



MODEL

3263 Manuals 3163 + 3200
with options C,G & P

ANALOG CONDITIONER

INSTRUCTION MANUAL



3000
Instrument Series

Copyright © 1996, Daytronic Corporation. All rights reserved.

No part of this document may be reprinted, reproduced, or used in any form or by any electronic, mechanical, or other means, including photocopying and recording, or in any information storage and retrieval system, without permission in writing from Daytronic Corporation. *All specifications are subject to change without notice.*



Model 3163 Instruction Manual, v. SB.5

Pub. No. 3163M.5, Issued 10/96

Part No. 91125

MODEL
3163
ANALOG CONDITIONER

INSTRUCTION MANUAL

Daytronic Corporation

Dayton, OH • Tel (800) 668-4745

www.daytronic.com

TABLE OF CONTENTS

<i>Section</i>	<i>Page</i>
1 Description	1
2 Installation and Cabling	4
3 Calibration	8
4 Block Diagram	12
5 Verification of Normal Operation	16

LIST OF ILLUSTRATIONS

<i>Figure</i>	<i>Page</i>
1 Model 3163 Analog Conditioner	1
2 Signal Source Wiring	3
3 Instrument Mounting Dimensions	6
4 Instrument Panel Mounting	7
5 I/O Wiring Data	9
6 Front Panel Description	11
7 Block Diagram	17

LIST OF TABLES

<i>Table</i>	<i>Page</i>
1 Specifications	2

PLEASE NOTE: Sections 6 and 7, Figures 8 and 9, and Table 2 have been removed from this manual.

If you need information regarding specific 3163 components and circuitry, please contact the Daytronic Service Department at (937) 293-2566.

INSTRUCTION MANUAL MODEL 3163 ANALOG CONDITIONER

1. DESCRIPTION

The Model 3163 Analog Conditioner accepts and conditions inputs from dc-to-dc lvdt's, potentiometer-type sensors, Hall-effect devices, photocells, current shunts, and other analog voltage sources with various grounding configurations and voltage and impedance levels. The output is the standard Five-Volt Data Signal Level of the *3000 Series* Instruments and is available at three different output terminals, each having a different bandpass: (1) dc to 2 kHz, (2) dc to 200 Hz, and (3) dc to 2 Hz. Active low-pass filters are used to achieve the 200-Hz and 2-Hz cutoff frequencies. The filtered outputs provide averaging or smoothing of signals containing noise or other dynamic components to allow a stable digital indication and precise, jitter-free control action. The Model 3163 is shown in Figure 1 and the specifications are given in Table 1.



Figure 1. Model 3163 Analog Conditioner

Model 3163

Table 1. Specifications

Input Type: Floating differential; 2, 3, or 4 wire.

Input Sensitivity: Continuously adjustable in four jumper selectable ranges: 50 to 500 millivolts, 500 millivolts to 5 volts, 5 to 50 volts, and 50 to 250 volts.

Input Impedance: One megohm.

Common-Mode Range: ± 100 volts dc.

Common Mode Rejection Ratio: 70 dB, dc to 60 Hz.

Excitation Supply: Regulated 10 volts ($\pm 0.02\%$), 20 milliamperes max.

Analog Outputs: Three analog outputs available; 0 to ± 5 volts with 50% overrange, 5 milliamperes maximum. Bandpass is dc to 2 kHz, dc to 200 Hz, or dc to 2 Hz, depending on output selected. Active low-pass filters provide for rolloff of 60 dB per decade above cutoff frequency. Full-scale slew time is $1.4/f$ seconds, where f is the cutoff frequency.

Accuracy: 0.1% of full scale for 60 days ("hands off") following initial calibration by user.

Dimensions: 1.7 x 4.41 x 8.5 (HWD inches).

Operating Temperature Range: 0 to 130 degrees F.

Power Requirements: 105 to 135 volts ac, 50 to 400 Hz at 5 watts maximum.

Daytronic Corporation

The Model 3163 has an isolated, floating differential input with wide common-mode range and excellent common-mode rejection. This allows even low-level signals to be obtained, essentially free from common-mode offset problems of either an ac or dc nature, from off-ground sources.

The signal source configuration can be either 2-, 3-, or 4-wire, as shown in Figure 2. A regulated 10-volt power supply is contained within the 3163 to permit the excitation of potentiometers, dc-to-dc lvdts, and similar devices. A half-bridge terminal allows zero-center operation of potentiometers. Zero adjustment of tare input values is also included.

The input range is adjustable from ± 50 millivolts to ± 250 volts, full scale, to accommodate virtually any level requirement. Front-panel *Coarse* and *Fine* SPAN controls allow convenient scaling of the output signal for digital display in the appropriate engineering units.

Calibration of the 3163 is accomplished by replacing the input signal with a precise, internally-generated reference voltage. The *calibration* mode can be entered either by pressing the front-panel CAL pushbutton or by shorting terminals at the instrument I/O connector with an external switch, transistor turn on, or similar technique.

The Model 3163 Analog Input Conditioner is also available in two additional forms. The Model 3263 contains a Digital Indicator to view the analog output of the

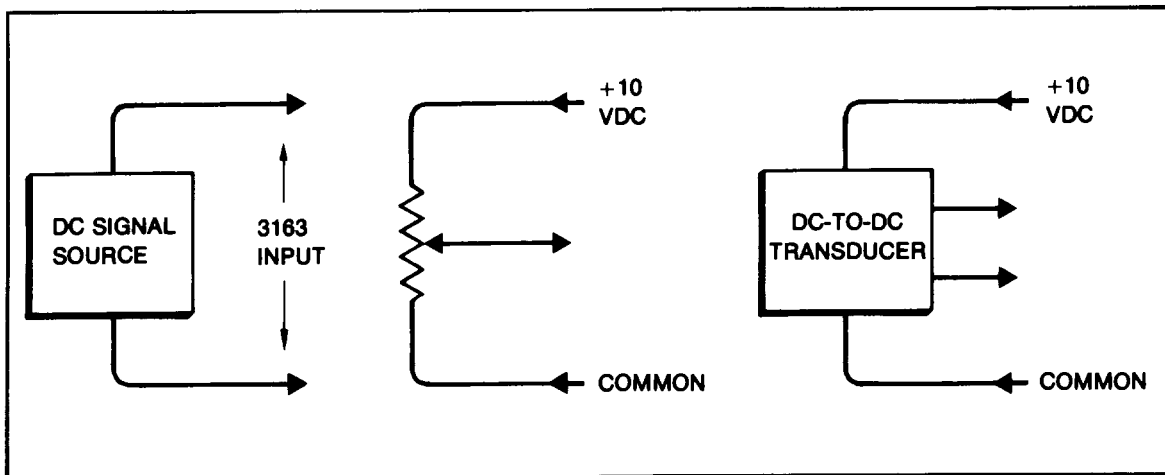


Figure 2. Signal Source Wiring

Model 3163

conditioner. The Model 3363 includes a Limit section (in addition to a Digital Indicator) which provides High/OK/Low indications and outputs. The Digital Indicator and Limit features are standard to all 3000 Instruments and are covered in separate instruction manuals.

2. INSTALLATION AND CABLING

The following paragraphs provide the instructions for instrument installation and cabling.

MOUNTING. The *3000 Series* Instruments can be operated as bench-top units or they can be rack- or panel-mounted. Clearance dimensions for a bench-mounted instrument are given in Figure 3. Panel cut-out dimensions for panel mounting are also shown in Figure 3. From one to four 3000 Series Instruments can be mounted in a 19-inch rack using the 1 3/4 inch high Model 3004 Rack Adaptor. Rack-mounting dimensions are also given in Figure 3. To panel mount an instrument, proceed as follows. Refer to Figure 4.

- (a) Remove the front panel by removing two 2-56 x 3/8 flat-head screws.
- (b) Remove the front bezel by removing the four 6-32 x 5/8 fillister-head screws.
- (c) Make the panel cutout and drill the screw clearance holes indicated in Figure 3. The front bezel can be used as a template to define the rectangular cutout and locate the clearance holes.
- (d) Hold the instrument enclosure behind the panel and reattach the front bezel to the enclosure from the front of the panel with the four mounting screws.
- (e) Reinstall the front panel.
- (f) Tighten the two securing screws of the rear-panel instrument I/O connector to ensure that the connector is seated and that the conditioner printed-circuit board is pushed fully forward so that the front-panel screwdriver adjustments and pushbuttons are accessible. These screws give approximately 1/8 inch of adjustment; consequently, this is the maximum panel thickness that should be used.

IMPORTANT: The unit is shipped with two **spacer washers** on the securing screws of the rear-panel I/O Connector. When **panel-mounting** the unit, you **MUST REMOVE THESE WASHERS**, so that the printed-circuit board may move forward about 1/8" during Step (f).

CAUTION

Do not overtighten the connector securing screws or resultant damage may occur to the printed circuit board.

AC POWER CONNECTION. To protect operating personnel, the *3000 Series* Instruments are equipped with a three-conductor power cord. When the cord is plugged into the appropriate receptacle, the instrument is grounded. The offset pin on the power cord is ground. To maintain the safety ground when operating the instrument from a two-contact outlet, use a three-prong to two-prong adaptor and connect the green pigtail on the adaptor to ground.

To prepare the instrument for operation, connect the power cable to a 105-135 volt ac, 50-400 Hz power source. The instrument can use up to 5 watts of power.

RANGE SELECTION. The input range of the Model 3163 is determined by jumper connections made at the instrument I/O connector. The full-scale input ranges provided are: (1) 50 to 500 millivolts, (2) 500 millivolts to 5 volts, (3) 5 to 50 volts, and (4) 50 to 250 volts. The jumper connection(s) used for each full-scale range are indicated in Figure 5(A).

INPUT CABLING. Cabling from the external analog source to the 3163 is accomplished via the supplied instrument I/O connector. The I/O connector pin numbers and functions are given in Figure 5. The 3163 has a floating differential input, and two-wire shielded cable is normally used for the input cabling. See Figure 5(B).

AUXILIARY SUPPLY CONNECTIONS. A 10-volt regulated power supply capable of delivering up to 20 milliamperes is included in the 3163 to power dc-to-dc transducers, potentiometers, and other such devices. Figure 5(C) shows a potentiometer connected to provide a zero-to-full scale output as the potentiometer wiper is moved. Figure 5(D) shows a potentiometer connected to provide a bipolar output (zero center). Figure 5(E) gives the wiring configuration for connecting the 3163 to a dc-to-dc transducer.

ANALOG OUTPUTS. Three different analog outputs are available at the instrument I/O connector. Each output has a different passband: dc to 2 kHz, dc to 200 Hz, and dc to 2 Hz. The 200-Hz and 2-Hz cutoff frequencies are achieved with

Model 3163

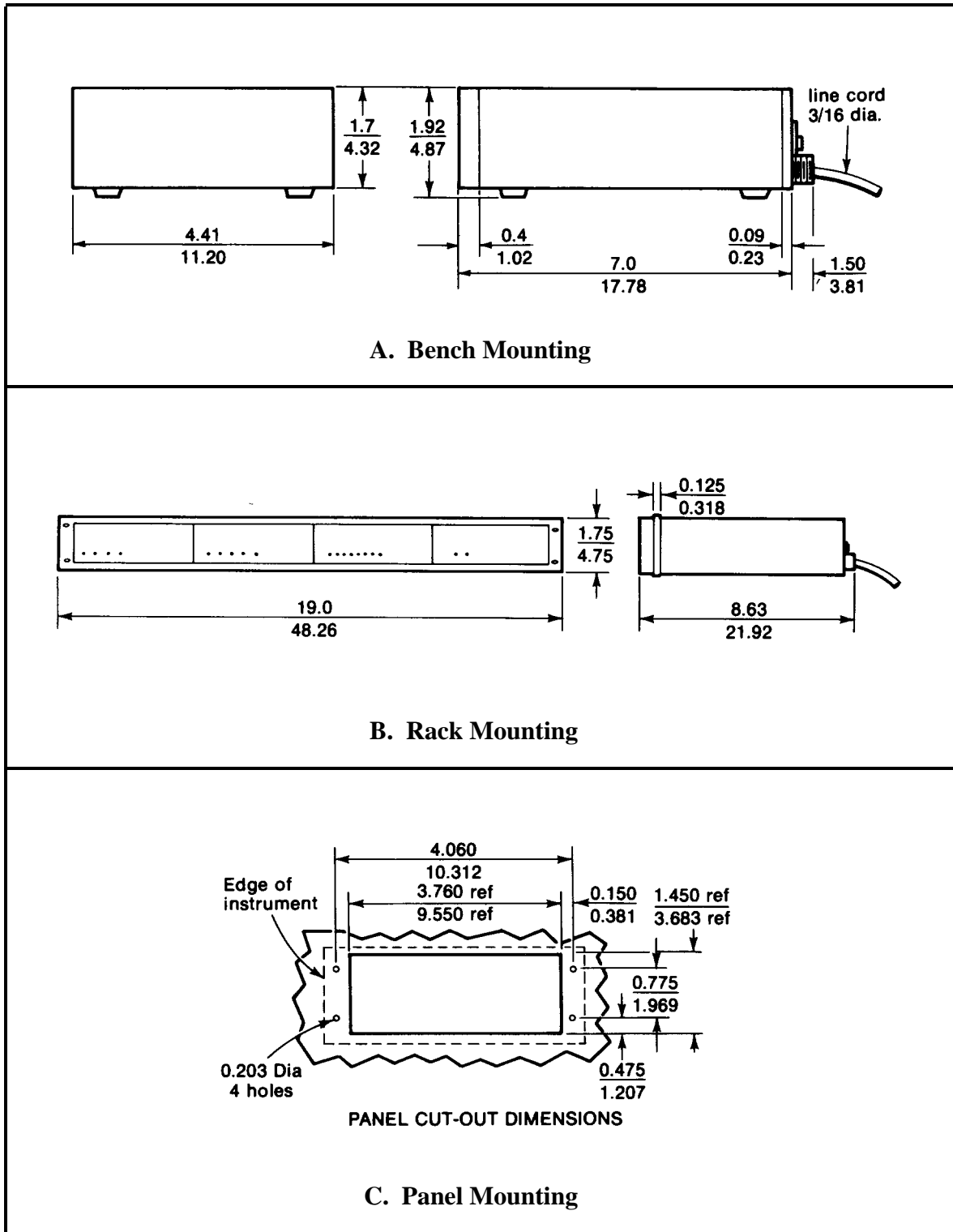


Figure 3. Instrument Mounting Dimensions

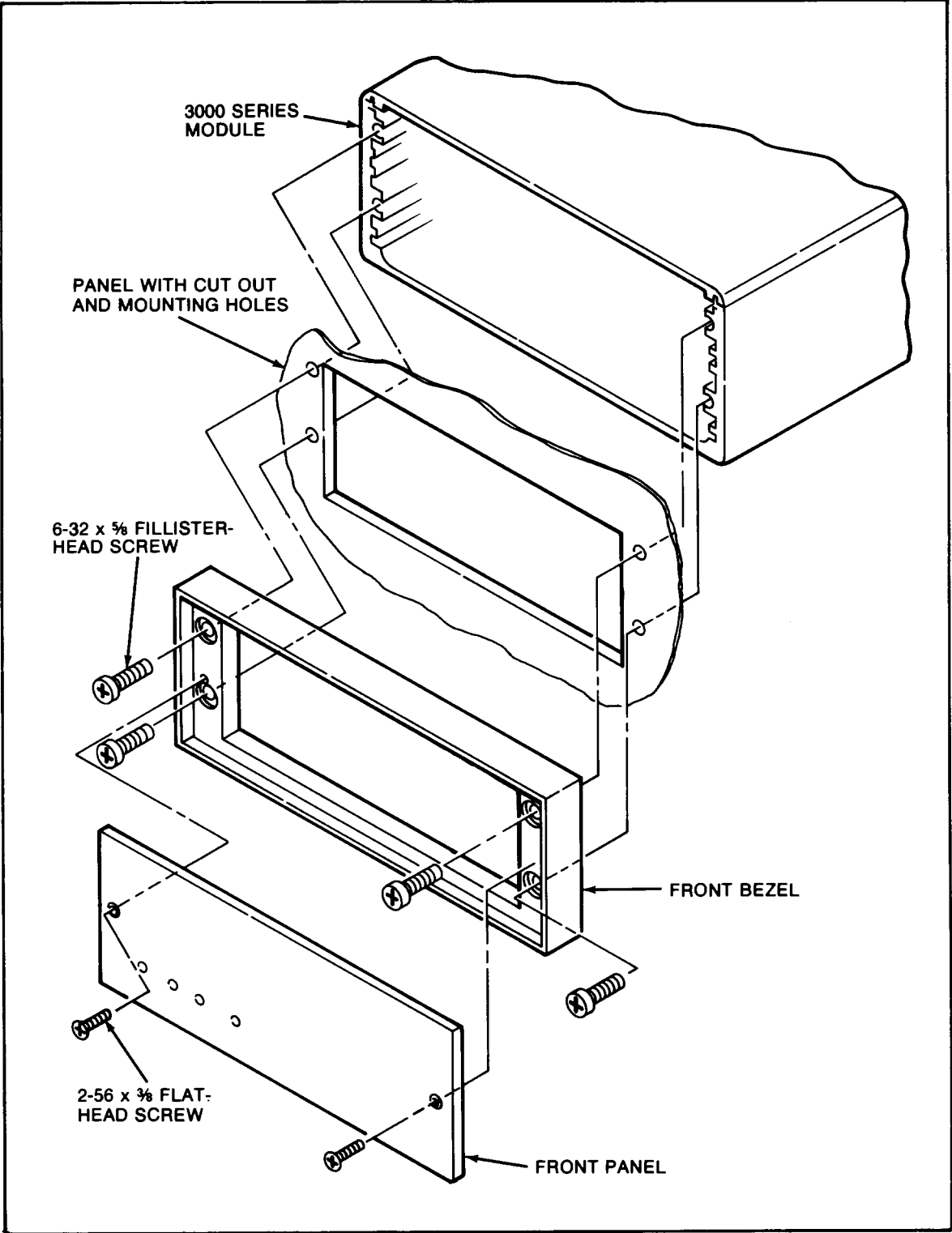


Figure 4. Instrument Panel Mounting

Model 3163

active low-pass filters. As the cutoff frequency is lowered, a trade off is made between noise elimination and increased time-to-answer or slew time. Each output has a 60-dB rolloff a decade from the cutoff frequency. The filter characteristics are given by the following equations.

$$A_{\text{out}} @ f_0 = 0.7 A_{\text{in}}$$
$$A_{\text{out}} @ 10f_0 = 0.001 A_{\text{in}}$$

where A_{out} = output amplitude
 A_{in} = input amplitude
 f_0 = selected cutoff frequency
 T = time-to-answer in seconds (output of filter within 0.1% of final value after step function is applied).

