

Model 3563-V1A/V1D
16/32-channel Thermocouple Signal Conditioner
INSTRUCTION MANUAL

January, 1991

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DG300A/DG301A/DG302A/DG303A GE INTERSIL DATA SHEETS

SCHEMATIC DRAWING #122227-C-5934

See Reply Card Following Warranty

WARRANTY

KPG:rem(WP)

16/32-channel Thermocouple Signal Conditioner

ADVANCE INFORMATION

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FEATURES

- 16- and 32-channel options (2-pole, lowpass filters on 16-channel option)
- Channel-by-channel selection of test voltage
- Test voltage transparent when disabled
- Multiplexer for use with 3518 ADC

APPLICATIONS

- Jet and rocket engine testing
- Thermocouple monitoring
- Analog voltage monitoring

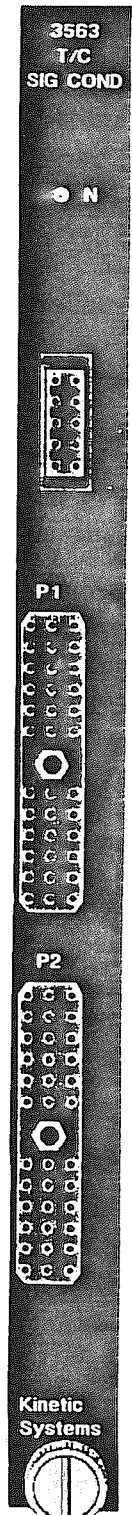
GENERAL DESCRIPTION

The Model 3563 is a single-width CAMAC module providing 16 or 32 channels of general-purpose analog signal monitoring with open circuit detection capability as well as 16 or 32 channels of input multiplexing. It is used with the Model 3518 16-bit Scanning A/D Converter Host module. The 32-channel version does not include input filters. The 16-channel version includes a 2-pole, lowpass filter per channel. When enabled from the Dataway, the 3563 switches a positive 10 volts resistance path onto the SOURCE leg of the incoming temperature signal and a negative 10 volts resistance path onto the RETURN leg. Reading the channel's new signal value with the 3518 verifies that the field wiring is intact and determines its resistance value. Plus and minus 10-volt sources are applied to the field wiring through precision, 100 kilohm resistors (one resistor per leg).

A mask register on the 3563 enables and disables the open circuit detection capabilities on a channel-by-channel basis. This is useful for thermocouples tied to a safety system, where increased signal levels generated by the open circuit detection could cause the system to go into an automatic shutdown condition. The mask register is written and read from the Dataway. Dataway commands are also provided to turn on and off the detection capability and to test the detection feature's state.

When the detection capability is disabled (turned off), the 10-volt sources are held at a ground potential to greatly reduce any effects from leakage through the FET switches used in the switching circuitry.

