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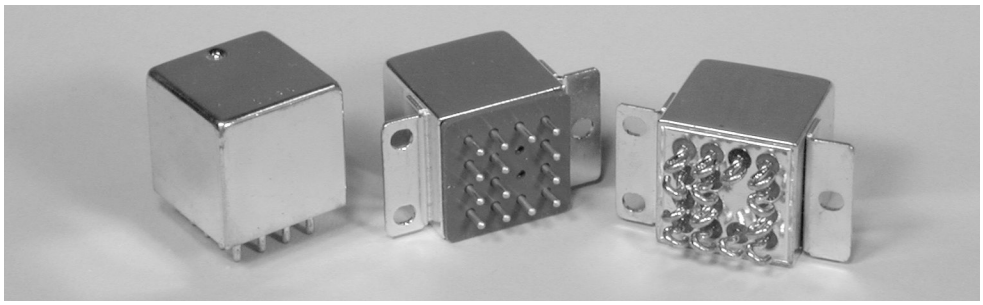
## TD2 Series Time Delay Relay

### Product Facts

- **Qualified to:**

  **MIL-PRF-83726/28**
  **MIL-PRF-83726/29**
  **MIL-PRF-83726/30**
  **MIL-PRF-83726/31**
- **Fixed delay on operate, fixed delay on release, adjustable delay on operate & adjustable delay on release**
- **Meets or exceeds electrostatic discharge MIL-STD-1686 Class Non-Sensitive**
- **Welded hermetically sealed enclosure occupies about 1 in³ (16.4 cm³)**
- **10A, 2 form C (DPDT) output contacts**



TD2 series time delay relays are available for delay on operate or delay on release operation. Either can be supplied as fixed or resistor adjustable types. Both military and commercial versions are offered.

These products consist of solid state timing circuits controlling our FCA-210 series relays, providing 2 Form C (DPDT) output contacts rated 10 amps. The internal timing circuit uses an R/C controlled oscillator with a programmable digital pulse counter, gating a semiconductor switch to operate the relay. Timing is independent of whether the controlling voltage is a ramp or step function.

For the adjustable models the user specifies a one decade range in seconds, within which the required delay will be set. This range is programmed internally at the time of manufacture. The required delay is obtained by calculating the oscillator timing resistor as follows and connecting it externally to terminals 1D - 3D as below.

$R_{EXT} = [(T_1 / T_0) -1]$ 100K Ohms

$T_0$ = Minimum time of selected decade in seconds.

T1 = Required time delay.

EXAMPLE

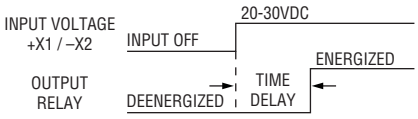
Selected Range = 3-30 sec

Required Time = 15 sec

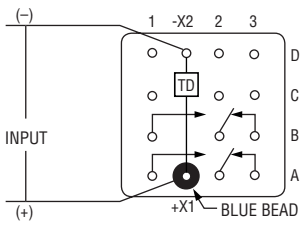
$R_{EXT} = [(15/3) -1]$ 100K = 400K

### Timing Action and Terminal Wiring

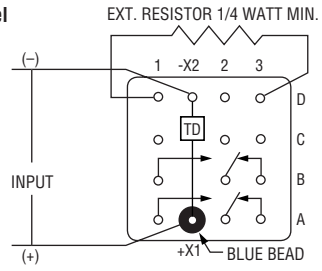
**Delay On Operate:**
The time delay starts on the application of input voltage to X1-X2. The timing circuit energizes the end of the time delay period.



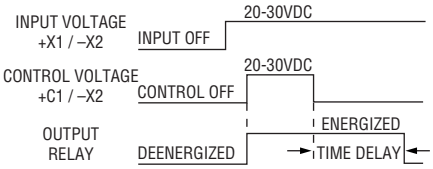

**Fixed Model**



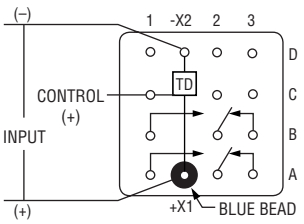

**Adjustable Model**



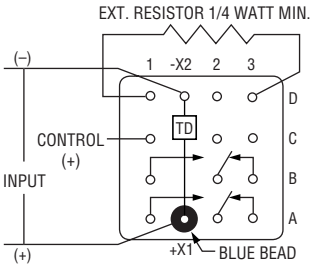

**Delay On Release:**
The input voltage is continuous to X1-X2. When the control voltage is applied to C1-X2 the timing circuit and the relay are both energized. The time delay starts when the control voltage is shut off.