REMOTE CALIBRATION CHECK. The instrument can be placed in the *calibration* mode by shorting pins 10 (*Signal Common*) and 8 (*Remote Cal*) of the I/O connector. Figure 5(F) indicates three methods of remotely entering the calibration mode (external switch, transistor, or TTL source). The *Remote Cal* function provides a convenient means for periodically monitoring calibration of the instrument from a remote location without pressing the front-panel CAL button.

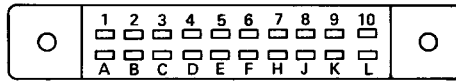
3. CALIBRATION

This section contains the instructions for calibrating the Model 3163. Included is a functional description of the instrument front panel (see Figure 6). To perform calibration, proceed as follows.

- (a) Turn power ON by placing the rear-panel slide switch in the ON position. The front-panel indicator should light to indicate the application of ac power.
- (b) With the external device in a zero output condition, set the 3163 output to zero using the front-panel ZERO control. In some instances, an integral digital indicator will be used to display the conditioner output (Model 3263 or 3363). When only the conditioner is supplied (3163), an external indicator must be used to monitor the conditioner output.

DAYTRONIC 3X63 INSTRUMENT I/O
CONNECTOR W/PIN DESIGNATIONS
(X=1, 2, or 3, e.g. 3163, 3263, or 3363)

Fig. 5 I/O Wiring Data



AMPHENOL 225-21021-103 REARVIEW

PIN

- 1 1/2 BRIDGE (+5 V)
- 2 ISOLATED COMMON
- 3 -SIGNAL INPUT
- 4 50 MV/500 MV RANGE
- 5 500 MV RANGE
- 6 5 V RANGE
- 7 50 V RANGE
- 8 REMOTE CALIBRATION
- 9 CHASSIS
- 10 OUTPUT SIGNAL COMMON

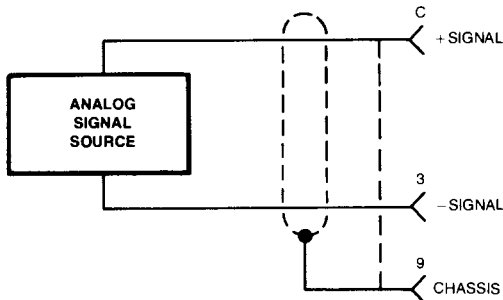
PIN

- A POWER COMMON (10 V AUXILIARY SUPPLY)
- B +10 V AUXILIARY SUPPLY
- C +SIGNAL INPUT
- D 50 MV/500 MV RANGE
- E 500 MV RANGE
- F 5 V RANGE
- H 50 V RANGE
- J ANALOG OUTPUT, ± 5 V-DC TO 2 HZ
- K ANALOG OUTPUT, ± 5 V-DC TO 200 HZ
- L ANALOG OUTPUT, ± 5 V-DC TO 2 KHZ

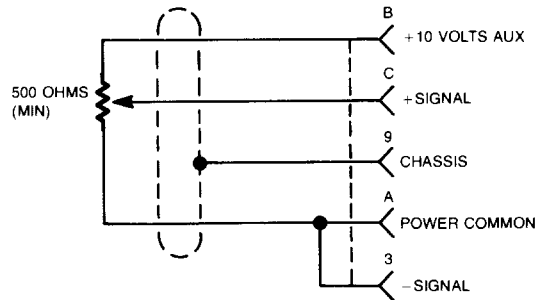
RANGE SELECT JUMPER CONNECTIONS

RANGE	JUMPER
50 TO 500 MV	D TO 4
500 MV TO 5 V	D TO 4 AND E TO 5
5 TO 50 V	F TO 6
50 TO 250 V	H TO 7

A. I/O Pin Assignments and Range Selection

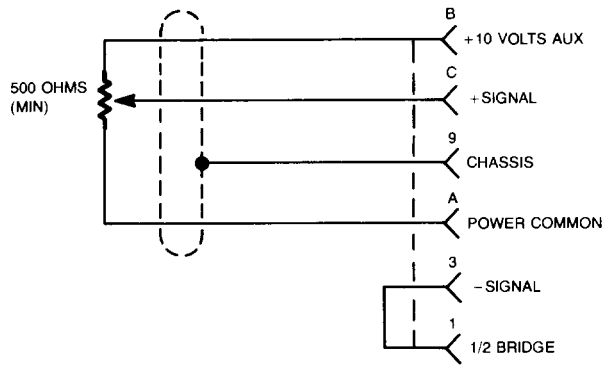


B. External Analog Signal Source

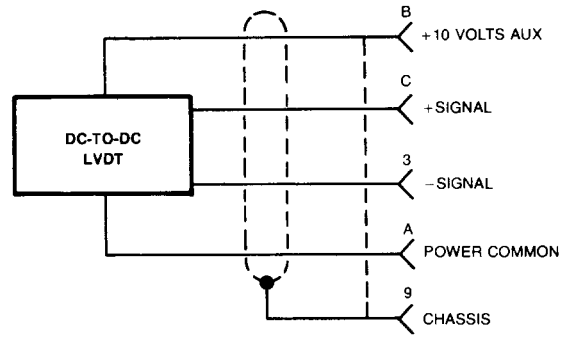


C. External Potentiometer, Zero to Full Scale

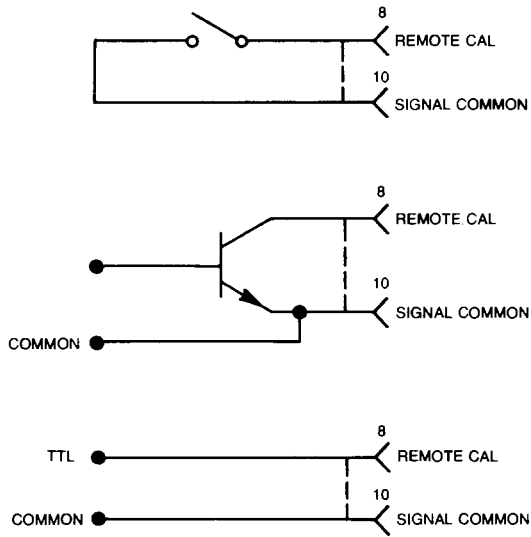
Fig. 5 (cont'd)



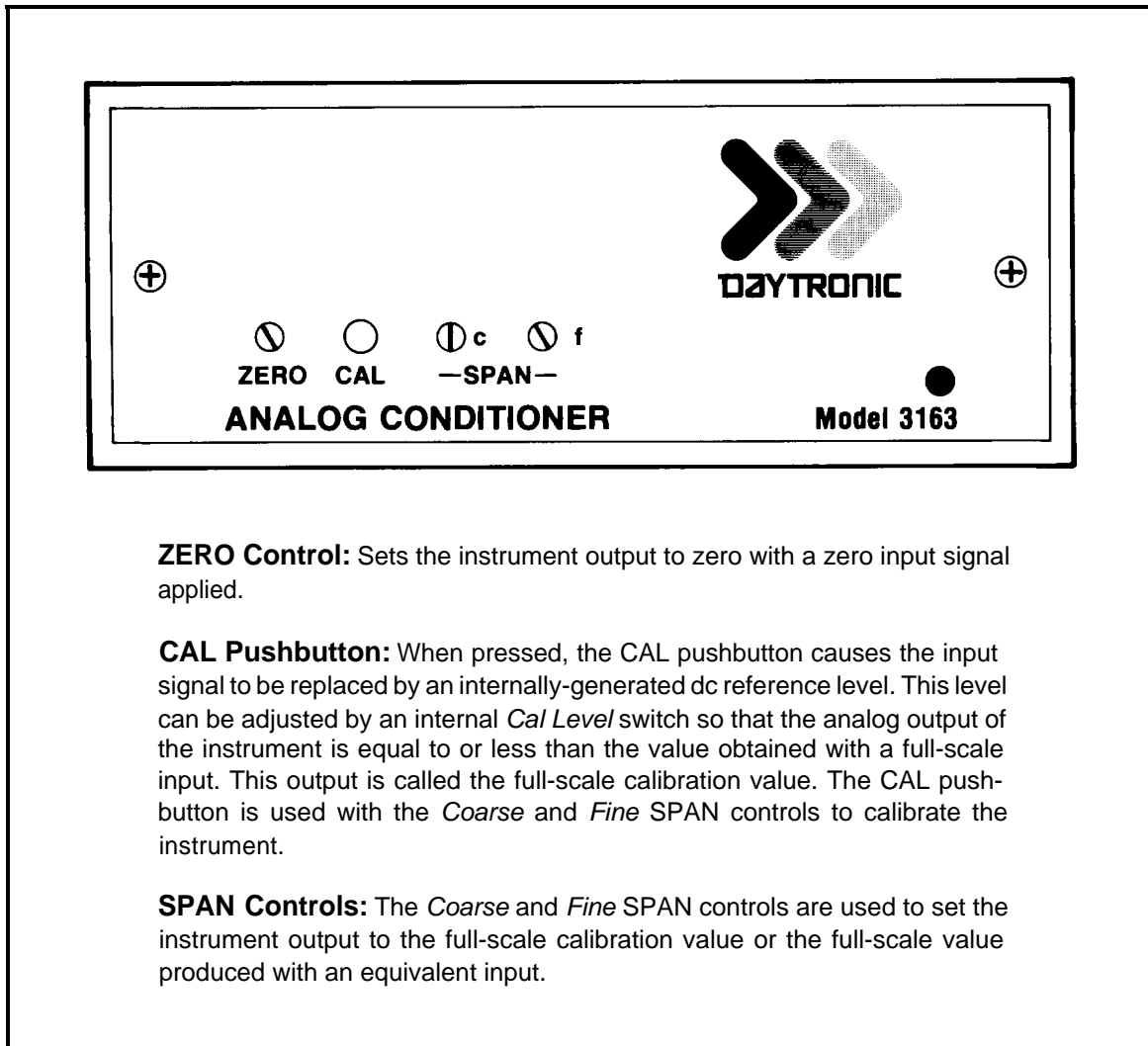
D. External Potentiometer, Zero Center



E. DC-to-DC LVDT



F. Remote Calibration Connections



ZERO Control: Sets the instrument output to zero with a zero input signal applied.

CAL Pushbutton: When pressed, the CAL pushbutton causes the input signal to be replaced by an internally-generated dc reference level. This level can be adjusted by an internal *Cal Level* switch so that the analog output of the instrument is equal to or less than the value obtained with a full-scale input. This output is called the full-scale calibration value. The CAL pushbutton is used with the *Coarse* and *Fine* SPAN controls to calibrate the instrument.

SPAN Controls: The *Coarse* and *Fine* SPAN controls are used to set the instrument output to the full-scale calibration value or the full-scale value produced with an equivalent input.

Figure 6. Front-Panel Description

- (c) Arrange for the input device to produce a known up-scale output that is greater than one-half of full scale. Adjust the *Coarse* and *Fine* SPAN controls until the output signal causes a reading equivalent to the input value.
- (d) Remove the front panel as described in Section 2. Press the CAL pushbutton and set the internal *Cal Level* switch for the output reading nearest to, but not exceeding, the full-scale output of the 3163. Since this reading is related to the proper SPAN control settings for a known input, it can be recorded for use in future calibration checks or recalibration.

Model 3163

To calibrate the instrument in the future, simply press the CAL push-button and adjust the SPAN controls to obtain the reading recorded during the initial calibration.

- (e) Replace the front panel of the instrument.

4. BLOCK DIAGRAM DESCRIPTION

The purpose of this section is to explain how the Model 3163 works by using a simplified block diagram of the conditioner. This is not intended to be used as a detailed theory of operation discussion for personnel untrained in electronic technology, but as a simplified explanation of the detailed schematic diagram provided with this manual. Throughout the following, refer to Figure 7.

POWER SUPPLIES. Primary power (115 volts ac, 50-400 Hz) is applied to the instrument by means of a rear-panel ac connection point and the supplied three-conductor power cord. A rear-panel slide switch is used to turn ON primary power. Overload protection is provided by a 0.25 ampere fuse mounted near the ac connection point. When the slide switch is ON, primary power is applied to the power transformer which provides the necessary power-line isolation and the low ac voltages required to develop the regulated dc voltages used in the 3163. The secondary of the power transformer has a grounded center tap, and a diode bridge functions as two full-wave rectifiers to produce ± 9 volts regulated dc. Two three-terminal integrated-circuit *Regulators* are used to develop these regulated voltages. The reference terminal of each *Regulator* is biased with one or two diodes to make certain that a minimum regulated voltage of 9 volts is achieved. The proper diode biasing is accomplished at factory check out.

A dc reference voltage of +2.5 volts is further developed from regulated +9 volts by the use of a third three-terminal *Regulator*. This precision dc reference is used in the *Auxiliary Power Supply* circuit and, when the instrument is so equipped, in the *Digital Indicator* and *Hi/Lo Limits* circuits. The *Auxiliary Power Supply* circuit is discussed in a following paragraph.

The -9 volts regulated is used to light the front-panel indicator (LED) which indicates the application of ac power to the instrument.

The + unregulated voltage from the diode bridge is used to develop the +10 volt output of the *Auxiliary Power Supply*. In addition, this voltage is routed to the

Daytronic Corporation

Digital Indicator and *HI/LO Limits* circuit boards where it is used to develop +5 volts regulated for the TTL logic employed in these circuits. Refer to the *Digital Indicator* and *HI/LO Limits Instruction Manuals*.

Another transformer secondary is used to develop a regulated ± 10 volts isolated supply (isolated from the output *Signal Common*). The use of this supply in the signal conditioner input circuitry makes possible the high common-mode range of the 3163.

A third transformer secondary supplies 5 volts ac to the *Digital Indicator* circuit board (when supplied). This ac voltage is used to develop an unregulated +6 volts dc. Refer to the *Digital Indicator Instruction Manual*.

