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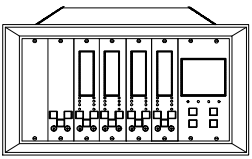
REVISION F,
DECEMBER 1996

3300/53 OVERSPEED PROTECTION SYSTEM

OPERATION / MAINTENANCE MANUAL

BENTLY NEVADA



NOTICE

Bently Nevada Corporation has attempted to identify areas of risk created by improper installation and/or operation of this product. These areas of risk 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. Contact could cause shocks, burns, or death.

Do not touch exposed wires or terminals.

CAUTION

Machine protection provided by this tachometer will be lost while the tachometer is removed from the rack.

Proximitor® is a registered trademark of Bently Nevada Corporation.

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FOREWORD

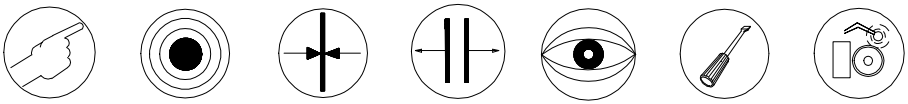
This manual shows how to install, operate, and maintain the components of the Overspeed Protection System.

For information about...	Read Section
Installation	4,5,6,28
Reading LEDs and LCDs	8,9,10,11,12,13,14
Reading programmed options	11,12,13,14
Setting or adjusting options	16,17,18,19,20,24
Testing	21,22,23,25,26,27

Related Documents

DOCUMENT	BENTLY NEVADA PART NUMBER
3300 System Overview, Installation Instructions and Troubleshooting	80170-01
3300/12 AC Power Supply	89602-01
3300/14 DC Power Supply	101256-01
3300/03 System Monitor	89604-01
Dynamic Data Manager System	46390-01

This manual uses these symbols to indicate actions in the step-by-step procedures.



PRESS FLASHING CONNECT DISCONNECT OBSERVE SCREWDRIVER ALARM

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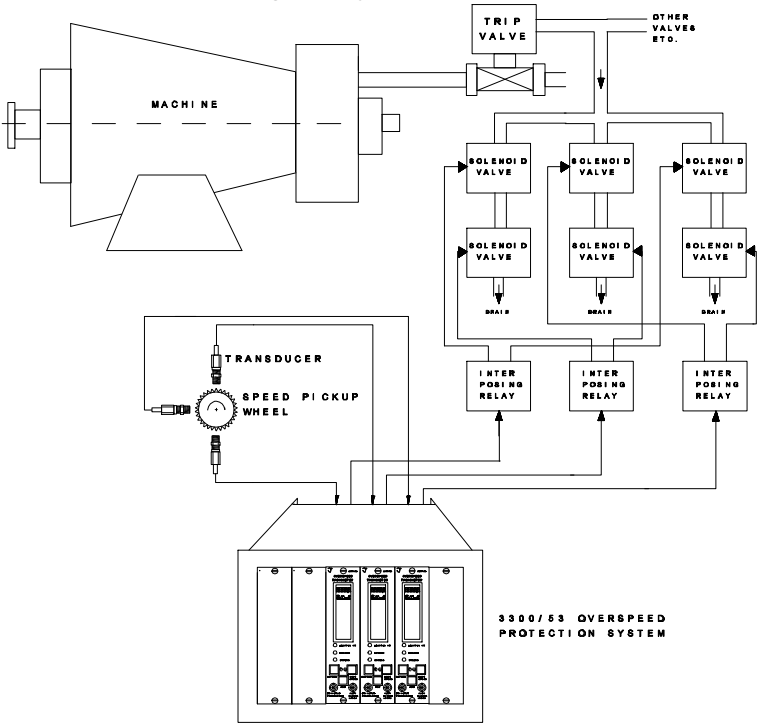
1 OVERSPEED PROTECTION SYSTEM

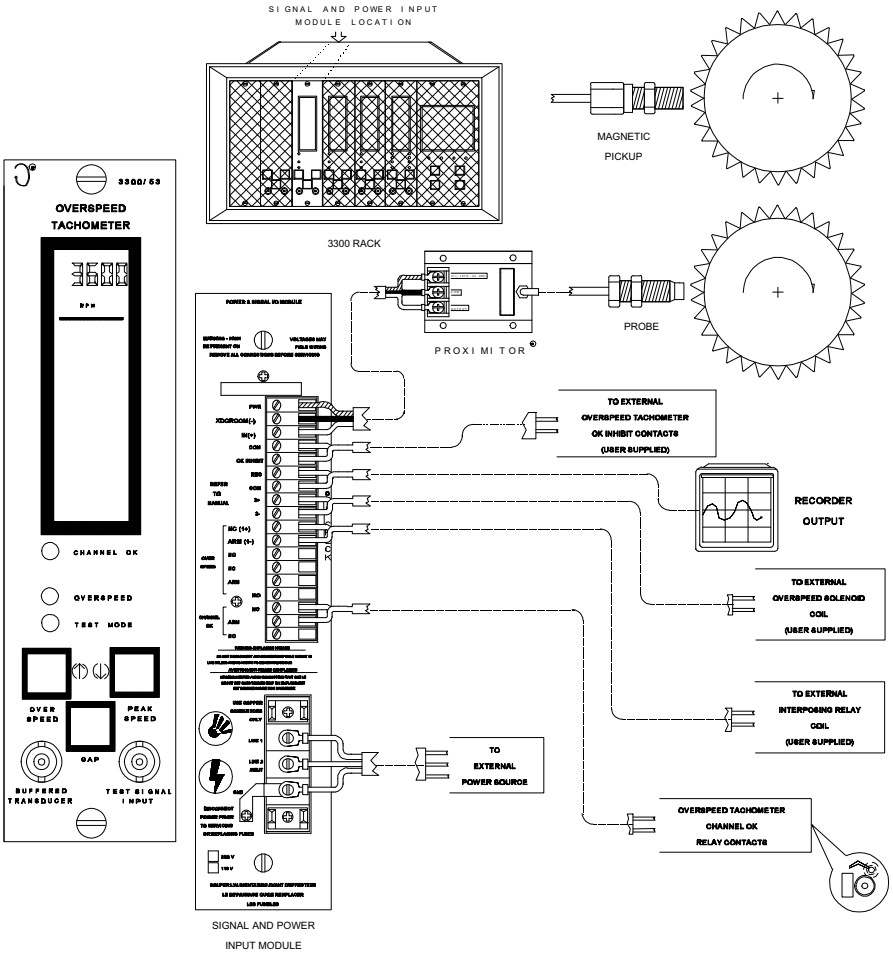
The Bently Nevada 3300/53 Overspeed Protection System is a component for use in an overspeed shutdown system. The overall performance of the shutdown system is dependent on other components in the system that are beyond the scope of supply of Bently Nevada. All these components need to be incorporated into a working system by a System Integrator who is familiar with overspeed shutdown systems. The System Integrator and the End User are ultimately responsible for the proper functioning of the system.



The 3300/53 Overspeed Protection System is available in a three channel version (shown above) or a two channel version. The 3300/53 system does **not** require a 3300 System Monitor or 3300 Power Supply to operate. The system can operate as a stand-alone system (shown above) or as part of 3300 monitoring rack as shown on the next page. If the 3300/53 system is mounted in a rack containing a 3300 Power Supply and System Monitor, serial data is available by connecting a Data Manager to the 3300 System.

1 OVERSPEED PROTECTION SYSTEM

The diagram below shows one channel of a 2 Channel Overspeed Protection System.



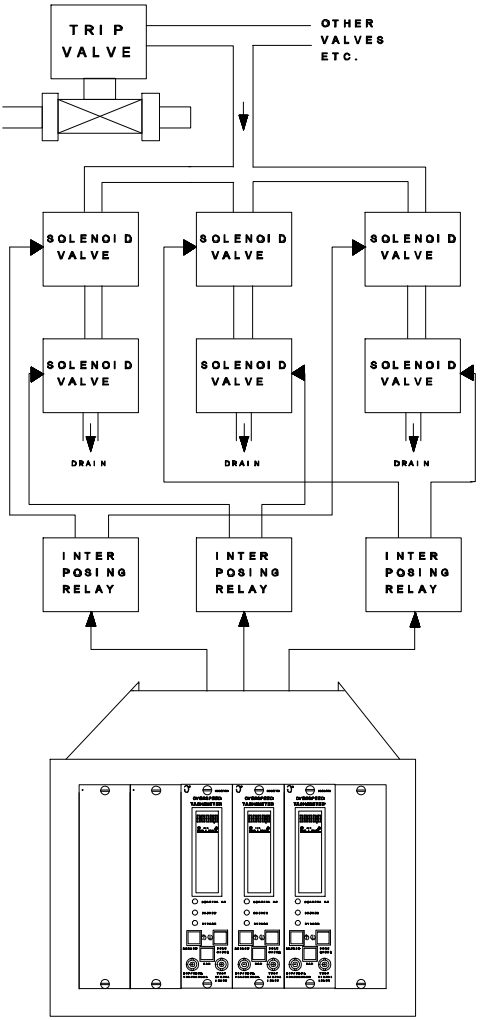
1 OVERSPEED PROTECTION SYSTEM

Three Channel Overspeed Protection System

Use the Three Channel Overspeed Protection System in a shutdown system as shown on the following page. Using the Overspeed system in this configuration provides the following benefits.

FEATURES	PROVIDES
3 independent channels of overspeed monitoring.	High immunity to missing an overspeed alarm.
2 out of 3 voting on overspeed alarm on both tachometers and solenoids.	High immunity to causing false machine shutdown.
Normally energized interposing relays and solenoid valves.	Provides machine shutdown on loss of all shutdown system power supplies.

1 OVERSPEED PROTECTION SYSTEM



1 OVERSPEED PROTECTION SYSTEM

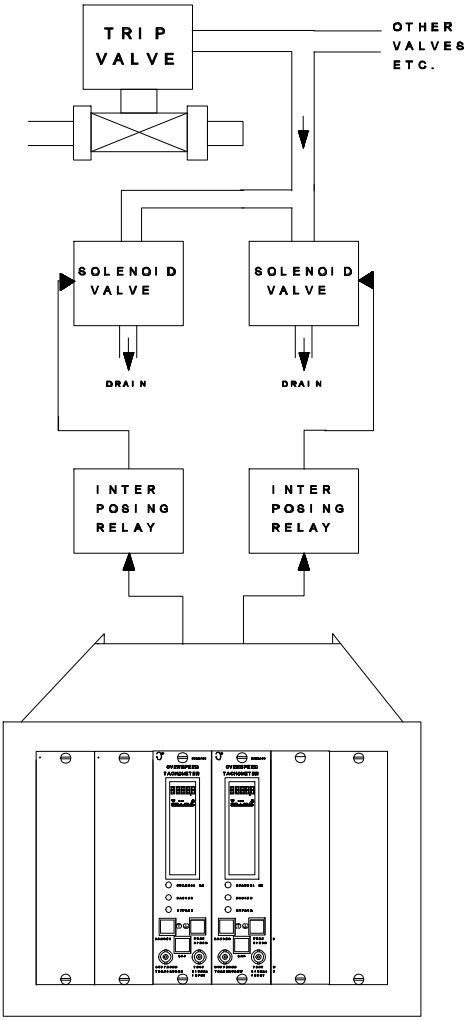
Two Channel Overspeed Protection System

Use the Two Channel Overspeed Protection System in a shutdown system as shown on the following page. Using the Overspeed system in this configuration provides the following benefits.

FEATURES	PROVIDES
2 independent channels of overspeed monitoring.	High immunity to missing an overspeed alarm.
1 out of 2 voting on overspeed alarm.	
Normally de-energized interposing relays and solenoid valves.	Coil failure of an interposing relay or solenoid will **not** cause an unwanted machine shutdown.
Coil open circuit detection (Coil Check) on normally de-energized interposing relays and solenoid valves.	Verification that normally de-energized relays are connected and have power applied.

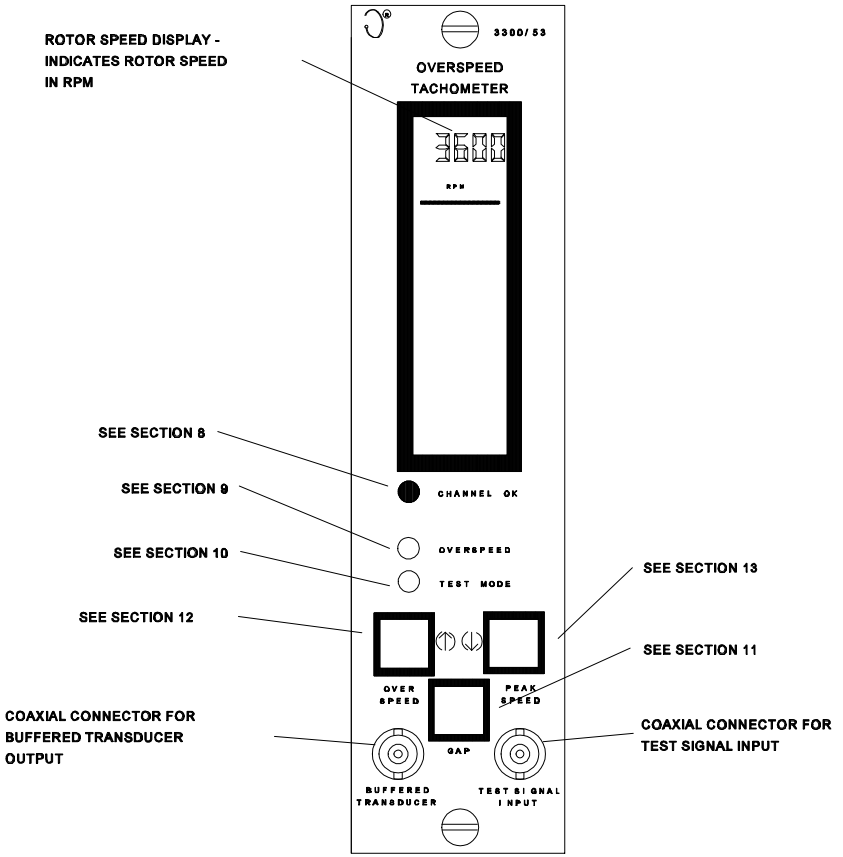
No matter how it is configured, it is still possible for a Two Channel Overspeed Protection System to cause a false machine shutdown under certain single point failure conditions. Bently Nevada strongly recommends the use of a Three Channel Overspeed Protection System. A Three Channel Overspeed Protection System can be configured so that no single point failure will cause either a missed overspeed alarm or a false machine shutdown (see the previous page for a description of the Three Channel system).

1 OVERSPEED PROTECTION SYSTEM



2 FRONT PANEL FEATURES

The LCD on the Overspeed Tachometer displays a variety of messages. The figure on this page shows what the LCD displays in typical operating mode. Refer to sections 8 to 14 in this manual to see how the tachometer uses the LCD to display other information.



3 TACHOMETER FUNCTIONS

The 3300/53 Overspeed system consists of either two or three channels of overspeed monitoring. Each channel consists of an Overspeed Tachometer, Signal and Power Input Module, and a transducer and field wiring. In a special purpose Steam Turbine application, each channel controls an external interposing relay that drives one or more solenoid valves. The solenoid valves are located in the machine trip system that shuts down a machine under fault conditions.

The system provides overspeed protection by measuring speed on 2 or 3 channels and then using voting circuitry to drive the Overspeed relay into alarm. Each channel measures speed by receiving a signal from either a Proximitor® or magnetic pickup, measuring the time between transducer pulses, and calculating the speed of rotation. Each tachometer contains Overspeed voting circuitry and each Signal and Power Input module contains an Overspeed relay. The voting circuitry on the tachometer drives its Overspeed relay into alarm when the Overspeed voting criteria is satisfied. Refer to the Overspeed Relay Operation in the Overspeed Alarm section.

Alarms

Each tachometer has one level of alarm, Overspeed. When a tachometer detects that the shaft speed equals or exceeds the setpoint level, the **OVERSPEED** LED comes on. When the Overspeed voting criteria is satisfied, the Overspeed relay will be driven off (alarm).

Channel OK Functions

The Channel OK functions check that the components of each channel are functioning properly. The Channel OK functions of the Overspeed Tachometer include Transducer OK and Tachometer OK.

TRANSDUCER OK -- Transducer OK checks the validity of the transducer pulses. The **CHANNEL OK** LED will go off, and the OK relay will be driven off (not OK) if any of the following conditions exist:

1. The transducer pulses are less than 101 RPM.
2. The tachometer detects missing or extra transducer pulses.
3. The tachometer is removed from the 3300 rack.

