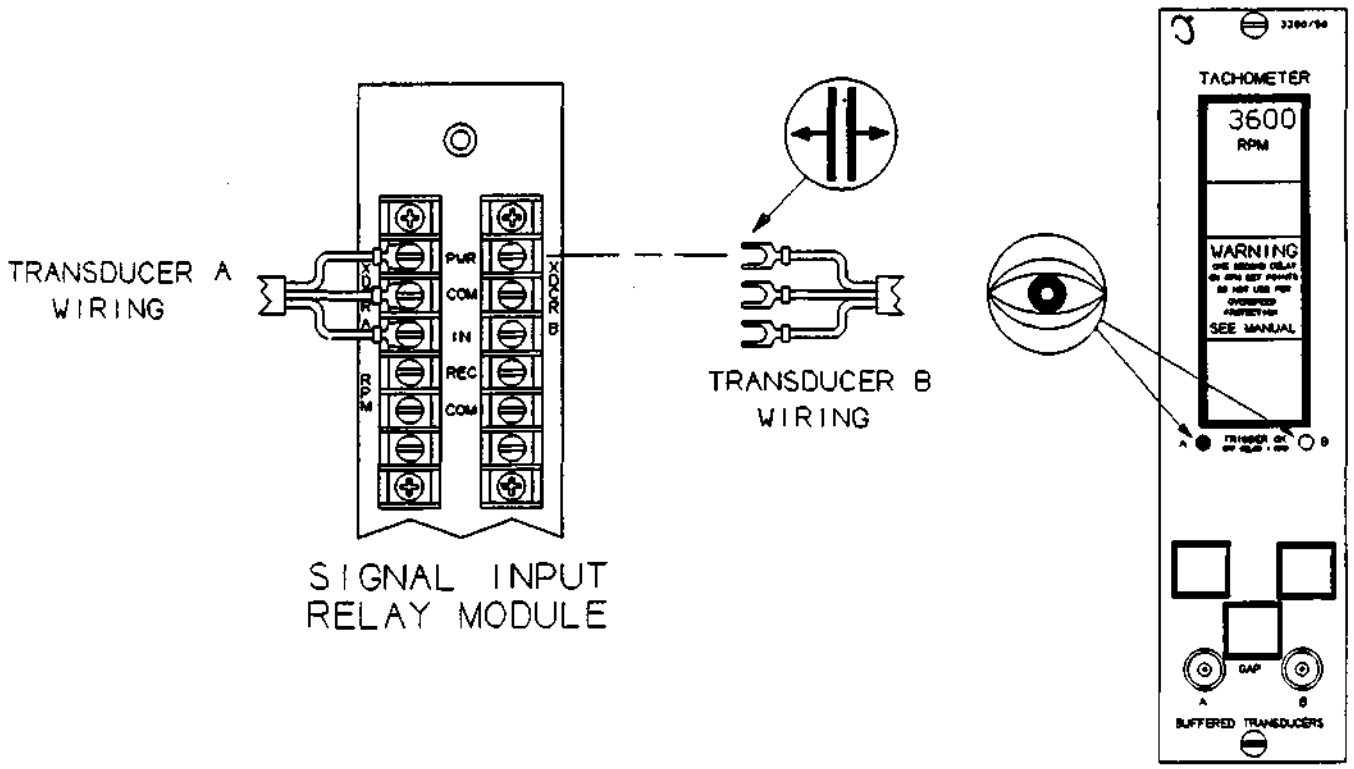
3. Reconnect the COM and IN wiring from the Transducer A terminals on the Signal Input Module.

4. Verify that the TRIGGER OK A LED turns back on.

NOTE: With low RPMs at one event per revolution, it may take up to several minutes for the TRIGGER OK LED to indicate OK.



26 Test Trigger OKs (Cont.)



1. Disconnect the COM and IN wiring from the Transducer B terminals on the Signal Input Module.

2. Verify that the TRIGGER OK B LED turns off.

NOTE: With low RPMs at one event per revolution, it may take up to one minute for the TRIGGER OK LED to indicate NOT OK.

3. Reconnect the COM and IN wiring from the Transducer B terminals on the Signal Input Module.

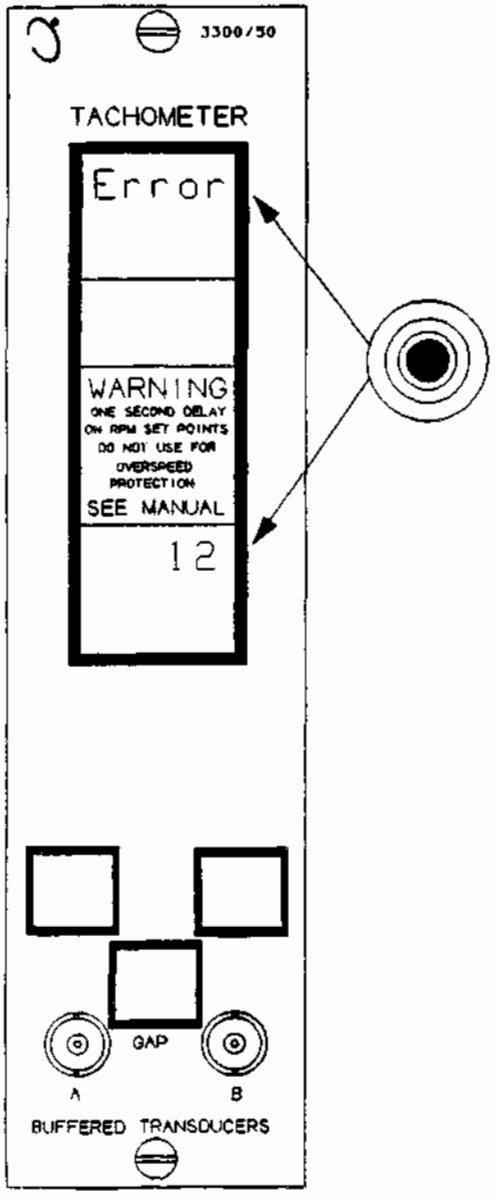
4. Verify that the TRIGGER OK B LED turns back on.

NOTE: With low RPMs at one event per revolution, it may take up to several minutes for the TRIGGER OK LED to indicate OK.

27 SELF TEST

THE MONITOR HAS THREE LEVELS OF SELF TESTS:

POWER-UP TEST: PERFORMED ONLY WHEN THE 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 DISPLAY.

BYPASS LED GOES ON AND OK LED FLASHES AT 5 HZ.

IF ERROR IS INTERMITTENT AND GOES AWAY, MONITORING IS RESUMED AND OK LED FLASHES AT 5 HZ.

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

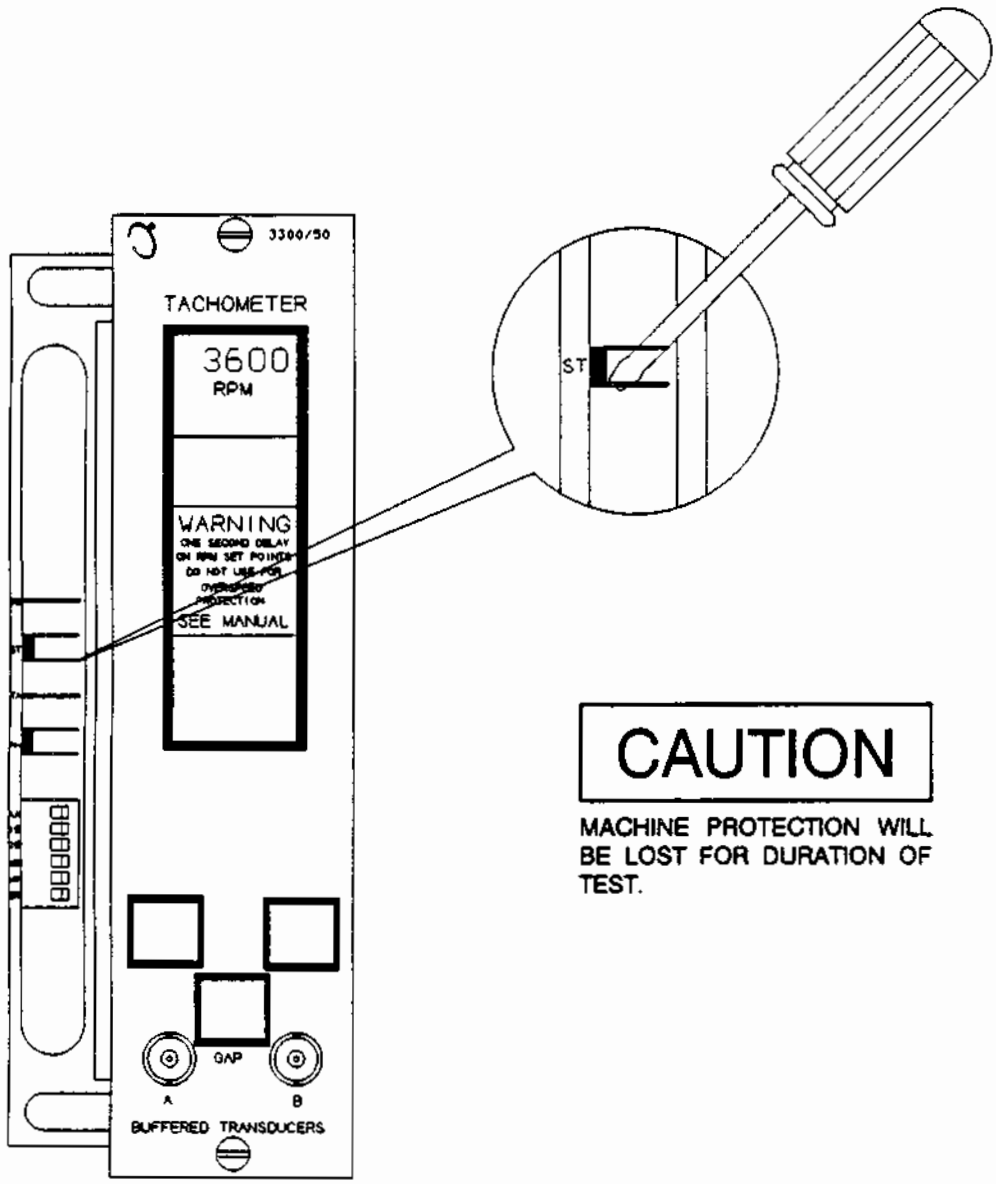
IF ERRORS ARE DETECTED DURING POWER-UP TEST OR USER-INVOKED SELF TEST:

MONITORING IS ABORTED UNTIL USER ACTION RESOLVES PROBLEM.