The +10 volts *Auxiliary Power Supply* is developed from the + unregulated voltage as previously stated. The +10 volts *Auxiliary* is available at the instrument I/O connector for use as excitation for dc-to-dc transducers or external potentiometers. In addition, a *Half-Bridge* output is available. The connection point of two equal resistors (R1-R2) placed across the power supply output is the *Half-Bridge* output (+5 volts). When the *Half-Bridge* output is connected to the *-Signal* input, the wiper of a potentiometer connected across the *Auxiliary Power Supply* can vary from +5 volts to -5 volts. This wiring arrangement is illustrated in Figure 5.

Transistor Q1 functions as an emitter-follower series regulator, with an operational amplifier providing the regulation control. The plus terminal of the *Control Amplifier* is biased from the +2.5 volt Reference. The minus terminal is normally at +2.5 volts through the dividing action of resistors R3 and R4. As the output of the *Auxiliary Power Supply* varies, the *Control Amplifier* output varies accordingly and provides a base drive to Q1 to maintain the supply output at +10 volts. A Zener diode in series with the output of the *Control Amplifier* acts as a *Level Translator* so that the amplifier can operate near its mid-range.

Transistor Q2 functions as a *Current Limiter* in the event that the supply output is accidentally shorted or otherwise overloaded. When the current through resistor R5 becomes great enough to forward bias Q2, transistor Q2 is turned on, and current is shunted through R6 and Q2, with the raw dc voltage now being dropped across R6.

Model 3163

CALIBRATION CIRCUIT. The *calibration* mode is entered when either the front-panel CAL button is pressed or the *Remote Cal* line is shorted to *Signal Common* at the Instrument I/O connector. Either of these conditions cause the output state of a *Comparator* to change. An *Optical Isolator* is controlled by the *Comparator* output, and its output controls *Analog Switches* S1, S2, and S3. The *Optical Isolator* is required since the 3163 input circuitry is powered from the isolated power supplies to allow operation from sources having off-ground or common mode voltages on their outputs.

When the 3163 is in the *calibration* mode, the input signal is disconnected from the *Input Amplifier* and replaced by an internally generated calibration voltage. This voltage is developed by a three-terminal *Regulator* from the +10 volts isolated. The output of the *Regulator* (+2.5 volts isolated) can be divided by a series of parallel resistances which are connected to the *Regulator* through switches. These switches in actuality are a single internal switch termed the *Cal Level* switch. The switch is a rotary type switch with ten positions, each of which yields up to four contact closures corresponding to the four weights of binary-coded decimal (BCD), that is, 1, 2, 4, and 8. The ten positions allow various combinations of contact closures, thus providing various *Cal Levels* to the *Input Amplifier* via *Analog Switch* S1. The user selects the *Cal Level* that provides a full-scale output indication less than, but closest to, that observed when a full-scale input signal is applied. The indication can then be used as a calibration value for future calibrations.

Analog Switch S2 is used during calibration to remove any offset imposed on the *Input Amplifier* by the ZERO control. *Analog Switch* S3 is used during calibration to remove a gain factor incorporated when the 500 millivolt-to-5 volt full-scale input range is selected. These functions are more completely described in the following paragraphs.

SIGNAL CONDITIONER. The input signal is applied to a resistance divider arrangement that has various taps to the *Input Amplifier*. The full-scale input range is determined by the tap used, and tap selection is accomplished with jumper-wire connections at the I/O connector. However, two of the available ranges (5 mv to 500 mv and 500 mv to 5 v) use the same tap point. The difference in signal levels encountered for the two ranges is compensated by changing the gain of the *Input Amplifier*. This is accomplished by installing a second jumper when the 500 millivolt-to-5 volt range is selected. This jumper places a short across a feedback resistor (R8) in the *Input Amplifier* circuit, increasing feedback, thereby decreasing gain. When the calibration mode is used, the gain correction is removed via *Analog Switch* S3.

The *Coarse* SPAN control also affects the gain of the *Input Amplifier* and is used for scaling the instrument output. The ZERO control provides a means of offsetting the output of the *Input Amplifier*. This zero offset voltage is eliminated during calibration by *Analog Switch S2*.

The *+Signal* input, after being properly divided, is applied to the plus terminal of the *Input Amplifier*, a non-inverting operational amplifier which is powered from the ± 10 volt *Isolated Supplies*. The minus terminal of the amplifier is returned to the *Isolated Common* through resistor R7. This arrangement allows the *Input Amplifier* to be totally referenced to the *Isolated Common* which is also the *-Signal* input to the conditioner. Common-mode or offset voltages up to 100 volts can be tolerated by the *Input Amplifier*.

The output of the *Input Amplifier* is applied to an inverting operational amplifier through resistor R9. The values of resistors R9 and R10 are such that the gain of the amplifier is approximately 1/200. In addition, the amplifier is powered from ± 9 volts regulated, and the plus terminal of the amplifier is returned directly to *Signal Common*. To comply with the summing point restraint of the amplifier, its output must go to the value which allows the minus terminal to be at the same potential as the plus terminal. An offset voltage of 10 volts at the output of the *Input Amplifier* would take the output of the inverting amplifier to -0.05 volts, and the offset would be dropped across resistor R9.

A second inverting amplifier with a gain of 200 is used to reamphfy the signal to its original level and return the proper signal polarity. It has the same configuration as the first amplifier, but the values of R11 and R13 are such to provide again of 200. Also, resistor R12 is returned to the *Isolated Common* so that the R11 and R12 junction is held at 0 volts or *Signal Common*. Since the plus terminal of the amplifier is tied to *Signal Common*, the output of the amplifier is quiescently at 0 volts also, the desired condition with an offset input but no signal input.

The net result of the two inverting operational amplifiers is to provide a gain of unity and the proper conditioning to eliminate offset or common-mode voltages. Only the input signal differential is passed through the amplifiers to the output filtering circuits of the conditioner. The *Fine* SPAN control is located in the feedback circuit of the second amplifier to provide a fine gain adjustment during calibration.

Three analog outputs of the conditioned signal are available at the module I/O connector. The three outputs provide three different passbands of dc to 2 kHz, dc to

Model 3163

200 Hz, and dc to 2 Hz. Output selection is a trade off between eliminating unwanted signals caused by vibration or increasing the time-to-answer (slew rate) of the conditioner. The 200-Hz and 2-Hz cutoff frequencies are achieved with the use of active low-pass filters. The rolloff of each output is 60 dB within a decade of the cutoff frequency.

5. VERIFICATION OF NORMAL OPERATION

It is the purpose of this section to aid the user in determining, in the event of a malfunction to which the Model 3163 is suspected of contributing, whether the instrument is functioning normally or whether it is the source of the observed trouble. In the event the unit requires repair, a complete parts list, schematic diagram, and component location drawing are included in this manual. The user may also contact the factory Service Department or the local Daytronic Representative for assistance.

If the instrument is suspected of faulty operation, observe the following steps.

- (a) If the unit is totally inoperative (front-panel power indicator does not light), check the primary power fuse (F1) located on the standup board which forms the power cord connection point. If the fuse is blown, replace it with a 0.50 ampere fuse (see Table 2 for part number). Before reapplying power, visually inspect the power cord and the input power connections for any discrepancy which could have caused the overload.
- (b) Disconnect the normal input source and make a jumper connection between pin C (+*Signal*) and pin 3 (-*Signal*) at the instrument I/O connector.
- (c) Adjust the front-panel ZERO control and verify that the instrument output can be set to zero.
- (d) Press the front-panel CAL button and observe an up-scale output indication. Set the module output to the full-scale calibration value using the *Coarse* and *Fine* SPAN controls. Steps (b) thru (d) verify the ability of the amplifier circuitry to adjust to zero and respond to the internal calibration signal. If this check is passed, the conditioner amplifier circuits are functioning normally. Check the instrument I/O connector for proper wiring of the input before proceeding. See Figure 5.

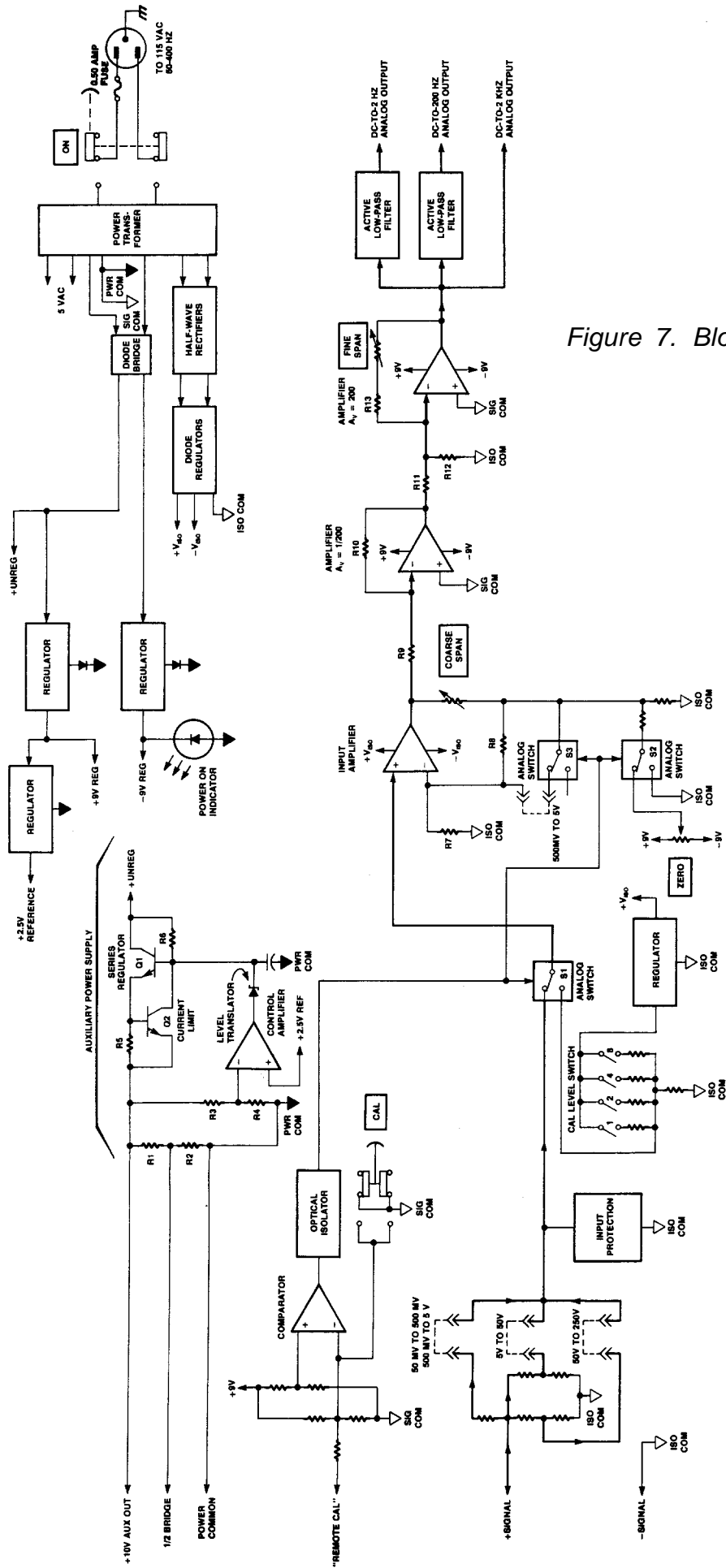


Figure 7. Block Diagram

Daytronic Corporation

- (e) If an unstable digital display or excessive output noise is encountered, the problem may be in the output filter circuits. The 2-Hz and 200-Hz outputs use active low-pass filters. The 2-kHz output is provided directly from the conditioner output amplifier. In general, if a problem is encountered with either the 2-Hz or 200-Hz output, but the problem disappears when another output is used, a filter circuit is faulty.
- (f) The above can be verified by checking each analog output with a test oscilloscope as a square-wave input signal is applied. The time-to-answer in seconds (output of conditioner within 0.1% of final value after step function is applied) should be 0.7 milliseconds for the 2-kHz output, 7 milliseconds for the 200-Hz output, and 0.7 seconds for the 2-Hz output.
- (g) If the *Auxiliary Power Supply* is used, connect a test oscilloscope to pins A (*Power Common*) and B (*+10 volts*) at the instrument I/O connector. The oscilloscope should indicate a dc level of approximately 10 volts that is free of excessive noise and ripple.



MODEL

3200 / 3300

DIGITAL INDICATOR

INSTRUCTION MANUAL



3000
Instrument Series



MODEL
3200 / 3300
DIGITAL INDICATOR

INSTRUCTION MANUAL

TABLE OF CONTENTS

<i>Section</i>	<i>Page</i>
1 Description	1
2 Installation	4
3 Operation	7
4 Block Diagram Description	8
5 Verification of Normal Operation	15

LIST OF ILLUSTRATIONS

<i>Figure</i>	<i>Page</i>
1 3000 Series Instrument with Digital Indicator	1
2 Full-Scale Displays for Three Ranges	6
3 Scale, Decimal Point, Dummy Zero Switches	7
4 A/D Converter Timing Diagram	10
5 Block Diagram Description	13

LIST OF TABLES

<i>Table</i>	<i>Page</i>
1 3000 Series Model Numbering	2
2 Specifications	4

PLEASE NOTE: Sections 6 and 7, Figures 6 and 7, and Table 3 have been removed from this manual.

If you need information regarding specific 3200/3300 components and circuitry, please contact the Daytronic Service Department at (937) 293-2566.

INSTRUCTION MANUAL 3200/3300 SERIES DIGITAL INDICATOR

1. DESCRIPTION

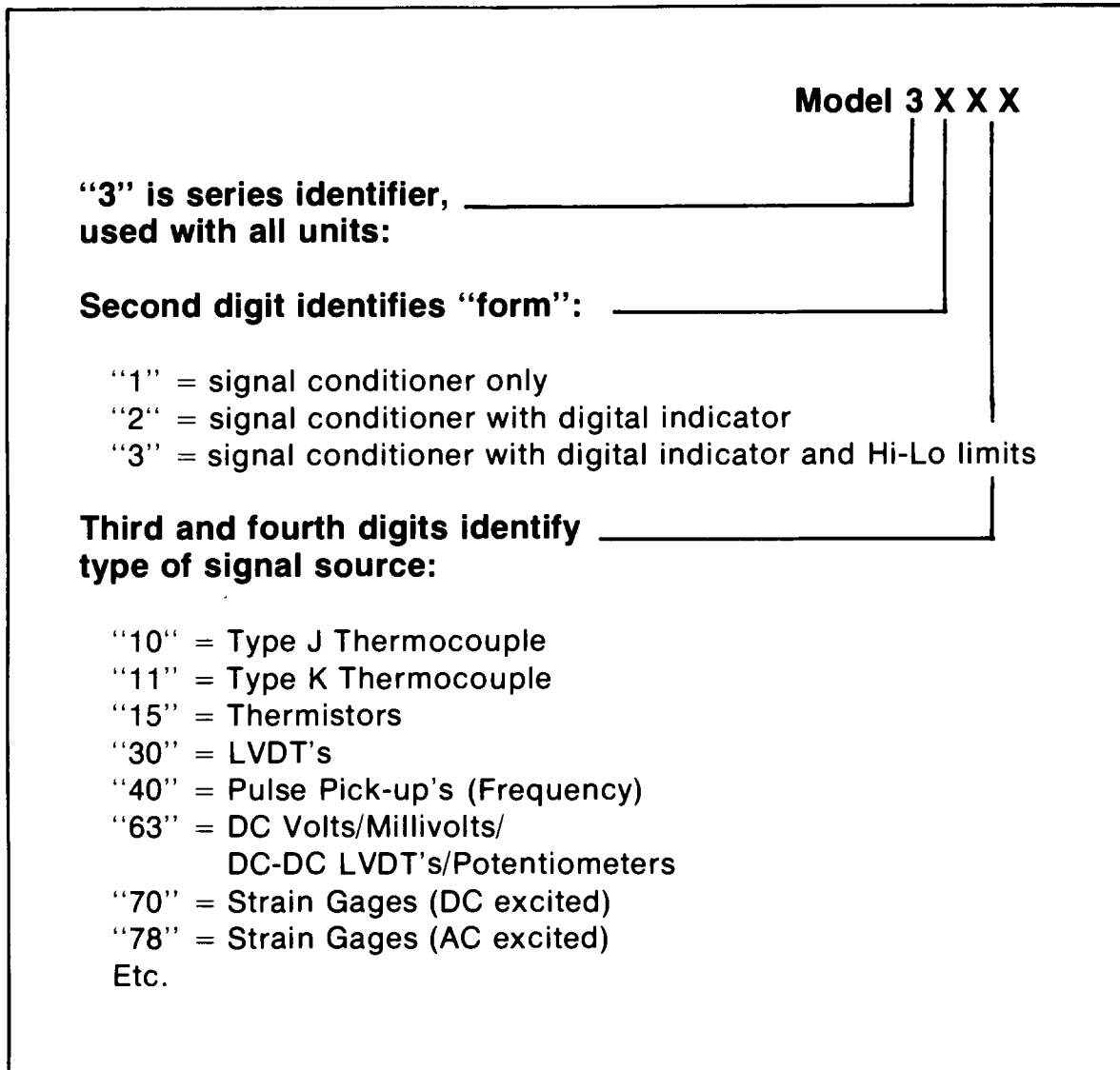
The *3000 Instrument Series* is a family of premium signal conditioning instruments that includes models to accommodate virtually all types of transducers and signal sources commonly encountered in electro-mechanical testing and control operations. The *3000 Instruments* are available in three forms: *Form 1* contains the Signal Conditioner only; *Form 2* is the Signal Conditioner with Digital Indicator; *Form 3* is the Signal Conditioner with Digital Indicator and Hi-Lo Limits. The Model numbering system used with the *3000 Series* identifies the form and the type of signal source. This numbering system is further explained in Table 1. From Table 1, it can be seen that all models having a Digital Indicator are identified by a 32XX or 33XX number, with the last two digits identifying the type of signal source (thermocouple, LVDT, etc).