The **CHANNEL OK** LED and OK relay can be restored as OK when the transducer pulses are less than 101 RPM by closing the external OK Inhibit contacts.

TACHOMETER OK -- Tachometer OK uses the self tests to check the integrity of the tachometer. If a self test fails, the OK relay is driven off (not OK) and the **CHANNEL OK** LED flashes at 5 Hz.

3 TACHOMETER FUNCTIONS

Coil Check OK

Coil Check OK verifies the continuity of the external interposing relay and solenoid drive coils. If the interposing relay or solenoid drive coils are detected as open circuit, the **CHANNEL OK** LED will go off, the OK relay will be driven off (not OK) and the front panel will display "COIL1" or "COIL2". Only use Coil Check OK in a Two Position Overspeed Protection System on normally de-energized interposing relays and solenoids.

OK Inhibit

The OK Inhibit function is provided for machine startup. If the tachometer detects an RPM value of less than 101 RPM, the channel will go not OK. This condition will cause the **CHANNEL OK** LED to go off and the OK relay to go not OK. If all channels in the Overspeed Protection system are not OK the Overspeed relays will be driven off (alarm). Connecting an external set of contacts which short across the **OK INHIBIT** and **COM** terminals on the Signal and Power Input Module will restore the channel OK when the RPM value is less than 101 RPM. **Close the external OK Inhibit contacts until the machine speed exceeds 125 RPM.**

Relays

OVERSPEED RELAY -- Each tachometer contains an Overspeed relay. In normal operation, the relay is energized (on, relay contact **NO** connected to **ARM**). A tachometer will drive its Overspeed relay off (alarm, relay contact **NC** connected to **ARM**) when the Overspeed voting criteria is satisfied. The Overspeed relay is latching in operation and must be reset following an Overspeed alarm.

CHANNEL OK RELAY -- Each tachometer contains a Channel OK relay. In normal operation the relay is energized (OK, contact **NO** connected to **ARM**). The relay will be driven off (not OK, contact **NC** connected to **ARM**) if any of the following conditions exist:

1. The transducer pulses are less than 101 RPM.
2. The tachometer detects missing or extra transducer pulses.
3. The tachometer is removed from the 3300 rack.
4. A self test fails.
5. The interposing relay or solenoid drive coil is detected as not OK.

The Channel OK relay can be restored as OK when the transducer pulses are less than 101 RPM by closing the external OK Inhibit contacts.

3 TACHOMETER FUNCTIONS

Switches on the Front Panel

OVERSPEED -- Press this switch to display the Overspeed setpoint

GAP -- Press this switch to display the Proximitor® gap voltage. Proximitor® gap is measured in negative DC voltage and is directly proportional to the distance between the face of the Proximior® and the surface being monitored. This function is disabled when the tachometer is programmed for a magnetic pickup transducer input.

PEAK SPEED -- The tachometer stores two values for maximum speed: one during normal operation and the other while the tachometer is in Test Mode. Section 13 shows how to read these Peak Hold values. The tachometer retains these values even after loss of tachometer power.

ALARM RESPONSE TIME -- The Overspeed alarm response time is the delay between when shaft speed exceeds the Overspeed setpoint and when the Overspeed relays are driven off (alarm). The alarm response time is calculated by the tachometer and is dependent upon the Overspeed setpoint and the events per revolution setting. The alarm response time is displayed in milliseconds at the bottom of the front panel display. Press the **OVERSPEED** and **PEAK SPEED** switches simultaneously to read the alarm response time.

Monitor Adjust

The Monitor Adjust function lets you perform the following operations:

1. Reset peak hold
2. Adjust the recorder full scale range.
3. Adjust the events per revolution setting.
4. Adjust the Overspeed setpoint.
5. Test Channel OK.
6. Test OK Inhibit.
7. Test Overspeed Alarm.
8. Reset Alarms.
9. User-invoked self test.

Test Mode

The Test Mode function lets you verify the Channel OK operation, Overspeed setpoint, and the Overspeed relay operation.

3 TACHOMETER FUNCTIONS

Input and Output

The tachometer receives input from either a Proximitor® or a magnetic pickup for Overspeed monitoring. The tachometer also accepts a Test Signal input for verifying the tachometer operation. The tachometer provides outputs from a coaxial connector on the front panel and from the recorder output at the rear of the rack.

TRANSDUCER SIGNALS -- The tachometer can use Proximitor® signals or magnetic pickup signals. These enter the rack through the Power and Signal Input Module at the rear of the rack

TEST SIGNAL -- The tachometer can use a function generator signal for verifying the tachometer operation. This signal enters the tachometer through the **TEST SIGNAL INPUT** coaxial connector on the front panel.

BUFFERED OUTPUT -- The **BUFFERED TRANSDUCER** coaxial cable connector on the front panel of the tachometer provides the buffered signal from the transducer. The buffered output signal can be selected as the raw transducer input or the conditioned transducer input. The conditioned signal is a 0 to 5 Vdc pulse wave-form which is used within the tachometer to determine shaft speed. Use this connector to connect external equipment to the tachometer.

RECORDER OUTPUT -- Depending on the option selected, the recorder output levels proportional to shaft speed are 0 to -10 Vdc, +1 to +5 Vdc, or +4 to +20 mA. Each tachometer has one recorder. **Use the recorder output for data logging purposes only. The recorder output is not suitable for use as a control system input.**

Self Tests

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

POWER UP -- A Power-up self test, consisting of a series of basic tachometer OK tests, is performed automatically each time the tachometer is turned on.

CYCLIC -- A Cyclic self test is performed automatically while the tachometer is operating. Any error encountered during cyclic tests disables the tachometer and flashes an error code on the front panel display. If the error is intermittent, the tachometer will begin operating again, and the error code will be stored for retrieval during User-invoked self tests. Stored error codes are indicated by the **CHANNEL OK** LED flashing at 5 Hz (5 times per second).

USER INVOKED -- A User-invoked self 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 **CHANNEL OK** LED at 5 Hz and displaying the error codes on the front panel liquid crystal display (LCD).

4 BACKPLANE INSTALLATION

The Overspeed system has its own backplane that mounts **inside** the 3300 rack and connects to the 3300 System backplane. The 3300/53 Tachometers connect to the Overspeed system backplane.
The Overspeed system backplane is held in position by two retention plates which are fitted behind the 3300 System backplane connectors. Install the Overspeed system backplane using the following procedure.

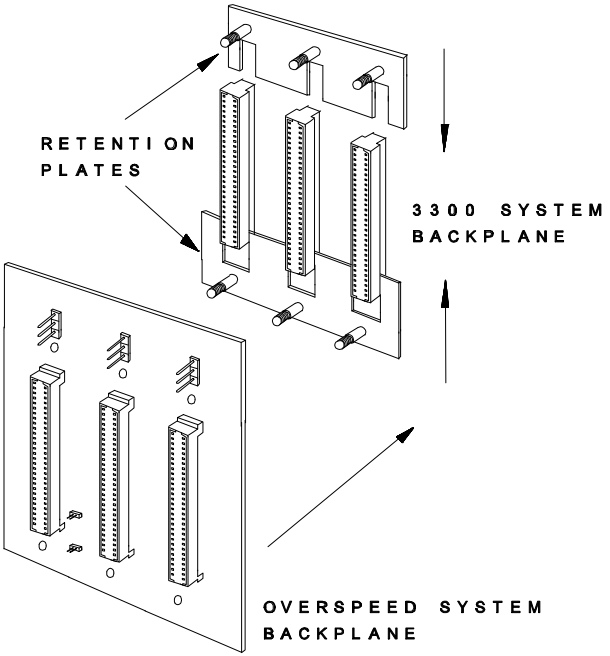
1. Set the jumper option on the backplane as follows.

WARNING

Incorrect jumper optioning of the Overspeed backplane could cause the Overspeed system to float without reference. This may cause high voltage to be present which can cause shock, burns, or death.

BACKPLANE OPTION	INSTALL	REMOVE
The 3300 rack contains a 3300 Power Supply	-	W1
The 3300 rack does not contain a 3300 Power Supply.	W1	-

4 BACKPLANE INSTALLATION



2. Slide the top retention plate behind the 3300 System backplane connectors.

3. Slide the lower retention plate behind the 3300 System backplane connectors and hold in position.

4. Press the Overspeed system backplane connectors into the 3300 System backplane connectors. Ensure that the retention plate studs pass though the holes in the Overspeed system backplane.

5. Secure the Overspeed system backplane in position by screwing the fastening nuts onto the retention plate studs. Lightly tighten the fastening nuts using an appropriate nut driver or spanner.

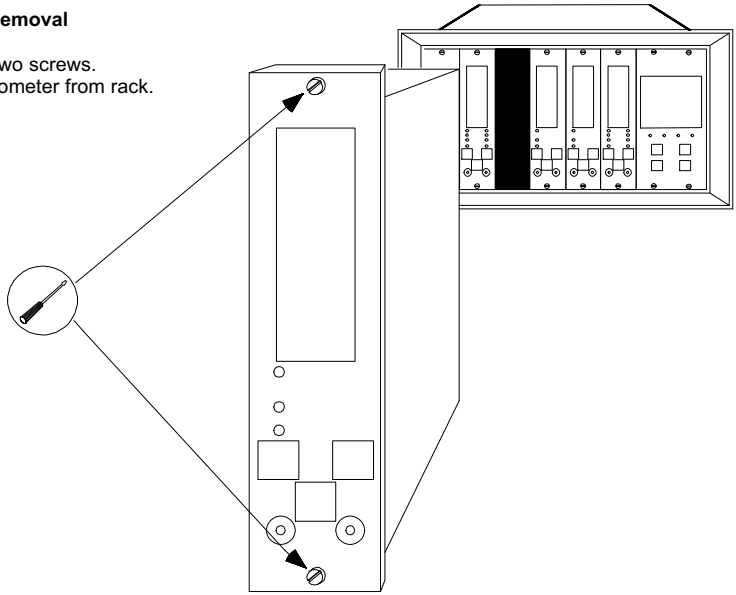
5 TACHOMETER REMOVAL

Removing a tachometer or input module from the system while the machine is running involves certain risks and compromises the redundant security of the system. Use the following precautions whenever you remove a tachometer or input module from the Overspeed system:

RISK	SUGGESTED PRECAUTION
The machine will shut down if all tachometers are removed from the rack or if all tachometers are not OK.	Remove only one tachometer at a time from the rack. Check that the tachometers that remain in the rack are OK and not in Overspeed alarm before removing a tachometer. (See section 9)
The machine will shut down if the input module is removed incorrectly.	Follow the Module Removal procedure (section 6) carefully and in the correct order.
Components in the tachometer can be damaged by electrostatic discharge (ESD).	Use a grounding strap when maintaining or handling the tachometer and use antistatic bags to store or transport the tachometer.

Tachometer Removal

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



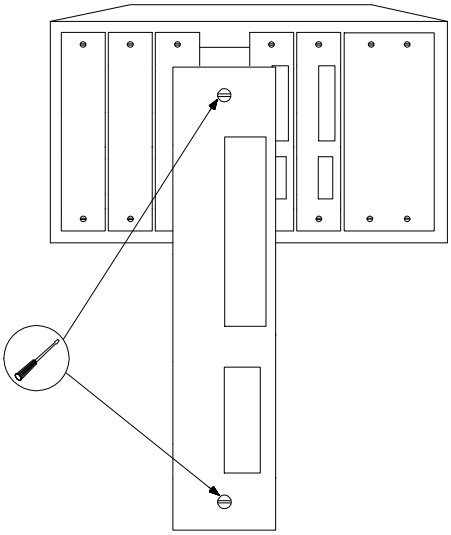
6 SIGNAL AND POWER INPUT MODULE

WARNING

High voltage present. Contact could cause shocks, burns, or death.

When removing a Power and Signal Input Module, ensure an external ground supply cable remains connected to either an Input Module not being removed, or to the 3300 Power Supply (if fitted).
Refer to the Field Wiring Diagrams section of this manual for earthing guidelines.

The Signal and Power Input Module is on the back of the rack. For field wiring diagrams, refer to the Field Wiring Diagrams section of this manual.



Module Removal

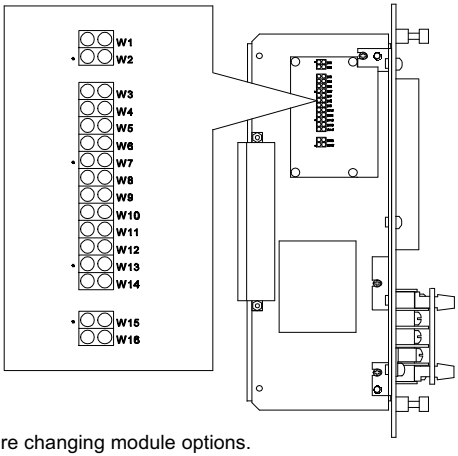
1. Bypass any external components (i.e. interposing relay) specified in the System Integrator's module removal procedure that are connected to the module.
2. Remove Power and Relay wiring, observing **WARNING** above.
3. Wear a grounding strap to prevent electrostatic discharge (ESD).
4. Remove the tachometer which is part of the same channel as the module being removed. Refer to Section 5, Tachometer Removal.
5. Loosen two screws.
6. Pull module from rack.

6 SIGNAL AND POWER INPUT MODULE

WARNING

Contact with High Voltage could cause shocks, burns, or death.

Ensure Power and Relay wiring has been removed before proceeding.



Module Options

Remove all four shunts from jumpers W1-W16 before changing module options.

Ensure the coil check circuit jumpers correspond to the interposing relay and solenoid valve operating voltage. **Incorrect optioning of jumpers W1-W16 may result in a machine shutdown.**

Coil Voltage Option	Install jumper	
	Coil Check Circuit 1	Coil Check Circuit 2
12 Vdc	W12 & W16	W1 & W6
24 Vdc	W11 & W16	W1 & W5
48 Vdc	W10 & W16	W1 & W4
110/125 Vdc	W9 & W16	W1 & W3
110/120 Vac	W14 & W15	W2 & W8
220/240 Vac *	W13 & W15 *	W2 & W7 *

NOTES:

* Denotes jumper settings when the module was shipped (for modules not requiring agency approvals).

BASEEFA approved modules cannot be optioned in the field.

For field wiring, see the Field Wiring Diagrams section of this manual.

7 TACHOMETER OPTIONS

OVERSPEED PROTECTION SYSTEM PART NUMBER

3300/53 ___ AA ___ BB ___ CC ___ DD ___ EE ___ FF ___ GG ___ HH

AA	Components	00 = 1 Tachometer (without a front panel) 01 = 1 Tachometer & 1 input module 02 = 2 Channel System 03 = 3 Channel System
BB	Power Input Voltage	01 = 110 Vac power supply 02 = 220 Vac power supply
CC	Events Per Revolution Hundreds	00 = 0 Hundreds of events per revolution 01 = 1 Hundreds of events per revolution 02 = 2 Hundreds of events per revolution
DD	Events Per Revolution Units	00 = 0 units of events per revolution through 99 = 99 units of events per revolution
EE	Recorder Full Scale Range	01 = 1000 RPM Recorder Full Scale through 20 = 20000 RPM Recorder Full Scale
FF	Agency Approvals	00 = No agency approval 01 = CSA 02 = BASEEFA
GG	Coil 1 Voltage Rating	00 = Non BASEEFA Approval 01 = No Coil 1 checking 02 = 12 Vdc 03 = 24 Vdc 04 = 48 Vdc 05 = 110 Vdc 06 = 120 Vac 07 = 240 Vac

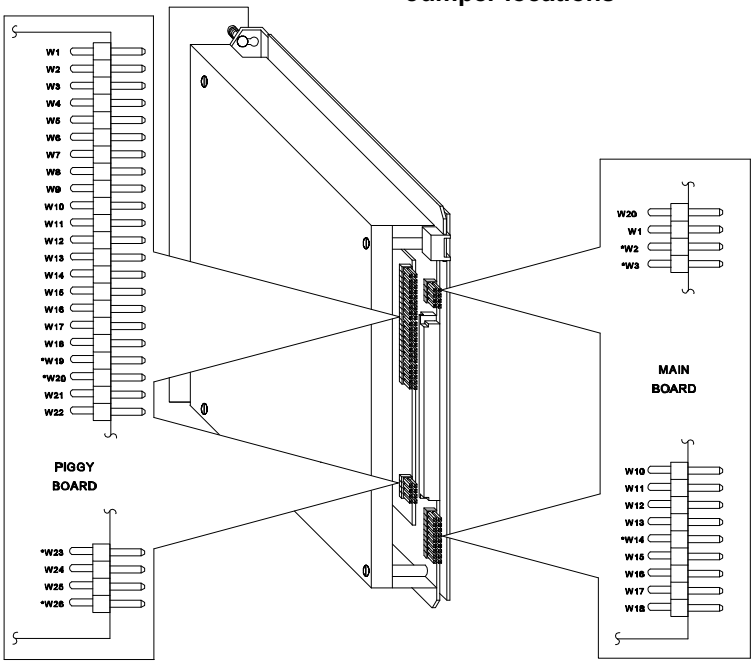
7 TACHOMETER OPTIONS

HH	Coil 2 Voltage Rating	00 = Non BASEEFA Approval 01 = No Coil 2 checking 02 = 12 Vdc 03 = 24 Vdc 04 = 48 Vdc 05 = 110 Vdc 06 = 120 Vac 07 = 240 Vac

PROGRAMMABLE OPTIONS

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

Jumper locations



7 TACHOMETER OPTIONS

Main Board Options

Use this table and the circuit board diagram on the previous page to set options.