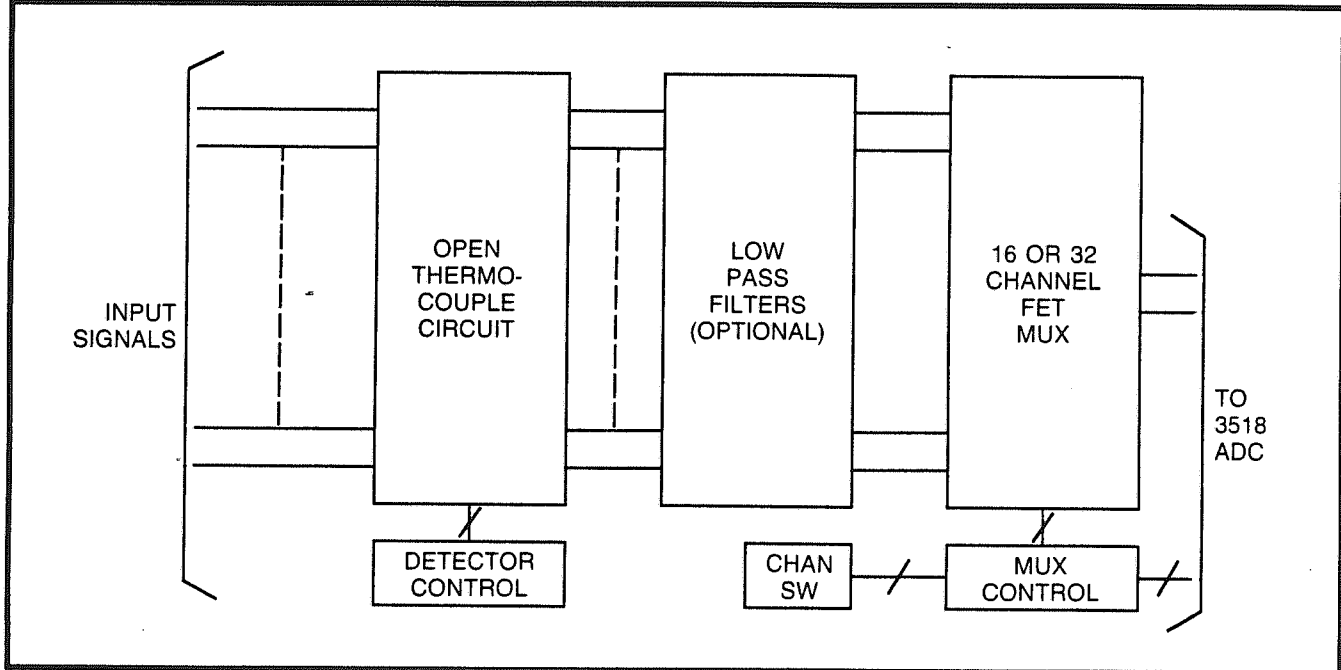
Analog signals are brought into the 3563 via one or two AMP, 36-contact, high-density, rectangular connectors mounted to the front panel (for the 16- or 32-channel version of the module). These connectors mate directly with the Model 5944-Z1A mating connectors and with the Model 5855-Series of cable assemblies. The multiplexer output and control signals are bussed between the front panel of the 3563, other signal conditioning modules, and the 3518 ADC module via a 10-wire flat ribbon cable. The front panel also contains a LED which flashes whenever the module is addressed and another LED indicating the state of the open circuit detection feature.



FUNCTION CODES

Command	Q	Action
F(0)·A(0) RD1	1	Reads the enabling mask for Channels 1 through 16.
F(0)·A(1) RD1	1	Reads the enabling mask for Channels 17 through 32.
F(1)·A(0) RD2	1	Reads the state of the channel selection switches.
F(16)·A(0) F06	1	Writes the enabling mask for Channels 1 through 16.
F(16)·A(1) F06	1	Writes the enabling mask for Channels 17 through 32.
F(24)·A(0) DIS	1	Disables open thermocouple detection.
F(26)·A(0) ENB	1	Enables open thermocouple detection.
F(27)·A(0) TST	ENA	Tests the state of the detection circuit.
Z·S2 ZED		Clears the channel selection masks.

Notes: X = 1 for all valid addressed commands.
ENA = Enabled.

SIMPLIFIED BLOCK DIAGRAM**OPTIONAL FILTERS**

The 16-channel version of the 3563 contains a passive, lowpass filter per channel. These filters provide a nominal 3dB attenuation at 10 hertz with a rolloff of 12 dB per octave above 10 hertz.

CHANNEL SELECTION

The 3563-V1A contains 32 channels and its Channel Address switch is normally set to "0" (with its first channel corresponding to the first channel of a 3518 scan). The 3563-V1D contains 16 channels and its Channel Address switch is normally set to 0 or 4 (with its 16 channels scanned as 0 to 15 or 16 to 31 by the host 3518). The number of scanned channels in the 3563 is also switch-selectable from four to 16 or 32 (depending upon option) in increments of four. The First Channel address and the number of scanned channels can be read via the Dataway for verification.

POWER REQUIREMENTS

+6 volts — 575 mA
 +24 volts — 15 mA
 -24 volts — 15 mA

ORDERING INFORMATION

Weight: .62 kg. (1 lb. 6 oz.)