Figure 1. 3000 Series Instrument with Digital Indicator

"3000" Digital Indicator

Table 1. 3000 Series Model Numbering



The *3000 Series* instruction manual system is designed to provide the user with the following documentation: (1) a separate instruction manual for each type of Signal Conditioner purchased; (2) an instruction manual covering only the Digital Indicator section of a *3000 Series* instrument, but applicable to any *Form 2* or *Form 3* instruments; and (3) an instruction manual covering only the Hi-Lo Limit section

of a *3000 Series* instrument, but applicable to any *Form 3* instrument. It is the purpose of this manual to cover the Digital Indicator section of all *Form 2* and *Form 3* instruments.

The Digital Indicator section of any *Form 2* or *Form 3* instrument consists of a printed-circuit board on which are mounted the required circuit components for digitizing the analog output of the Signal Conditioner and the light-emitting-diode (LED) display. This board is mounted above the circuit board which contains the components for the Signal Conditioner. The digits which comprise the display are mounted on a small board which is affixed to the digitizer board with a right-angle printed-circuit board header. The *Form 3* instruments contain an additional printed-circuit board for the Hi-Lo Limit circuitry.

The LED display is comprised of six orange digits with polarity sign. The 0.4 inch height of the digits, combined with the inherent brilliance of an LED type of display, make the display easily discernible in normal room lighting. The display is viewed through the red plastic front panel of the instrument to provide filtering of external light and enhance the display brilliance. The front panel is opaque except for that portion through which the display is viewed. A typical *3000 Instrument* with Digital Indicator is shown in Figure 1.

The Digital Indicator scaling is selected with rear-panel pushbutton switches. Full-scale values of ± 5000 counted by *1's*, ± 10000 counted by *2's*, or ± 20000 counted by *5's* can be selected. The most significant digit (MSD) of the display contains the polarity sign and is either unlit or lights as a *1* for displays of 10000 or greater. The least significant digit (LSD) is a dummy zero which can be turned ON or left unlit as desired. In addition, decimal-point position can be selected to give display readings as follows: 1.XXXX, 1X.XXX, 1XX.XX, 1XXX.X, or 1XXXX (no decimal point). Decimal-point location and dummy zero selection are also accomplished with rear-panel switches (miniature slide-switch bank). When the 20000 scale is selected, the display is digitally limited to read a maximum number of 19995 since the MSD is either unlit or reads a "1" for displays of 10000 or greater. The 5000 and 10000 scales are analog limited to an overrange of approximately 5600 and 11200, respectively. An overrange condition on any range is indicated by a flashing display. The sampling rate of the display is 3 samples per second. The Digital Indicator specifications are summarized in Table 2.

"3000" Digital Indicator

Table 2. Specifications

Display: Orange LED's, six digits with polarity sign, 0.4 inch height. MDS is either unlit or reads a 1 and contains the polarity sign. LSD is a dummy zero which can be programmed to be lit or unlit (rear-panel switch).

Scaling: Selectable at rear panel; full-scale values of ± 5000 counted by 1's, ± 10000 counted by 2's, or ± 20000 counted by 5's.

Decimal Point: Decimal-point location can be selected with rear-panel switches as follows: 1.XXXXX, 1X.XXX, 1XX.XX, 1XXX.X, or 1XXXX (no decimal point).

Sampling Rate: 3 samples per second.

Legends: Each instrument supplied with an appropriate assortment of user-installable rub-on engineering unit legends.

2. INSTALLATION

The *3000 Series* Instruments can be operated as bench-top instruments or they can be rack- or panel-mounted. Dimensions for all three types of mounting and corresponding mounting instructions are given in the accompanying Signal Conditioner *Instruction Manual*. The following paragraphs provide the instructions for legend installation, scale selection, decimal point/dummy zero selection, and ac power connection.

Legend Installation. A sheet of dry-transfer lettering is supplied with each instrument to provide the user with a means of affixing an engineering-unit legend to the front panel. The sheet contains the common engineering units encountered in making electro-mechanical measurements and additional alpha-numeric characters. Space is supplied on the front panel to affix the desired legend to the right of the display. To affix the legend to the front panel, press the dry-transfer sheet firmly

Daytronic Corporation

against the panel with the desired legend or character situated in place. Rubbing the legend or character with a ball-point pen will cause the legend to be transferred onto the panel. The legend can be protected from scratches which may occur during calibration/operation of the instrument by lightly spraying it with Krylon #1306 Workable Fixative.

If it is desired to change a legend, remove the legend to be replaced by pressing masking tape against the legend, then pulling off the gummed tape.

Scale Selection. Figure 2 shows the full-scale display for the three selectable scales: ± 5000 counted by 1's, ± 10000 counted by 2's, and ± 20000 counted by 5's. The figure also indicates the last active digit and the dummy zero which can be lit for any scale selection. The first digit of the display contains the polarity sign and lights as 1 on the 10000 and 20000 scales for values equal to or greater than 10000. On the 20000 range, because the most significant digit is either unlit or a 1 and the count is by 5's, the greatest number which can be displayed is 19995. Of course, this would be displayed as 199950 if the dummy zero were lit.

Scale selection is accomplished with the two pushbutton switches located at the rear panel. The panel is marked to indicate which switches are pushed IN or left OUT for the corresponding scale selection. The switches have a push-push action and are illustrated, with the scale selection coding, in Figure 3. With both switches OUT, the ± 5000 range is selected. With the left switch OUT and the right switch IN, the ± 10000 range is selected. With the left switch IN and the right switch OUT, the ± 20000 range is selected.

Decimal Point/Dummy Zero Selection. Decimal-point location and dummy-zero activation are selected with a rear-panel miniature slide switch bank. The switch bank is marked on the rear panel as shown in Figure 3. The decimal-point position can be fixed at any one of the display locations indicated on Figure 3. Place any one of slide switches 1 through 4 ON to light the decimal point at the desired location. Place slide switch 5 ON if no decimal point is to be lit. To activate the dummy zero (digit to the right of last active digit will continuously light as a zero), place slide switch 6 ON.

AC Power Connection. To protect operating personnel, the *3000 Series* Instruments are equipped with a three-conductor power cord. When the cord is plugged into the appropriate receptacle, the instrument is grounded. The offset pin on the

"3000" Digital Indicator

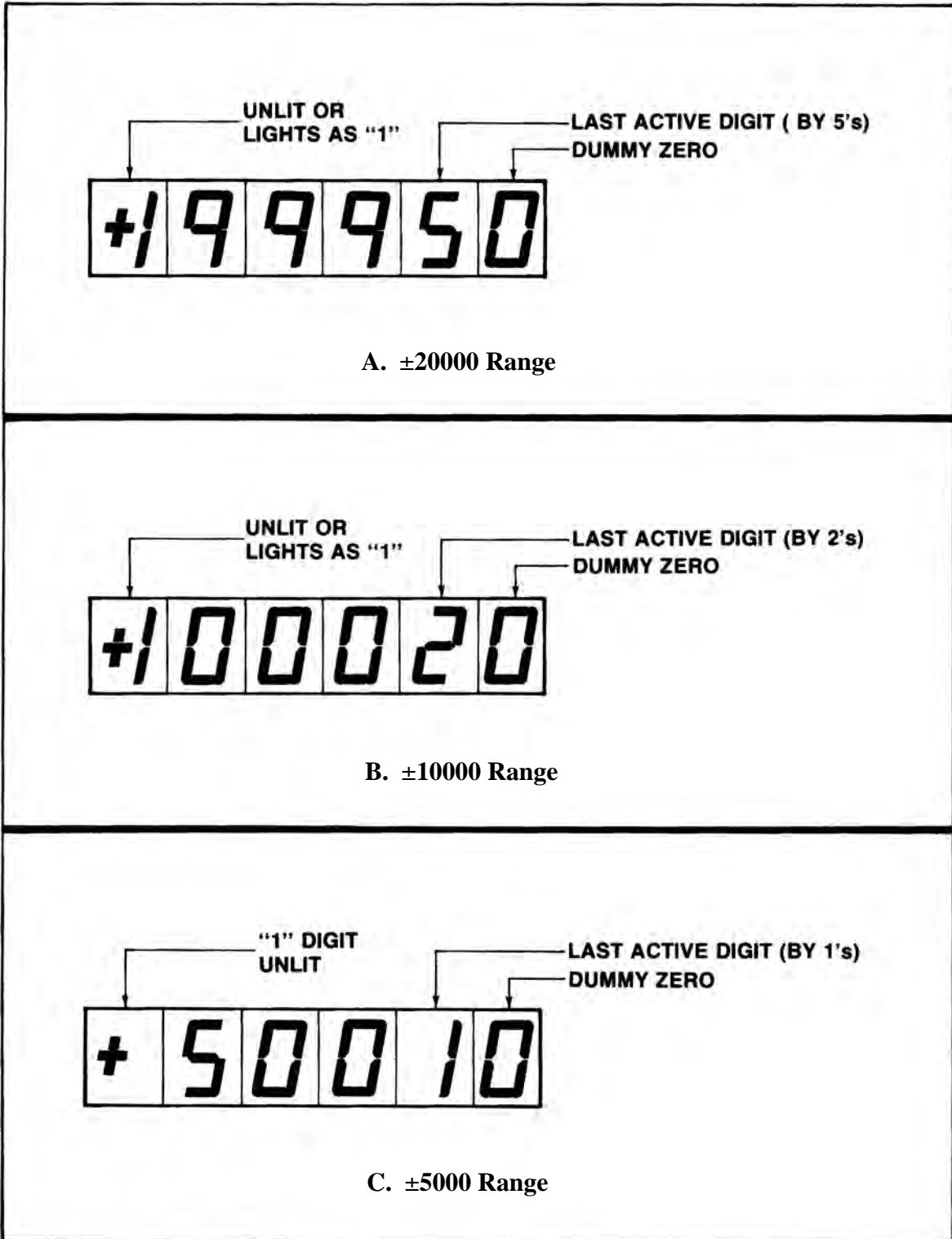


Figure 2. Full-Scale Displays for Three Ranges

power cord is ground. To maintain the safety ground when operating the instrument from a two-contact outlet, use a three-prong to two-prong adaptor and connect the green pigtail on the adaptor to ground.

To prepare the instrument for operation, connect the power cable to a 105-135 volt ac, 50-400 Hz power source. The instrument can use up to 5 watts of power.

3. OPERATION

The only operation required is turning ON/OFF ac power to the instrument. This is accomplished with the rear-panel slide switch (see Figure 3). The display lights immediately when ac power is ON.

NOTE

In all instances, a flashing display indicates that an overrange condition has occurred, and it is likely that the Signal Conditioner amplifiers are being overdriven. The 5000 and 10000 ranges are analog limited at approximately 5600 and 11200, and while a number may be displayed, if

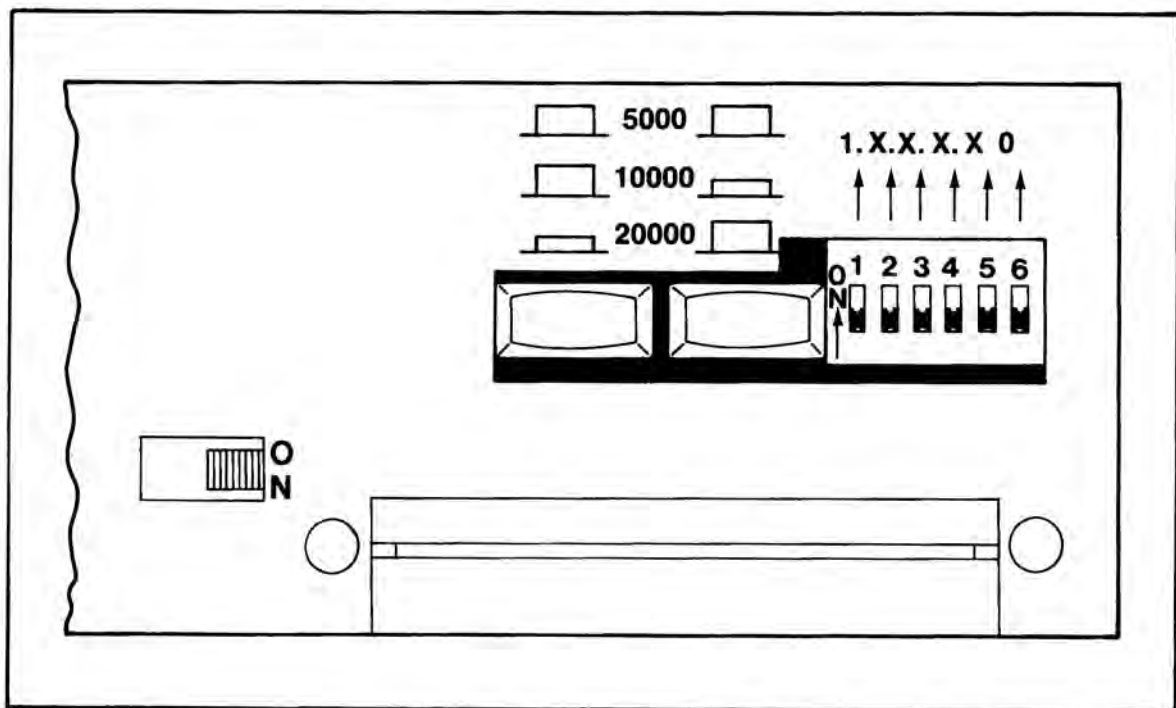


Figure 3. Scale, Decimal Point, Dummy Zero Switches

"3000" Digital Indicator

the display is flashing an overrange condition has occurred. Consequently, the displayed value may be invalid. The 20000 range is digitally limited to 19995. When an overrange occurs on this range, the display will flash all zeros.

4. BLOCK DIAGRAM DESCRIPTION

The purpose of this section is to explain how the Digital Indicator works by using a simplified block diagram. This section is not intended to provide a detailed explanation of electronic circuits for personnel untrained in electronic technology. However, it provides an adequate overview of operation for those familiar with basic electronic circuit operation. Throughout the following, refer to Figure 5.

Power Supplies. The integrated-circuit chips which comprise the *A/D Converter* and the *Overrange Comparator* are CMOS circuits which require ± 9 volts regulated. These voltages are supplied from power supplies contained on the Signal Conditioner circuit board and are discussed in the *Signal Conditioner Instruction Manual*.

The digital part of the *A/D Converter*, the *Bit Selector*, and the various logic gates and inverters are operated from +5 volts regulated (TTL logic). The +5 volt supply consists of a three-terminal *Regulator*. The unregulated input to the Regulator is obtained from Signal Conditioner circuit board (unregulated side of +9 volt supply).

The *BCD-to-7-Segment, Decoder, Display Drivers*, and *Display LED's* operate from +6 volts unregulated. Five volts ac is supplied from the Signal Conditioner circuit board (secondary of power transformer located on board). Plus 6 volts unregulated is developed with a *Diode Bridge* and *Filter* located on the Digital Indicator board.