OPTIONS	SETTING	INSTALL	REMOVE
OK Mode	Latching	W10	———
	Nonlatching *	———	W10
Coil 1 Check	Enable	W11	———
	Disable *	———	W11
Coil 2 Check	Enable	W12	———
	Disable *	———	W12
Transducer Input **	3300 and 7200 Proximitor	W1, W13, W20	W2, W3, W14
	Magnetic Pickup *	W2, W3, W14	W1, W13, W20

NOTES:
* Denotes option settings when module was shipped.
** There is an additional setting on the Piggy board for this option.
Jumpers W15 - W18 are not used.

Piggy Board Options

Use this table and the circuit board diagram on the previous page to set options.

OPTIONS	SETTING	INSTALL	REMOVE
Transducer Hysteresis Conditioning	0.2 Volts	W25	W24, W26
	0.5 Volts *	W26	W24, W25
	1.25 Volts	W24	W25, W26
	2.0 Volts	———	W24, W25, W26

7 TACHOMETER OPTIONS

Piggy Board Options (continued)

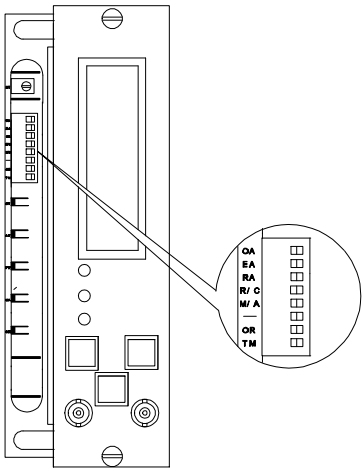
OPTIONS	SETTING	INSTALL	REMOVE
Recorder Output	+4 To +20 mA *	W20	W17, W18, W21, W22
	+1 To +5 Volts	W17, W22	W18, W20, W21
	0 To -10 Volts	W18, W21, W22	W17, W20
Recorder Clamping	NOT OK = 4 mA	———	W19
	NOT OK = 2 mA *	W19	
Transducer Input **	3300 and 7200 Proximitor	———	W23
	Magnetic Pickup *	W23	———

NOTES:
* Denotes option settings when tachometer was shipped.
** There is an additional setting on the Main board for this option.
Jumpers W1- W16 are spare jumper header holders.

Dip Switch Settings

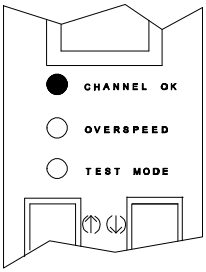
The figure on the right shows the location of the Dip Switches.

SWITCH NAME	SWITCH SETTING	
	LEFT	RIGHT
R/C	Raw buffered transducer	Conditioned buffered transducer
M/A	Manual Threshold	Automatic threshold



8 CHANNEL OK

Channel OK



NOTE: Each tachometer has an OK relay. When a channel is OK, the OK relay will be energized (ON, contact **NO** connected to **ARM**). A channel that is not OK will de-energize it's OK relay (OFF, contact **NC** connected to **ARM**). The Overspeed Tachometers do **not** drive the 3300 System OK Relay.

CHANNEL OK LED	LCD DISPLAY	CONDITION	OK RELAY
□		Tachometer OK The RPM value is greater than 100 RPM There are no missing or extra pulses Coil Check circuits are OK.	ON
□	tdcr	The RPM value is less than 101 RPM, or There are missing or extra pulses *	OFF**
□	COIL1	Coil Check circuit 1 is not OK	OFF
□	COIL2	Coil Check circuit 2 is not OK	OFF
◎	tdcr	Flashing at 1 Hz means that the transducer has been not OK since the last reset, or a Power-up or User-invoked self test.	ON
◎	COIL1	Flashing at 1 Hz means that Coil Check circuit 1 has been not OK since the last reset.	ON
◎	COIL2	Flashing at 1 Hz means that Coil Check circuit 2 has been not OK since the last reset.	ON

8 CHANNEL OK

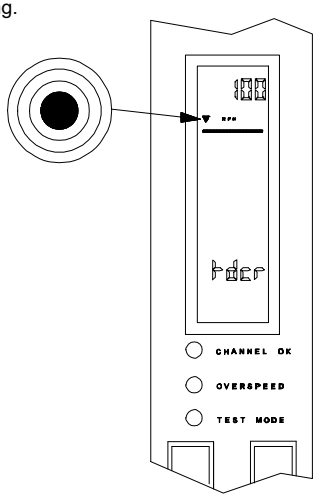
Channel OK Continued

CHANNEL OK LED	LCD DISPLAY	CONDITION	OK RELAY
◎		Flashing at 5 Hz means that an error was found during a cyclic test. See Section 26 on how to read stored error codes.	OFF***
□		Loss of tachometer power supply.	OFF

* The front panel will still indicate the current RPM when this is below 101 RPM.

** A not OK channel caused by an RPM value of 100 RPM or less can have Channel OK restored by closing the external OK Inhibit contacts.

*** The OK relay will be on if the EEPROM contains stored errors and an error does not currently exist, and the OK mode is nonlatching.



The flashing triangular down arrow on the front panel display indicates that the RPM value is 100 RPM or less.

NOTE: A not OK channel caused by an RPM value of 100 RPM or less can be bypassed to restore Channel OK by closing the external OK Inhibit contacts.

8 CHANNEL OK

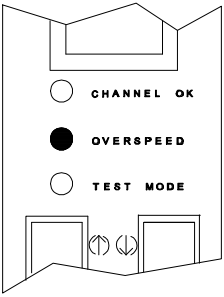
Exceptions With Coil Checking Enabled in a System

NOTE: In a Two Channel Overspeed Protection System with coil checking enabled, a Not OK condition on both channels will cause the Overspeed Relay to trip. The table below shows the front panel display under each Not OK condition. The Overspeed Relay is connected across the COIL1 coil checking circuitry. Because of this, even when the cause of original Not OK condition has been corrected, all channels will remain Not OK. The front panel display will be as shown in the table below. Self test must be performed on any channel to clear the Not OK conditions (refer to section 26,SELF TEST). Once self test has been performed, any stored errors must be cleared (refer to section 24, RESET ALARMS). The system will then return to normal operation.

CHANNEL	CHANNEL OK LED	LCD DISPLAY	CONDITION	LCD DISPLAY AFTER CLEARING THE CAUSE OF NOT OK
1	□	tdcr	The RPM value is less than 101 RPM, or There are missing or extra pulses	COIL1
2	□	tdcr		COIL1
1	□	COIL1	Coil Check circuit 1 or 2 is Not OK	COIL1
2	□	COIL1		COIL1

9 OVERSPEED ALARM

Overspeed LED

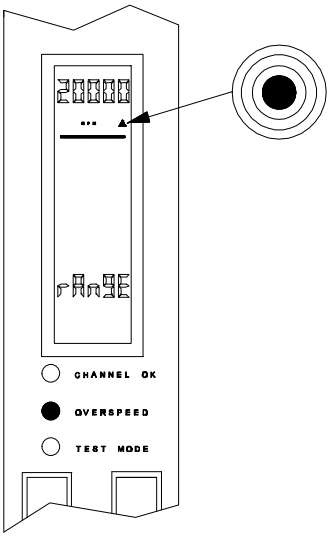


LED DISPLAY	CONDITION
○ OVERSPEED	Tachometer RPM value is less than the Overspeed setpoint.
● OVERSPEED	Tachometer RPM value is equal to or greater than the Overspeed setpoint.*

* The Overspeed alarm is latching. To reset an Overspeed alarm, refer to Section 24.

9 OVERSPEED ALARM

Overrange



The flashing triangular up arrow and "rAngE" on the LCD display indicate that the tachometer speed input is overrange. The overrange RPM is dependent on the Overspeed setpoint and events per revolution setting as given by the following formula.

Overrange RPM = (120000000 X Divide) / (EPR X 1428)

where Divide = Round up to integer value ((Overspeed setpoint X EPR) / 30000)

where EPR = Events per Revolution setting

In the overrange condition, the tachometer is no longer able to monitor the shaft speed because the speed input signal is too great. **Do not use a tachometer in an application where the machine speed may reach the overrange RPM value.**

9 OVERSPEED ALARM

Overspeed Relay Operation

Each tachometer has an Overspeed relay. Each Overspeed relay is normally energized (ON = no alarm, contact **NO** connected to **ARM**). When the Overspeed system alarm voting criteria is satisfied and the tachometer is present in the rack each Overspeed relay is de-energized (OFF = alarm, contact **NC** connected to **ARM**). See Tables 9.1 and 9.2 for the operation of the Overspeed relays.

VOTING CRITERIA FOR A TWO CHANNEL SYSTEM

The table below lists all the conditions which cause a tachometer Overspeed relay to be de-energized (OFF = alarm).

9.1 Overspeed Relay Operation - Two Channel System

TACHOMETER CHANNEL STATUS		CHANNEL OVERSPEED RELAY	
1	2	1	2
● OVERSPEED	● CHANNEL OK -- ○ CHANNEL OK -- ○ OVERSPEED	OFF	OFF
● CHANNEL OK -- ○ CHANNEL OK -- ○ OVERSPEED	● OVERSPEED	OFF	OFF
● OVERSPEED	● OVERSPEED	OFF	OFF
○ CHANNEL OK	○ CHANNEL OK	OFF	OFF
● OVERSPEED	Tachometer removed from rack	OFF	ON
Tachometer removed from rack	● OVERSPEED	ON	OFF
○ CHANNEL OK	Tachometer removed from rack	OFF	ON
Tachometer removed from rack	○ CHANNEL OK	ON	OFF
Tachometer removed from rack	Tachometer removed from rack	OFF	OFF

NOTE: Refer to section 8 for a description of the conditions which cause a channel to go not OK.

9 OVERSPEED ALARM

VOTING CRITERIA FOR A THREE CHANNEL SYSTEM

The table below lists all the conditions which cause a tachometer Overspeed relay to be de-energized (OFF = alarm).

9.2 Overspeed Relay Operation - Three Channel System

TACHOMETER CHANNEL STATUS			CHANNEL OVERSPEED RELAY		
1	2	3	1	2	3
● OVERSPEED	● OVERSPEED	● CHANNEL OK - ○ OVERSPEED	OFF	OFF	OFF
● OVERSPEED	● CHANNEL OK - ○ OVERSPEED	● OVERSPEED	OFF	OFF	OFF
● CHANNEL OK - ○ OVERSPEED	● OVERSPEED	● OVERSPEED	OFF	OFF	OFF
● OVERSPEED	● OVERSPEED	● OVERSPEED	OFF	OFF	OFF
○ CHANNEL OK	● OVERSPEED	● CHANNEL OK - ○ CHANNEL OK - ○ OVERSPEED	OFF	OFF	OFF
○ CHANNEL OK	● CHANNEL OK - ○ CHANNEL OK - ○ OVERSPEED	● OVERSPEED	OFF	OFF	OFF
● OVERSPEED	○ CHANNEL OK	● CHANNEL OK - ○ CHANNEL OK - ○ OVERSPEED	OFF	OFF	OFF

9 OVERSPEED ALARM

9.2 Continued

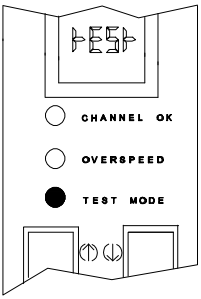
TACHOMETER CHANNEL STATUS			CHANNEL OVERSPEED RELAY		
1	2	3	1	2	3
● CHANNEL OK - ○ CHANNEL OK - ○ OVERSPEED	○ CHANNEL OK	● OVERSPEED	OFF	OFF	OFF
● OVERSPEED	● CHANNEL OK - ○ CHANNEL OK - ○ OVERSPEED	○ CHANNEL OK	OFF	OFF	OFF
● CHANNEL OK - ○ CHANNEL OK - ○ OVERSPEED	● OVERSPEED	○ CHANNEL OK	OFF	OFF	OFF

NOTES:

1. Refer to section 8 for a description of the conditions which cause a channel to go not OK.

2. When a tachometer is not OK or removed from the rack, the Overspeed system will revert to the Overspeed relay operation of a two channel system (see Table 9.1 above). While a tachometer is removed from the rack it's Overspeed relay will **not** be de-energized.

10 TEST MODE

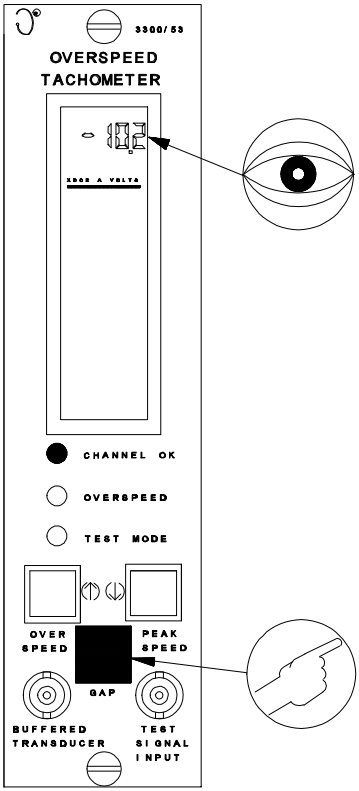


TEST MODE LED	LCD DISPLAY	CONDITION
□		Tachometer performing normal monitoring.
□	TEST	Tachometer in Test mode.

11 READ GAP VOLTAGE

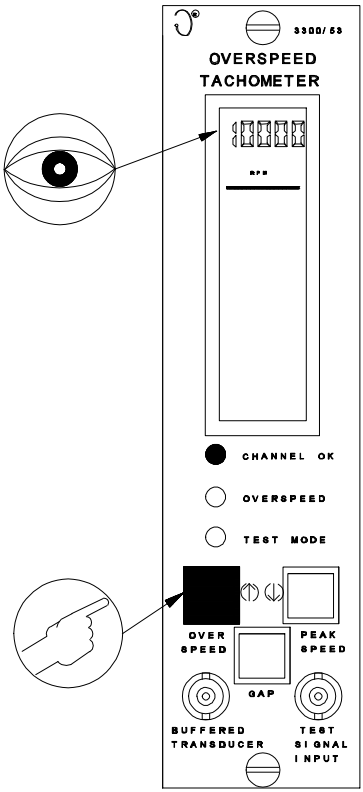
Press the **GAP** switch and read the transducer voltage.

NOTE: The voltage will only be displayed when a Proximitor® is programmed as the transducer input.



12 READ SETPOINT

Press the **OVERSPEED** switch and read the Overspeed setpoint on the front panel display.

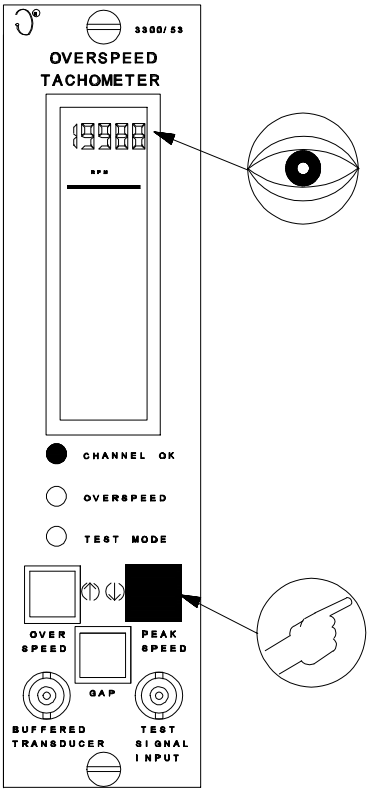


13 READ PEAK HOLD

Press the **PEAK SPEED** switch and read the peak hold value.