- Model 3563-V1A** — 32-channel Thermocouple Signal Conditioner w/o Filters
- Model 3563-V1D** — 16-channel Thermocouple Signal Conditioner w/Filters
- Accessories** — Model 3518-Z1A 16-bit Scanning A/D Converter Host
 Model 5944-Z1A Mating Connector (two connectors required for 3563-V1A)
 Model 1854-A2A Termination Panel with 5855-B30J Cables (two cables required for 3563-V1A)
 Model 5855-A30J Cable Assembly (two cables required for 3563-V1A)
 Model 5840-M000-V000 Ribbon Cable - 10 Conductor (one cable required for 3563-V1A or V1D)

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MODULE CONNECTIONS

The analog inputs are connected to the front panel connectors, P1 and P2. Connector P1 contains channels 1-16 and connector P2 contains channels 17-32. These connectors mate directly with the Model 5944-Z1A mating connectors and with the Model 5855-Series of cable assemblies.

The multiplexer output and control signals are bussed between front panel connector P3 of the 3563, other signal conditioning modules and the 3518 ADC module via a 10 wire flat ribbon cable, Model 5840 M000-V000. See pages 8-11 for connector pinouts.

WRITE INSTRUCTIONS

The Model 3563 contains two Write Mask Registers that contain an enable mask bit for each channel; thereby allowing the user to individually select which channels he would like to monitor for an open thermocouple. By using the CAMAC command F(16)A(0), (Mask Register 1), the mask bit for channels 1-16 may be enabled. By using the CAMAC command F(16)A(1), (Mask Register 2), the mask bit for channels 17-32 may be enabled. F(16) A(1) is valid for Model 3563-V1A, 32-channel option only.

Data Bits	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Channel	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01

Write/Read Mask Register 1
F(16)A(0)

Data Bits	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
Channel	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Write/Read Mask Register 2
F(16)A(1)

READ INSTRUCTIONS

The Model 3563 contains two Read Mask Registers that contain the status of the enable mask bits for all channels. By using the CAMAC command F(0)A(0), the mask status for channels 1-16 will be returned. By using the CAMAC command F(0)A(1), the mask status for channels 17-32 will be returned. F(0) A(1) is valid for Model 3563-V1A, 32-channel option only.

CHANNEL SELECTION REGISTER AND SWITCH SETTINGS

The 3563 is part of the 3518 family of signal conditioning modules. The 3518 acts as a signal conditioner host and interfaces to any combination of 3563, 3564, 3565 and 3569 modules through a single, 10-pin, front panel connector. Since all of the signal conditioning modules share this common bus, address switches must be set on each module to enable the analog output onto the bus at the appropriate times. The 3518 is capable of digitizing 32 channels of analog input. The output from a given signal conditioning module may lie anywhere within the 3518's 32-channel spectrum. The starting channel and number of channels to be scanned are switch selectable in groups of four at the signal conditioning module. Figure 1 shows a sample configuration involving multiple types of signal conditioning modules. Figure 2 shows the switch selections

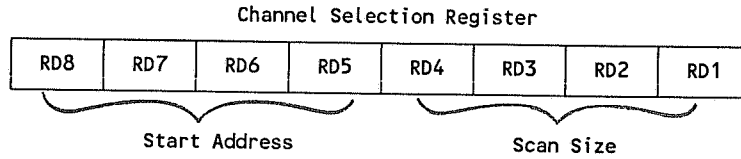
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required for various starting addresses and scan sizes. When setting these switches at each signal conditioning module, care must be taken to insure that no two modules occupy the same portion of the 3518's address spectrum. If an overlap condition does occur, the 3518 will detect it and flash the ERROR LED until the configuration is corrected. The 3518 will also disable all signal conditioners during the overlap period to protect the equipment. On the Model 3563-V1A, V1D, the first channel scanned switch (channel address) is SW1 and the scan size switch is SW2. The first Channel Address and the number of scanned channels can be read via the Dataway for verification by using the CAMAC command F(1) A (0). See Figure 3 for switch locations.