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

27 SELF TEST (CONT)

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

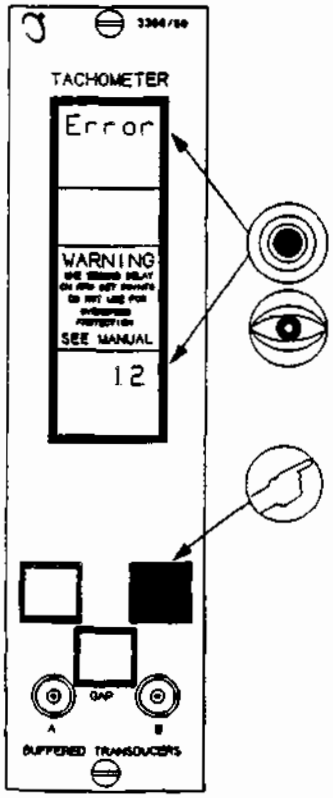


CAUTION

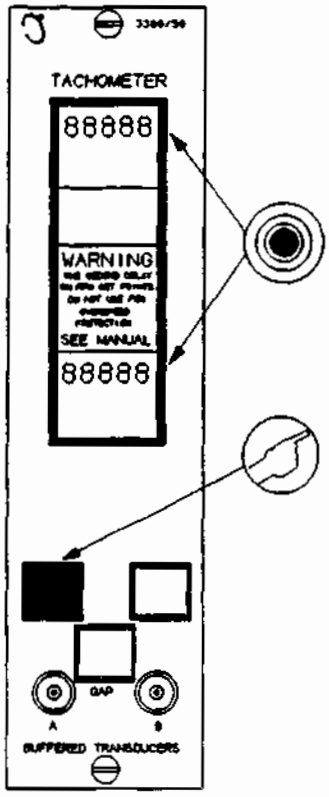
MACHINE PROTECTION WILL BE LOST FOR DURATION OF TEST.

27 SELF TEST (CONT)

AT THE 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.

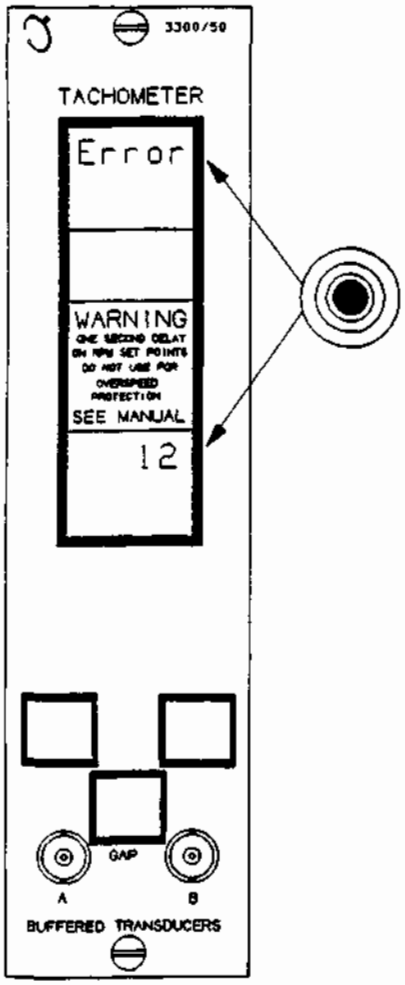


READ CODES ON LIST; STEP THROUGH EACH ERROR CODE ON LIST BY PRESSING AND HOLDING THE RIGHT ALERT SWITCH FOR APPROXIMATELY ONE SECOND.



AT THE END OF THE LIST, THE LCD WILL DISPLAY ALL EIGHTS. TO REREAD THE LIST, PRESS THE RIGHT ALERT SWITCH. TO CLEAR THE LIST FROM MEMORY, PRESS AND HOLD THE LEFT ALERT SWITCH FOR APPROXIMATELY ONE SECOND.

27 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. *
21	INCORRECT SWITCH OR SWITCH COMBINATION. ****
32	AUTO THRESHOLD OR MAGNETIC PICKUP NOT ALLOWED WITH A ZERO SPEED TACHOMETER.
33	THE PROCESSOR HAS NOT BEEN PROGRAMMED FOR THE TACHOMETER TYPE. *
34	THE INPUT FREQUENCY TO THE TACHOMETER IS TOO HIGH FOR PROPER OPERATION.

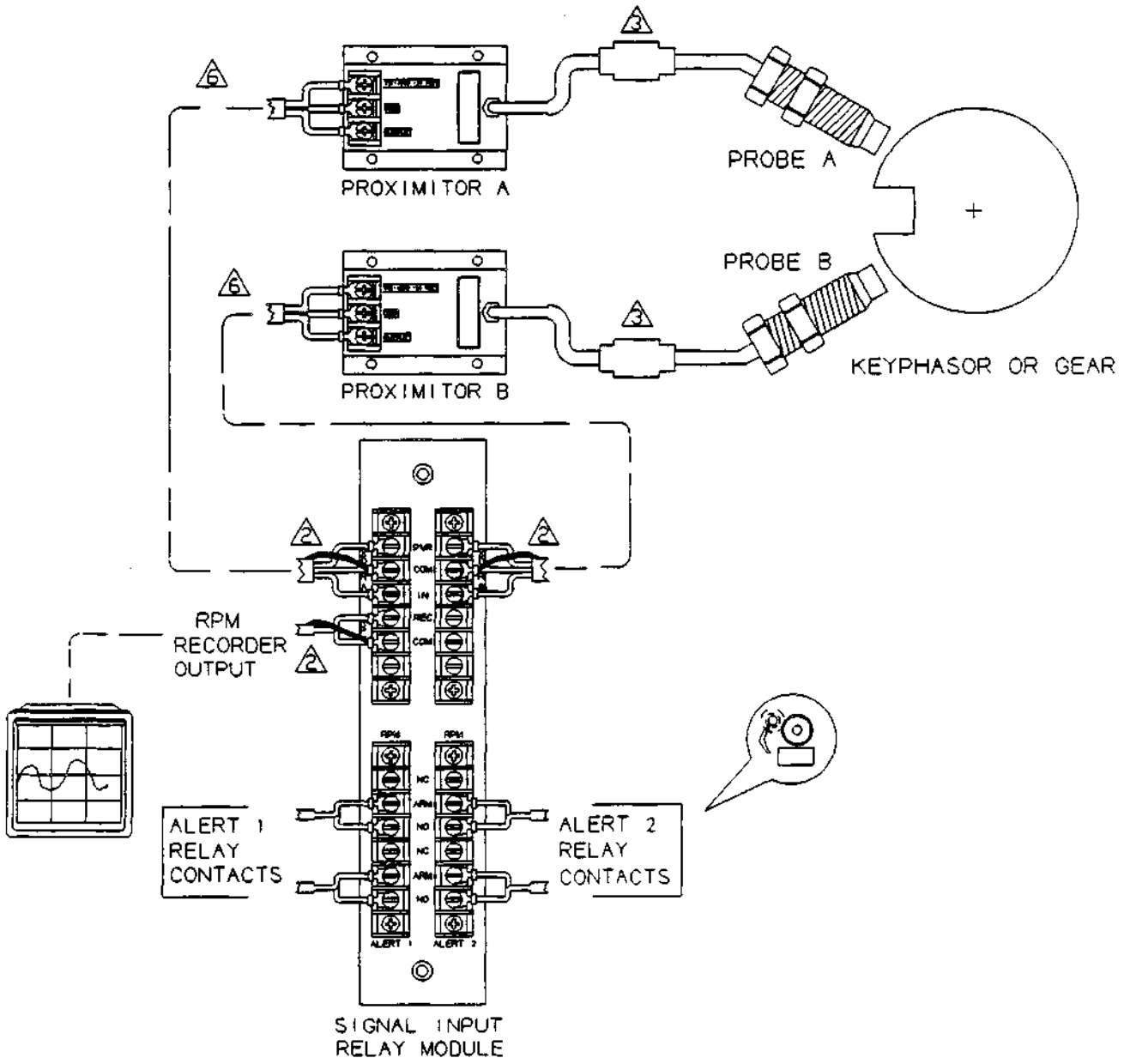
* TESTED ONLY AT POWER-UP OR USER-INVOKED SELF TEST. THIS ERROR IS DISPLAYED ON THE FRONT PANEL BUT IS NOT STORED IN MEMORY.

** TESTED ONLY AT CYCLIC SELF TEST. ERRORS 2, 3 AND 14 ARE NONRECOVERABLE AND ERRORS 5 THROUGH 12 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 SETUP MODE.

28 Field Wiring Diagram (Dual Setpoint Tach)



28 Field Wiring Diagram (Dual Setpoint Tach) (Cont)

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.