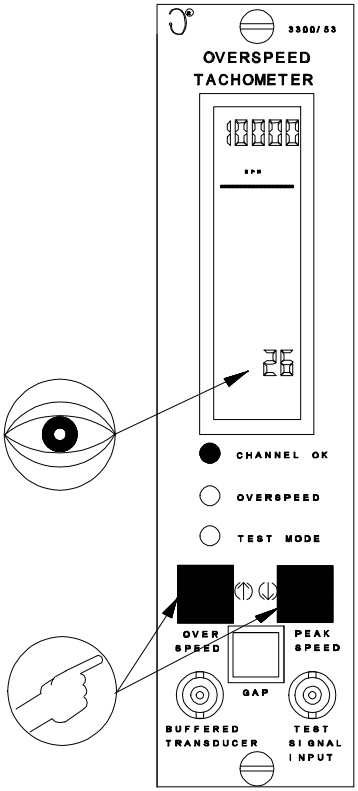
The peak hold value is the maximum RPM obtained during normal monitoring since the last peak hold reset.

Pressing the **PEAK SPEED** switch when in Test Mode displays the peak hold value obtained during Test Mode. The peak hold value is the maximum RPM obtained since the last peak hold reset.



14 READ ALARM RESPONSE TIME

Press the **OVERSPEED** and **PEAK SPEED** switches simultaneously to read the Overspeed alarm response time. This tachometer is displaying an alarm response time of 26 milliseconds.



15 MONITOR ADJUST MODE

Place the tachometer in Monitor Adjust mode to enable any of the following functions:

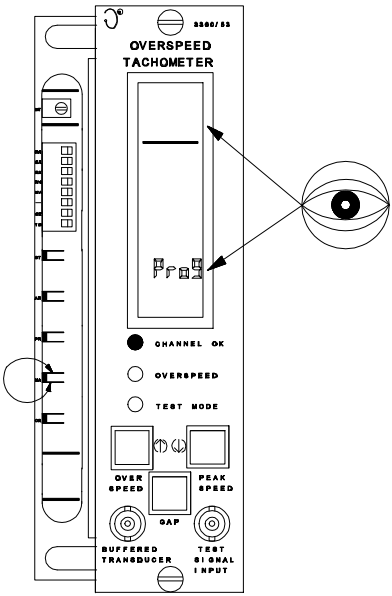
TERMINAL/DIP SWITCH SYMBOL	FUNCTION	SEE SECTION
PR	Reset Peak Hold	16
RA	Adjust Recorder Full Scale Range	17
EA	Adjust Events per Revolution	18
OA	Adjust Overspeed Setpoint	20
TM	Test Channel OK	21
TM	Test OK Inhibit	22
TM, OR	Test Overspeed Alarm	23
AR	Reset Alarms	24
ST	User-invoked self test	26

Components in the tachometer can be damaged by electrostatic discharge (ESD).

Use a grounding strap when maintaining or handling the tachometer.

To enter Monitor Adjust mode, short the Monitor Adjust terminals (**MA**) using a clip lead. The front panel will display "Prog".

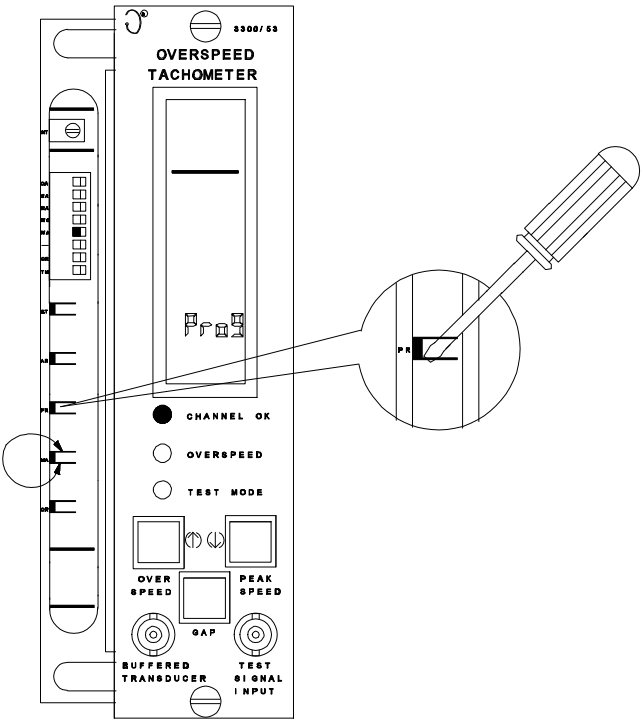
NOTE: Overspeed monitoring is performed during Monitor Adjust mode.



16 RESET PEAK HOLD

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Reset the values stored in Peak Hold memory by shorting across Peak Hold Reset (**PR**) pins for 10 seconds. The maximum speed under normal monitoring and the maximum speed detected during Test Mode will be reset to zero.

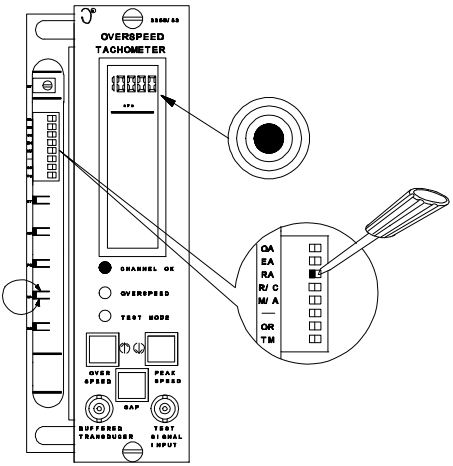


17 ADJUST RECORDER FULL SCALE

The recorder full scale range is factory set to the customer ordered option.

1. Place the tachometer in Monitor Adjust mode (see Section 15).

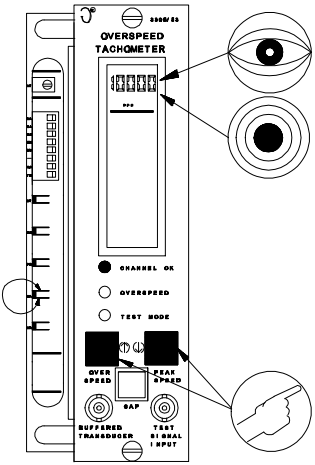
2. Set the Recorder Full Scale Range Adjust (**RA**) switch to the left (ON). The recorder full scale will begin flashing.



3. Adjust the setting for the recorder full scale by pressing the (▲) or (▼) switches on the tachometer.

4. Set the Recorder Full Scale Range Adjust switch (**RA**) to the right (OFF). If the short is removed from the Monitor Adjust terminals (**MA**) before the **RA** switch is set OFF, the adjustment will not be stored.

5. Remove the clip lead from the Monitor Adjust terminals **MA**.



18 ADJUST EVENTS PER REVOLUTION

The events per revolution is factory set to the number of teeth on the multitooth gear being observed by the tachometer's transducer. **Since adjusting events per revolution incorrectly or inconsistently may compromise the machinery protection, keep the following precautions in mind before you proceed with this procedure.**

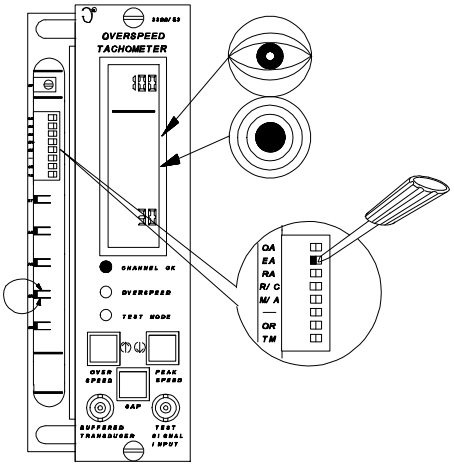
RISK	SUGGESTED PRECAUTIONS
Loss of machine protection or machine shutdown.	Adjust events per revolution correctly and check that the setting for events per revolution is the same for all the tachometers in the system.
Reading for speed is overrange.	The events per revolution is limited by the Overspeed setpoint as given in this relation: $EPR < \frac{1875000}{Overspeed\ Setpoint}$ where EPR = Events per revolution. When changing the events per revolution to a higher value, first change the Overspeed setpoint to its required value.

Adjusting the events per revolution while the machine is running may compromise the redundant security of the system because the channel may go not OK when the new event per revolution setting is stored. **Check that the tachometers that are not being adjusted are installed and are OK and not in Overspeed alarm before using this procedure.**

18 ADJUST EVENTS PER REVOLUTION

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Set the Events Per Revolution Adjust switch (**EA**) to the left (ON). The events per revolution and the associated alarm response time will begin flashing. This tachometer is displaying an events per revolution of 100 and an alarm response time of 30 milliseconds.



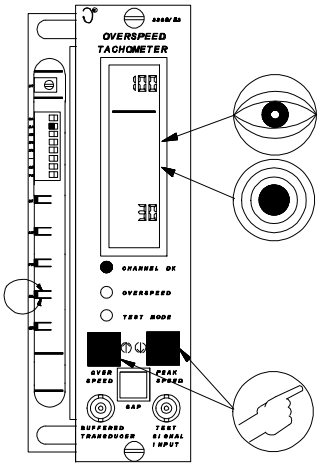
3. Adjust the setting for the events per revolution by pressing the (▲) or (▼) switches on the tachometer.

4. Verify the response time as displayed at the bottom of the LCD is fast enough for your protection system. If the time is too slow, use a multitooth gear which has more teeth and readjust the events per revolution setting.

5. Set the Events Per Revolution Adjust switch (**EA**) to the right (OFF). If the short is removed from the Monitor Adjust terminals (**MA**) before the **EA** switch is set OFF, the adjustment will not be stored.

6. Remove the clip lead from the Monitor Adjust terminals **MA**.

7. If the transducer goes not OK when the clip lead is removed, perform Reset Alarms to restore the **CHANNEL OK** LED (see Section 24). The OK relay will also be restored if the OK mode is set to latching.

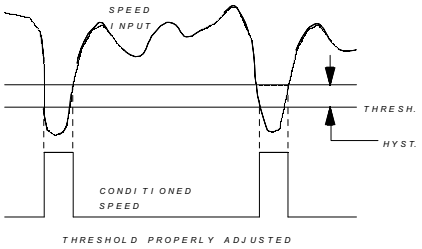


19 ADJUST THRESHOLD AND HYSTERESIS

The tachometer is shipped from the factory with the threshold set to automatic. The automatic threshold has a lower operation limit of 10 Hz. The automatic threshold should work well in most installations. If you cannot obtain an acceptable trigger out signal with this setting, use section 7 (Tachometer Options) to change the threshold setting to manual, and use the following procedure to adjust the threshold.

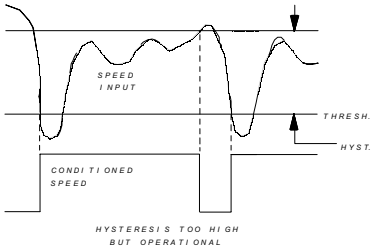
This procedure shows how to adjust the manual threshold and hysteresis so that the trigger out signal contains one pulse for each transducer event in the input signal. Threshold is the voltage level in the input signal where the trigger out pulse is turned on. Hysteresis is the difference between the level where the trigger out pulse turns on and the level where it turns off.

The objective of the procedure is to set the manual threshold and hysteresis so that the trigger out signal contains one pulse for each transducer event as shown in figure 1. Figures 2 and 3 show the effect of incorrect adjustments.



F I G U R E 1

FIGURE 2



The Overspeed Tachometer is normally shipped from the factory with the hysteresis set at 0.5 V. Since this setting should work well in most installations, we recommend that you leave the hysteresis setting at 0.5 V and use the following procedure to adjust the threshold. If you cannot obtain an acceptable trigger out signal with this procedure, use section 7 (Tachometer Options) to change the hysteresis setting.

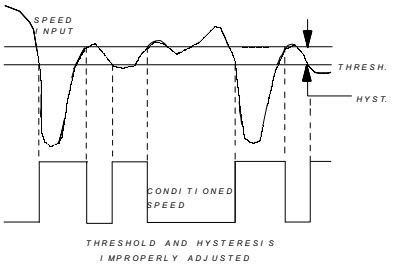


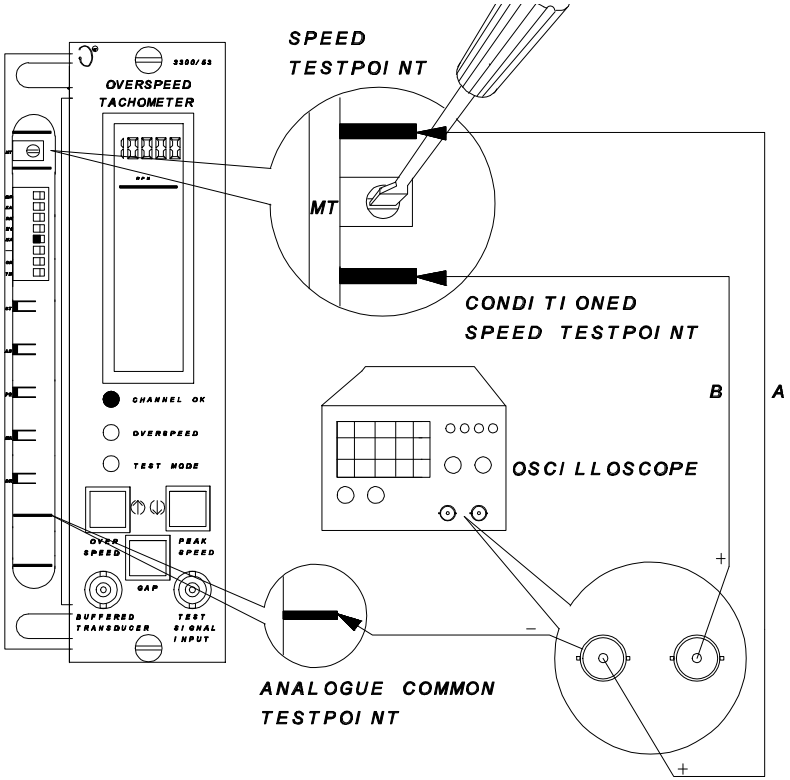
FIGURE 3

Before you begin this procedure, you will need a dual trace oscilloscope and you will need to check that the transducer is properly installed and that the machine is running.

19 ADJUST THRESHOLD AND HYSTERESIS

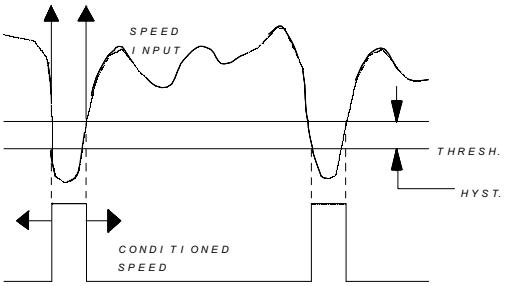
Adjusting the manual threshold while the machine is running may compromise the redundant security of the system because the channel may go not OK during the procedure. **Check that the tachometers that are not being adjusted are installed and are OK and not in Overspeed alarm before using this procedure.**

1. Connect an oscilloscope as shown below.

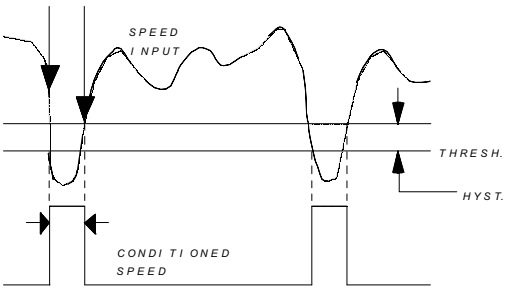


19 ADJUST THRESHOLD AND HYSTERESIS

Turning the adjustment screw on the manual threshold (**MT**) potentiometer counter clockwise will move the trigger points up.



Turning the adjustment screw on the manual threshold (**MT**) potentiometer clockwise will move the trigger points down.



2. If the conditioned speed square wave is not present, adjust the potentiometer clockwise or counter clockwise until the conditioned speed square wave appears.

3. Adjust the manual threshold so that the conditioned speed edges are centred around the negative peak of the input signal.

