# MODEL 10A16-4C
# QUAD PLATINUM RTD CONDITIONER CARD

## 1 GENERAL DESCRIPTION AND SPECIFICATIONS

The Model 10A16-4C is designed for high-accuracy temperature measurement using platinum **Resistance Temperature Detectors (RTD's)**. Precision constant-current excitation is provided for four independent sensor channels, which may be intermixed as required. RTD inputs are normally set for four-wire cabling, with maximum excitation of one milliampere and input impedance of 10 MΩ, to eliminate common self-heating and cable-loading errors. However, for an RTD channel with shared current return and sense signals, three-wire mode is available, if desired, via an internal jumper setting (as explained in Section 3.a, below).

### ADDITIONAL 10A16-4C SPECIFICATIONS

**RTD Types**: Platinum; DIN (European) standard with "ice-point" resistance of 50, 100, or 200 ohms, or American standard with "ice-point" of 100 ohms

**Range and Resolution**: See Table 1, below; automatically selected—on an individual channel basis—when the channel is configured; for System 10 channel "type" codes assigned to 10A16-4C data channels, see Table 1; for *high RTD resolution*, using a specially modified 10A16-4C card, see Section 3.c, below

**Linearization**: Internal digital linearization; maximum error: ±0.1° C (±0.2° F)

**Excitation (per channel)**: Nominal 5 V-DC; 1 mA, maximum

**Amplifier (per channel)**:

**Input Impedance (Differential)**: 10 megohms

**Offset**: Initial: ±0.1 mV; vs. Temperature: ±0.5 µV/°C; vs. Time: ±5 µV/month

**Gain Accuracy**: ±0.02% of full scale

**Gain Stability**: vs. Temperature: ±25 ppm/°C; vs. Time: ±20 ppm/month

**Filter (per channel)**: 3-pole modified Butterworth; 3 dB down at 2 Hz; 60 dB down at 25 Hz

**Step-Response Settling Time (Full-Scale Output)**:

To 1% of final value: 0.6 sec
To 0.1% of final value: 0.8 sec
To 0.02% of final value: 1.5 sec

**Total System Accuracy** (typical, including Model 10A16-4C and system data collection and processing): see Table 1, below

**Auxiliary Outputs**: Filtered outputs available on mainframe wire-wrap pins

**Table 1 RTD Ranges for the Model 10A16-4C**

| Platinum RTD Standard | Resis-tance | Range | Display Resolution[3] | Typical System Accuracy[4] | Maximum Expected Error[4] | Channel Type Code |
|---|---|---|---|---|---|---|
| DIN[1] | 50 Ω | -150° C to +600° C | 1.0° C | ± 1° C | ± 1.3° C | A9 |
| DIN[1] | 50 Ω | -150° C to +600° C | 0.1° C | ± 0.2° C | ± 0.4° C | AA |
| DIN[1] | 50 Ω | -238° F to +1112° F | 1.0° F | ± 1° F | ± 1.5° F | AB |
| DIN[1] | 50 Ω | -238° F to +1112° F | 0.2° F | ± 0.3° F | ± 0.6° F | AC |
| DIN[1] | 100 Ω | -150° C to +600° C | 1.0° C | ± 1° C | ± 1.3° C | A1 |
| DIN[1] | 100 Ω | -150° C to +600° C | 0.1° C | ± 0.2° C | ± 0.4° C | A2 |
| DIN[1] | 100 Ω | -238° F to +1112° F | 1.0° F | ± 1° F | ± 1.5° F | A3 |
| DIN[1] | 100 Ω | -238° F to +1112° F | 0.2° F | ± 0.3° F | ± 0.6° F | A4 |
| DIN[1] | 200 Ω | -150° C to +600° C | 1.0° C | ± 1° C | ± 1.3° C | A5 |
| DIN[1] | 200 Ω | -150° C to +600° C | 0.1° C | ± 0.2° C | ± 0.4° C | A6 |
| DIN[1] | 200 Ω | -238° F to +1112° F | 1.0° F | ± 1° F | ± 1.5° F | A7 |
| DIN[1] | 200 Ω | -238° F to +1112° F | 0.2° F | ± 0.3° F | ± 0.6° F | A8 |
| American[2] | 100 Ω | -150° C to +600° C | 0.1° C | ± 0.2° C | ± 0.4° C | AD |
| American[2] | 100 Ω | -238° F to +1112° F | 0.2° F | ± 0.3° F | ± 0.6° F | AE |

[1] $\alpha = 0.00385$.

[2] $\alpha = 0.00392$.

[3] Note that a specially modified version of the 10A16-4C yields resolution of 0.01° C (0.02° F) when used with System 10 "custom linearization." See Section 3.c for details.

[4] Including ± one count of least significant digit displayed.