**Fixed Model**




**Adjustable Model**




**Terminal designations shown in the diagrams above are for reference only. They do not appear on the relay header.**

## TD2 Series Time Delay Relay (Continued)

### Specifications

| | |
|---|---|
| Timing Data | |
| Timing Action | Delay on Operate or Delay on Release |
| Time Delay, Fixed – M83726/28, /29 and Commercial 28C, 29C | Select from 0.1 to 600 sec for Commercial Models<br>Select from 0.1 to 500 sec for Mil-Spec Models |
| Time Delay, Adjustable – M83726/30, /31 and Commercial 30C, 31C | Select one decade between 0.1 to 1.0 and 60 to 600 seconds |
| Timing Accuracy (note 1) | ±10% of Nominal Value |
| Recycle Time (note 2) | 50 ms, max., to next cycle. |
| Power Interrupts | Accuracy is not affected by power interruptions up to 1 ms spaced at least 10ms apart. |
| **Input Data** | |
| Input Voltage | 28 Vdc nominal, range 20 - 32 Vdc |
| Duty Rating | Continuous |
| Input Current | 110 mAdc Max @ 25°C |
| Control Voltage (applies only to Delay on Release type) | 20 - 32 Vdc |
| Control Current | 15 mAdc Max (applies only to delay on release types) |
| Input Voltage Polarity Protection | The timer will be inoperative during, and undamaged by, reversal of the polarity of the input voltage. |
| **Output Data** | |
| Contact Form | 2 Form C (DPDT) |
| Contact Material | Silver Cadmium Oxide, Gold plated |
| Contact Rating in Amps (Continuous Duty) | |

| Type of Load | Life (Min.) Cycles | 28 Vdc | 115 Vac 400Hz | 115/200 Vac – 3 phase 400 Hz. | 115/200 Vac – 3 phase 60 Hz.* |
|---|---|---|---|---|---|
| Resistive | $100 \times 10^3$ | 10 | 10 | 10 | 2.5 |
| Inductive | $20 \times 10^3$ | 8 | 8 | 8 | 2.5 |
| Motor | $100 \times 10^3$ | 4 | 4 | 4 | 2.0 |
| Lamp | $100 \times 10^3$ | 2 | 2 | 2 | 1.0 |

* 60 Hz. loads are rated at $10 \times 10^3$ cycles.

| | |
|---|---|
| Overload Current | 40 Adc; 60A, 400 Hz. |
| Rupture Current | 50 Adc; 80A, 400 Hz. |
| Max. Contact Drop at 10A | Initial 0.150V; After Life 0.175V |
| **Electrical Data** | |
| Electrostatic Discharge Withstand Voltage | 16,000V |
| Transients (note 3): | |
| Positive Transients | +80V |
| Self-generated Transients | ±50V, Max. |
| Spike Susceptibility | ±600V, 10 µs, Max. |
| Insulation Resistance (note 4) | 1,000 megohms at 500Vdc, between each pin and case |
| Dielectric Strength (note 4) | 1,000Vrms at 60 Hz at sea level, between case and all pins connected together |
| **Environmental Data** | |
| Ambient Temperature Range, Operating | -55°C to +125°C |
| Altitude | 80,000 feet maximum |
| Shock Resistance | 100 G's, 6 ms. |
| Vibration Resistance, Sinusoidal | Z & Y Enclosure: 30 G's, 33-3000Hz.; X & W Enclosure: 20 G's, 33-3000Hz. |
| Mechanical Data | |
| Approximate Weight | 2.5 oz. (71g) Max. |

**NOTES**

1. The accuracy requirement applies to any combination of operating temperature and voltage. Add ±10ms for timing less than one second.
2. Recycle time to assure that the next timing cycle will be completed. Units can be recycled during timing and after time-out:
   Delay on operate models – Power must be OFF the input at least 10 ms. Delay on release models – Power must be ON the control terminal at least 10 ms.
3. Transient specifications are based on a maximum duty cycle of 1/50.
4. All wired terminals must be connected together during this test. Dielectric withstanding voltage and insulation resistance are measured between all mutually insulated wired terminals and between all these terminals and case.
5. Inductive loads must be diode suppressed.