4. Remove the oscilloscope and close the front panel.

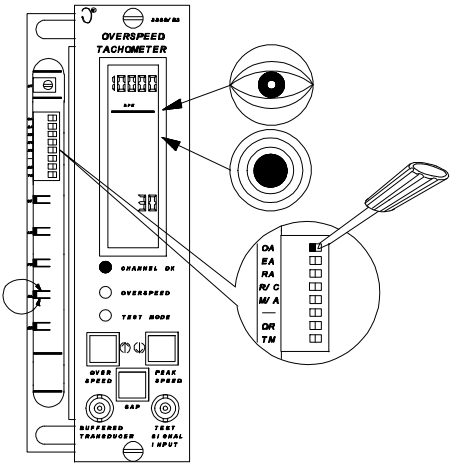
20 ADJUST OVERSPEED SETPOINT

Adjusting the Overspeed setpoint incorrectly can compromise the redundant security of the system and affect the alarm response time. **Keep the following items in mind before using this procedure:**

- **The setpoints in all the tachometers in a system must be the same. Settings that are not the same will result in loss of machine protection or cause a machine shut down.**
- **The setting for Overspeed setpoint and events per revolution affect the alarm response time. Be sure that the settings for these parameters will provide an adequate alarm response time.**
- **The tachometer may go not OK when the new setpoint is stored. Check that the tachometers that are not being adjusted are installed and are OK and not in Overspeed alarm before using this procedure.**

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Set the Overspeed Setpoint Adjust switch (**OA**) to the left (ON). The Overspeed setpoint and alarm response time will begin flashing. This tachometer is displaying an Overspeed setpoint of 10000 RPM and an alarm response time of 30 milliseconds.



20 ADJUST OVERSPEED SETPOINT

3. Adjust the Overspeed setpoint by pressing the (▯) or (▯) switches on the tachometer. The Overspeed setpoint has a maximum value of 20000 RPM. The Overspeed setpoint is also limited by the events per revolution as given in this relation:

$$Setpoint < \frac{1875000}{EPR}$$

   where EPR = Events per revolution.

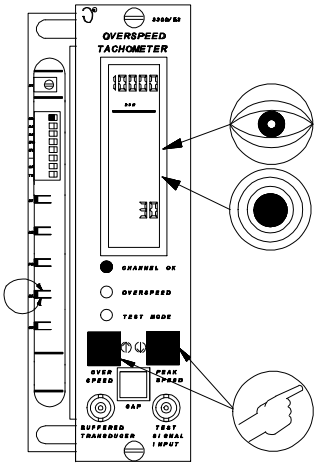
   When changing the Overspeed setpoint to a higher value, first change the events per revolution to its required value.

4. Verify that the alarm response time as displayed at the bottom of the LCD is fast enough for your system. If the time is too slow, use a multitooth gear which has more teeth and readjust the events per revolution setting (see Section 18).

5. Set the Overspeed Setpoint Adjust switch (**OA**) to the right (OFF). If the short is removed from the Monitor Adjust terminals (**MA**) before the **OA** switch is set OFF, the adjustment will not be stored.

6. Remove the clip lead from the Monitor Adjust terminals **MA**.

7. If the transducer goes not OK when the clip lead is removed, perform Reset Alarms to restore the **CHANNEL OK** LED (see Section 24). The OK relay will also be restored if the OK mode is set to latching.



21 TEST CHANNEL OK

Testing channel OK while the machine is running will compromise the redundant security of the system because the channel will go not OK during the test. **Check that the tachometers that are not being tested are installed and are OK and not in Overspeed alarm before using this test.**

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Set the Test Mode switch (**TM**) to the left (ON).

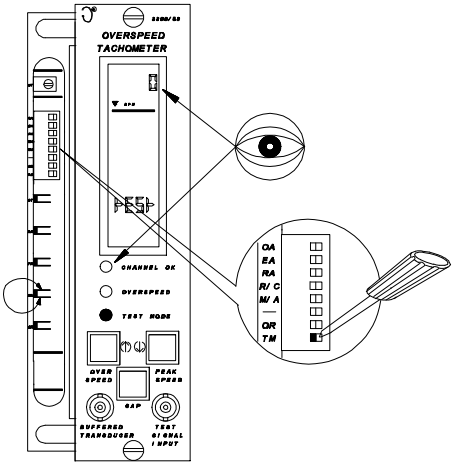
3. Verify that the front panel displays 0 RPM, the **CHANNEL OK** LED goes off, the **TEST MODE** LED comes on, and the OK relay is driven off.

4. Set the Test Mode switch (**TM**) to the right (OFF). The **TEST MODE** LED will go off.

5. Perform Reset Alarms to restore the **CHANNEL OK** LED. The OK relay will also be restored if the OK mode is set to latching (see Section 24).

NOTE: With low RPMs and low events per revolution, it may take up to 30 seconds for the tachometer to go OK.

6. Remove the clip lead from the Monitor Adjust terminals **MA**.



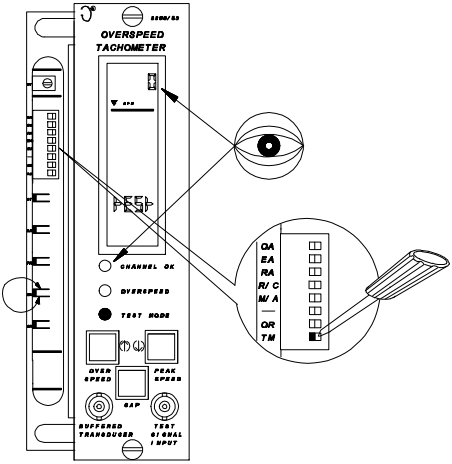
22 TEST OK INHIBIT

Testing OK inhibit while the machine is running will compromise the redundant security of the system because the channel will go not OK during the test. **Check that the tachometers that are not being tested are installed and are OK and not in Overspeed alarm before using this test.**

1. Place the tachometer in Monitor Adjust mode (see Section 15).

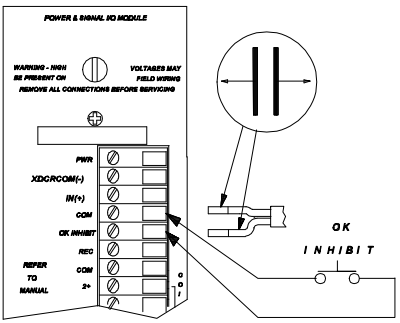
2. Set the Test Mode switch (**TM**) to the left (ON).

3. Verify that the front panel displays 0 RPM, the **CHANNEL OK** LED goes off, the **TEST MODE** LED comes on, and the OK relay is driven off.



4. Disconnect the OK Inhibit field wiring from the **OK INHIBIT** and **COM** terminals on the Signal and Power Input Module.

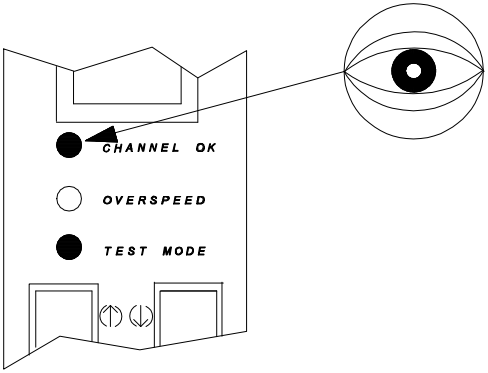
5. Connect a switch between the **OK INHIBIT** and **COM** terminals so the switch can be used to open or close the contact between the two terminals.



22 TEST OK INHIBIT

6. Set the switch so that the connection is closed.

7. Perform Reset Alarms (see Section 24). Verify that the **CHANNEL OK** LED remains on steady and the OK relay is driven on (OK).



8. Set the switch so that the connection between the **OK INHIBIT** and **COM** terminals is open.

9. Verify that the **CHANNEL OK** LED goes off and the OK relay is driven off.

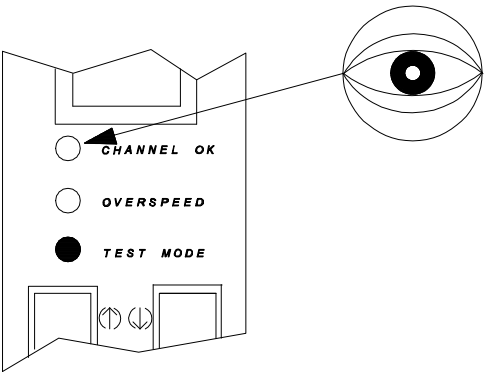
10. Disconnect the switch and reconnect the field wiring.

11. Set the Test Mode switch (**TM**) to the right (OFF). The **TEST MODE** LED will go off. The OK relay will be restored if the channel is OK and the OK mode is set to nonlatching.

12. Perform Alarms Reset to restore the **CHANNEL OK** LED. This will also restore OK relay if the OK mode is set to latching (see Section 24).

NOTE: With low RPMs and low events per revolution, it may take up to 30 seconds for the tachometer to go OK.

13. Remove the clip lead from the Monitor Adjust terminals **MA**.



23 TEST OVERSPEED ALARM

A complete Overspeed system test, including voting logic, should be performed by the System Integrator when the system is commissioned and at any time the system configuration is changed.

The following tests are intended for routine checks of each channel. They have limited capability to exercise portions of the shutdown system. The exact type of test that is performed in these routine tests and the frequency of the tests are critical to the proper functioning of the shutdown system and should be determined by the System Integrator.

Testing the Overspeed alarm while the machine is running will compromise the redundant security of the system because the channel will go not OK during the test. **Check that the tachometers that are not being tested are installed and are OK and not in Overspeed alarm before using this test.**

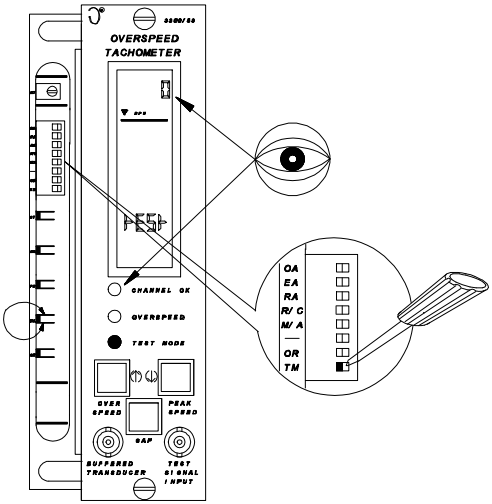
Test Overspeed Setpoint

Use the following procedure to verify the Overspeed setpoint.

NOTE: The Overspeed relay will NOT change state during this procedure.

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Set the Test Mode (**TM**) switch to the left (ON). The front panel will display 0 RPM, the **CHANNEL OK** LED will go off, the **TEST MODE** LED will come on, and the OK relay will be driven off.



23 TEST OVERSPEED ALARM

3. Connect a function generator to the front panel connector as shown on the right. Adjust the function generator to obtain a square wave with an amplitude of between 2 V pp and 10 V pp, with zero Vdc offset.

4. Set the transducer threshold to Automatic (see Section 7).

5. Adjust the function generator frequency using the following relation to obtain an RPM signal which is greater than 100 RPM and less than the Overspeed setpoint.

   Frequency = (RPM x EPR) / 60

   Where EPR is the events per revolution setting.

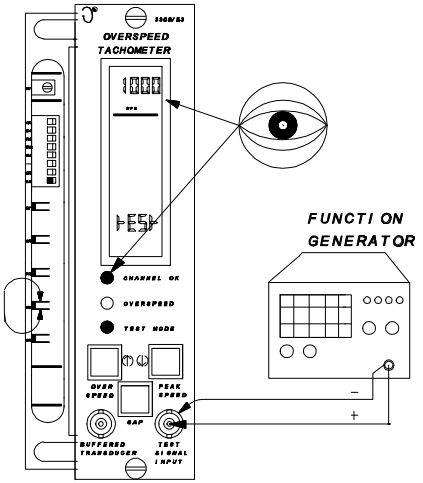
6. Perform Alarms Reset (see Section 24). The **CHANNEL OK** LED will come on, the OK relay will go OK and the front panel will display RPM.

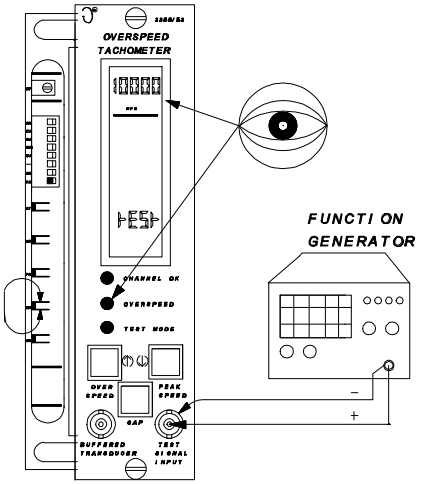
7. Gradually increase the function generator frequency to the Overspeed setpoint. Verify that the **OVERSPEED** LED comes on.

8. Disconnect the function generator and set the Test Mode (**TM**) switch to the right (OFF). The **TEST MODE** LED will go off and the **OVERSPEED** LED will go off. Reset the transducer threshold to Manual if this is the desired setting (see Section 7). The OK relay will be restored if the OK mode is set to nonlatching.

9. Perform Alarms Reset to restore the **CHANNEL OK** LED. This will also restore the OK relay if the OK mode is set to latching (see Section 24).

10. Remove the clip lead from the Monitor Adjust terminals (**MA**).





23 TEST OVERSPEED ALARM

Test Overspeed Relay

Use the following procedure to verify the tachometer Overspeed relay operation

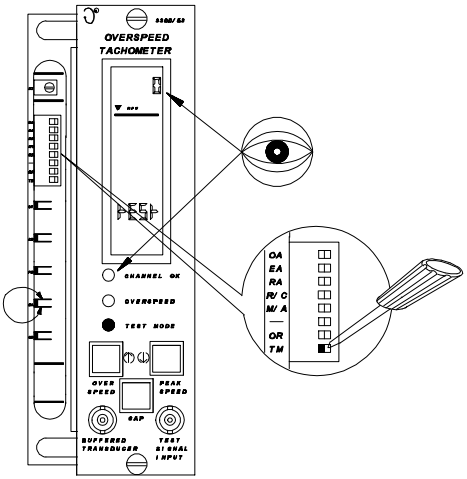
During this test, the tachometer being tested will operate as an independent channel and will exist as a Channel not OK to the Overspeed system (see Tables 9.1 and 9.2). Exceeding the Overspeed setpoint during this procedure will drive the Overspeed relay of the tested tachometer off (alarm) but will not cause other tachometers in the system to drive their Overspeed relays off.

Testing the Overspeed relay while the machine is running will cause the Overspeed relay for the tested channel to change state and will compromise the redundant security of the system. **Take the following precautions before proceeding with this test:**

- **Check that the tachometers that are not being tested are installed and are OK and not in Overspeed alarm.**
- **Bypass any external components (i.e. interposing relay contacts) for the channel being tested that are required by the System Integrator's test procedure.**

At the end of the test, restore the tested channel to the system by removing the clip lead from the Overspeed Relay Enable terminals (OR).

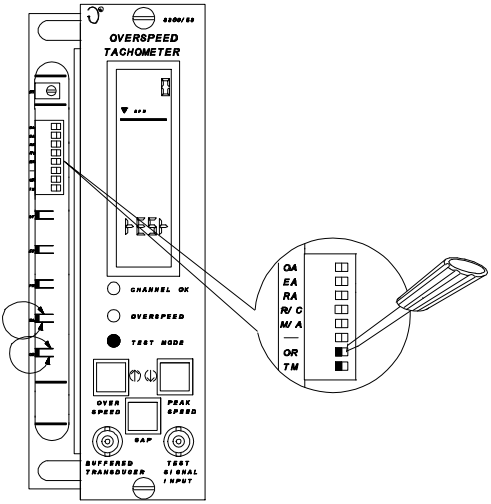
1. Place the tachometer in Monitor Adjust mode (see Section 15).
2. Set the Test Mode (**TM**) switch to the left (ON). The front panel will display 0 RPM, the **CHANNEL OK** LED will go off, the **TEST MODE** LED will come on, and the OK relay will be driven off.



23 TEST OVERSPEED ALARM

3. Set the Overspeed Relay Enable switch (**OR**) to the right (ON).

4. Short the Overspeed Relay Enable terminals (**OR**) using a clip lead.



5. Connect a function generator to the front panel connector as shown below, to the right.

6. Adjust the function generator to obtain a square wave with an amplitude of between 2 V pp and 10 V pp, with zero Vdc offset.

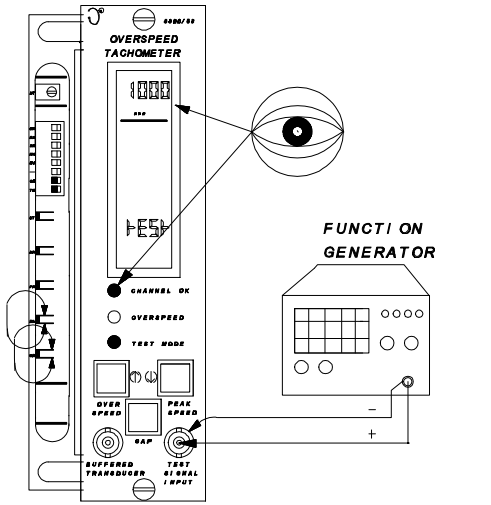
7. Set the transducer threshold to Automatic (see Section 7).