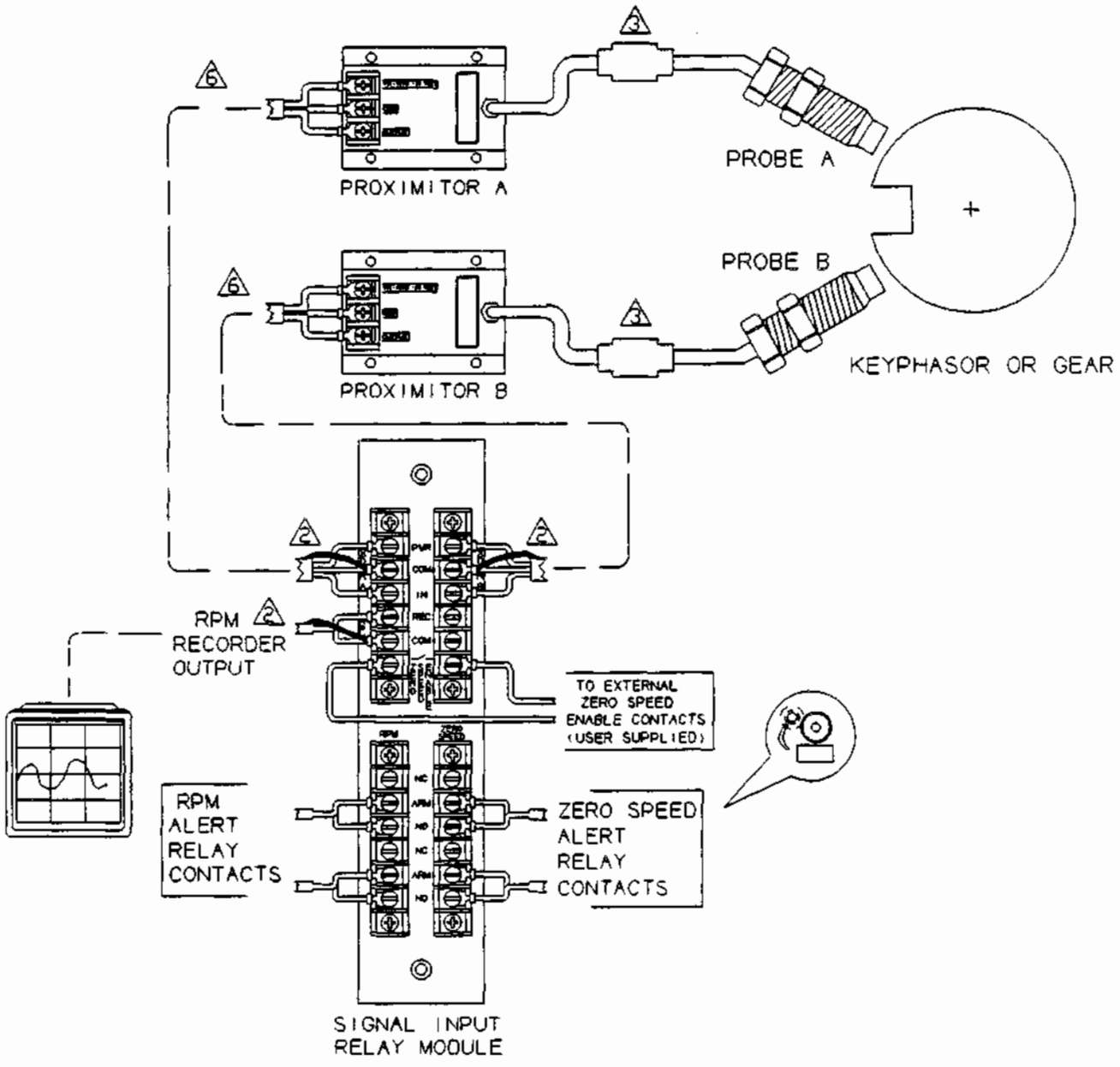
⚠3. To electrically isolate and protect coaxial connection, use connector protector kit part number 40113-02.

4. To minimize ground loops, 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 exceed 1000 feet (305 metres).

29 Field Wiring Diagram (Zero Speed Tach)



29 Field Wiring Diagram (Zero Speed Tach) (Cont)

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.

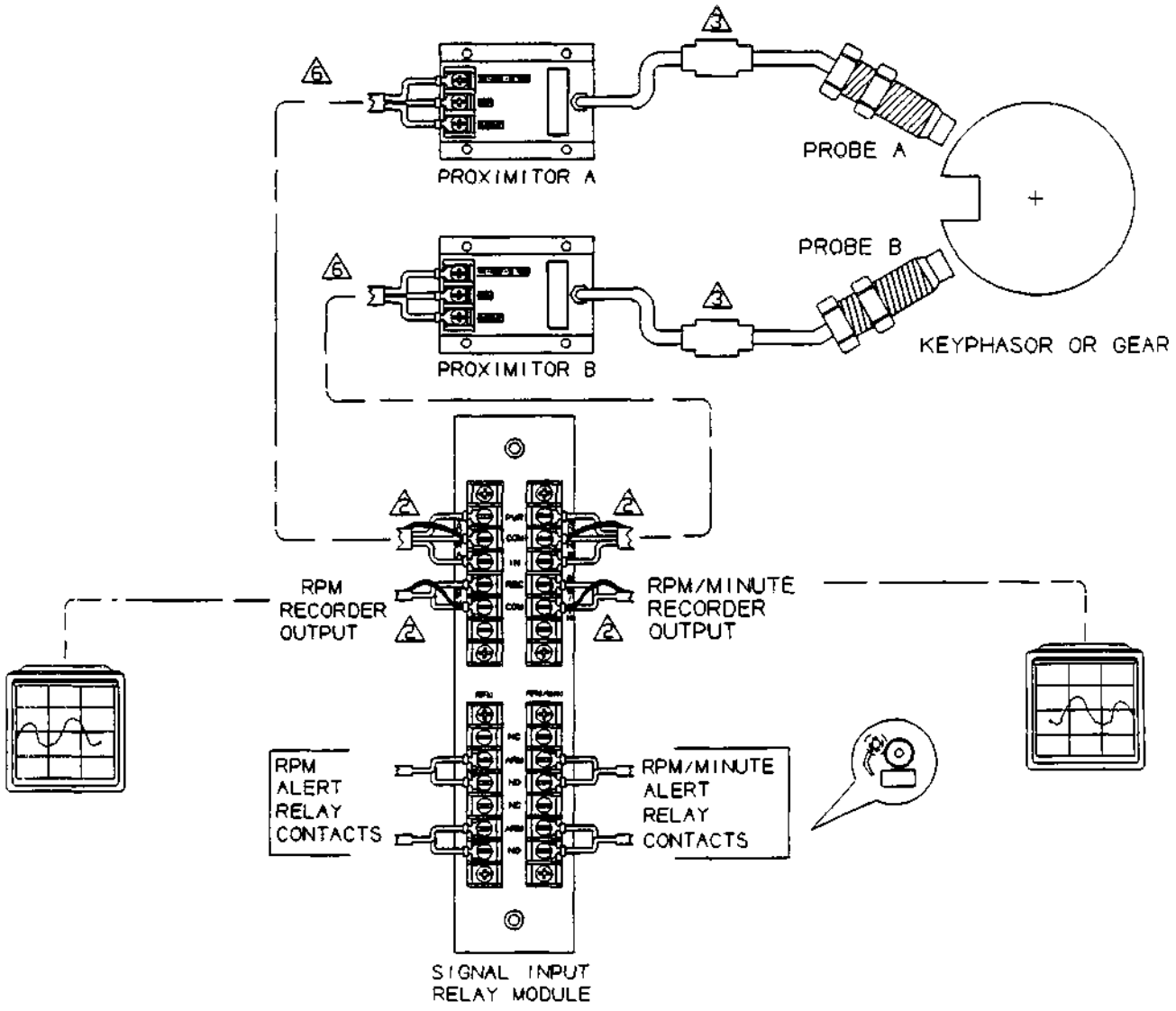
⚠3. To electrically isolate and protect coaxial connection, use connector protector kit part number 40113-02.

4. To minimize ground loops, 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 exceed 1000 feet (305 metres).

30 Field Wiring Diagram (Rotor Accel Tach)



30 Field Wiring Diagram (Rotor Accel Tach) (Cont)

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 connector protector kit part number 40113-02.

4. To minimize ground loops, a single point earth ground (GND) to system common (COM) connection is recommended.

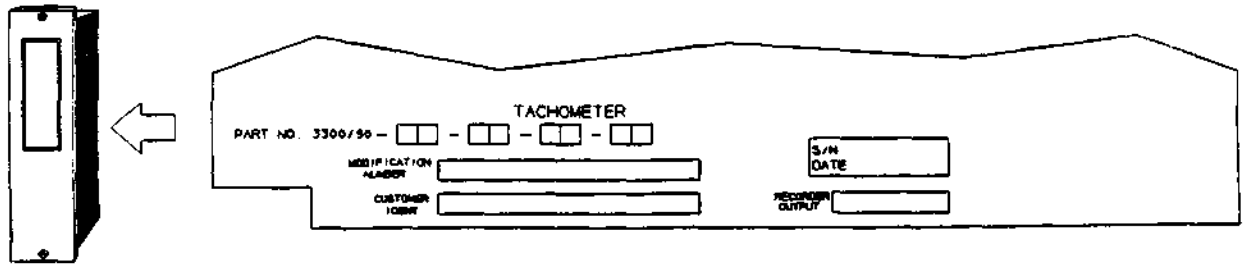
5. Proximitor case must be electrically isolated from earth ground. Electrical isolation: 500 Vac (RMS) minimum. Isolation kit part number 19094-01 may be used to satisfy isolation requirement.