A +2.5 volts precision reference is supplied from a precision power supply located on the Signal Conditioner circuit board. This reference is used in the *A/D Converter* for digitizing the analog input signal.

A/D Converter. The *A/D Converter* is a dual-slope converter which digitizes the analog input signal using a ratiometric integrating technique. The analog signal input, a reference input, and a clock input are applied to the converter. The measurement cycle is divided into an *Auto-Zero* cycle, a *Signal Integrate* cycle, and

a *Reference Integrate* cycle. Each cycle has a time base in which a certain amount of clock pulses occur. The clock used is a 100-kHz crystal oscillator. The *Auto-Zero* cycle is used to bring the output of the integrator to zero and lasts 10,000 counts. The next cycle is the *Signal Integrate* cycle which also lasts 10,000 counts. If the analog input is zero at the start of the *Signal Integrate* cycle, the integrator will see the same voltage that existed in the previous state. Thus, the integrator output will not change but will remain stationary during the entire *Signal Integrate* cycle. If the analog input is not equal to zero, an unbalanced condition exists compared to the *Auto-Zero* cycle and the integrator will generate a ramp whose slope is proportional to the analog input. At the end of this cycle, the sign of the ramp is determined. If the input signal was positive, a voltage which is V_{REF} more negative than during *Auto-Zero* is applied to the integrator input. The *A/D Converter* chip generates the equivalent of a *+Reference* or *-Reference* from the single *+Reference* applied. The reference voltage returns the output of the integrator to zero. The time, or number of counts, required to do this is proportional to the input voltage. The *Reference Integrate* cycle can be a maximum of 20,000 counts. The full measurement cycle is then a maximum of 40,000 counts, with the answer to the measurement being achieved when the reference voltage returns the integrator output to zero. The full measurement cycle is shown in Figure 4.

The DIGIT DRIVES are positive-going signals that last for 200 clock pulses (see Figure 4). The scan sequence is D5 (MSD), D4, D3, D2, and D1 (last active digit). The scan is continuous unless an overrange occurs. Then all DIGIT DRIVES are blanked from the end of the first scan until the beginning of the *Reference Integrate* cycle when D5 will start the scan again. This gives a blinking or flashing display as a visual indication of overrange. Because the Digital Indicator has 5000 and 10000 ranges as well as a 20000 range, an analog *Overrange Comparator* is used as well as the inherent overrange capability of the *A/D Converter*. The *Overrange Comparator* is described in a following paragraph.

The binary-coded-decimal (BCD) outputs of the *A/D Converter* are positive logic signals that go on simultaneously with the DIGIT DRIVE. Since the DIGIT DRIVES are blanked for an overrange on the 20000 scale, the display will flash all zeros when this condition occurs on this scale.

Input Attenuators/Range Switches. The 5-volt analog signal input (full scale) and the 2.5 volt reference from the Signal Conditioner are applied to attenuator networks where 2-volt and 1-volt signal and reference inputs are developed for the *A/D Converter*. Since, on the 20000 range, the *Reference Integrate* cycle can be

"3000" Digital Indicator

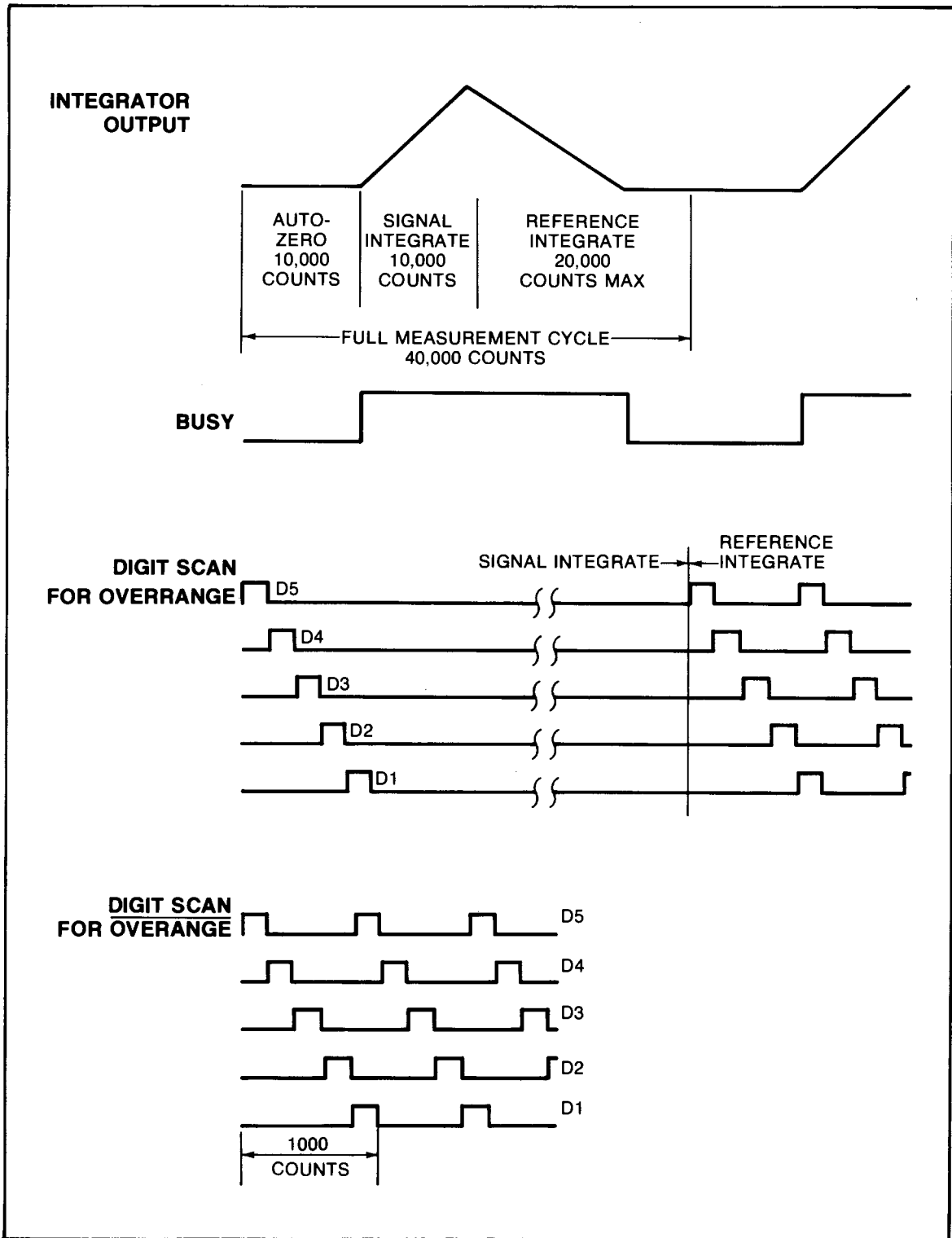


Figure 4. A/D Converter Timing Diagram

twice as long as the *Signal Integrate* cycle, the analog input voltage required to give a full-scale reading is exactly equal to $2 V_{REF}$. Consequently, on the 20000 range, the V_{REF} is 1 volt and the V_{SIG} is 2 volts for full scale. On the 10000 range, the two cycles can be equal; thus, $V_{SIG} = V_{REF} = 2$ volts. On the 5000 range, the analog voltage for a full-scale reading is then equal to $1/2 V_{REF}$; thus, V_{REF} must be 2 volts and V_{SIG} 1 volt. The appropriate levels are switched to the *A/D Converter* through the rear-panel *Range* switches.

Bit Selector/Decoding Logic. The Bit Selector transfers one of two sets of 4-line BCD data applied at input ports to output ports upon receiving a command at the A SELECT or B SELECT port. When the A SELECT port is high, the X input data is transferred to the Z output ports. Conversely, when the B SELECT input is high, the Y input data is transferred to the Z output ports. The Y data is obtained directly from the BCD output ports of the *A/D Converter*. The X data is comprised of specially coded bits used to count by 2's or 5's when the 10000 or 20000 ranges are selected, respectively. On the 5000 range, the A SELECT input is held low through the *Range* switches and the B SELECT input is high. The Y data is transferred to the output of the *Bit Selector* and the display count is by 1's. On the 10000 range, the A SELECT input is held low except when the D1 DIGIT DRIVE is high. When D1 is high, the A SELECT is high and the B SELECT is low, transferring the X data to the Z ports of the *Bit Selector* and allowing the display to count by 2's. Operation on the 20000 range is identical except that the bit coding is arranged to give a count by 5's with the X data.

Display Coding/Driving. The display is a 4.5-digit LED display with polarity and a dummy zero. DS2 through DS6 are 7-segment displays with common cathodes. The *Bit Selector* output ports are connected as inputs to a *BCD-to-7-Segment Decoder*. The 7 outputs of the decoder are connected as inputs to the segments (anodes) of DS2 through DS6. The DIGIT DRIVES of the *A/D Converter* are used to sequentially turn on DS2 through DS6 through *Display Drivers* which sink current. DS1 is either unlit or lights as a 1 for displays of 10000 or greater. Unlike DS2 through DS6, DS1 is a common anode device. The DS1 segments (cathodes) are sunk via a display driver from the 1 bit of the *A/D Converter*. The DS1 anode is then brought high by D5 through a driver comprised of an inverter and a transistor which applies +6 volts unregulated to the anode when D5 is high.

The last digit of the Display (DS6) is the dummy zero digit. When the *Dummy Zero Select* switch is ON, the DS6 cathode is sunk when D5 is high. The outputs of the *BCD-to-7-Segment Decoder* are tied to the DS6 segments. Also, when D5 is

"3000" Digital Indicator

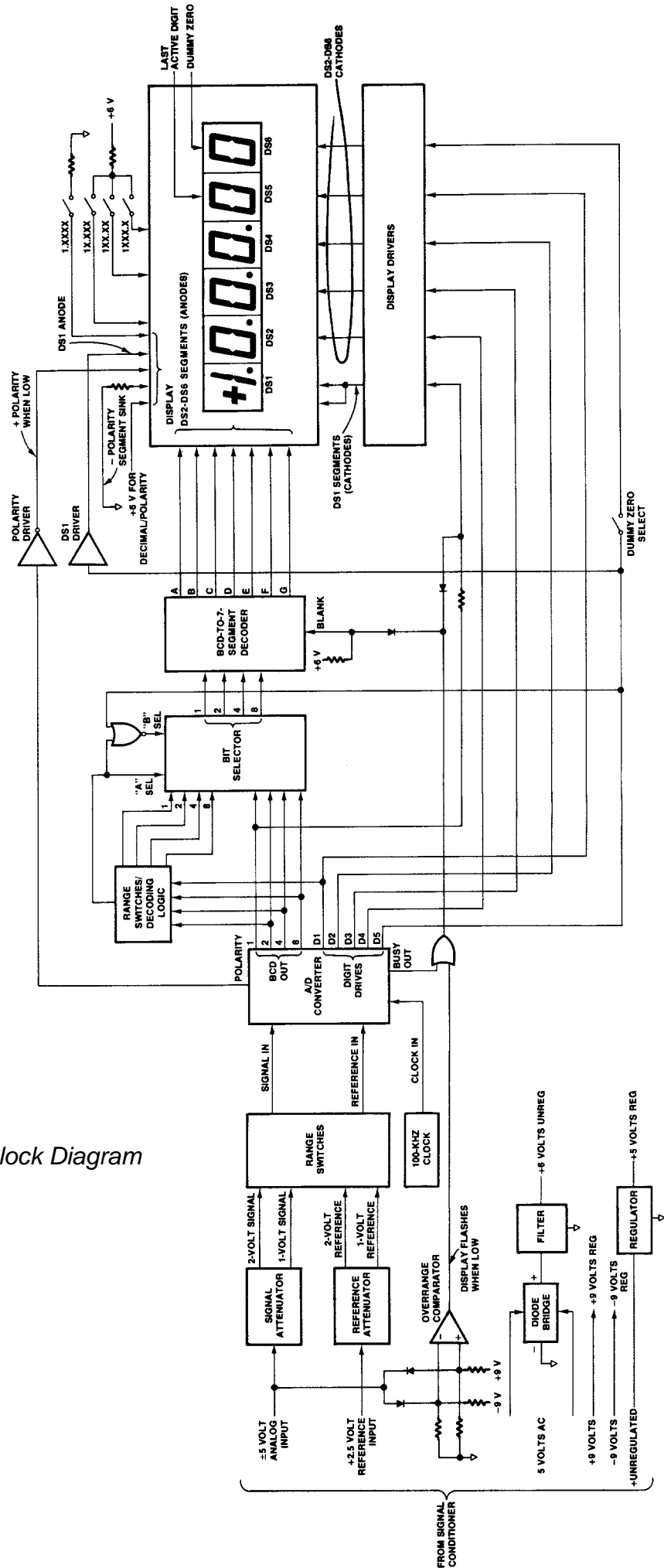
high, the B SELECT input to the *Bit Selector* is pulled low through the NOR gate connected to the port. The A SELECT input is also low since it is either held hard low through the *Range* switches on the 5000 range or it is connected to D1 through the *Range* switches on the 10000 and 20000 ranges (when D5 is high D1 must be low). With the A SELECT and B SELECT inputs both low, the Z ports of the *Bit Selector* assume the low state no matter what the X and Y input data reads. Consequently, each time D5 is high, DS6 displays a zero.

The polarity sign is also part of DS1. The minus (-) segment is always lit through 6 volts and an external resistor tied to circuit common. When the *A/D Converter* senses a positive polarity, the POLARITY port goes high. This action drives an inverter low to light the vertical portion of the polarity sign.

Decimal point position is selected with rear-panel slide switches (as is dummy zero selection). Only one of the *Decimal* slide switches is turned ON at any one time. The decimal-point LED for DS1 is hard wired to +6 volts. Turning ON the associated *Decimal* switch connects an external resistor and circuit common to the other side of the decimal-point LED. Since the remaining digits with decimal-point LED's (DS2 through DS4) are common cathodes devices, each LED is sunked when the corresponding DIGIT DRIVE is high and associated *Decimal* switch is ON, applying +6 volts to the other side of the LED through an external resistor.

Analog Overage. Digital overrange for the 20000 range is inherent in the A/D Converter chip and has been previously described. However, for the 5000 and 10000 ranges, an analog overrange circuit is required. The *Overage Comparator* is dc biased with equal resistors returned to the ± 9 volt supplies so that its output is at approximately 4.5 volts. Both of the comparator inputs are connected through diodes to the analog input from the Signal Conditioner. When the analog input is one diode drop above or below the comparator biasing, an overrange condition exists since approximately 5.2 volts is present at the analog input (5 volts = full-scale value). The output of the *Overage Comparator* goes low when either of the input diodes is forward biased. The comparator output and the BUSY output of the A/D Converter are gated through an OR gate. The BUSY signal is high during the Signal and Reference Integrate cycles of the A/D Converter, then it goes low. This causes the output of the OR gate to go low. The BLANK port of the BCD-to-7-Segment Decoder is normally held high through an external resistor. When the OR gate output goes low, the BLANK port is pulled low through a diode, causing DS2 through DS6 to flash. Since DS1 is not driven from the decoder, a second diode and resistor are used to pull the *A/D Converter 1-bit* output low when the overrange OR gate is low. This action causes DS1 to flash.

Figure 5. Block Diagram



5. VERIFICATION OF NORMAL OPERATION

It is the purpose of this section to aid the user in rapidly determining whether the Digital Indicator is functioning normally or whether it is the source of the observed trouble. In the event a repair to the Digital Indicator is required, a complete parts list, schematic diagram, and component location drawing are included in this manual. The user may also contact the factory Service Department or the local Daytronic Representative for assistance.

One of the two techniques can be used to rapidly determine whether the Digital Indicator is malfunctioning or whether the problem is in the Signal Conditioner, transducer, or transducer cabling. If the unit is a *Form 2* instrument (no Hi-Lo Limits), attempt to zero and calibrate the Signal Conditioner while observing the Signal Conditioner analog output (use the dc-to-2Hz output) on a dc coupled oscilloscope. If the Digital Indicator is unstable or reads erratically, but the oscilloscope indicates a stable analog output from the Signal Conditioner, the problem is likely in the Digital Indicator. In the event the Signal Conditioner output is unstable or noisy, consult the Signal Conditioner *Instruction Manual* for the proper action to be taken.

If the instrument is a *Form 3* type, push one of the Limit pushbuttons and observe how the limit value is displayed on the Digital Indicator. If the display is stable with the Limit button pressed, but is unstable when the button is released, the problem is in the Signal Conditioner, transducer, or transducer cabling. If the display is unstable or erratic whether the button is pressed or released, the problem is in the Digital Indicator.