8. Use the following relation to adjust the function generator frequency to obtain an RPM signal which is greater than 100 RPM, and less than the Overspeed setpoint.

   Frequency = (RPM x EPR) / 60

   Where EPR is the events per revolution setting.

9. Perform Alarms Reset to restore the **CHANNEL OK** LED and the OK relay (see Section 24).



23 TEST OVERSPEED ALARM

10. Gradually increase the function generator frequency to the Overspeed setpoint RPM value.

11. Verify the **OVERSPEED** LED comes on. Verify the Overspeed relay is driven off (contact **NC** connected to **ARM**).

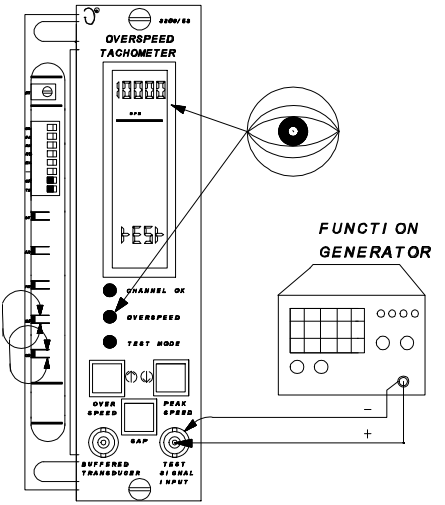
12. Disconnect the function generator. Set the Overspeed Relay Enable switch (**OR**) to the right (OFF) and remove the clip lead from the Overspeed Relay Enable terminals (**OR**).

13. Set the Test Mode switch (**TM**) to the right (OFF). The **TEST MODE** LED will go off, the **OVERSPEED** LED will go off, and the Overspeed relay will be driven on (no alarm). Reset the transducer threshold to Manual if this is the desired setting (see Section 7).

14. Perform Alarms Reset to restore the **CHANNEL OK** LED (see Section 24). This will also restore the OK relay if the OK mode is set to latching.

15. Remove the clip lead from the Monitor Adjust terminals (**MA**).

16. Remove any external bypassing.



23 TEST OVERSPEED ALARM

Use the following test to verify the correct operation of the Overspeed alarm operation, including voting logic. This test should only be performed at installation before the Overspeed system is connected to external components (i.e. interposing relay).

Test Two Channel Overspeed Protection System

1. Set the left tachometer (viewed from the front) Overspeed Setpoint to 2000 RPM (see Section 20).

2. Set the right tachometer (viewed from the front) Overspeed Setpoint to 1000 RPM (see Section 20).

3. Connect a function generator to the **XDCRCOM(-)** and **IN(+)** terminals on both Signal and Power Input Modules as shown on the right.

4. Adjust the function generator to obtain a square wave with an amplitude of 8 V pp.

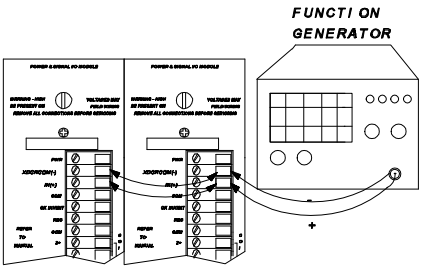
5. Set the transducer threshold to Automatic (see Section 7).

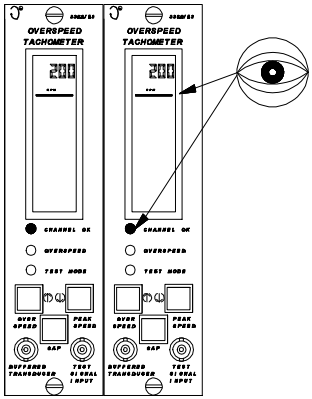
6. Adjust the function generator frequency using the following relation to obtain an RPM signal of 200 RPM.

   Frequency = (RPM x EPR) / 60

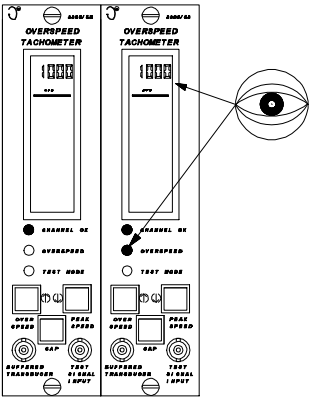
   where EPR is the events per revolution setting.

7. Perform Alarms Reset on both tachometers (see Section 24). The **CHANNEL OK** LEDs will come on, the OK relay will go OK and the front panels will display 200 RPM. Verify that both tachometers Overspeed relays are on (contact **NO** connected to **ARM**).





23 TEST OVERSPEED ALARM



8. Gradually increase the function generator frequency to give an RPM signal of 1000 RPM. Verify that the right tachometer **OVERSPEED** LED comes on. Verify that both tachometers Overspeed relays are driven off (contact **NC** connected to **ARM**).

9. Gradually increase the function generator frequency to give an RPM signal of 2000 RPM. Verify that the left tachometer **OVERSPEED** LED comes on. Verify that both tachometers Overspeed relays remain off (contact **NC** connected to **ARM**).

10. Reduce the function generator frequency to give an RPM signal of 200 RPM. Perform Alarms Reset on each tachometer (see Section 24). Verify that both tachometers Overspeed relays are on (contact **NO** connected to **ARM**).

11. Repeat the above steps 6 to 10 for each of the 3 conditions shown in the table on the next page. For each condition verify that the Overspeed relays are driven off (contact **NC** connected to **ARM**) when the function generator frequency is 1000 RPM.

12. Disconnect the function generator. Verify that both tachometers OK LEDs go off and the Overspeed relays are driven off (contact **NC** connected to **ARM**).

13. Reset the transducer threshold to Manual if this is the desired setting (see Section 7). Perform Alarms Reset on each tachometer (see Section 24).

14. Adjust the Overspeed setpoints on both tachometers to the correct value (see Section 20).

The setpoints in all the tachometers in a system must be the same. Settings that are not the same will result in loss of machine protection or cause a machine shutdown.

23 TEST OVERSPEED ALARM

TACHOMETER (Viewed from front)	TACHOMETER OK STATUS	TACHOMETER SETPOINT
LEFT RIGHT	OK OK	1000 2000
LEFT RIGHT	NOT OK OK	2000 1000
LEFT RIGHT	OK NOT OK	1000 2000

23 TEST OVERSPEED ALARM

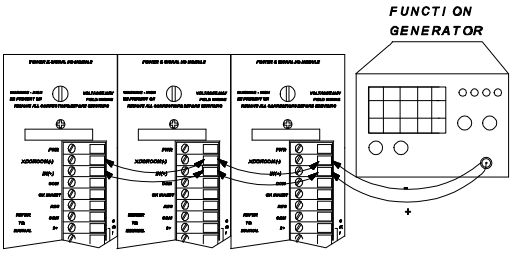
Test Three Channel Overspeed Protection System

1. Set the left tachometer (viewed from the front) Overspeed Setpoint to 3000 RPM.(see Section 20).

2. Set the center tachometer (viewed from the front) Overspeed Setpoint to 2000 RPM (see Section 20).

3. Set the right tachometer (viewed from the front) Overspeed Setpoint to 1000 RPM (see Section 20).

4. Connect a function generator to the **XDCRCOM(-)** and **IN(+)** terminals on all three Signal and Power Input Modules as shown on the right.



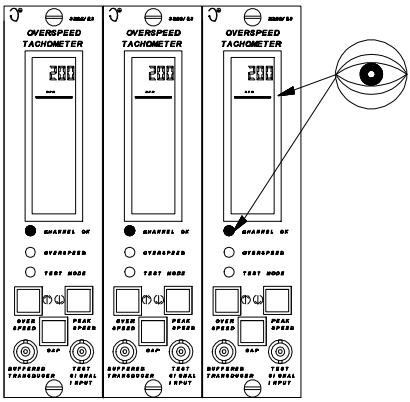
5. Adjust the function generator to obtain a square wave with an amplitude of 8 V pp.

6. Set the transducer threshold to Automatic (see Section 7).

7. Adjust the function generator frequency using the following relation to obtain an RPM signal of 200 RPM.

   Frequency = (RPM x EPR) / 60
   where EPR is the events per revolution setting.

8. Perform Alarms Reset on all three tachometers (see Section 24). The **CHANNEL OK** LEDs will come on, the OK relay will go OK and the front panels will display 200 RPM. Verify that all three tachometers Overspeed relays are on (contact **NO** connected to **ARM**).



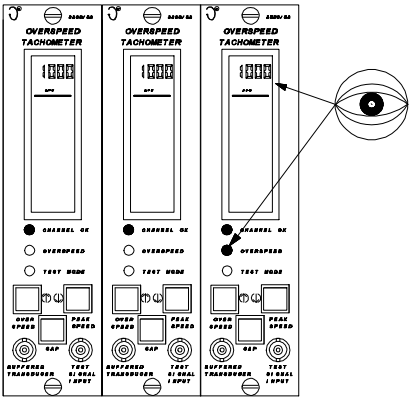
23 TEST OVERSPEED ALARM

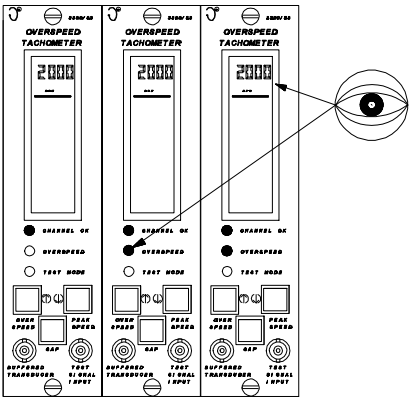
9. Gradually increase the function generator frequency to give an RPM signal of 1000 RPM. Verify that the right tachometer **OVERSPEED** LED comes on. Verify that all three tachometers Overspeed relays remain on (contact **NO** connected to **ARM**).

10. Gradually increase the function generator frequency to give an RPM signal of 2000 RPM. Verify that the center tachometer **OVERSPEED** LED comes on. Verify that all three tachometers Overspeed relays are driven off (contact **NC** connected to **ARM**).

11. Gradually increase the function generator frequency to give an RPM signal of 3000 RPM. Verify that the left tachometer **OVERSPEED** LED comes on. Verify that all three tachometers Overspeed relays remain off (contact **NC** connected to **ARM**).

12. Reduce the function generator frequency to give an RPM signal of 200 RPM. Perform Alarms Reset on each tachometer (see Section 24). Verify that all three tachometers Overspeed relays are on (contact **NO** connected to **ARM**).





23 TEST OVERSPEED ALARM

13. Repeat the above steps 7 to 12 for each of the twelve conditions shown in the table on the next page. For each condition verify that the Overspeed relays are driven off (contact **NC** connected to **ARM**) when the function generator frequency is 2000 RPM.

14. Disconnect the function generator. Verify that all three tachometers OK LEDs go off and the Overspeed relays are driven off (contact **NC** connected to **ARM**).

15. Reset the transducer threshold to Manual if this is the desired setting (see Section 7). Perform Alarms Reset on each tachometer (see Section 24).

16. Adjust the Overspeed setpoints on all three tachometers to the correct value (see Section 20).

The setpoints in all the tachometers in a system must be the same. Settings that are not the same will result in loss of machine protection or cause a machine shutdown.

23 TEST OVERSPEED ALARM

TACHOMETER (Viewed from front)	TACHOMETER OK STATUS	TACHOMETER SETPOINT
LEFT CENTER RIGHT	OK OK OK	1000 2000 3000
LEFT CENTER RIGHT	OK OK OK	1000 3000 2000
LEFT CENTER RIGHT	NOT OK OK OK	1000 2000 3000
LEFT CENTER RIGHT	NOT OK OK OK	1000 3000 2000
LEFT CENTER RIGHT	OK NOT OK OK	2000 1000 3000
LEFT CENTER RIGHT	OK NOT OK OK	3000 1000 2000
LEFT CENTER RIGHT	OK OK NOT OK	2000 3000 1000
LEFT CENTER RIGHT	OK OK NOT OK	3000 2000 1000
LEFT CENTER RIGHT	NOT OK NOT OK OK	1000 3000 2000
LEFT CENTER RIGHT	NOT OK OK NOT OK	1000 2000 3000
LEFT CENTER RIGHT	OK NOT OK NOT OK	2000 1000 3000

24 RESET ALARMS

Since the Overspeed alarm is latching, an intermittent alarm in a three channel system increases the chance of a machine shutdown. We recommend using this procedure to reset all intermittent Overspeed alarms.

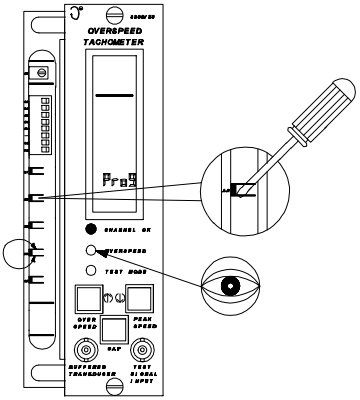
Resetting alarms will result in the following actions:

- The **CHANNEL OK** LED will remain on steady.
- If the OK mode is set to latching, the OK relay will be restored (ON).
- The **OVERSPEED** LED will go off.
- In a two channel Overspeed system, both tachometer's Overspeed relays will be restored (ON) when both tachometers have alarms reset performed.
- In a three channel system, all three tachometer's Overspeed relays will be restored (ON) when two tachometers have alarms reset performed.

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Reset the OK and Overspeed alarms by shorting across the Alarms Reset (**AR**) pins for 10 seconds.

3. Remove the clip lead from the Monitor Adjust terminals (**MA**).



25 TEST COIL CHECK OK

Perform the following test on tachometers in the Two Channel Overspeed Protection System. Since this test involves disabling the interposing relay and solenoid valve, bypass any external components specified in the System Integrator's test procedure. **Failure to bypass the external components may shutdown the machine or cause a loss of machine protection.**

WARNING

High voltage present. Contact could cause shocks, burns, or death.

1. Disconnect the power supply to the interposing relay observing the **WARNING** above. Verify that the **CHANNEL OK** LED goes off, the OK relay is driven off, and the front panel displays "COIL1".

2. Reconnect the power supply to the interposing relay observing the **WARNING** above. The OK LED will flash and the front panel LCD will display "COIL 1".

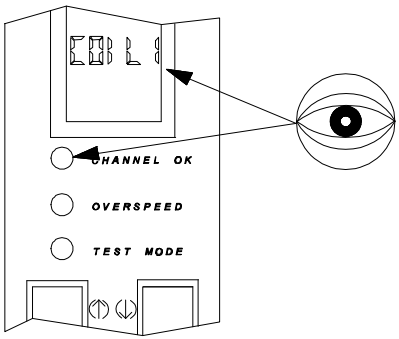
3. Perform Alarms Reset to restore the **CHANNEL OK** LED (see Section 24). This will also restore the OK relay if the OK mode is set to nonlatching.

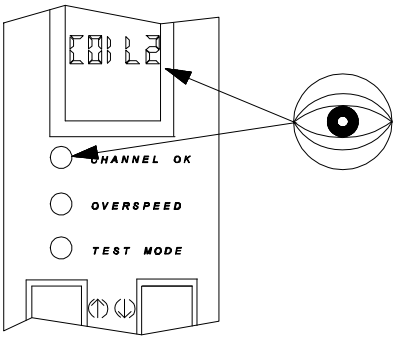
4. Disconnect the power supply to the solenoid valve observing the **WARNING** above. Verify the **CHANNEL OK** LED goes off, the OK relay is driven off, and the front panel displays "COIL2".

5. Reconnect the power supply to the solenoid valve observing the **WARNING** above. The OK LED will flash and the front panel LCD will display "COIL 2".

6. Perform Alarms Reset to restore the **CHANNEL OK** LED (see Section 24). This will also restore the OK relay if the OK mode is set to nonlatching.

7. Remove any external bypassing.





26 SELF TEST

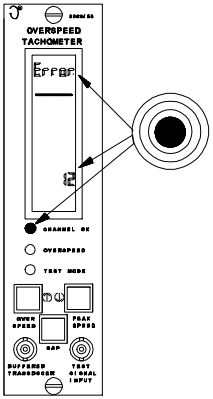
The tachometer has three levels of self tests:

SELF TEST	PERFORMED
Power-up	When the tachometer is turned on.
Cyclic	Continuously during monitoring operations.
User-invoked	When you initiate the self test by temporarily shorting the self test pins.

When the tachometer detects an error, it displays an error condition in two ways depending on whether the error is active or stored. An active error is an error that currently exists. A stored error condition results from a storable error momentarily occurring after the last time all errors were cleared.