## TD2 Series Time Delay Relay (Continued)

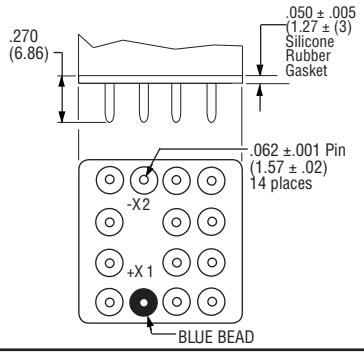
### Outline Dimensions

The standard terminal types and enclosures are illustrated below with dimensions expressed as inches ± 0.010 and (millimeters ±0.25).

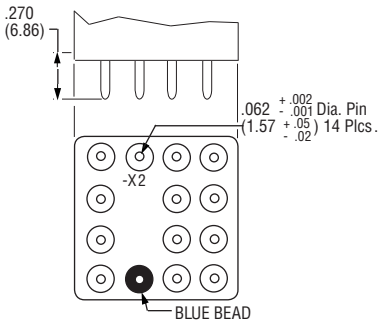
### Terminals

All terminals on 0.200 (5.4) centers.

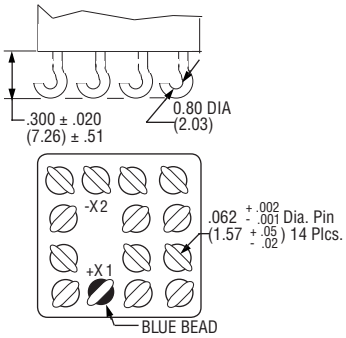
CODE "P"
Socket Pins – Gold Plated




CODE "T"
Circuit Board Pins – Tin/Lead Plated



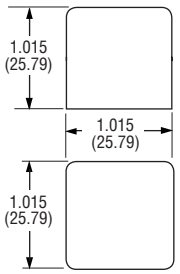

CODE "S"
Solder Hooks



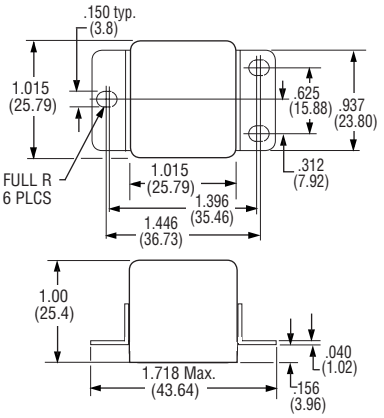

### Enclosures

All Enclosures have cupro-nickel cans bright acid tin/lead plated after assembly to terminal headers.

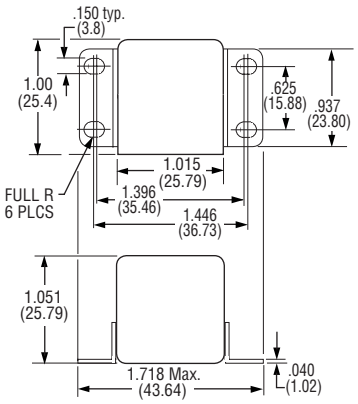
CODE "Z"



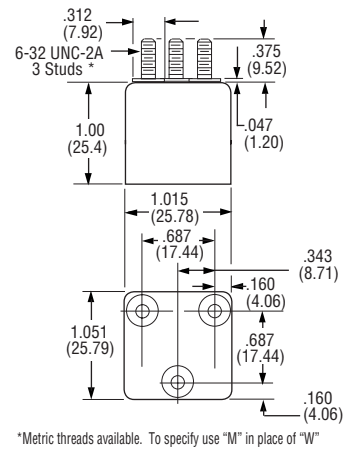

CODE "Y"




CODE "X"




CODE "W"




*Metric threads available. To specify use "M" in place of "W"

For factory-direct application assistance, phone 419-521-9500 or fax 419-526-2749.

## TD2 Series Time Delay Relay (Continued)

### Part Numbering System
### Mil-Spec Types

| Typical Mil-Spec Part Number | TD2 | 28- | 5002 | P |
|---|---|---|---|---|

Series:

TD2 = Time delay relay with 2 pole, 10A output

Mil-Spec Model:

28 = M83726/28 (Fixed, Delay on Operate)
29 = M83726/29 (Fixed, Delay on Release)
30 = M83726/30 (Adjustable, Delay on Operate)
31 = M83726/31 (Adjustable, Delay on Release)

Time Delay Range (Within 0.1 to 500 seconds):

For /28 and /29 types (fixed types), the delay is expressed in milliseconds in a four-digit code. The first three digits are significant. The fourth is the number of zeros following the first three.
Example: 5002 is 50 seconds.