CHANNEL	INPUT	START ADDR. SWITCH	SCAN SIZE SWITCH
0	3564-V1A Filtered Strain Gage (4)	0	0
1			
2			
3			
4	3563-V1D Filtered Thermocouple (12)	1	2
5			
6			
7			
8			
9			
10			
11			
12	3565-V1A Filtered RTD (8)	4	1
13			
14			
15			
16			
17			
18	3569-V1D Filtered Analog (8)	6	1
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

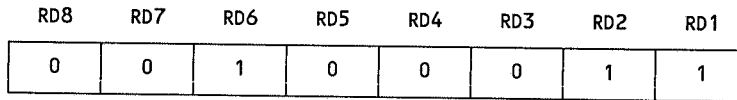
FIGURE 1

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SW1 Switch Position	First Channel Scanned	Start Address RD8-RD5	SW2 Switch Position	Number of Channels Scanned	Scan Size RD4-RD1
0	0	0 0 0 0	0	4	0 0 0 0
1	4	0 0 0 1	1	8	0 0 0 1
2	8	0 0 1 0	2	12	0 0 1 0
3	12	0 0 1 1	3	16	0 0 1 1
4	16	0 1 0 0	4	20	0 1 0 0
5	20	0 1 0 1	5	24	0 1 0 1
6	24	0 1 1 0	6	28	0 1 1 0
7	28	0 1 1 1	7	32	0 1 1 1

Example:



= Start at channel 8, scan 16 channels

FIGURE 2

Note: SW2 switch positions 4-7 are only valid for Model 3563-V1A (32-channel option).

THERMOCOUPLE DETECTION

The open thermocouple detection capability is enabled using the CAMAC command F(26)A(0). Once enabled +10 Volts is applied to the **SOURCE** leg of the incoming signal and -10 Volts is applied to the **RETURN** leg. The open thermocouple detection capability is disabled using the CAMAC command F(24)A(0). Once disabled the +10 and -10 Volt sources are removed from the incoming temperature signal. The state of the open circuit detector may be checked in one of two ways. First is by visual inspection of the front panel enable LED. When the LED is on, the detection circuit is enabled. The second way is by using the CAMAC command F(27)A(0). When the detection circuit is enabled, the CAMAC Q response line will be 1 (Q is set). When the detection circuit is disabled, the Q response line will be 0 (NO-Q).

ISOTHERMAL REFERENCE

For temperature monitoring systems using the Model 3563-V1A and the Model 1991-V1A, channel 1 and/or channel 17 on the Model 3563-V1A may be strapped to receive an Isothermal Reference from the Model 1991-V1A Isothermal Panel. To use the Isothermal Reference, strap channel 1 to locations 1-2, 3-4, 5-6, and 7-8, and channel 17 to locations 1-2, 3-4, 5-6, and 7-8. See Figure 3 for Strap Locations. Both channels have an adjustment pot which is adjusted for room

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temperature of 25°C or 298°K. Every 1 mv change will correspond to 1°K. The Model 3563-V1D, 16-channel option may be strapped to receive an Isothermal reference on channel 1 only.

EXAMPLE: At room temperature 298°K the ADC module will see 298 mv.

When the module is not used for temperature monitoring:

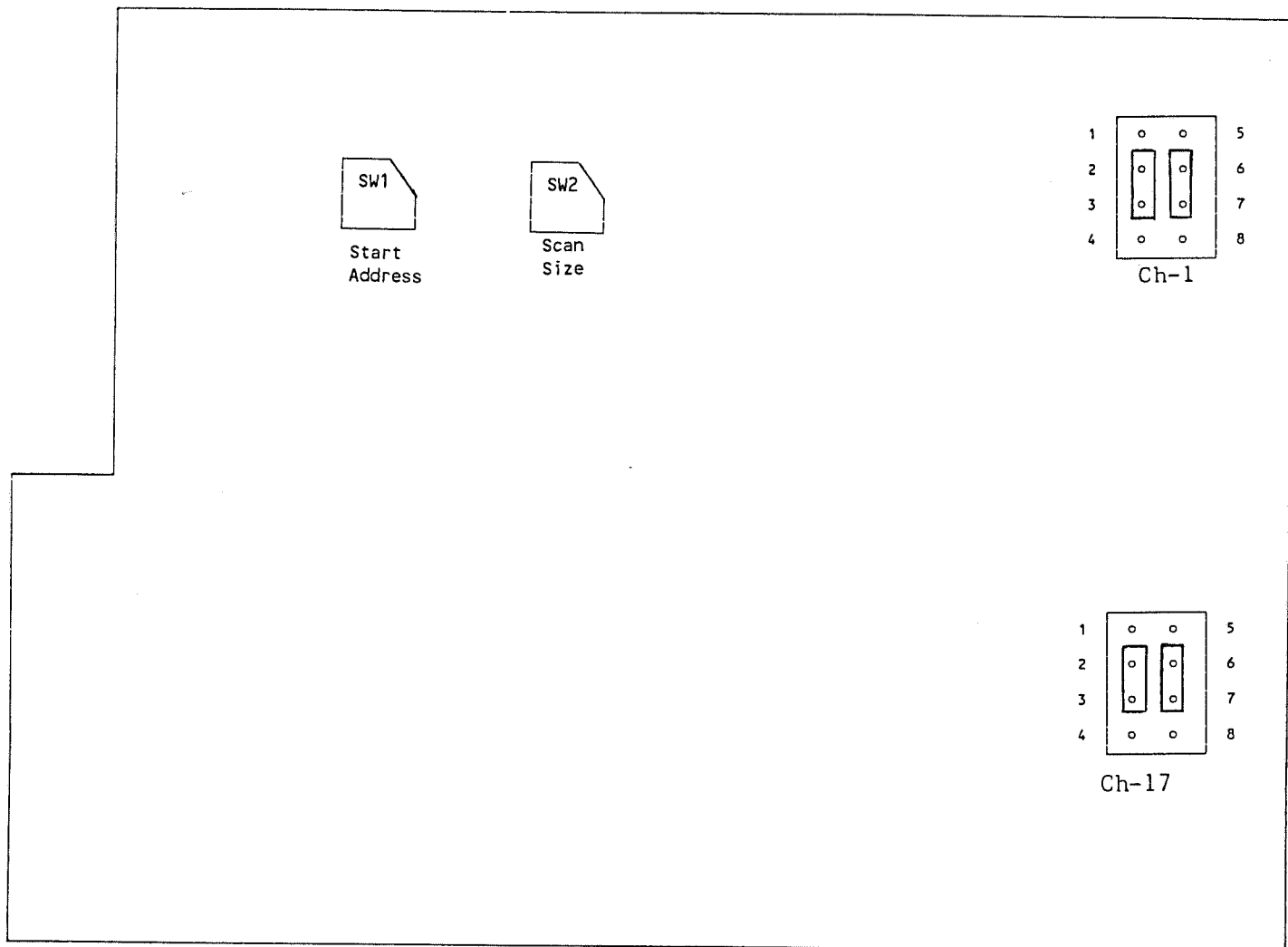
Channel Numbers 1 and 17 should be strapped 2-3 and 6-7.
See Figure 3 on page 7.

NOTE: The 1991-V1A Isothermal Panel has channels labeled 0-15 and the 3563-V1A has channels labeled 1-16, with channel 1 or 17 being used as the reference channel. Therefore, the first channel on the 3563-V1A will be channel 2 which will correspond to channel 0 on the 1991-V1A.

1991-V1A Channels		3563-V1A Channels	
Channel	0	Channel	2
Channel	1	Channel	3
Channel	2	Channel	4
Channel	3	Channel	5
Channel	4	Channel	6
Channel	5	Channel	7
Channel	6	Channel	8
Channel	7	Channel	9
Channel	8	Channel	10
Channel	9	Channel	11
Channel	10	Channel	12
Channel	11	Channel	13
Channel	12	Channel	14
Channel	13	Channel	15
Channel	14	Channel	16
Channel	15	Channel	No Channel

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Figure 1 shows the factory setting for temperature compensation disabled.