If the tachometer detects an active error, the following events occur:

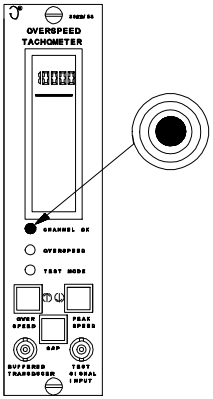
- Monitoring stops until the problem is resolved
- The error code is stored in memory and flashes on the LCD display
- The **CHANNEL OK** LED flashes at 5 Hz



Active error indication.

If the tachometer no longer detects an active error and a stored error exists, the following events occur:

- Monitoring resumes
- If the **CHANNEL OK** LED would otherwise be on, the **CHANNEL OK** LED will flash at 5 Hz to indicate that an error code has been stored



Stored error indication.

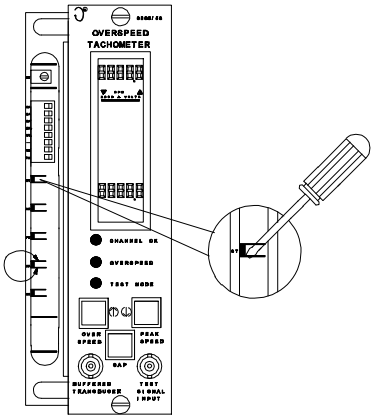
26 SELF TEST

The tachometer will go not OK during the User-invoked self test. **To reduce the chance of a machine shutdown, check that all the other tachometers are installed and are OK and not in Overspeed alarm before using this procedure.**

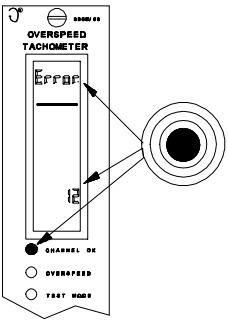
Recall stored error codes by using the User-invoked self test. Use the following steps to run the User-invoked self test, read error codes, and clear stored error codes:

1. Place the tachometer in Monitor Adjust mode (see Section 15).

2. Initiate the User-invoked self test by shorting the two self test pins (**ST**) with a screwdriver. All the LEDs and LCD elements will come on for 5 seconds.



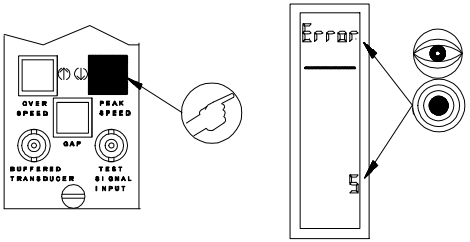
The error code is given by the flashing "ERROR" indicator and flashing error code number. For example, the tachometer to the right is indicating error code number 12.



26 SELF TEST

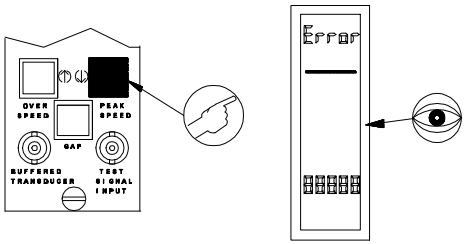
2. Read any other stored error codes by pressing and holding the **PEAK SPEED (□)** switch for one second.

For example, the display to the far right contains a second stored error code — number 5.



When you reach the end of the error code list, the LCD displays all eights.

You may read through the list again by continuing to press the **PEAK SPEED (□)** switch.

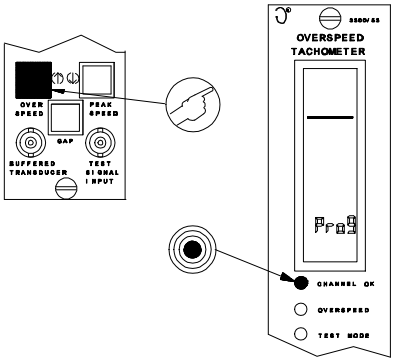


3. When the LCD displays all eights, clear error codes from memory by pressing and holding the **OVERSPEED (□)** switch for one second.

After you clear the error codes, the **CHANNEL OK** LED will flash at 1 Hz (or remain off if the OK mode is set to nonlatching) to indicate that the tachometer has been not OK.

4. Perform Alarms Reset to restore the **CHANNEL OK** LED and OK relay (see Section 24).

5. Remove the clip lead from the Monitor Adjust terminals **MA**.



27 ERROR CODES

Refer to Tachometer Functions and Self Test sections for more information about displaying error codes. Refer to the Self Test section for information about clearing stored errors.

NOTE: Following power up the monitor may display error codes. These errors must be cleared (refer to section 26, SELF TEST) before normal operation can commence.

ERROR CODE	DESCRIPTION	RECOVERY
2	ROM checksum error	Install your spare tachometer and contact your local Bently Nevada office for service.
3 and 4	Recoverable EEPROM error	Readjust the Overspeed setpoint and the events per revolution setting. Recall and clear the error as described in the Self Test section. If the error is persistent, install your spare tachometer and contact your local Bently Nevada office for service.
	Error 5 through 15 (excluding 14) are node voltage out of tolerance error :	
5 6 7 8 9 10 11 12 13 15	+VRA & -VT +VRA & -VRX +5V & -VRA +5V +5VL MVREF +VRA +VRH +VRL +VRLD	Recall and clear the error codes as described in the Self Test section. If the error is persistent, install your spare tachometer and contact your local Bently Nevada office for service.
14	RAM error	Install your spare tachometer and contact your local Bently Nevada office for service.
16	Incorrect Transducer Input jumper option	Check that the Transducer Input jumper is correct. If the error is not recoverable, install your spare tachometer and contact your local Bently Nevada office for service.

27 ERROR CODES

ERROR CODE	DESCRIPTION	RECOVERY
17	CONFIG register error	Install your spare tachometer and contact your local Bently Nevada office for service.
21	SPI error	Install your spare tachometer and contact your local Bently Nevada office for service.

NOTES:

1 If the tachometer experiences recurring stored errors, contact your local Bently Nevada office for service.

2 When the tachometers are powered up, it is possible that the monitors may display stored errors due to power supply sequencing. Recall and clear any stored errors using the procedure described in the Self Test section. If the errors are persistent, install your spare tachometer and contact your local Bently Nevada office for service.

28 RECOMMENDED SPARE PARTS

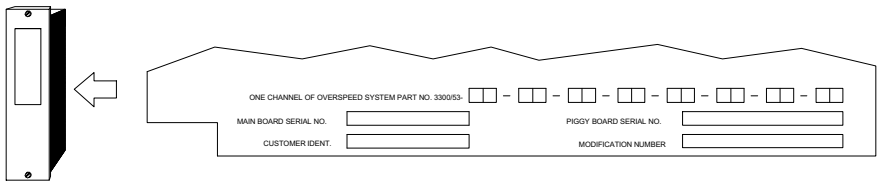
The tachometer comes with options set as described in section 7, Tachometer Options.

QTY	DESCRIPTION	PART NUMBER	ORDERED OPTION **							
	3300/53 OVERSPEED PROTECTION SYSTEM	3300/53	AA	BB	CC	DD	EE	FF	GG	HH
1	3300/53 TACHOMETER (without Front Panel)	3300/53	00	**	**	**	**	00	00	00
1	3300/53 OVERSPEED TACHOMETER CHANNEL (Tachometer, Front Panel and SPIM)	3300/53	01	**	**	**	**	**	**	**
1	FRONT PANEL ASSEMBLY	102703-01								
1	SIGNAL AND POWER INPUT MODULE	102717	00	**	**	**	**	**	**	**
1	SPARE JUMPERS (100 PIECES)	88706-01								
1	PRIMARY POWER FUSE (SEE BB AND FF CATALOG OPTIONS) BB=01, FF=00 BB=01, FF=01/02 BB=02, FF=00 BB=02, FF=01/02	 01700108 01710514 01700107 01710513								

NOTES: To order replacement parts, specify the part number according to this table, as indicated on the identification decal. If you have a tachometer that has been modified, specify the modification number on the parts order. The modification number (if any) will be shown on the identification decal.

** Use the option letter in the Overspeed Protection System part number to choose the appropriate spare part for your system.

If in doubt about the part number, call your Bently Nevada Corporation representative before ordering the part.



29 SPECIFICATIONS

INPUTS

Power Input: 95 - 125 Vac 50/60 Hz, 0.29 A max. (steady state), 2.5 A peak inrush (110/120 Vac Option)
190 - 250 Vac 50/60 Hz, 0.15 A max. (steady state), 2.5 A peak inrush (220/240 Vac Option)

Installation (Overvoltage) Category II (BSEN61010-1: 1993)

Signal Inputs: Either of the following:
Proximity Transducer System, 0 to -24 Vdc.
Magnetic Pick-up.

Input Impedance: Proximity Transducer System: 150 k□
Magnetic Pick-up: 300 k□

Input Frequency: 0 to Overrange. (Overrange is dependent upon Overspeed setpoint and Events per Revolution setting).

SIGNAL CONDITIONING

Hysteresis: Jumper programmable: 0.2, 0.5, 1.25 or 2.0 Volts.

Events per Revolution: 1 through 255

OVERSPEED ALARM

Setpoint: Adjustable from 100 to 20,000 RPM (maximum value is dependent on events per revolution setting)

Accuracy: ± 4 RPM of setpoint.

Requirements: Shaft speed equaling or exceeding the Overspeed setpoint level.

Alarm Response Time Accuracy: ± 1 millisecond @ 25□C
The response time is calculated by the tachometer and is dependent upon the overspeed setpoint and the events per revolution setting. The Alarm Response Time can be displayed in milliseconds on the front panel. The Response Time does **not** include the Overspeed relay contact bounce.

RPM DISPLAY

Range: 0 to Overrange (Overrange value is dependent on Events Per Revolution setting and Overspeed setpoint)

Resolution: ±1 RPM @ 25□C.

Accuracy: ± 1 RPM of input RPM.

Range Indicators: The over arrow flashes to indicate an RPM Overrange condition and the under arrow flashes to indicate the RPM value is 100 RPM or less.

29 SPECIFICATIONS

LEDs

Green:	Annunciates the CHANNEL OK condition.
Red:	Annunciates OVERSPEED and TEST MODE conditions.

CONTROLS

Front Panel:	Three front panel switches for reading the OVERSPEED setpoint, PEAK SPEED value, Proximitor® gap voltage, and alarm response time.
Internal:	Switches on circuit board for Overspeed setpoint adjustment, Events per Revolution adjustment, Recorder Full Scale Range adjustment, Raw or Conditioned Buffered Transducer, Manual or Automatic Threshold, Overspeed Relay Enable, and Test Mode Enable.
External:	External remote controls: OK Inhibit.

OUTPUT

Recorder:	Output proportional to selected full scale RPM range. Output is protected against continuous short circuit to ground: +4 mA to +20 mA, +12 Vdc compliance. +1 Vdc to +5 Vdc, 100 □ minimum output impedance. 0 Vdc to -10 Vdc, 100 □ minimum output impedance. **The recorder output is for data logging purposes only. It is not suitable for use as a control system input.**
Transducer Power:	-24 Vdc Power Supply. Output is short circuit protected.
Alarms and OK:	Relay drives for OVERSPEED and CHANNEL OK.
Accuracy:	From the display to the digital byte: for all recorders: ±1 RPM or ±0.4% of displayed speed, whichever is greatest. from the digital byte to the recorder output: +4 to +20 mA recorder: ±0.09 mA offset, ±0.7% of signal @ 25□C. ±0.11 mA offset, ±1.0% of signal, 0 to 65□C. +1 to +5 V recorder: ±10 mV offset, ±1.1% of signal @ 25□C. ±14 mV offset, ±1.3% of signal, 0 to 65□C. 0 to -10 V recorder: ±15.0 mV offset, ±1.0% of signal @ 25□C. ±18.0 mV offset, ±1.1% of signal, 0 to 65□C.

EXTERNAL INTERPOSING RELAY AND SOLENOID VALVE RATINGS

The interposing relay and solenoid valves specifications must meet the following criteria for correct system alarm operation.

D.C. Ranges:	+12 Vdc, +24 Vdc, +48 Vdc and +100/125 Vdc, tolerances of -25% and +10% of nominal voltage.
A.C. Ranges:	110/120 Vac (83 to 125 Vac) and 220/240 Vac (165 to 250 Vac).

29 SPECIFICATIONS

Coil Impedance:

RANGE	IMPEDANCE
+12 Vdc	Rcoil < 160□
+24 Vdc	Rcoil < 500□
+48 Vdc	Rcoil < 1.03k□
+110/125 Vdc	Rcoil < 2.17k□
110/220 Vac	Zcoil < 4.05k□
220/240 Vac	Zcoil < 7.14k□

Drop-out Voltage: D.C. Coils: □ 10 % of nominal coil operating voltage
< Must Operate Voltage
A.C. Coils: □ 20 % of nominal coil operating voltage
< Must Operate Voltage

Must Operate Voltage: D.C. Coils: □ 75 % of nominal coil operating voltage
> Drop-out Voltage
A.C. Coils: □ 80 % of nominal coil operating voltage
> Drop-out Voltage

RELAY CONTACT RATINGS

D.C. Relays * : 4 Amps □ 24 Vdc resistive or inductive load.
900 milliamps @ 48 Vdc inductive load.
1 Amp @ 48 Vdc resistive load.
100 milliamps @ 110 Vdc resistive or inductive load.

A.C. Relays ** : 4 Amps @ 110 Vac resistive or inductive load.
1 Amp @ 250 Vac resistive or inductive load.

3300/53 ENVIRONMENTAL RATINGS ***

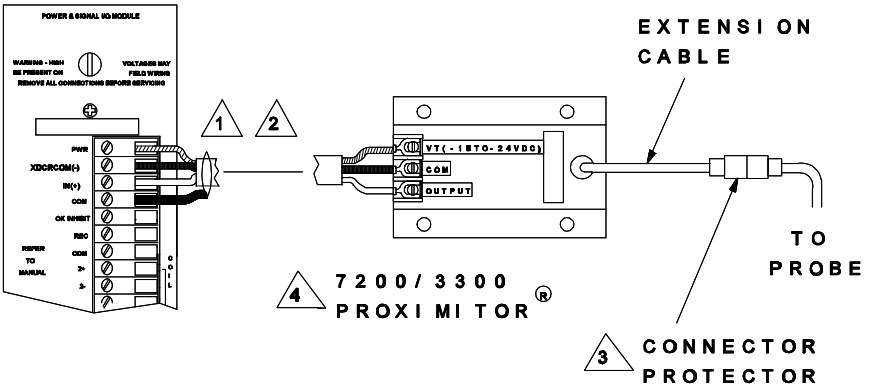
Temperature: Operating +32□F to +149□F (0□C to +65□C).
Storage -40□F to +185□F (-40□C to +85□C).

Humidity: 0 to 95%, noncondensing.

NOTES:
* Inductive load specified at L/R rating of 7 milliseconds.
** Inductive load specified at cosØ = 0.4.
*** Operation outside the specified limits will result in false readings or loss of machine protection.

30 FIELD WIRING DIAGRAMS

Proximitor® to Tachometer Field Wiring



1. Transducer shield is single point grounded to **COM** terminal as shown. Shields should be insulated.

2. If frequencies above 6 kHz will be observed by the transducer or if cable lengths greater than 1000 ft are required between the Signal and Power Input Module and the Proximitor®, refer to Applications Note AN085 for Overspeed Protection Systems regarding signal degradation to ensure that the signal amplitude is large enough to provide safe operation and to the Operation Manual provided with the transducer for information on frequency response vs. cable length.