For /30 and /31 types (adjustable types), the delay decade range is expressed in milliseconds in a four-digit code representing the upper limit of the range. The first three digits are significant. The fourth is the number of zeros following the first three.
Example: 1001 is 1 second, so the range is 0.1 to 1 second.

Terminals:

P= Socket Pin Terminals
S= Solder Hook Terminals

Note: Mil-spec models have “Y” type enclosure.

### Commercial Types

| Typical Commercial Part Number | TD2 | 28C- | 1001 | P | Y |
|---|---|---|---|---|---|

Series:

TD2 = Time delay relay with 2 pole, 10A output

Commercial Model:

28C = Fixed, Delay on Operate (COTS version of M83726/28)
29C = Fixed, Delay on Release (COTS version of M83726/29)
30C = Adjustable, Delay on Operate (COTS version of M83726/30)
31C = Adjustable, Delay on Release (COTS version of M83726/31)

Time Delay Range (Within 0.1 to 600 seconds):

For fixed types, the delay is expressed in milliseconds in a four-digit code. The first three digits are significant. The fourth is the number of zeros following the first three.
Example: 5002 is 50 seconds.

For adjustable types, the delay decade range is expressed in milliseconds in a four-digit code representing the upper limit of the range. The first three digits are significant. The fourth is the number of zeros following the first three.
Example: 1001 is 1 second, so the range is 0.1 to 1 second.

Terminals:

P= Socket Pin Terminals
S= Solder Hook Terminals
T= Solder Pin Terminals

Enclosure

W = Mounting Studs
X = Horizontal Flange Mount
Y = Raised Vertical Flange Mount
Z = No Mount

**NOTE:** Commercial versions are available with timing ranges outside of .1 to 600 sec. range.

For factory-direct application assistance, phone 419-521-9500 or fax 419-526-2749.

## FCB-205 Series, 5 Amperes, DPDT

### Product Facts

- Hermetically Sealed
- All Welded Construction
- Balanced Force
- Permanent Magnet Drive
- Contacts rated low level to 5 Amps VDC and 115/200 VAC 400 Hz, 3 Phase
- Weight .54 ounces max. (15.4 grams)
- Qualified to M83536/1, /2

The Series FCB-205 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state. This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other forms of the FCB relay:

**FCB-405** — 5 Amp 4PDT Relay

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 115VAC 400Hz | 115/200VAC 400Hz, 3Ø |
|---|---|---|---|---|
| Resistive | 100 | 5 | 5 | 5 |
| Inductive | 20 | 3 | 5 | 5 |
| Motor | 100 | 2 | 3 | 3 |
| Lamp | 100 | 1 | 1 | 1 |

*60 Hz loads rated for 10,000 operations

Low Level Switching Capability: With contacts operating a load of 10 to 50 microamperes at 10 to 50 millivolts, the contact resistance miss detection level shall be 100 ohms max. Cycling rate is 1 to 12 per second, for 100,000 operations.

**Overload Current** — 20 AMPS DC, 30 AMPS 400Hz
**Rupture Current** — 25 AMPS DC, 40 AMPS 400Hz
**Contact Make Bounce** —1.0 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 5 Amps** — INITIAL 0.100 VOLTS
**End of Life** — 0.125 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude** — 300,000 Feet

**Shock*** —
Z, Y, & X Enclosures —
200 g for 6 mS
W & M Enclosures (Stud Mtg.) —
100 g for 6 mS
T Enclosure (Socket Mounted in Track) —
50 g for 11 mS

**Vibration, Sinusoidal*** —
Z, Y, & X Enclosures —
0.12 DA 10 to 70 Hz, 30 g 70-3000Hz
W & M Enclosures (Stud Mtg.) —
0.12 DA 10 to 57 Hz, 20 g 57-3000Hz
T Enclosure (Socket Mounted in Track) —
0.06 DA 10 to 57 Hz, 10 g 57 to 500Hz,
20 g 500 to 3000 Hz

**Vibration, Random*** —
Z, Y, & X Enclosures —
0.4 $g^2$/Hz 50-2000Hz
T, W & M Enclosures —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1000 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 250 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests —
50 MΩ Min.