MODEL 3563 SWITCH AND STRAP LOCATIONS

FIGURE 3

P 1

A 1	B 1	C 1
A 2	B 2	C 2
A 3	B 3	C 3
A 4	B 4	C 4
A 5	B 5	C 5
A 6	B 6	C 6
A 7	B 7	C 7
A 8	B 8	C 8
A 9	B 9	C 9
A10	B10	C10
A11	B11	C11
A12	B12	C12

P 2

A 1	B 1	C 1
A 2	B 2	C 2
A 3	B 3	C 3
A 4	B 4	C 4
A 5	B 5	C 5
A 6	B 6	C 6
A 7	B 7	C 7
A 8	B 8	C 8
A 9	B 9	C 9
A10	B10	C10
A11	B11	C11
A12	B12	C12

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Pin NO.	NOMENCLATURE
A1	Channel 1 Signal (Input)
A2	Channel 1 Return (Input)
A3	Channel 2 Signal (Input)
A4	Channel 2 Return (Input)
A5	Channel 3 Signal (Input)
A6	Channel 3 Return (Input)
A7	Channel 4 Signal (Input)
A8	Channel 4 Return (Input)
A9	Channel 5 Signal (Input)
A10	Channel 5 Return (Input)
A11	Channel 6 Signal (Input)
A12	Channel 6 Return (Input)
B1	Channel 7 Signal (Input)
B2	Channel 7 Return (Input)
B3	Channel 8 Signal (Input)
B4	Channel 8 Return (Input)
B5	Channel 9 Signal (Input)
B6	Channel 9 Return (Input)
B7	Channel 10 Signal (Input)
B8	Channel 10 Return (Input)
B9	Channel 11 Signal (Input)
B10	Channel 11 Return (Input)
B11	Channel 12 Signal (Input)
B12	Channel 12 Return (Input)
C1	Channel 13 Signal (Input)
C2	Channel 13 Return (Input)
C3	Channel 14 Signal (Input)
C4	Channel 14 Return (Input)
C5	Channel 15 Signal (Input)
C6	Channel 15 Return (Input)
C7	Channel 16 Signal (Input)
C8	Channel 16 Return (Input)
C9	Digital Ground
C10	Digital Ground
C11	Digital Ground
C12	Digital Ground

Connector P1 Pin-Out

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Pin No.	Nomenclature
A1	Channel 17 Signal(Input)
A2	Channel 17 Return(Input)
A3	Channel 18 Signal(Input)
A4	Channel 18 Return(Input)
A5	Channel 19 Signal(Input)
A6	Channel 19 Return(Input)
A7	Channel 20 Signal(Input)
A8	Channel 20 Return(Input)
A9	Channel 21 Signal(Input)
A10	Channel 21 Return(Input)
A11	Channel 22 Signal(Input)
A12	Channel 22 Return(Input)
B1	Channel 23 Signal(Input)
B2	Channel 23 Return(Input)
B3	Channel 24 Signal(Input)
B4	Channel 24 Return(Input)
B5	Channel 25 Signal(Input)
B6	Channel 25 Return(Input)
B7	Channel 26 Signal(Input)
B8	Channel 26 Return(Input)
B9	Channel 27 Signal(Input)
B10	Channel 27 Return(Input)
B11	Channel 28 Signal(Input)
B12	Channel 28 Return(Input)
C1	Channel 29 Signal(Input)
C2	Channel 29 Return(Input)
C3	Channel 30 Signal(Input)
C4	Channel 30 Return(Input)
C5	Channel 31 Signal(Input)
C6	Channel 31 Return(Input)
C7	Channel 32 Signal(Input)
C8	Channel 32 Return(Input)
C9	Digital Ground
C10	Digital Ground
C11	Digital Ground
C12	Digital Ground

Connector P2 Pin-Out
Model 3563-V1A (32-channel option only)

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Pin No.	Nomenclature
1	Ground
2	Signal
3	Return
4	Ground
5	Ground
6	Unused
7	Increment
8	Clear Channel
9	Error
10	Overlap Detect

Connector P3 Pin-Out