## 2 TRANSDUCER CONNECTIONS

The Model 10A16-4C's I/O CONNECTOR mates with Daytronic CONDITIONER CONNECTOR No. 60322, shown in Fig. 1.5 (in Manual Section 1.E.1). Standard *four-wire* RTD cabling is shown in Fig. 1(a), below. With separate excitation and sense lines, this mode of cabling normally yields the highest measurement accuracy. However, any 10A16-4C input channel can be set to accommodate the alternative *three-wire* cabling shown in Fig. 1(b). THE APPROPRIATE JUMPER SETTING MUST BE MADE FOR EACH 10A16-4C CHANNEL, DEPENDING ON WHETHER 4-WIRE OR 3-WIRE CABLING IS BEING USED FOR THAT CHANNEL (see the instructions in Section 3.a, below). Table 2 gives standard pin assignments for the I/O Connector.

**IMPORTANT:** When cabling the 10A16-4C, you can ensure static protection by connecting the SHIELD wire to **Pin 10** as well as to the connector ground lug, as shown in Fig. 1.

**Table 2 Model 10A16-4C Pin Assignments**

| I/O Connector Pin Number | Conditioner Channel Number | Conditioner Line Function |
|---|---|---|
| 1 | 1 | +SIGNAL |
| A | 1 | –SIGNAL |
| 2 | 1 | +CURRENT |
| B | 1 | –CURRENT |
| 3 | 2 | +SIGNAL |
| C | 2 | –SIGNAL |
| 4 | 2 | +CURRENT |
| D | 2 | –CURRENT |
| 5 | 3 | +SIGNAL |
| E | 3 | –SIGNAL |
| 6 | 3 | +CURRENT |
| F | 3 | –CURRENT |

*(cont'd)*

| I/O Connector Pin Number | Conditioner Channel Number | Conditioner Line Function |
|---|---|---|
| 7 | 4 | +SIGNAL |
| H | 4 | –SIGNAL |
| 8 | 4 | +CURRENT |
| J | 4 | –CURRENT |
| 10 | | SHIELD |
| 9,K,L | | Not Committed |