**Operate Time at Nominal Voltage** — 4 ms or less

**Release Time at Nominal Voltage** — 4 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 20 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 95 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 500 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 500 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 1600 Ω | 36.0 | 2.5 | 14.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVERVOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.

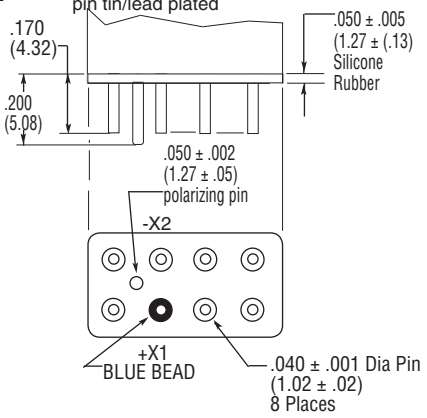
## FCB-205 Series, 5 Amperes, DPDT (Continued)

Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

### Terminals

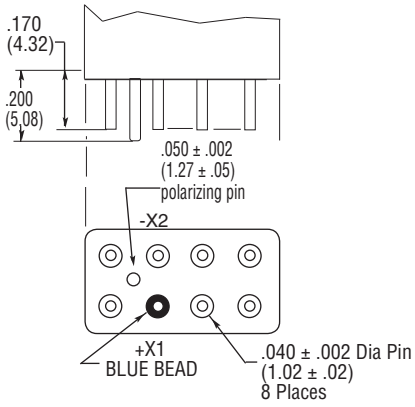
**CODE "A"** — **Socket Pin Terminals**

Socket Pins Gold Plated. Polarizing pin tin/lead plated



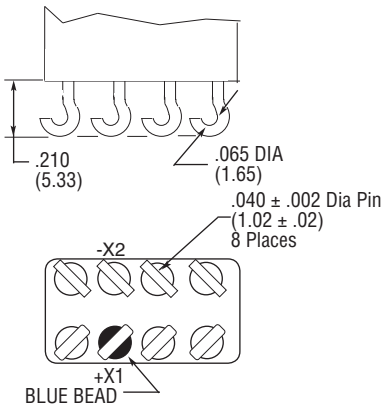

**CODE "B"** — **Solder Pin Terminals**

All Terminals Tin/Lead Plated



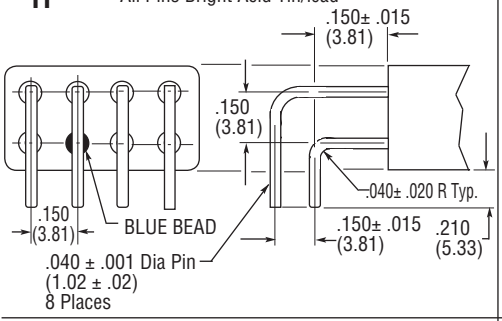

**CODE "C"** — **Solder Pin Terminals**

Hook Terminals Tin/Lead Plated

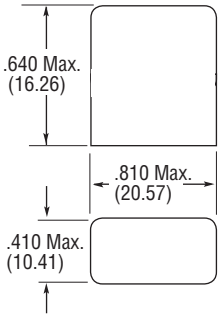



**CODE "H"** — **90° Solder Pins**

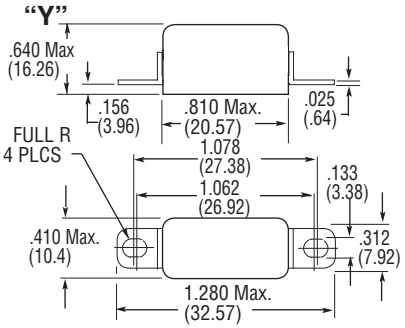
All Pins Bright Acid Tin/lead




**CODE "Z"**




**CODE "Y"**



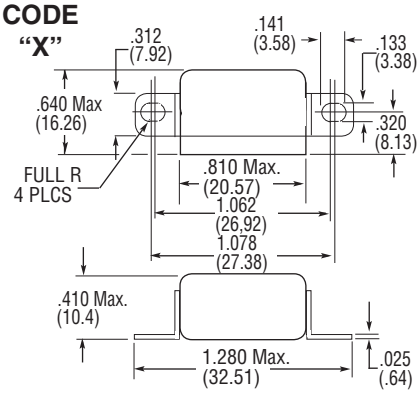

### Enclosures

All Enclosures have Cupro-Nickel Cans bright acid tin/lead plated after assembly to terminal headers.