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

31 Recommended Spare Parts

QTY	DESCRIPTION	PART NUMBER
	TACHOMETER	3300/50 - [ ][ ] - [ ][ ] - [ ][ ]
1	FRONT PANEL ASSEMBLY	78412-04 [01] 78412-03 [02] 78412-03 [03]
1	MONITOR CIRCUIT ASSEMBLY	82962-01
1	EXPANDER BOARD PWA	81410-01
1	SIGNAL INPUT RELAY MODULE	[01]
	NO RELAYS	84689-01 [00]
	EPOXY SEALED RELAYS	84140-01 [01]
	HERMETICALLY SEALED RELAYS	84146-01 [02]
		[02]
	NO RELAYS	84689-01 [00]
	EPOXY SEALED RELAYS	84141-01 [01]
	HERMETICALLY SEALED RELAYS	84147-01 [02]
		[03]
	NO RELAYS	84689-01 [00]
	EPOXY SEALED RELAYS	84142-01 [01]
	HERMETICALLY SEALED RELAYS	84148-01 [02]

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 10 of this manual). If in doubt about the part number, call your Bently Nevada Corporation representative before ordering.



32 Specifications

INPUTS

Signal Inputs:	Redundant inputs. Any two of the following: Proximity Probes. 0 to -24 or 0 to -18 Volt. Magnetic Pickups. (Not allowed for Zero Speed Application) 3300 System (Rack) Keyphasors.
Input Impedance:	10k Ohm
Input Frequency:	10kHz Maximum

SIGNAL CONDITIONING

OK Detection:	A Transducer is detected as NOT OK if the RPM reading changes more than 50% between consecutive input triggers above 100 RPM. A Transducer must have three consecutive OK readings before it can return to OK from a NOT OK status. A Transducer is also detected as NOT OK if the RPM value is above 99,999 RPM or below 1 RPM.
Transducer Switching:	The Tachometer automatically switches to the OK transducer if one should go NOT OK. The monitor uses the highest RPM reading of the two transducers, when both are OK.
Input Threshold:	Jumper optioned for Automatic or Manual. (Automatic not allowed on Zero Speed Tachometers)
Automatic Threshold:	Limited to inputs above 5 Hz or 300 RPM at one event per revolution.
Hysteresis:	Jumper selectable from 0.2 to 2.0 Volts.
Events per Revolution:	255 Maximum, 0.1 Minimum

RPM ALERTS

Setpoints:	Adjustable from 1 to 99,999 RPM
Requirements:	Three valid input triggers above an over speed setpoint or below an under speed setpoint.
Alert Delay:	One second or three valid input triggers, whichever is greatest.

RPM/MIN ALERT (Rotor Accel Tach Only)

Setpoint:	Adjustable from 20 to 9,980 RPM/MIN in 20 RPM/MIN steps.
Requirements:	Three valid input triggers above the RPM/MIN setpoint.
Alert Delay:	One second or three valid input triggers, whichever is greatest.

32 Specifications (Cont)

ZERO SPEED ALERT (Zero Speed Tach Only)

Setpoint:	Adjustable from 1 to 100 RPM
Requirements:	External Zero Speed Enable contacts (user-supplied) must be closed. Three valid inputs below the Zero Speed setpoint, or one minute (maximum) without an input trigger. Both transducers must meet all OK detection requirements as the rotor speed approaches the Zero Speed setpoint.
Alert Delay:	One second or three valid input triggers, whichever is greatest. One minute is required to declare a Zero Speed Alert when three input triggers are not detected. (Machine rotor at zero RPM)

RPM DISPLAY

Range:	1 to 99,999 RPM
Resolution:	+/- 1 RPM
Accuracy:	+/- 1 RPM @ 25°C.
Over/Under Indicators:	One of two arrows indicates whether an RPM setpoint is an over or under Alert. The over arrow flashes to indicate an over range condition.

RPM/MIN DISPLAY (Rotor Accel Tach Only)

Range:	-9,999 to 9,999 RPM/MIN
Resolution:	+/- 1 RPM/MIN
Accuracy:	+/- 20 RPM/MIN @ 25°C.
Over Indicator:	The over arrow flashes to indicate an over range condition.

ZERO SPEED DISPLAY (Zero Speed Tach Only)

"ZERO SPEED":	Indicates Zero Speed Monitor (Always on during monitoring)
"ENABLED":	Indicates when the Zero Speed Enable contacts (user-supplied) have been closed.
"ALERT":	Indicates when a Zero Speed Alert setpoint is being read or adjusted.

LEDs

Green:	Annunciates the TRIGGER OK condition or monitor OK condition.
Red:	Annunciates ALERTS and BYPASS conditions.

32 Specifications (Cont)

CONTROLS

Front Panel: Front panel switches (3) for reading the ALERT setpoints, PEAK HOLD value, and probe gap voltage.

Internal: Switches on circuit board for setpoint adjustment, Relay Bypass, Monitor Bypass, and monitor set-up.

External: External remote controls: Reset, Inhibit, setpoint, full scale and hysteresis adjust (↑ and ↓).

OUTPUT

Recorder: Output proportional to selected full scale RPM (and RPM/MIN) ranges. Output is protected against continuous short circuit to ground:
+4 mA to +20 mA, +12 Vdc compliance.
+1 Vdc to +5 Vdc, 100 Ohm minimum output impedance.
0 Vdc to -10 Vdc, 100 Ohm minimum output impedance.

Transducer Power: -24 Vdc or -18 Vdc per option selected in Power Supply. Output is short circuit protected.

Alerts and OK: Relay drives for Alerts and monitor (system) OK.

RELAY CONTACT RATINGS

Relays: 5 Amps @ 120 Vac 50/60 Hz.
5 Amps @ 28 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).

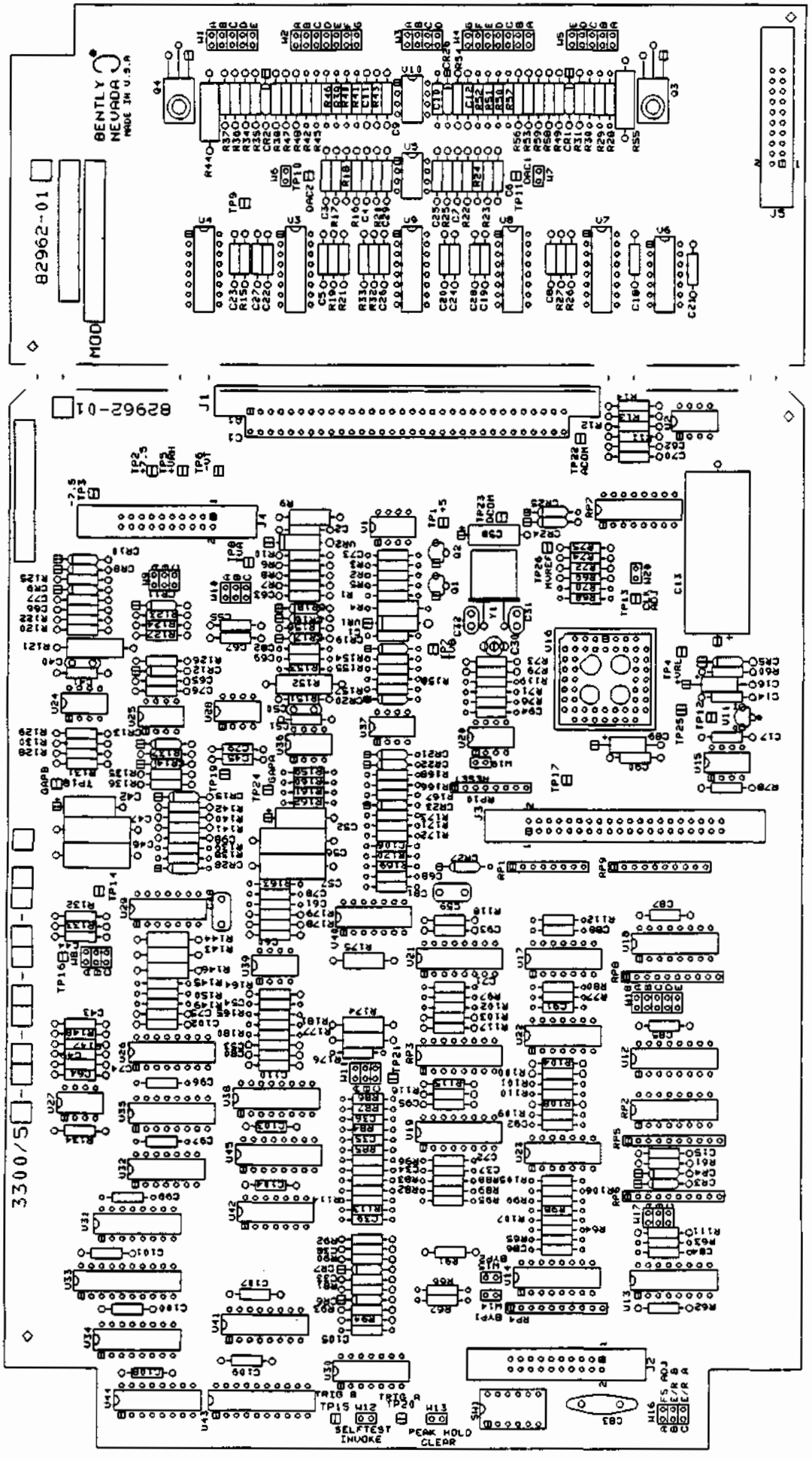
Humidity: 0 to 95%, noncondensing.