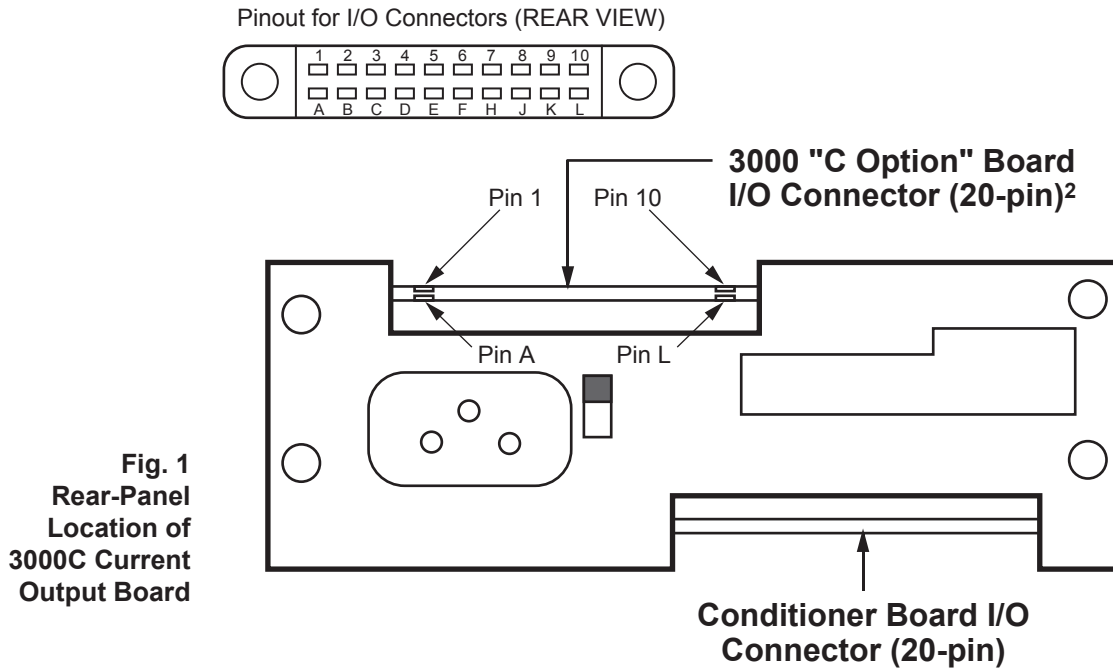
3000 SERIES
"C" Option
4-20 mA CURRENT OUTPUT

INSTRUCTION MANUAL

1. General Description

Operating in this mode, any 3000 Series instrument can transmit high-accuracy measurement data as *process signals for supervisory monitoring and control*.¹ Each "C" unit produces two kinds of analog output simultaneously: (1) its normal voltage output and (2) a current output continuously proportional to the voltage signal to within $\pm 0.05\%$.

As normally shipped, this option generates a current output within the ISA standard signal range of 4 to 20 mA, corresponding to a range of 0 to +5 V. Bipolar ranges of ± 16 mA and 4 to 12 to 20 mA are also available, each corresponding to -5 to +5 V. Voltage compliance is +5 V relative to Signal Common.



2. Connections / Output Mode Selection

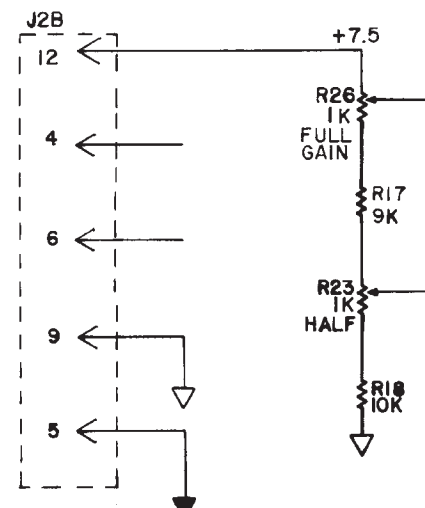
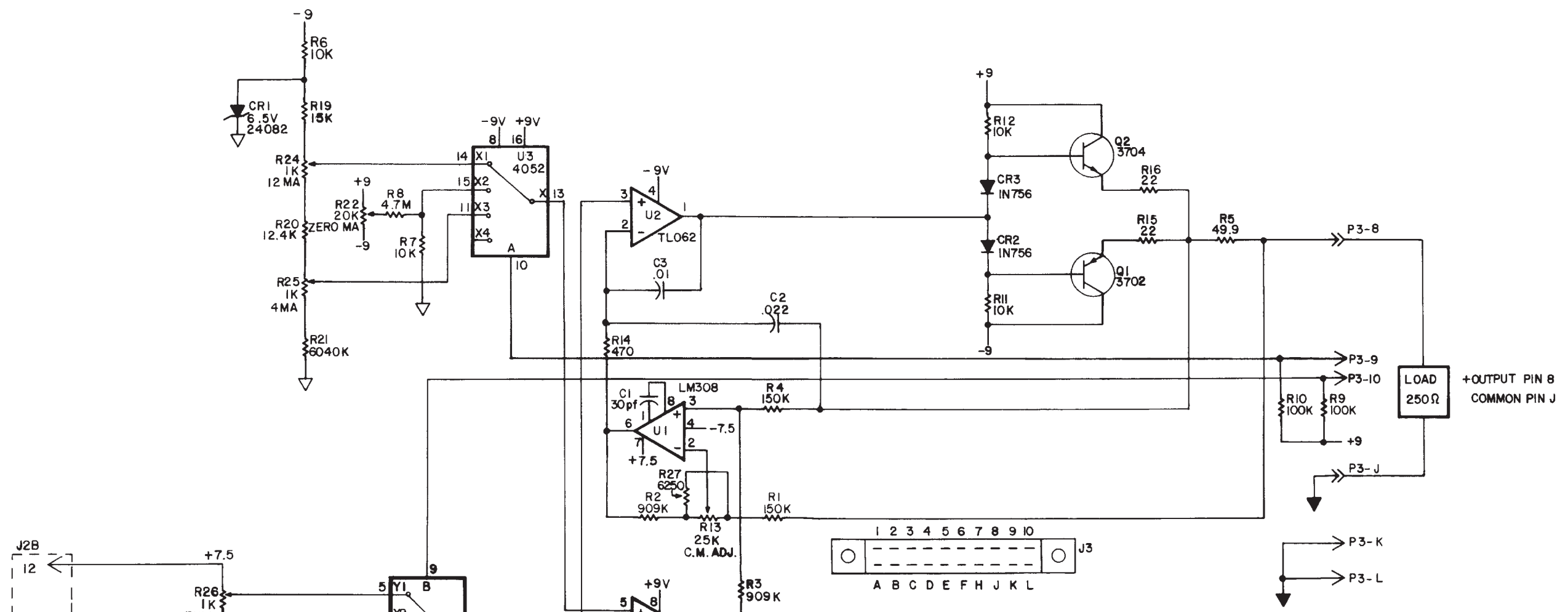
Pin assignments for the 3000C board's 20-pin I/O connector (shown in Fig. 1) are given in the following table.³

Pin Number	Function
8	CURRENT OUTPUT SIGNAL Range will be standard unipolar 4-20 mA if Pins 9 and 10 are both unconnected; the output is single-ended, and should be returned to Pin J (COMMON)
9	± 16 mA MODE Connecting Pin 9 to Pin K will set the current output range to bipolar ± 16 mA
10	4-12-20 mA MODE Connecting Pin 10 to Pin L will set the current output range to bipolar 4-12-20 mA (with 12 mA as effective "zero")
J	COMMON
K, L	for OUTPUT MODE SELECTION

¹ NOTE: The "C" Option may NOT be used in combination with the "P," "G," "R," or "S" Option.

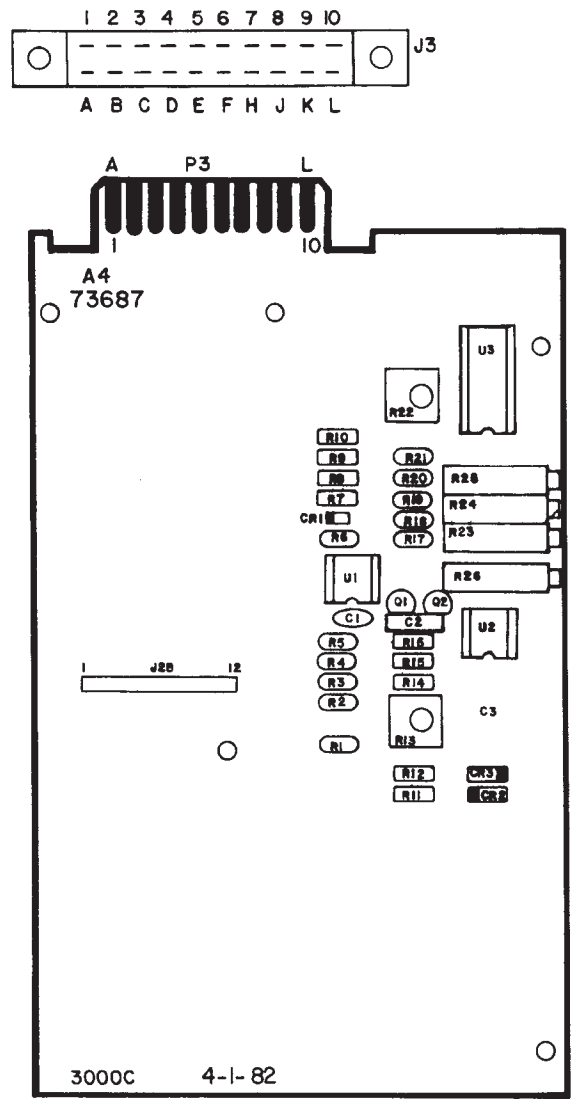
² In **Form 3 ("33XX")** instruments with the "C" Option, current-output circuitry is integrated with the **3300 HI-LO Limits Board**.

³ For all other (*limit-related*) I/O connections for **Form 3 ("33XX")** instruments with the "C" Option, see the *Model 3300 HI-LO Limits Instruction Manual*.



73687-3000C

- NOTES:
1. ALL -9V WIRES GO TO J2B PIN 6.
 2. ALL 9V WIRES GO TO J2B PIN 4.
 3. ALL POW COM WIRES GO TO P3 PINS J,K,L, FROM J2B PIN 5.
 4. ALL SIG COM WIRES GO TO J2B PIN 9.



CURRENT MODES
 NO STRAP 4 TO 20 MA MODE
 9 TO K ± 16 MA MODE
 10 TO L 4-12-20 MODE 12 MA ZERO

POWER PIN CHART

DEVICE	PIN	TO	PIN	TO	PIN	TO
U1	LM308	4	-9V	7	+9V	
U2	TL062	4	-9V	8	+9V	
U3	4052	8	PCOM	16	+9V	7 -9V

CSR	C	7-1-96	WAS VERSION 003	SLS	
T.T	B	2-7-91	REV. 001 TO REV. 002, 003 TO 005	MW	
	A	10-24-90	ADDED PIN CHART, J2B, REMOVED P3.		
ZONE	REV.	DATED	DESCRIPTION	APP.	CONTROL
DHL DES.	CHK.				
CLM DFT.	APP.				
DATE:	7-12-83	REV:	7-1-96	REV. LEVEL:	C
NAME:	4 TO 20 MA CURRENT OUTPUT CARD			s3000C NUMBER	

3000C 4-1-82



3000 SERIES

“G” Option

DUAL GALVANIC ISOLATED OUTPUT

INSTRUCTION MANUAL

1. General Description

With this optional circuit board, a **Form 1 (“31XX”)** or **Form 2 (“32XX”)** instrument can furnish two independent *galvanic outputs*, fully isolated not only from each other but also from the 3000 instrument's “common.” Each output is normally set at the factory for a full-scale range of **0-10 V-DC** ($\pm 0.2\%$) when the data signal from the 3000 unit's conditioner card is at its standard 5-V level. Though normally preset at “2.00,” each input's gain can be adjusted within $\pm 5\%$, if desired, by means of potentiometer controls on the G-option card.

The use of galvanically isolated outputs prevents ground-loop effects in interconnections with remote data-acquisition systems or controllers. The presence of two independent outputs lets you send collected data to two different systems or devices, each with its own ground.

Load limit for each output exceeds 10 kilohms. Output bandwidth is normally 40 Hz; the “G” option can be easily modified, however, for other bandwidths up to 500 Hz (contact the factory for details).

NOTE: The only other options that may be combined with the “G” option are the “B” (battery-powered) and “F” (230 V-AC-powered) options.

2. Additional 3000(G) Specifications

Output Range: ± 10 V-DC full scale (2 mA max), normal; internal controls give approximately $\pm 5\%$ of adjustment authority on both SPAN and ZERO

Common-Mode Range: ± 500 V, max

Common-Mode Rejection Ratio: DC: -120 dB; at 60 Hz: -60 dB

Linearity: $\pm 0.1\%$ of full scale

Maximum Zero Drift, After Warmup of One-Half Hour: $\pm 0.2\%$ of full scale*

Maximum Span Drift, After Warmup of One-Half Hour: $\pm 0.2\%$ of full scale*

* Applies to the 3000 “G” Option only and does not include possible drift contributed by the signal conditioner board of the base 3000 instrument.

3. Installation and Cabling

When viewing the 3000 instrument from the rear, the Galvanic Output Board is in the upper left of the rear panel (see Fig. 1). Access to the output signals is through a 20-pin edge card connector with a key slot between contact pads 4 and 5. The user must provide his own cable connection to the card, pinout for which is as follows:

Pin No. (see Fig. 1)	Function
2,B	SIGNAL 1 OUT
1,A,3,C	ISO COM 1
9,K	SIGNAL 2 OUT
8,J,10,L	ISO COM 2

Cabling of the isolated analog outputs is shown in Fig. 2. Each output is single-ended and returns to its own ISOLATED COMMON. Each output's SHIELD should be tied to the instrument chassis via one of the screws holding the rear panel.

4. Calibration

NO ADJUSTMENT OF THE G OPTION IS NECESSARY DURING NORMAL USE.** Follow the normal calibration procedure given in the respective *3000 Instrument Instruction Manual*.

** As mentioned above, separate ZERO and SPAN adjustment controls are provided on the G Option board for each isolated output, if it is desired to refine the “2.00” gain to which the output has been set prior to shipment. These controls, shown in Fig. 3, may be accessed by removing the 3000 instrument's front panel.