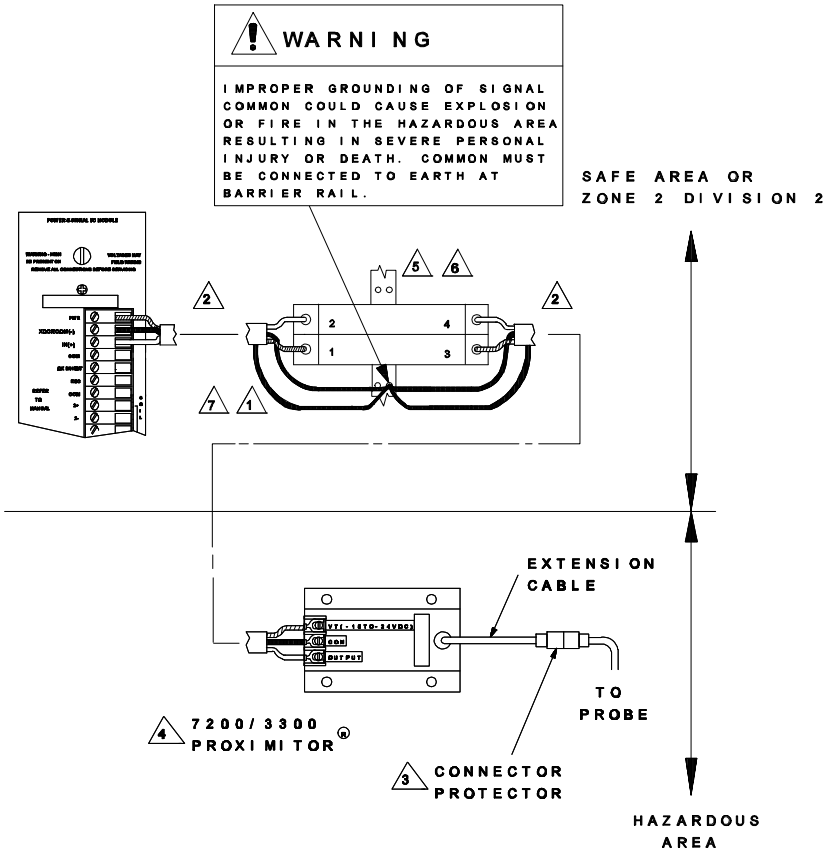
3. To electrically isolate and protect coaxial connection, use connector kit part number 40113-02.

4. 7200 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 the isolation requirement.

5. Wiring Recommendation: Power and Signal Input Module to Proximitor®, 18 to 22 AWG (0.5 to 1.0 mm^2, solid or stranded, 3-wire, with 100% shield coverage, and insulating sheath (Tri-rated cable complying with BS6231 is recommended).

30 FIELD WIRING DIAGRAMS

Proximitor® to Tachometer Field Wiring with Barriers



30 FIELD WIRING DIAGRAMS

1. Barriers are mounted to the barrier rail which is the potential equalization bus between system ground and earth ground. To minimize ground loop problems, a single point earth ground to system common is recommended at the barrier rail. Total earth loop impedance must not exceed 1 ohm. Remove the single point ground connection on the 3300 Power Input Module if one is mounted in the rack. Remove the single point ground jumper (W1) on the 3300/53 backplane if the Overspeed system is mounted in a rack not containing a 3300 Power Input Module.

2. If frequencies above 6 kHz will be observed by the transducer or if cable lengths greater than 1000 ft are required between the Signal and Power Input Module and the Proximitor®, refer to Applications Note AN085 for Overspeed Protection Systems regarding signal degradation to ensure that the signal amplitude is large enough to provide safe operation and to the Operation Manual provided with the transducer for information on frequency response vs. cable length.

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

4. 7200 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 the isolation requirement.

5. Barriers located in Division 2 or Zone 2 hazardous area must be installed in a NEMA 4 or IP54 approved protective housing.

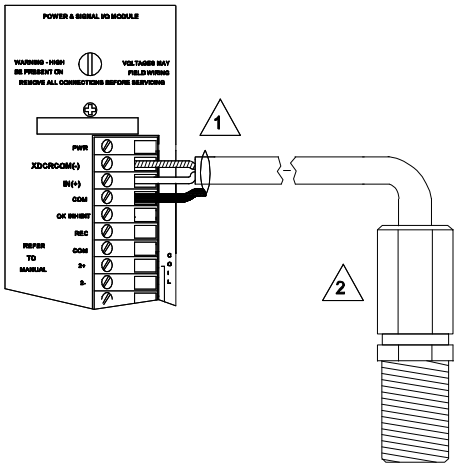
6. Use MTL safety barrier per drawing BA22000, Note 14.

7. Transducer shields are joined as shown terminating at barrier ground. Shields should be insulated.

8. Wiring Recommendation: Power and Signal Input Module to Proximitor®, 18 to 22 AWG (0.5 to 1.0 mm^2, solid or stranded, 3-wire, with 100% shield coverage, and insulating sheath (Tri-rated cable complying with BS6231 is recommended).

30 FIELD WIRING DIAGRAMS

Magnetic Pickup to Tachometer Field Wiring

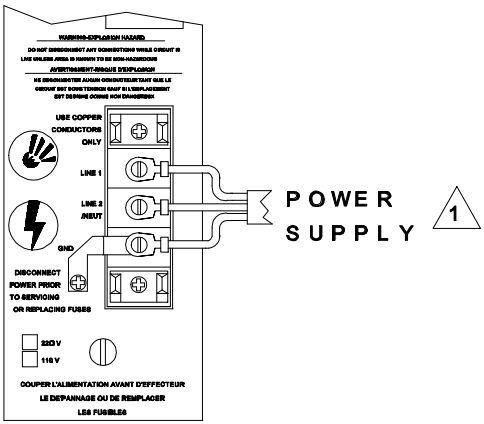


1. Transducer shield is single point grounded to **COM** terminal as shown. Shields should be insulated.

2. Magnetic pickup positive lead is connected to **IN(+)** terminal as shown. Magnetic pickup negative lead is connected to **XDCRCOM(-)** terminal as shown.

30 FIELD WIRING DIAGRAMS

Tachometer Power Field Wiring



WARNING

Failure to follow these earthing guidelines could result in the Overspeed system to float without reference. This may cause high voltage to be present which can cause shock, burns, or death.

Ensure that the Overspeed System external supplies conform to the Overspeed System Specifications. A supply outside the specified range for the power input option chosen will cause the channel to go not OK. Refer to the Secifications section of this manual for acceptable voltage ranges.

1. Important Earthing Guidelines:

   i. When the Overspeed system is mounted in a rack containing a 3300 Power Supply and System Monitor, note the following:

      a. Do **not** connect the Overspeed system external supply ground cable to the 3300/53 Power and Signal Input Module **GND** terminal.
      b. The single point chassis to ground connection is the external power supply ground cable to 3300 Power Input Module connection.

   ii. When the Overspeed system is mounted in a rack *not* containing a 3300 Power Supply and System Monitor, note the following:

      a. Create a single point Overspeed system chassis connection to ground by connecting the Overspeed system external supply ground cable to *only one* of the Overspeed system Power and Signal Input Module **GND** terminals (as shown above).

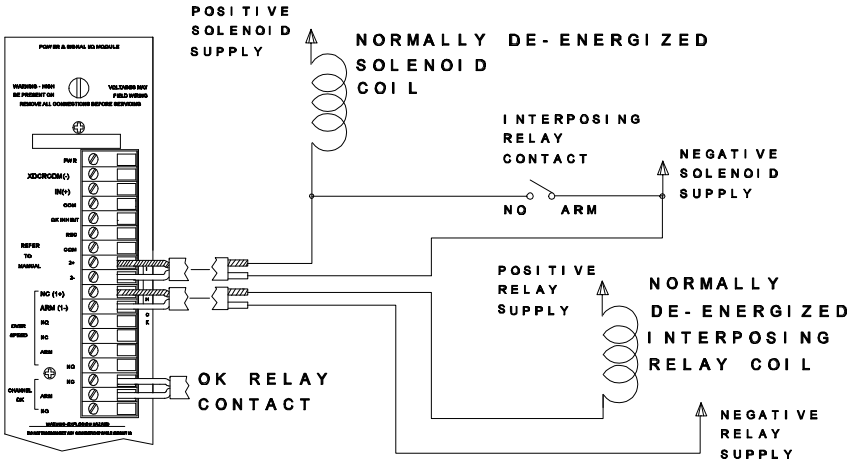
30 FIELD WIRING DIAGRAMS

2. Wiring Recommendation: Power and Signal Input Module to mains power (Line 1 and Line2/Neutral), 16 AWG (1.5 mm^2) minimum, solid or stranded wire with insulating sheath. Power and Signal Input Module to mains earth, should be at least the same size as power wiring, insulated or non-insulated, insulation should be either green/yellow or transparent (Tri-rated cable complying with BS6231 is recommended).

3. Circuit Breaker: An external circuit breaker should be installed to protect against mains power short circuits. This circuit breaker should be installed close to the Overspeed Protection System and it should be marked to identify it as the disconnecting device for the Overspeed Protection System.

30 FIELD WIRING DIAGRAMS

Two Channel Overspeed Protection System Alarm Relay Field Wiring



CAUTION

Ensure that the solenoid and interposing relay coil supply voltage and coil resistance are within the required tolerance (see the Specifications section).

Incorrect coil supply voltage or coil resistance will cause false Coil Check OK indication and incorrect relay / solenoid operation.

1. The solenoid must be normally de-energized for Coil Check OK operation. Connect the solenoid across the **(2+)** and **(2-)** terminals as shown when using a Two Channel Overspeed Protection System.

2. The interposing relay must be normally de-energized for Coil Check OK operation. Connect the interposing relay across the **NC (1+)** and **ARM (1-)** terminals as shown when using a Two Channel Overspeed Protection System.

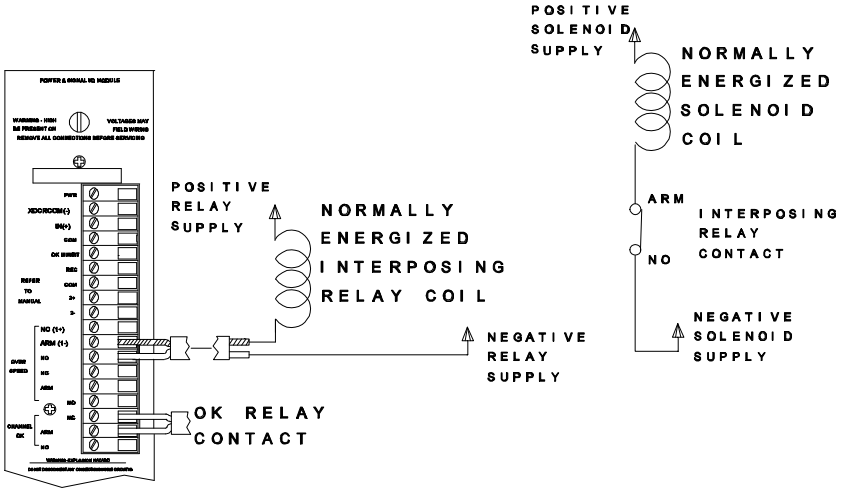
3. Wiring Recommendation: Alarm Relay Outputs and Coil Check Circuit Inputs, 18 AWG (1.0 mm^2)

30 FIELD WIRING DIAGRAMS

minimum, solid or stranded, with insulating sheath (Tri-rated cable complying with BS6231 is recommended). Coil Check Circuit Inputs of 125 Vdc, 110 Vac and 220 Vac should be fitted with circuit breakers to protect against short circuits.

30 FIELD WIRING DIAGRAMS

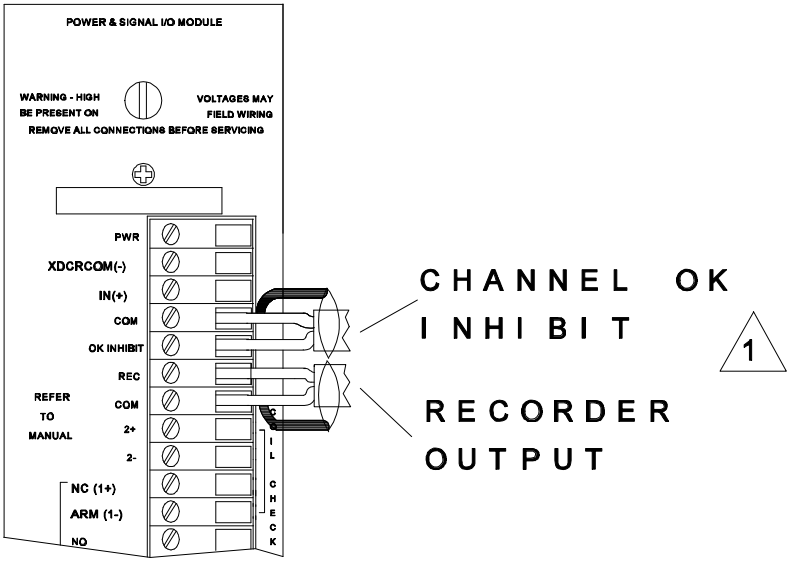
Three Channel Overspeed Protection System Alarm Relay Field Wiring



1. Wiring Recommendation: Alarm Relay Outputs and Coil Check Circuit Inputs, 18 AWG (1.0 mm^2) minimum, solid or stranded, with insulating sheath (Tri-rated cable complying with BS6231 is recommended). Coil Check Circuit Inputs of 125 Vdc, 110 Vac and 220 Vac should be fitted with circuit breakers to protect against short circuits.

30 FIELD WIRING DIAGRAMS

OK Inhibit and Recorder Output Field Wiring



1. Wiring Recommendations:

   a. Power and Signal Input Module to Recorder, 18 to 22 AWG, solid or stranded, 2-wire shielded, with insulating sheath. Shield is single point grounded to **COM** terminal as shown.

   b. Power and Signal Input Module to external (user-supplied) OK Inhibit contacts, 18 to 22 AWG, solid or stranded, 2-wire shielded, with insulating sheath. Shield is single point grounded to **COM** terminal as shown.

31 EUROPEAN EMC DIRECTIVE CE

This section provides the installation instructions required to ensure compliance of 3300/53 Overspeed Protection Systems that have been declared compliant with European Directive 89/336/EEC (EMC Directive).

3300/53 Systems meet the Directive requirements as complete systems enabling the 3300/53 System to be installed in any position of any 3300 rack.

The 3300/53 System may be used with any compliant 3300 system component. 3300/53 Systems are intended for use in an Industrial environment.

The applicable Standards are EN55011 and EN50082-2 (EMC Directive).

Compliant Part Numbers

Part Number	Description
3300/53	Overspeed Protection System

includes all options and configurations

Testing and Test Levels

EN55011 (Conducted & Radiated Emissions)	EN61000-4-2 (Susceptibility to ESD)	EN61000-4-4 (Susceptibility to EFT)	ENV50140 (Susceptibility to Radiated RFI)	ENV50141 (Susceptibility to Conducted RFI)
Class A	8 kV air discharge (Severity Level 3)	2 kV - Power lines 1 kV - Signal lines (Severity Level 3)	10 V/m (80% A.M. at 1 kHz) (Severity Level 3)	10 Volts (Severity Level 3)

Installation Instruction

(reference Figure 1)

To ensure compliance with the European EMC Directive, the 3300/53 Overspeed Protection System must be installed in accordance with the following instructions. These instructions are in addition to other installation instructions given in this manual.

31 EUROPEAN EMC DIRECTIVE CE

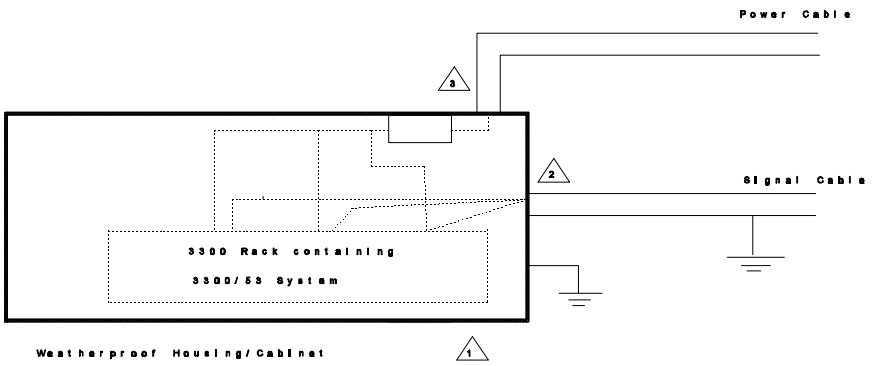


Figure 1

1. The system rack must be installed in a metal housing to prevent access to the 3300/53 System and to provide an Electromagnetic Interference (EMI) screen. Typically a 3300 Weatherproof Housing, 19" cabinet or a RFI shielding enclosure would be suitable. The 3300/53 System and housing must be thoroughly grounded.

2. All signal wiring to the system must be shielded. Typically, multi-conductor cables with braid screens (as a minimum) should be used. Cable screens must be terminated to the housing at the entry point. This should be done using cable glands to provide 360° termination of screens to the housing.

3. Mains power to each channel of the 3300/53 System must be filtered using a Belling & Lee SF4200-1/01 type panel mount filter or equivalent (one providing the same attenuation ±20 dB over the frequency range 0.15 to 300 MHz) mounted inside the housing. A good ground between the filter and the housing wall must be achieved to ensure proper functioning of the filter. Wiring between the mains inlet and the filter inputs must be kept as short as possible to reduce radiation inside the cabinet.

Additional Notes

- Larger Hysteresis settings are less susceptible to EMI than smaller settings.