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34 Appendix

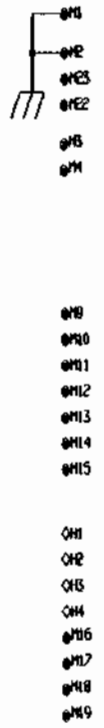
SCHEMATICS AND TECHNICAL DRAWINGS

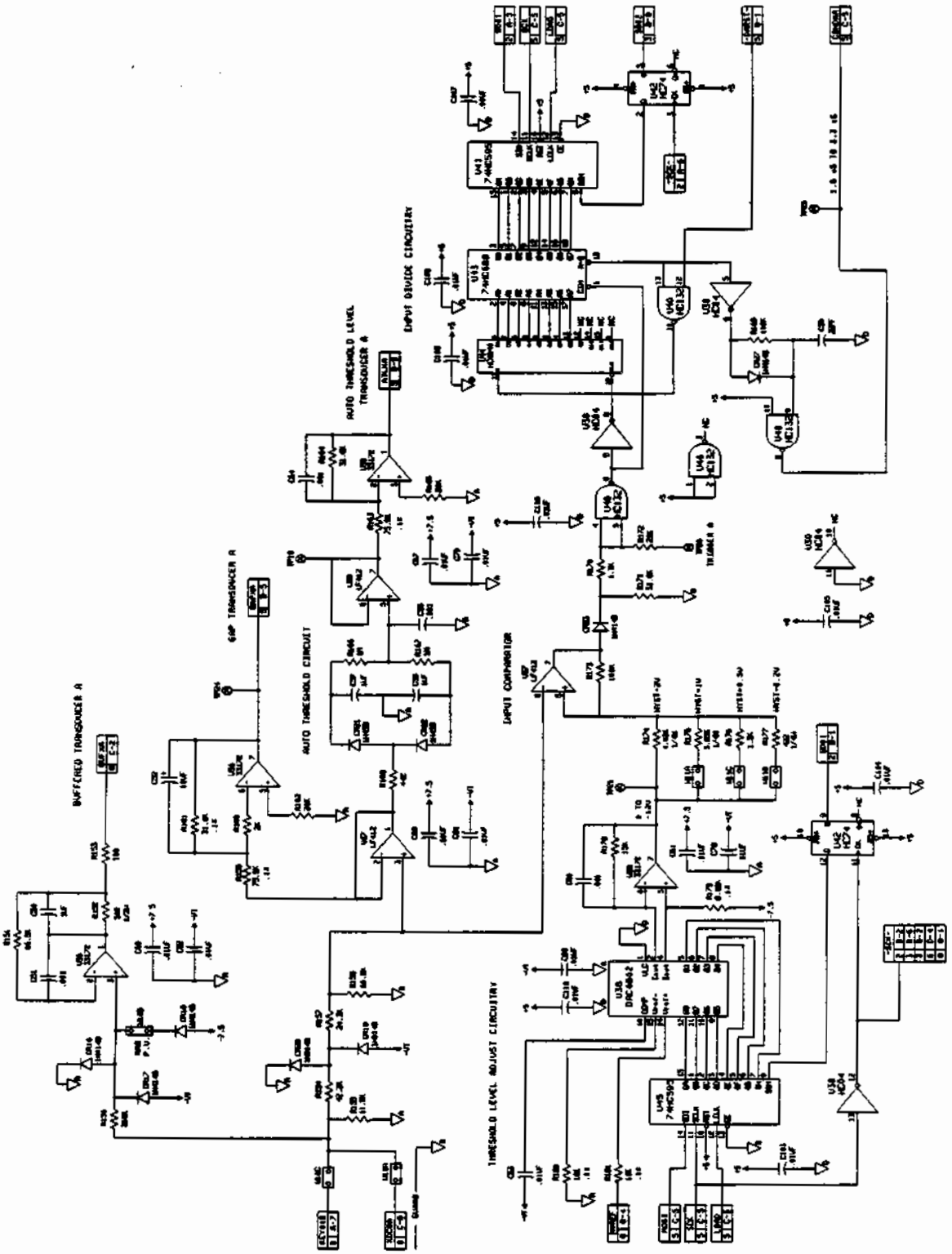

BENTLY NEVADA
MADE IN U.S.A.
82962-01
3300/50-
SELFTEST INVOKE
PEAK HOLD CLEAR

SPARE COMPONENTS		
COMPONENT	SHEET	ZONE
U30	2	A-4
RR3	4	A-5
RP1	4	C-6
RP10	5	D-5
U6	7	A-4
U9	7	A-3
U2	8	C-5
U40	2	A-2
U29	3	A-2

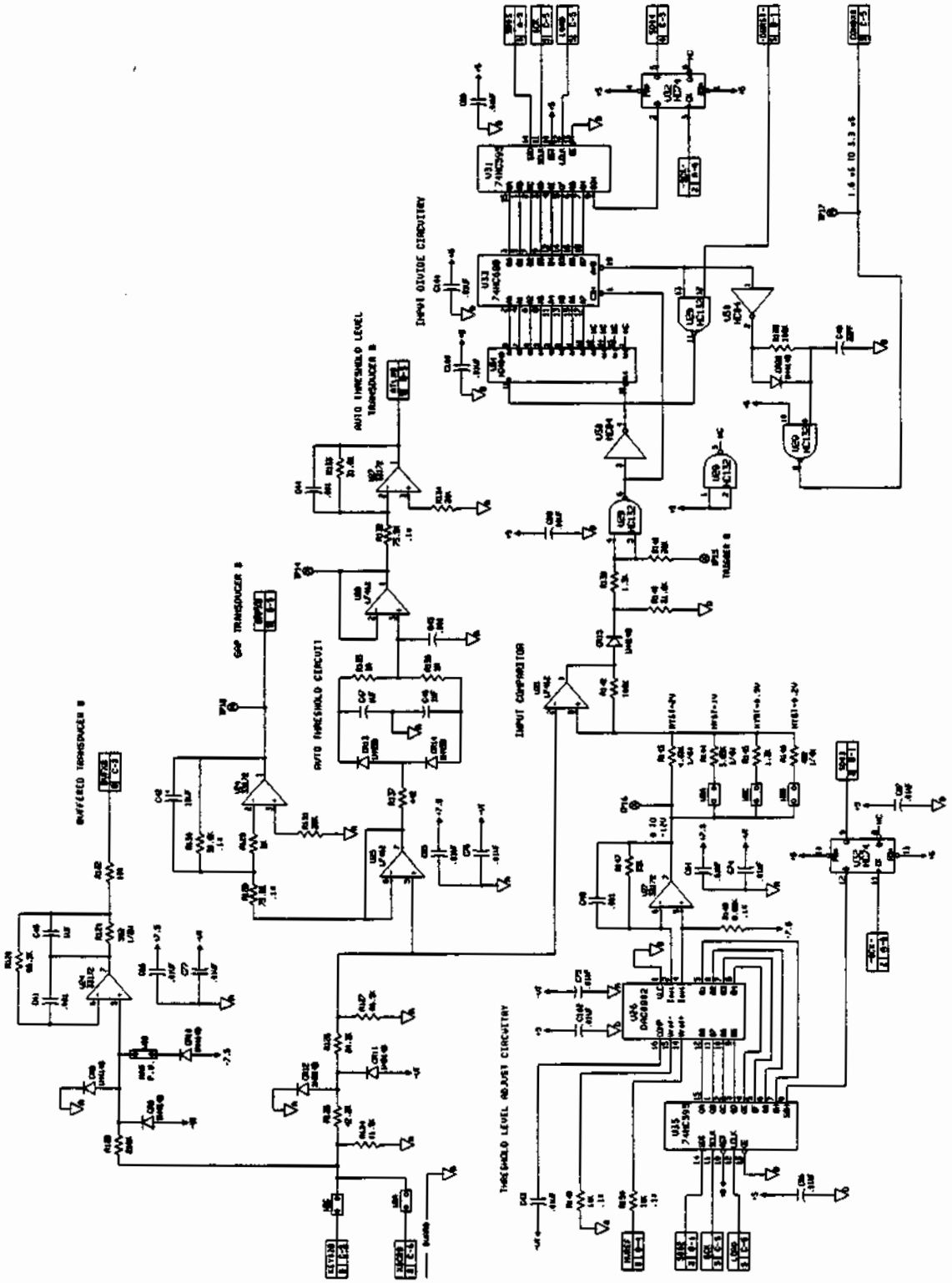
REFERENCE DESIGNATORS	
LAST USED	NOT USED
C110	
CR28	
J5	
Q4	
R181	
RP10	
SW1	
TP26	
U45	
VR2	
W20	
Y1	

VOLTAGE CHART		
REF DESIG	PIN NO.	TO
U1,24,25,27,28,36,39	8	+7.5
	4	-VT
U2,5	8	+7.5
	4	-7.5
U3,8	13	+5P
	3	-7.5P
U4,7	16	+5P
	8	DCOMP
U6	14	+5P
	7	DCOMP
U9	12	+5P
	13	+7.5P
	7	DCOMP
	3	-7.5P
U10	8	+VOP
	4	-VOP
U12,13,14,18,31,34,35,41,44,45	16	+5
	8	DCOM
U16	26	+5
	1	DCOM
U17	3	+5
	12	DCOM
U19,21	16	+5
	8	DCOM
	7	-7.5
U22,23,29,30,32,40,42	14	+5
	7	DCOM
U33,43	20	+5
	10	DCOM