Pinout for I/O Connectors (REAR VIEW)

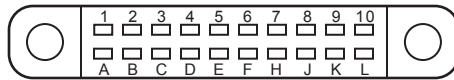


Fig. 1
Rear-Panel
Location of
3000G Galvanic
Output Board

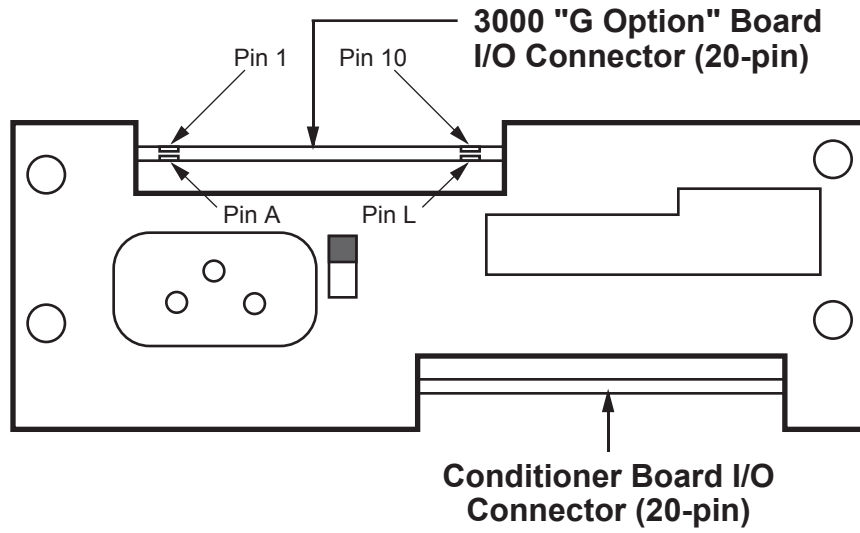


Fig. 2
Cabling of
Isolated
Outputs

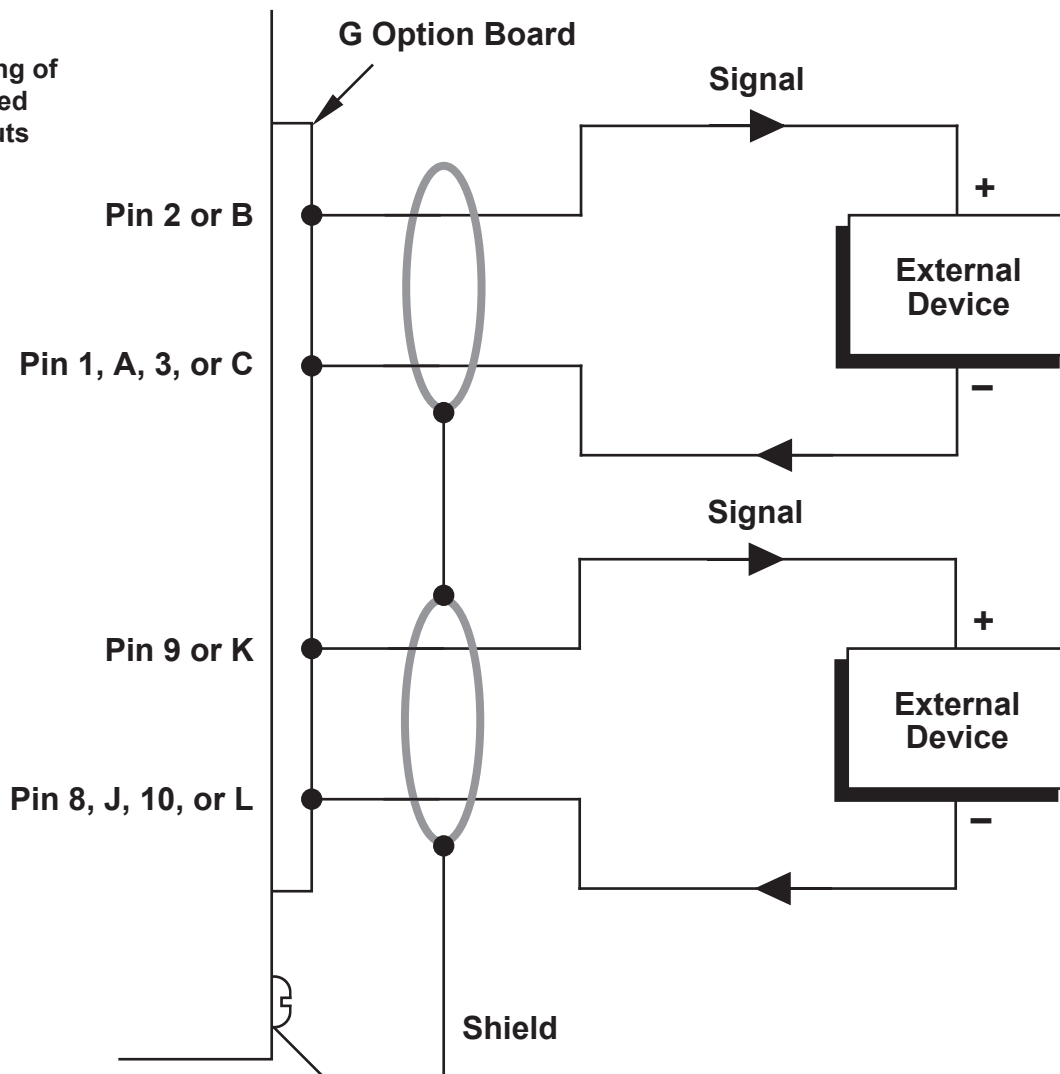
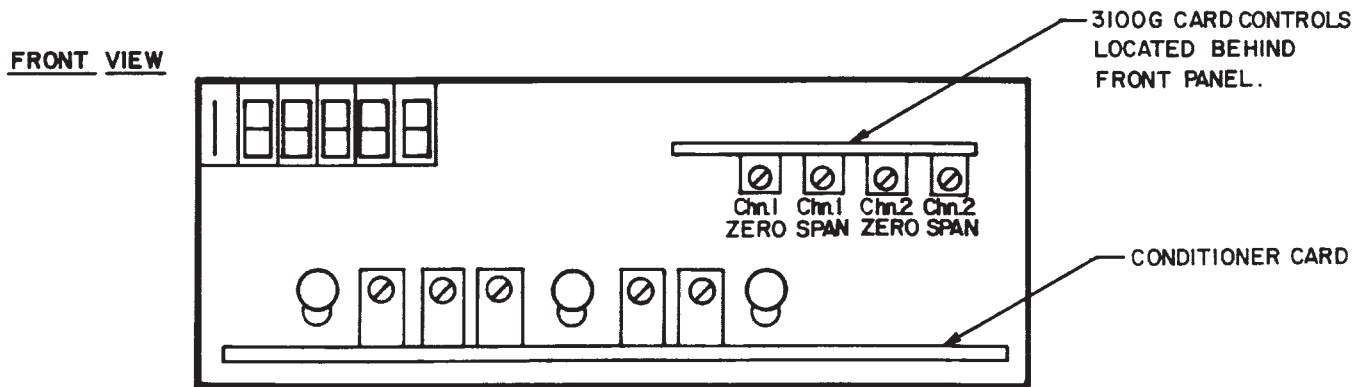
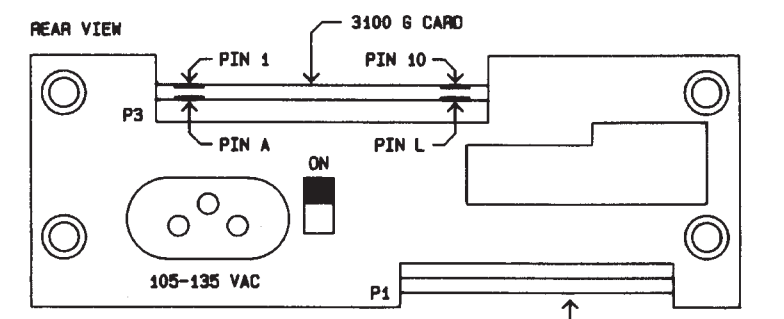
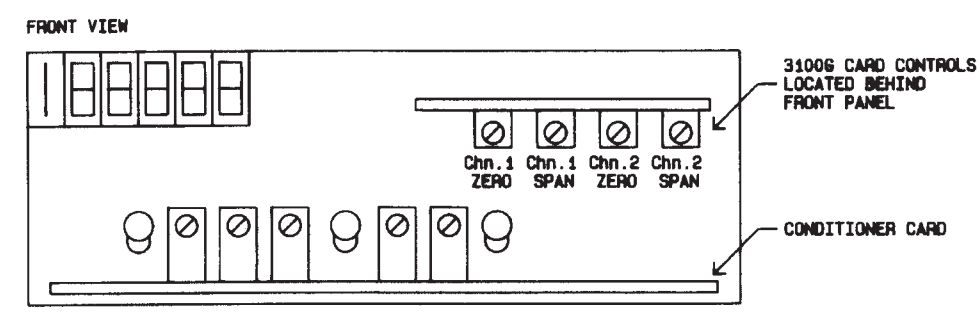
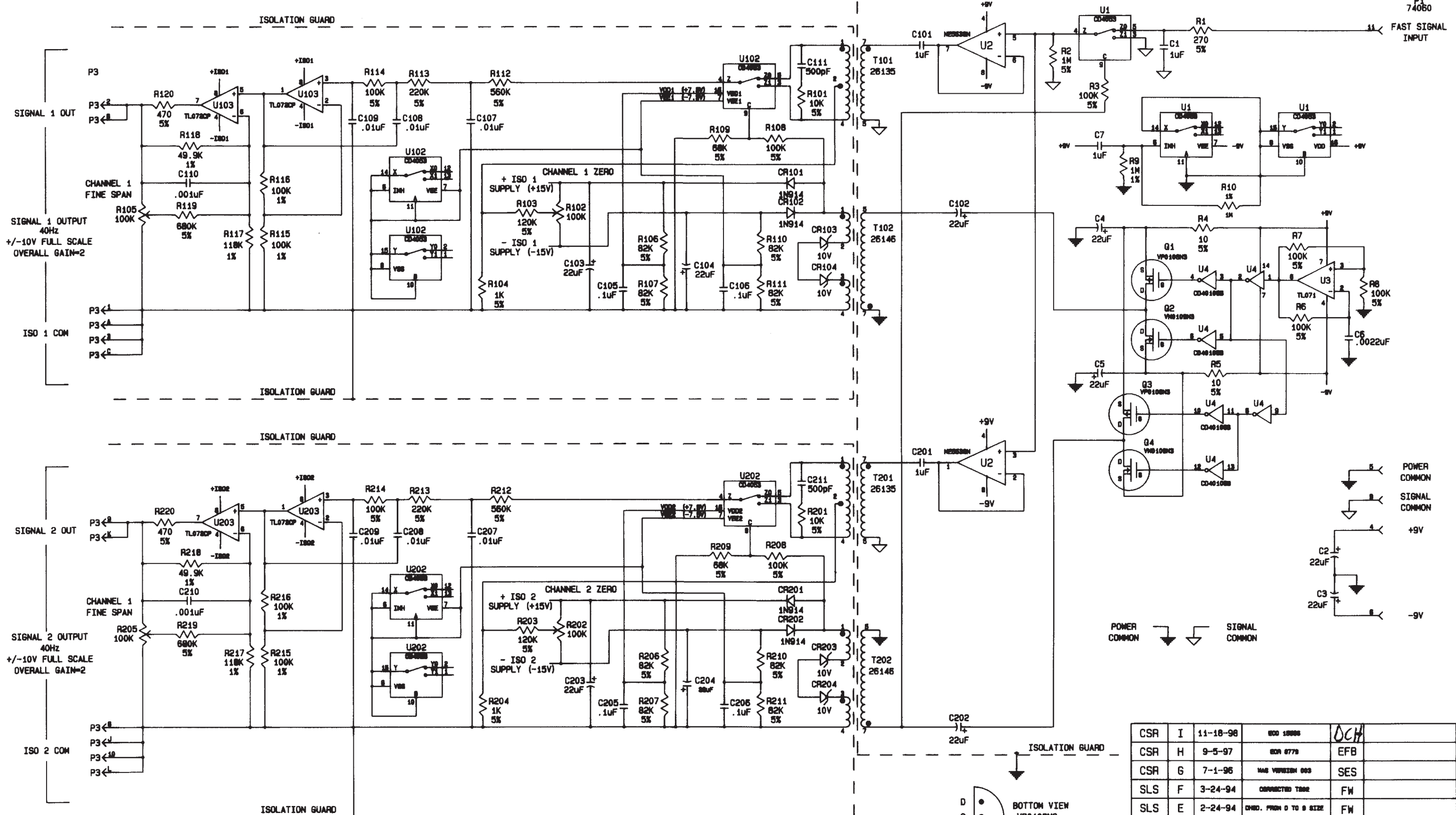


Fig. 3 Location of Internal G-Option Controls





BOARD NO.: 73871.1
BOARD DATE: 2-5-87

PROPRIETARY INFORMATION
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF DAYTRONIC CORPORATION, AND REMAINS THE PROPERTY OF DAYTRONIC CORPORATION. NEITHER THIS DOCUMENT NOR THE INFORMATION CONTAINED HEREIN MAY BE REPRODUCED, USED OR DISCLOSED TO ANY THIRD PARTY WITHOUT THE EXPRESS WRITTEN CONSENT OF DAYTRONIC CORPORATION.

CSR	I	11-18-98	800 10888	DCH	
CSR	H	9-5-97	800 8778	EFB	
CSR	G	7-1-96	MAN VERSION 003	SES	
SLS	F	3-24-94	CORRECTED TIME	FW	
SLS	E	2-24-94	CHNG. FROM 0 TO 8 SIZE	FW	
CLM	D	4-8-93	SEE SCR #6480	MW	
	C	11-29-90	CHG VER. R117-R118 R117-R118 ADD C111, C111	MW	
	B	10-31-90	CHNG. FROM 031006	MW	
	A	8-2-88	ADDED C110, C210 BOTH .001uF; CHNG. VER. #	MW	
DFT.	REV.	DATED	DESCRIPTION	APP.	CONTROL
DSA DES.	DSA CHK.				
KIS DFT.	FW APP.				
DATE	1-12-87	REV	11-18-98	REV. LEVEL:	I
NAME	GALVANIC ISOLATED OUTPUT OPTION CARD (3100G)			NUMBER	s3000G



3000 SERIES
“P” Option
ANALOG PEAK CAPTURE

INSTRUCTION MANUAL

1. General Description

With the installation of a special "P" version of the 3000 Series HI-LO LIMITS board (shown in Figure 2, below), *real-time analog peak capture* is possible for a **Form 2 ("32XX")** or **Form 3 ("33XX")** instrument, in addition to its normal "tracking" function.¹

Controlled either by front-panel push buttons (Fig. 1) or by a remote user-installed switch (Fig. 3), a "P" unit can "freeze" and display the last positive input-signal "peak" value to have been perceived. The analog output is held at this value until a TRACK/RESET command is applied.² A subsequent higher signal excursion disables the "hold," permitting the capture of subsequent higher peaks. Because it is digitally held, a displayed peak value will not decay. The maximum decay rate for a held analog output is only 0.1% of full scale per minute.

For capture of negative "peaks" (signal minima), the input lines may be inverted.

With all **Form 3** instruments, limits are automatically latched upon peak capture, and are automatically reset on return to normal TRACK mode. See the *Model 3300 HI-LO Limits Instruction Manual* for complete details regarding limit setup and operation (including mode selection, setting of limit setpoint values, and logic output connections for annunciation and control). For selection of engineering-unit digital range and resolution, see the *Model 3200/3300 Digital Indicator Instruction Manual*.

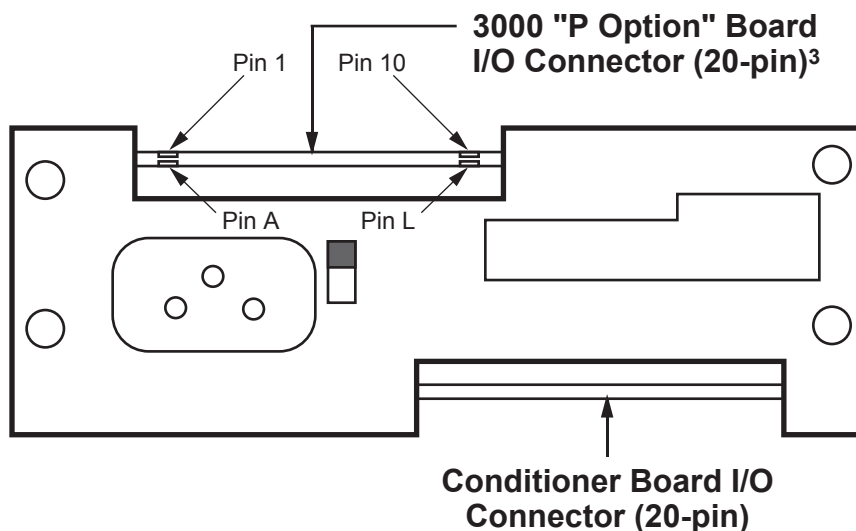


Fig. 1
Model 3378P Front Panel, showing push buttons for Peak / Track control

Pinout for I/O Connectors (REAR VIEW)



Fig. 2
Rear-Panel Location of 3000P Peak Capture Board



¹ NOTE: The "P" Option may NOT be used in combination with the "C," "G," "R," or "S" Option.

² To prevent low-level signal noise from triggering a "peak hold," the peak capture function is automatically disabled when the input is less than 8% of full scale. If you require peak capture within the 0-8% range, contact the factory.

³ In **Form 3 ("33XX")** instruments with the "P" Option, peak-capture circuitry is integrated with the **3300 HI-LO Limits Board**.