**Fig. 1 Model 10A16-4C Transducer Cabling**

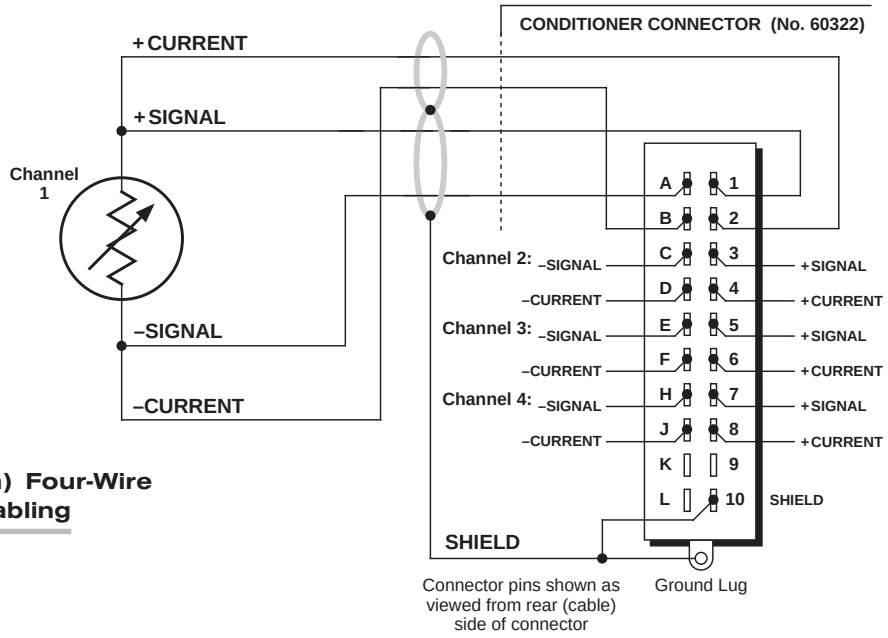



**Fig. 1(a) Four-Wire RTD Cabling**

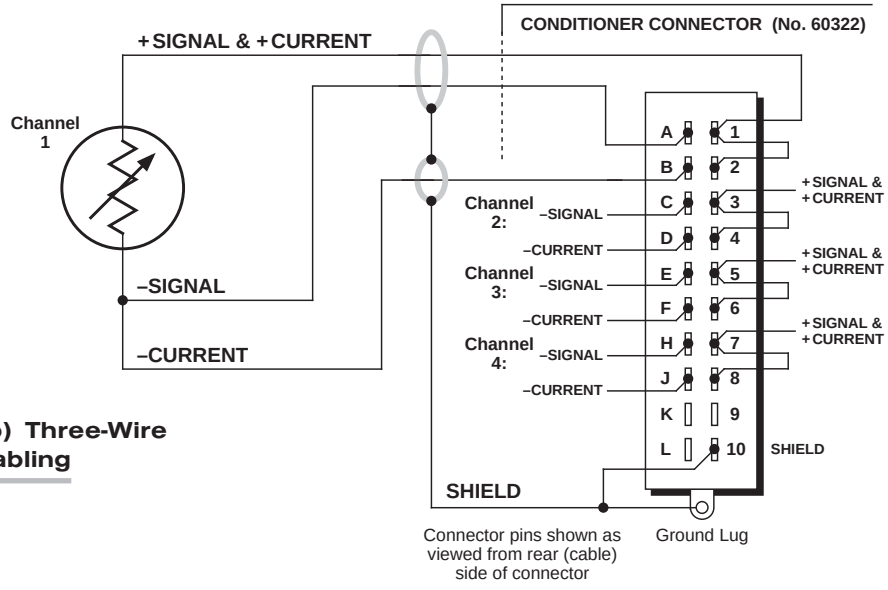
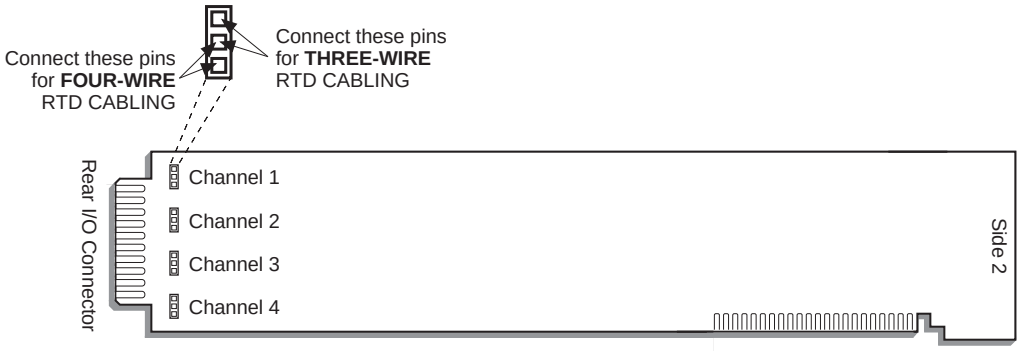



**Fig. 1(b) Three-Wire RTD Cabling**

**Fig. 2 10A16-4C "RTD CABLING" Programming Jumper Pins**




# 3 SETUP AND/OR OPERATING CONSIDERATIONS

## 3.a SETTING A 10A16-4C CHANNEL FOR FOUR-WIRE OR THREE-WIRE RTD CABLING

When the Model 10A16-4C is shipped, all four channels are normally set for the *four-wire* RTD cabling shown in Fig. 1(a), above, since this mode of cabling normally yields the highest accuracy. If you wish to use the *three-wire* cabling shown in Fig. 1(b) for a given 10A16-4C channel, you should

1. Remove the 10A16-4C card from its mainframe slot. For "Card Insertion and Removal," see Manual Section 1.B. Since the 10A16-4C is "hot-pluggable," you need NOT turn off mainframe power before removing the card.

2. Refer to Fig. 2, above, and locate the four sets of "RTD CABLING" PROGRAMMING JUMPER PINS, one for each channel, on the top (component) side of the card. One "minijumper" is provided for each channel, for interconnecting any two adjacent jumper pins.

3. Position the jumper for each active channel as shown in Fig. 2 to set the desired wiring mode for that channel.

4. Reinsert the 10A16-4C card into its mainframe slot.

## 3.b CONFIGURATION AND CALIBRATION

For initial configuration of ANALOG INPUT CHANNELS dedicated to a specific Model 10A16-4C card when used in System 10, see the general remarks on System 10 "real-channel" configuration in Manual Section 1.G.1 and elsewhere in the *System 10 Guidebook*. For 10A16-4C channel "type" codes, see Table 1, above.

When used in System 10, the Model 10A16-4C normally employs **CPU-BASED ABSOLUTE CALIBRATION** (described in Manual Section 1.G.3.a). This means that NO calibration need be performed by the user, once each 10A16-4C-based input channel has been properly configured. Note, however, that you may subsequently improve the "absolute" calibration provided by the system processor by using the standard **ZERO (ZRO)** and **FORCE (FRC)** commands to perform **TWO-POINT (DEADWEIGHT) CALIBRATION** on a real-time basis—but only *when independently*

*and accurately known temperature references are available* (preferably the high and low extremes to which the sensor will be subjected). The mainframe's **EEPROM Write Protect Switch** must be ON for these commands to be effective. See Manual Section 1.G.5 for a general discussion of this conventional "zero and span" calibration technique.

## 3.C HIGH RTD RESOLUTION WITH SPECIALLY MODIFIED 10A16-4C

To implement a resolution of *0.01° C (0.02° F)* for Channel No. "x" of a specially modified 10A16-4C card, when used in System 10 (only), you need only enter the following **LINEARIZE (LIN)** command, having first turned ON the system EEPROM SWITCH:

**LIN x = F1(CHN x) [CR]**

The effect of this command is to apply to all readings of Channel No. x a prestored "Linearization Table No. 1." It also automatically assigns to the "linearized" Channel No. x a new "type" designation of "EA."

For a full discussion of System 10 "custom linearization," see Manual Section 2.L.