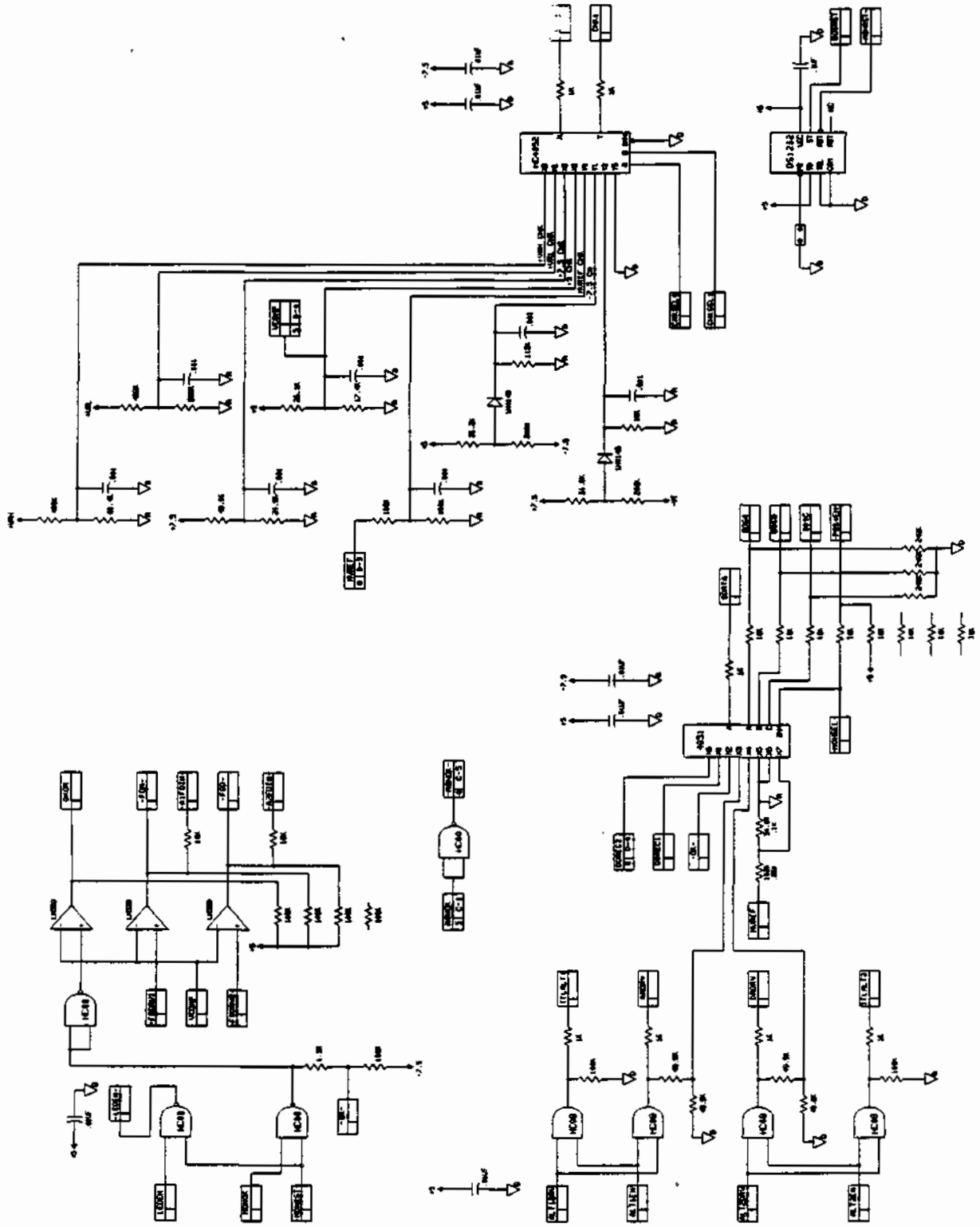




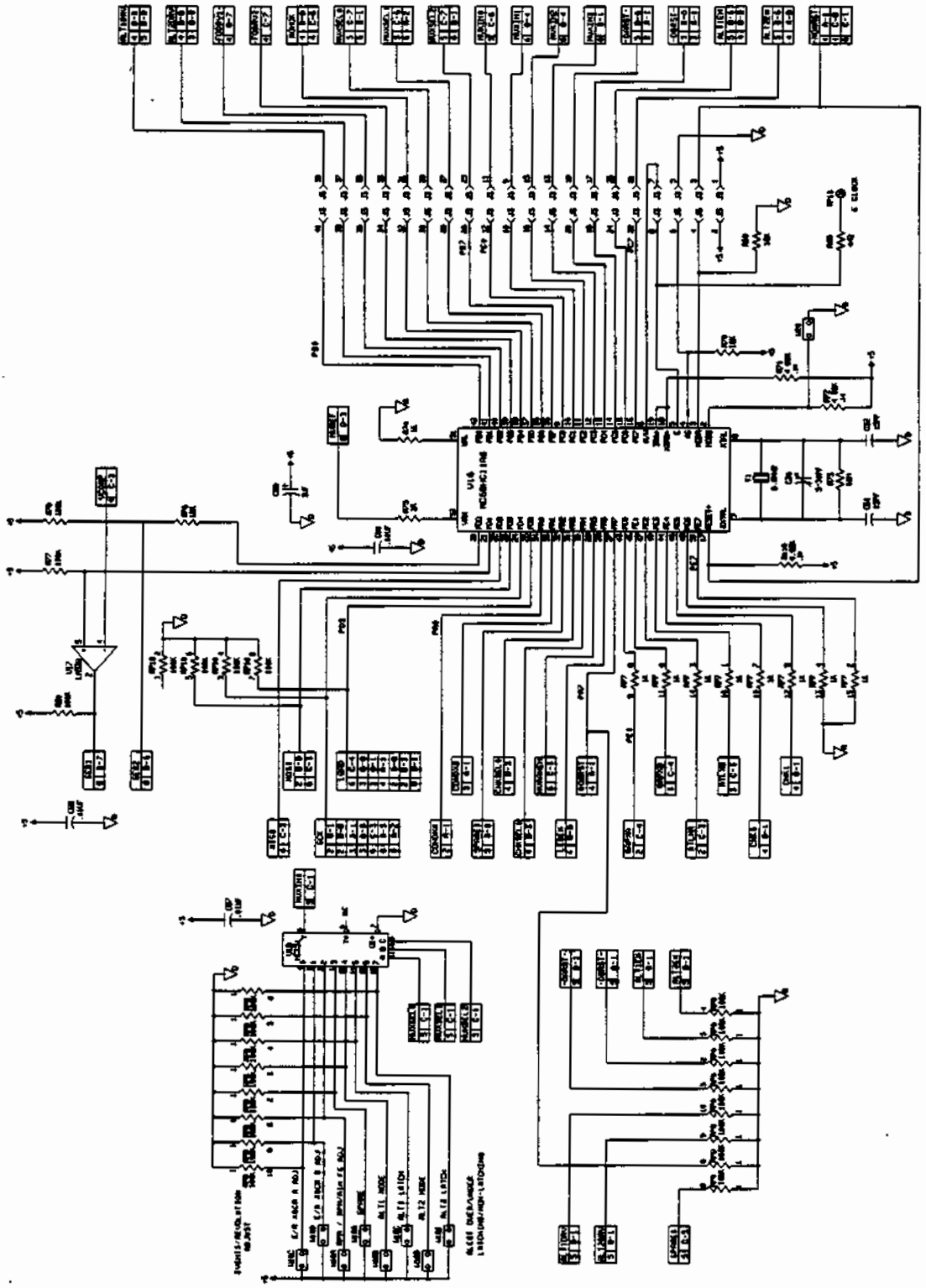
3300/50 TACHOMETER PWA AND SCHEMATIC DRAWINGS SHEET 3 OF 9



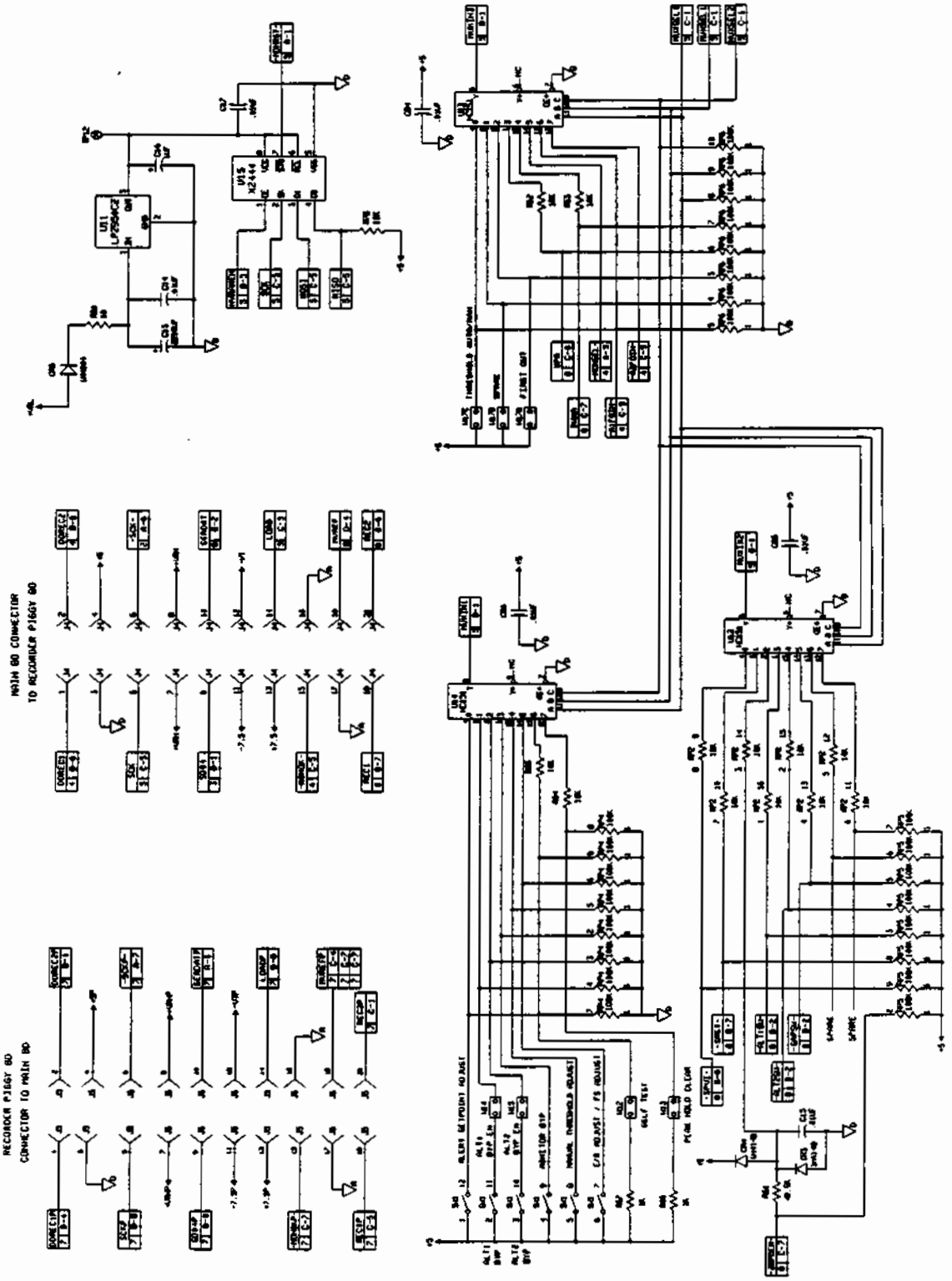
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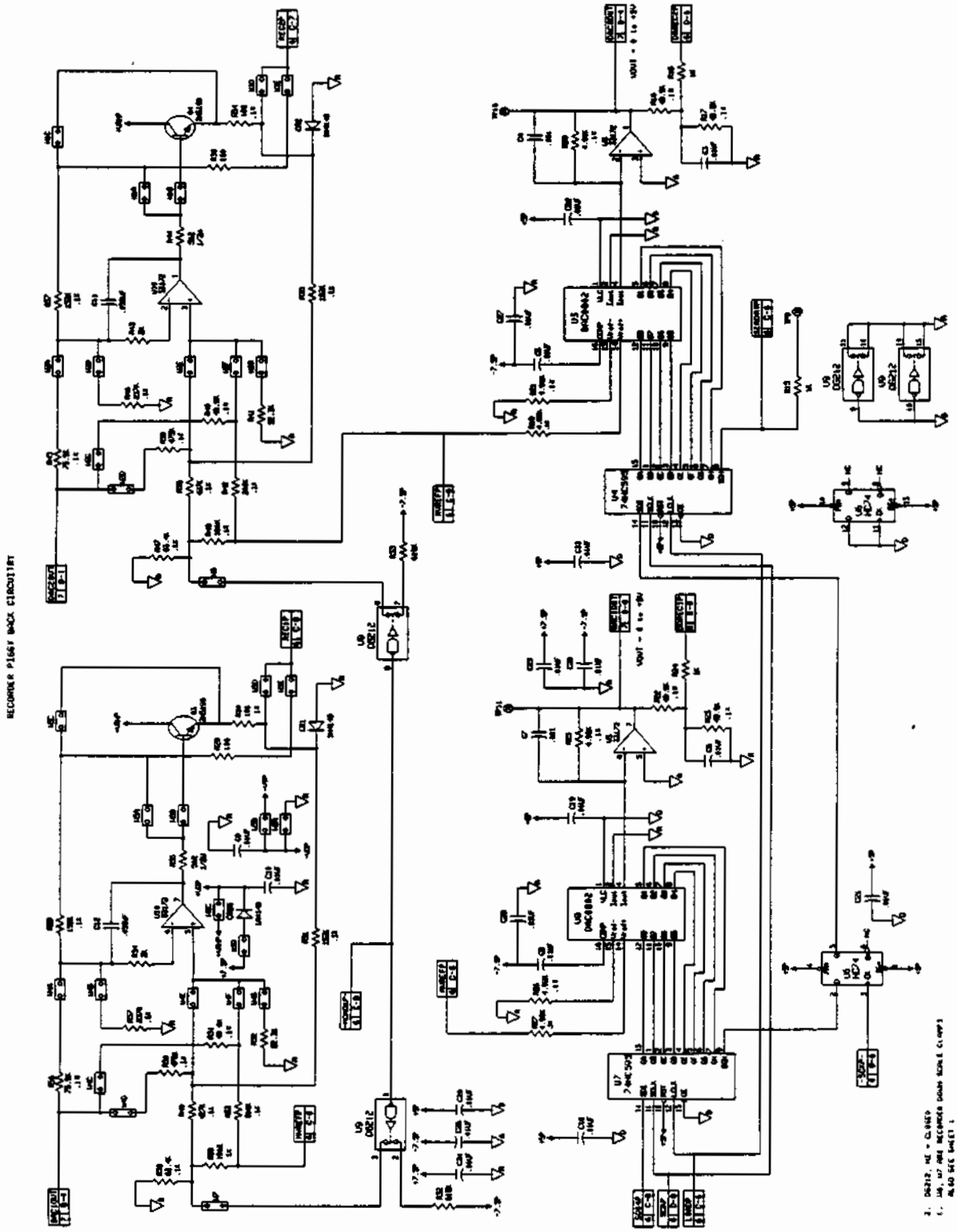
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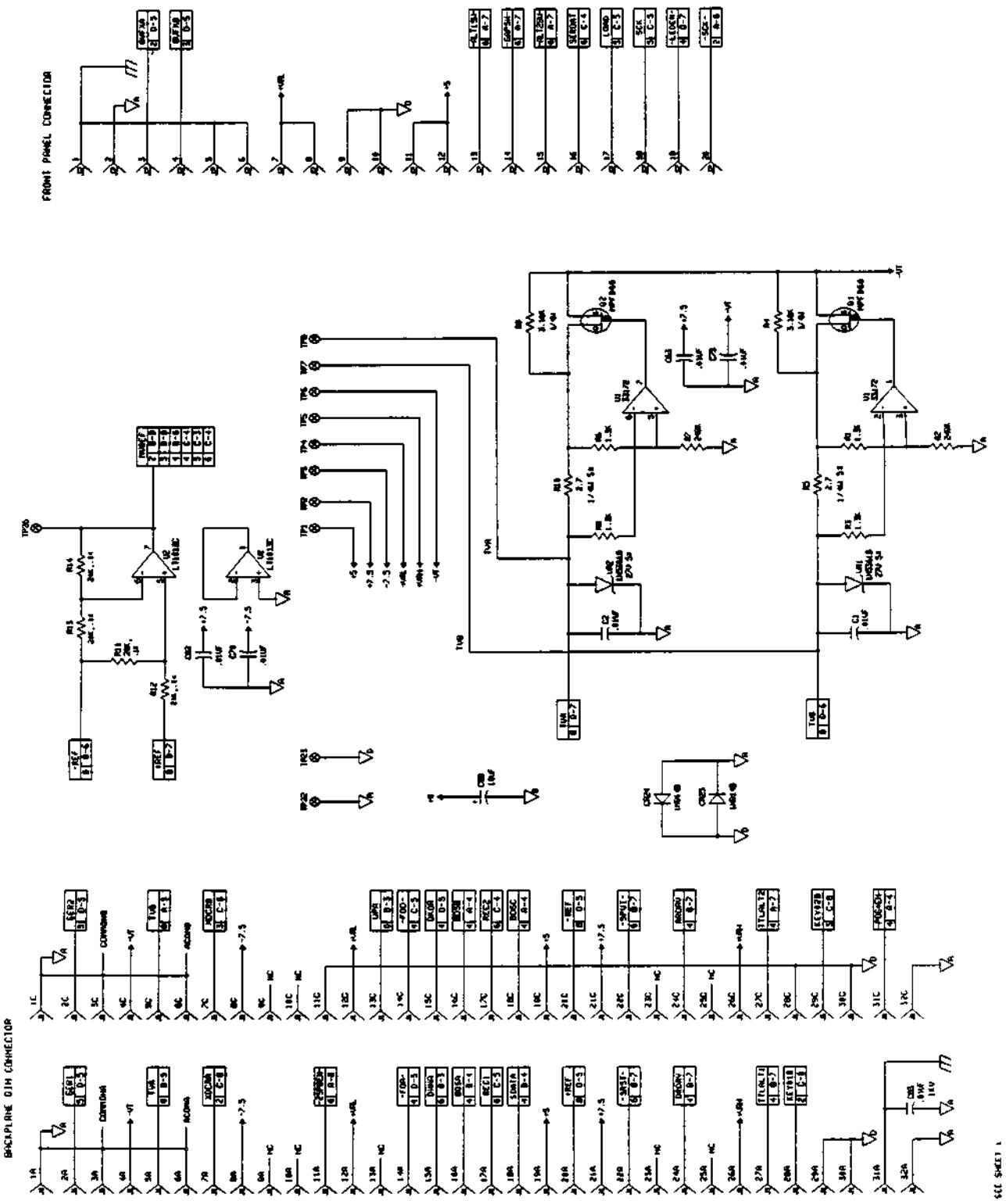