2. Connections

Pin assignments for the 3000P board's 20-pin I/O connector (shown in Fig. 1) are given in the following table.*

Pin Number	Function
7	PEAK ANALOG SIGNAL Holds peak analog input value when in PEAK mode; follows analog input continuously when in TRACK mode
8	TRACK Used for external <i>peak reset</i> control (see Fig. 3, below)
9	SLOW Tie to Pin K for <i>narrowband-signal</i> peak processing (DC to 2 Hz)
10	FAST Tie to Pin K for <i>wideband-signal</i> peak processing (DC to highest available low-pass filter corner frequency)
B or J**	COMMON
K	PEAK RESPONSE SELECT Tied to Pin 9 or 10 to select narrowband or wideband peak processing, respectively

As indicated in the table, *a jumper must be installed between PIN K and either PIN 9 ("SLOW") or PIN 10 ("FAST")*, depending on whether you want to capture peaks for a *narrowband* signal (DC to 2 Hz) or a *wideband* signal (DC to highest available low-pass filter corner frequency), respectively.

3. Operation

As mentioned above, PEAK/TRACK operation can be locally controlled by front-panel push buttons, while the PEAK RESET function can be remotely controlled by a logic-level command to the rear 3000P connector (when the instrument is set to PEAK mode via the front-panel buttons).

For front-panel control, you will use the two LIMIT SET buttons as follows:

BOTH BUTTONS PRESSED ("IN")

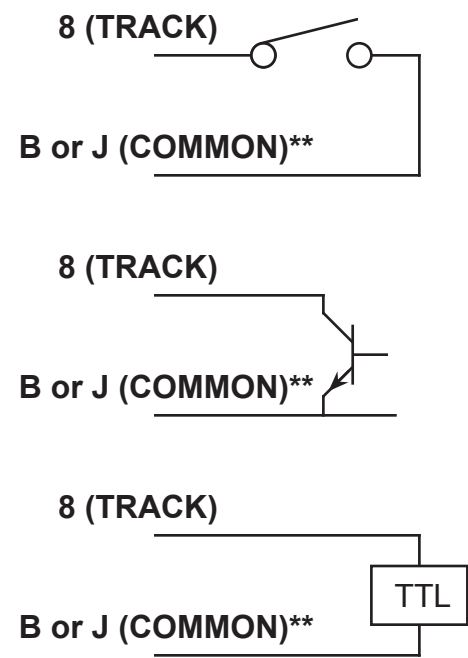
Places the unit in TRACK mode. The analog output at Pin 7 will continuously follow the analog input. This mode is used to *reset* the instrument following peak capture.

BOTH BUTTONS UNPRESSED ("OUT")

Places the unit in PEAK mode. The analog output at Pin 7 will continuously represent the most positive value experienced by the analog input signal since PEAK mode was last begun.

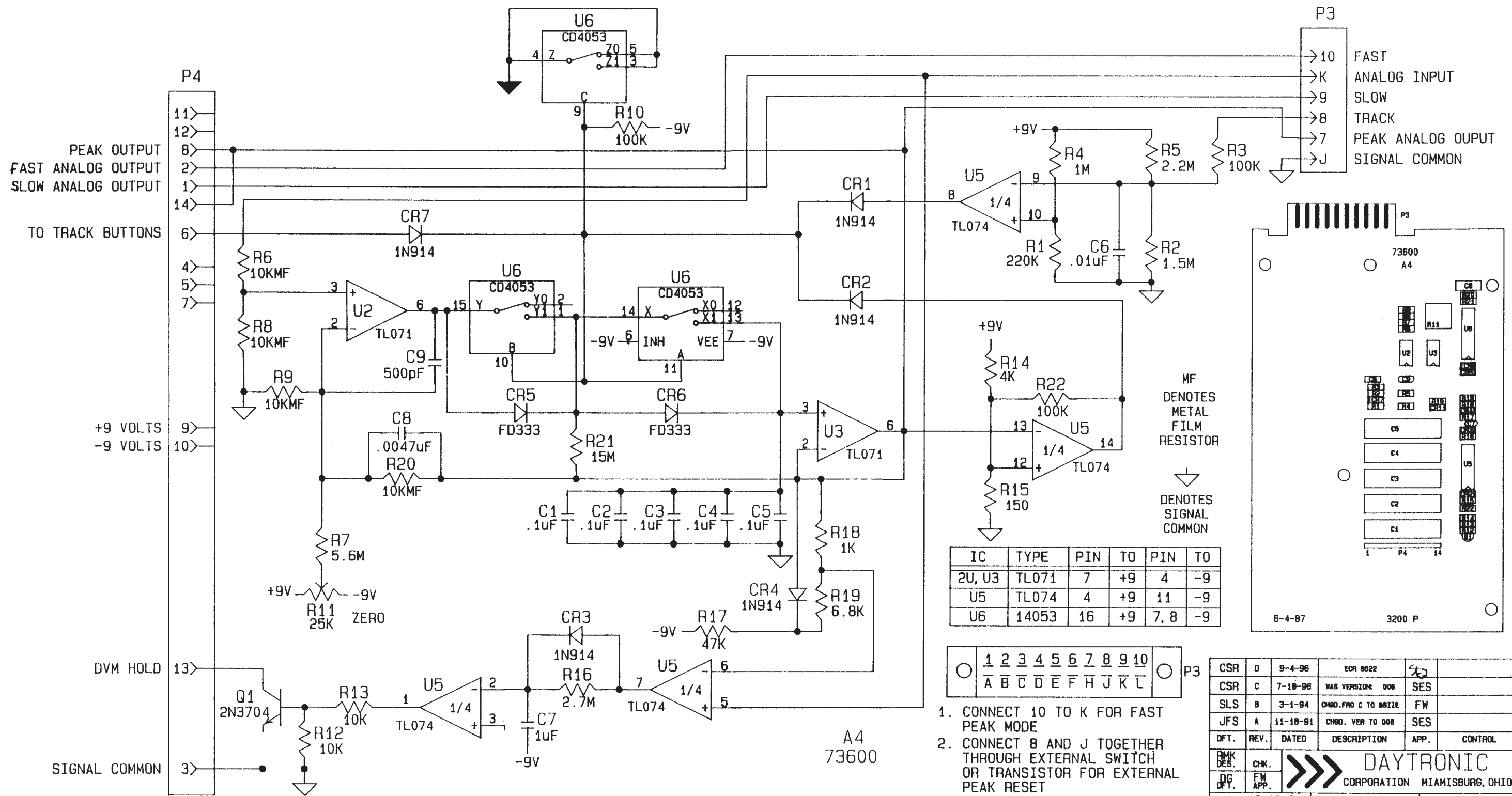
When (and only when) the instrument is set to PEAK mode via the front-panel buttons, a PEAK RESET can be externally applied by connecting **Pin 8** of the rear I/O connector with the **COMMON** line (**Pin B or J****), as shown in Fig. 3. Thus, when these pins are connected via an external contact closure (as in the top diagram of Fig. 3), CLOSING the switch will cause the output at Pin 7 to once again TRACK the analog input, while OPENING the switch will return the output to PEAK mode.

Fig. 3
Track/Reset Via External Command (Switch, Open Collector Transistor, or TTL Logic)



* For all other (*limit-related*) I/O connections for **Form 3 ("33XX")** instruments with the "P" Option, see the *Model 3300 HI-LO Limits Instruction Manual*.

** Use **Pin B** for **Form 3 ("33XX")** instruments; use **Pin J** for **Form 2 ("32XX")** instruments.

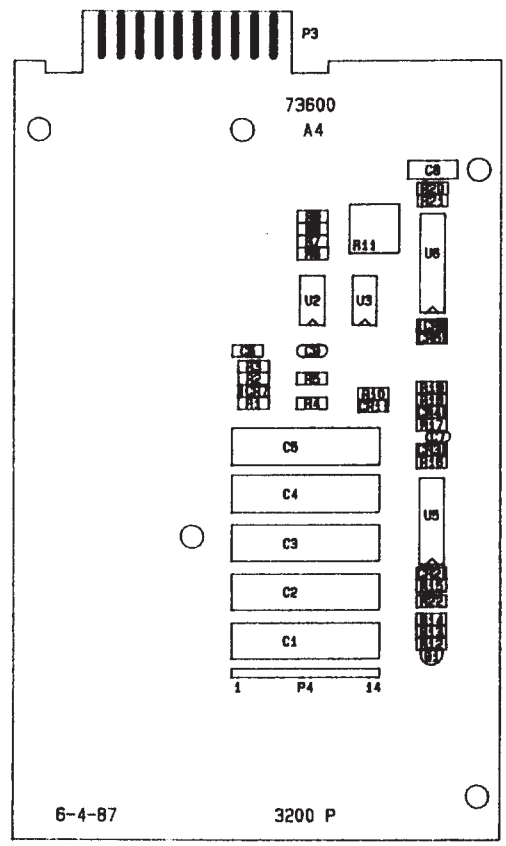


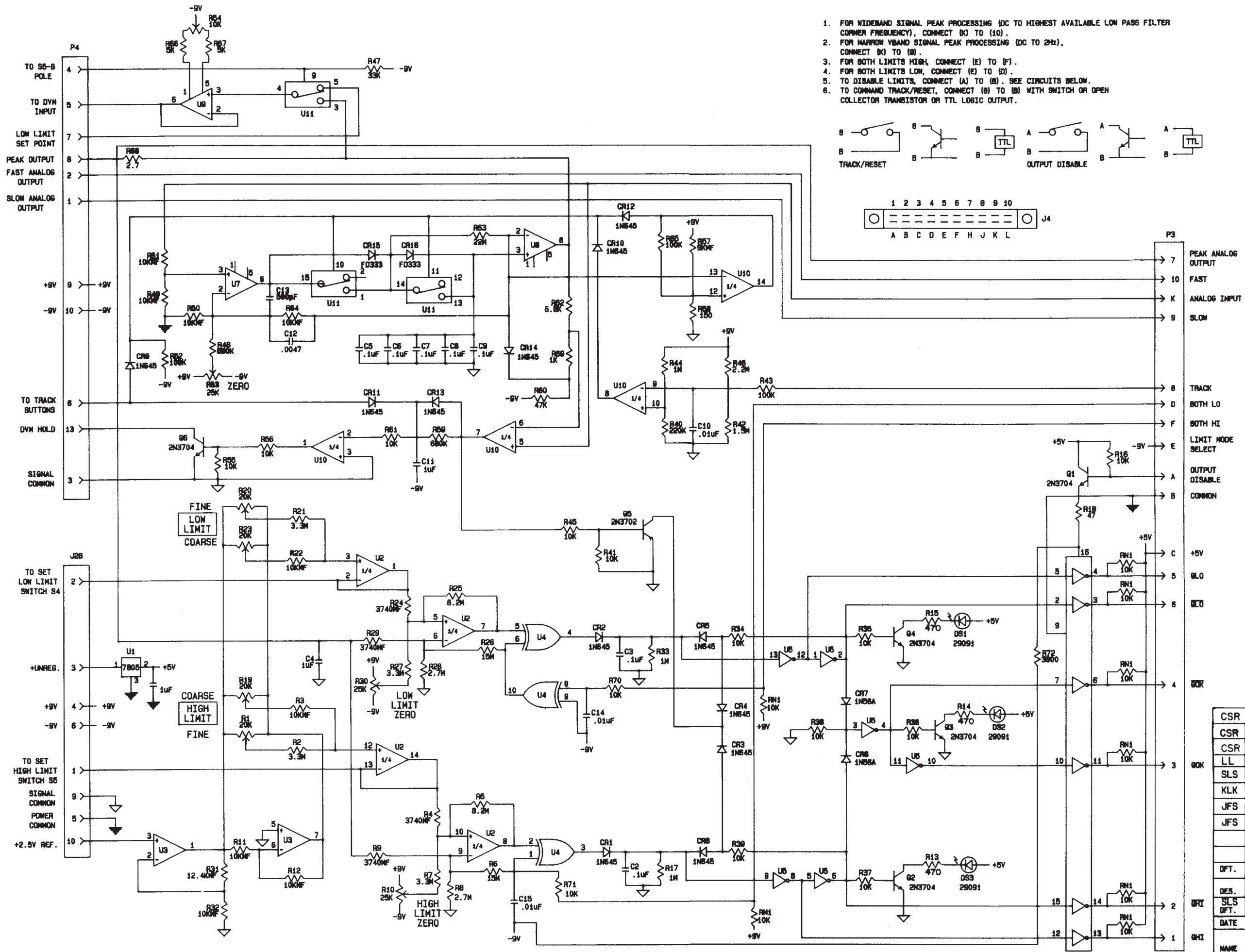
IC	TYPE	PIN	TO	PIN	TO
2U, U3	TL071	7	+9	4	-9
U5	TL074	4	+9	11	-9
U6	14053	16	+9	7, 8	-9



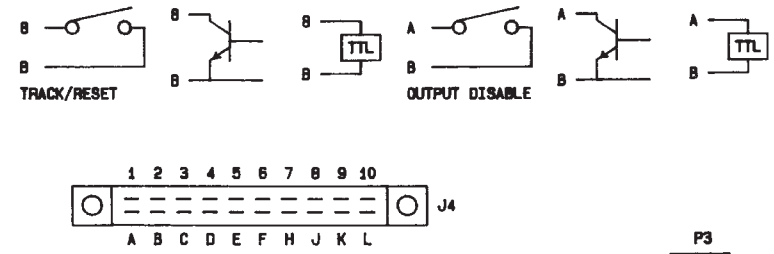
- CONNECT 10 TO K FOR FAST PEAK MODE
- CONNECT 8 AND J TOGETHER THROUGH EXTERNAL SWITCH OR TRANSISTOR FOR EXTERNAL PEAK RESET

CSR	D	9-4-96	ECR 0622	SES	
CSR	C	7-18-96	WAS VERSION: 008	SES	
SLS	B	3-1-94	CHGD. FRO C TO 0012E	FW	
JFS	A	11-18-91	CHGD. VER TO 008	SES	
DFT.	REV.	DATED	DESCRIPTION	APP.	CONTROL
RMK DES.	CHK.				
DG DFT.	FW APP.				
DATE	12-12-79	REV	9-4-96	REV. LEVEL:	D
NAME	3000 PEAK BOARD			s3200P NUMBER	





1. FOR WIDEBAND SIGNAL PEAK PROCESSING (DC TO HIGHEST AVAILABLE LOW PASS FILTER CORNER FREQUENCY), CONNECT (K) TO (10).
2. FOR NARROW BAND SIGNAL PEAK PROCESSING (DC TO 2Hz), CONNECT (K) TO (9).
3. FOR BOTH LIMITS HIGH, CONNECT (E) TO (F).
4. FOR BOTH LIMITS LOW, CONNECT (E) TO (D).
5. TO DISABLE LIMITS, CONNECT (A) TO (B). SEE CIRCUITS BELOW.
6. TO COMMAND TRACK/RESET, CONNECT (8) TO (8) WITH SWITCH OR OPEN COLLECTOR TRANSISTOR OR TTL LOGIC OUTPUT.



IC	TYPE	PIN	TO	PIN	TO
U2	TL074	4	+9	11	-9
U3	MC1458	8	+9	4	-9
U7, U8, U9	TL071	7	+9	4	-9
U11	CD4053	16	+9	6, 7, 8	-9
U4	CD4070	14	+9	7	-9
U10	TL074	4	+9	11	-9
U5	74C914	14	+5	7	P.C.
U6	75484	1	+5	8	P.C.

▽ - DENOTES SIGNAL COMMON
 ⚡ - DENOTES POWER COMMON
 MF - DENOTES METAL FILM RESISTOR

BD. NO. 73613.1
 BD. DATE: 1-6-92

CSR	J	9-4-96	SEE ECR 8523	SE	
CSR	H	7-26-96	WAS VERS 013	SE	
CSR	G	10-23-95	SEE ECR 8150	MW	
LL	F	11-8-94	SEE ECR 7091	MW	
SLS	E	5-16-94	ENTRUS SCH 3170 CAD	SES	
KLK	D	5-8-93	SEE SCH 6878	MW	
JFS	C	3-25-92	SEE SCH 6878	MW	
JFS	B	11-16-91	CHAS. VER. TO .007	SES	
	A	1-17-91	CHAS. VER. FROM 200, 100, 100 FROM 100, 100, 100 TO 100, 100 FROM 100, 100	MW	
			FROM 2.2K, 10K, .001 TO 2.2K, 10K, .001	MW	
DFT.	REV.	DATED	DESCRIPTION	APP.	CONTROL
DES.	JCZ	CHK.			
SLS	DL	APP.			
DATE	4-26-80	REV.	9-4-96	REV. LEVEL	1
NAME LIMIT PEAK BOARD					NUMBER s3300P

DAYTRONIC
 CORPORATION MIAMISBURG, OHIO

This page intentionally blank.



Daytronic Corporation

Dayton, OH • (800) 668-4745
www.daytronic.com