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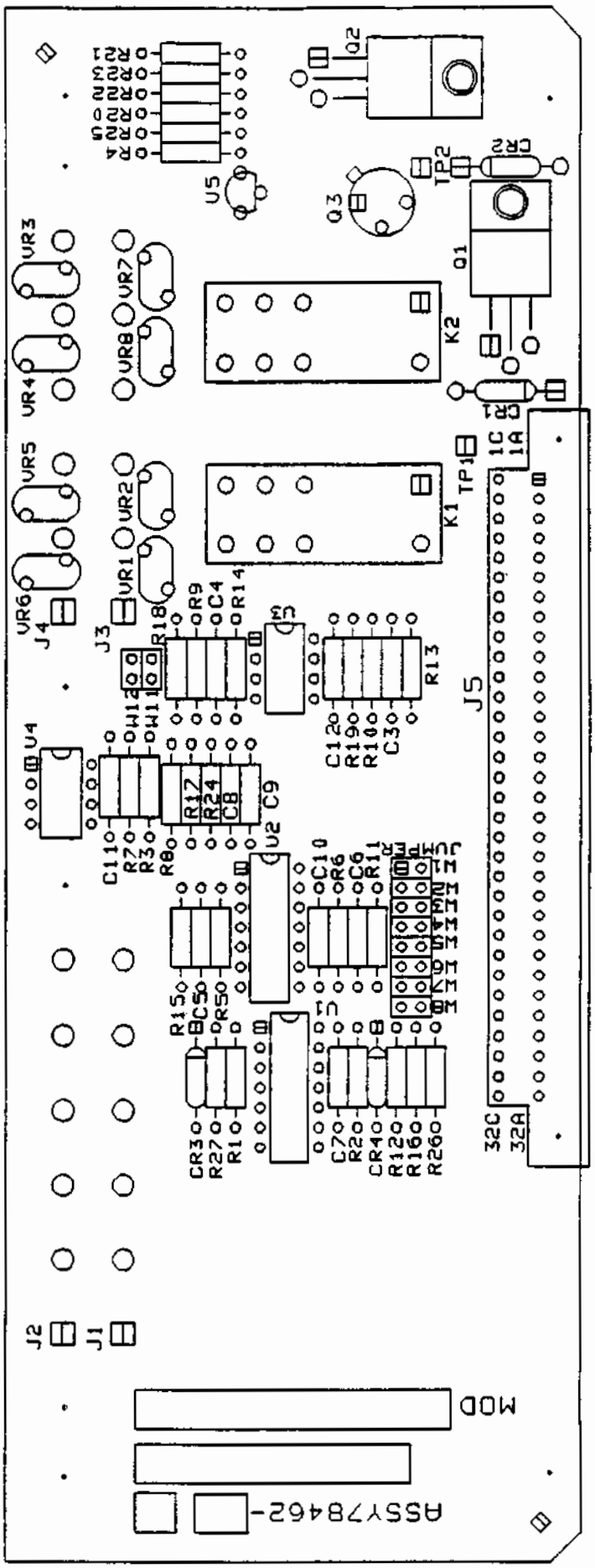
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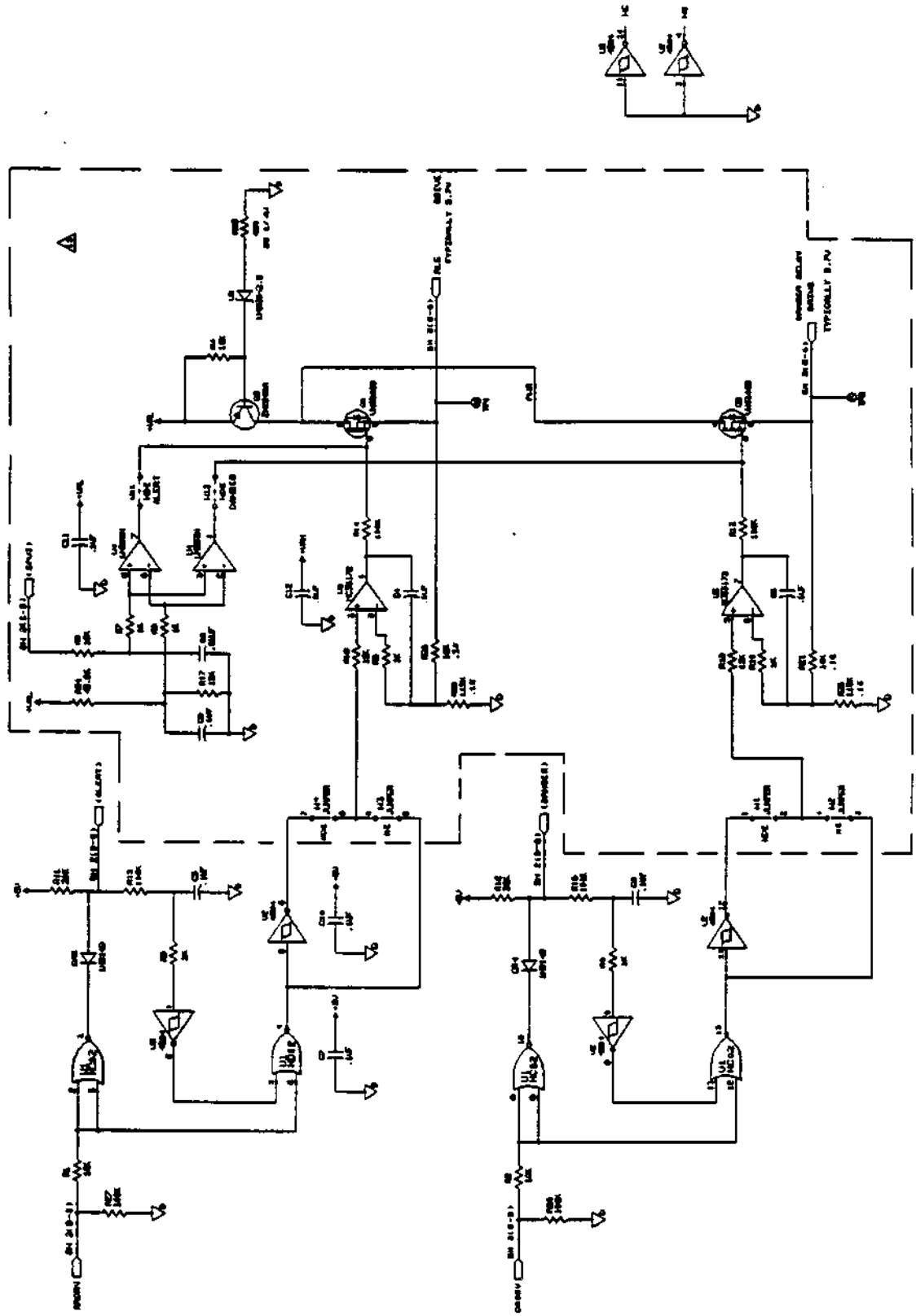
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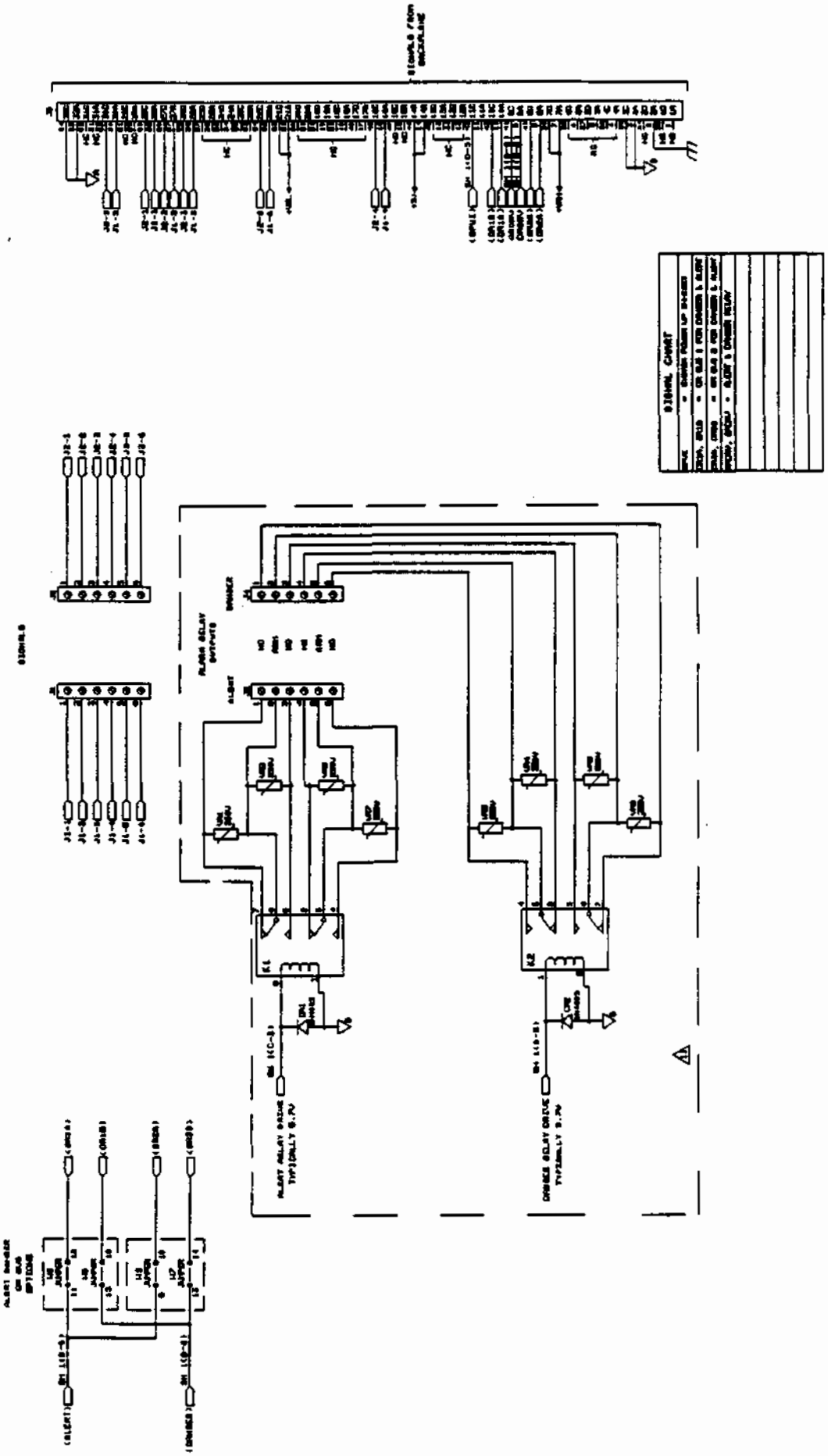
3300/50 TACHOMETER PWA AND SCHEMATIC DRAWINGS SHEET 9 OF 9



Signal Input Relay Module (Epoxy) PWA Drawing
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Signal Input/Relay Module (Epoxy) Schematic
Page (1 of 2)



Signal Input/Relay Module (Epoxy) Schematic
Page (2 of 2)

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