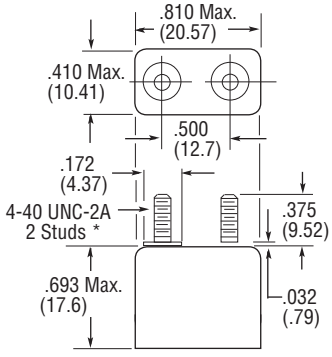
Dimensions: Inches ± .010 (mm ± .25)

Enclosure "T" is for use with track mounted sockets and requires socket pin terminals, but no gasket. The gasket is included in the socket assembly.

**CODE "X"**



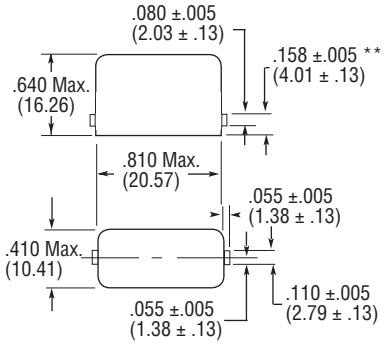

**CODE "W"**




*Metric threads available,To specify use M in place of W

**CODE "T"**

M83536/2-028
(REFERENCE ONLY)



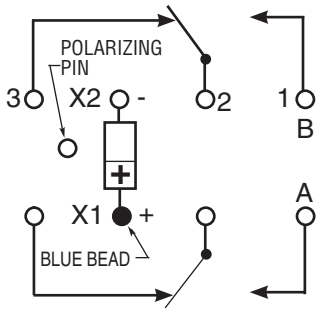

NOTE: FOR USE WITH TRACK MOUNT PER MIL-R-6106/23

** MEASURED FROM SURFACE OF HEADER

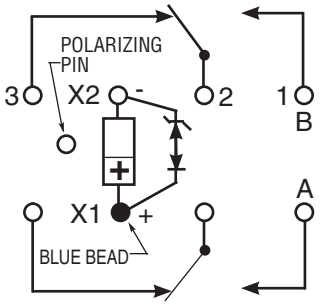
## FCB-205 Series, 5 Amperes, DPDT (Continued)

### Terminal Wiring

#### DC Coils



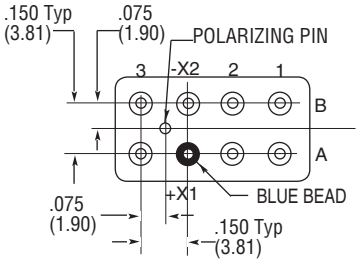

#### Transient Suppression




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




**TERMINAL VIEW**

### HOW TO ORDER

**FCB-205-A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins)

**ENCLOSURE** (With Flanges)

**COIL** (28 VDC With Transient Suppression).

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## FCB-405 Series, 5 Amperes, 4PDT

### Product Facts

- Hermetically Sealed
- All Welded Construction
- Balanced Force
- Permanent Magnet Drive
- Contacts rated low level to 5 Amps 28 VDC and 115/200 VAC 400 Hz, 3 Phase
- Weight .93 ounces max. (26.4 grams)
- Qualified to M83536/5 & /6

The Series FCB-405 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state. This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other versions of this relay:

**FCB-205** — 5 Amp DPDT Relay

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 115VAC 400Hz | 115/200VAC 400Hz-3Ø |
|---|---|---|---|---|
| Resistive | 100 | 5 | 5 | 5 |
| Inductive | 20 | 3 | 5 | 5 |
| Motor | 100 | 2 | 3 | 3 |
| Lamp | 100 | 1 | 1 | 1 |

Low Level Switching Capability: With contacts operating a load of 10 to 50 microamperes at 10 to 50 millivolts, the contact resistance miss detection level shall be 100 ohms max. Cycling rate is 1 to 12 per second, for 100,000 operations.

**Overload Current** — 20 AMPS DC, 30 AMPS 400Hz
**Rupture Current** — 25 AMPS DC, 40 AMPS 400Hz
**Contact Make Bounce** —1.0 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 5 Amps** — INITIAL 0.100 VOLTS
**End of Life** — 0.125 VOLTS

### General Specifications

**Temperature Rating — -70˚C TO + 125˚C**

**Altitude — 300,000 Feet**

**Shock*** —
Z & Y Enclosures —
200 g for 6 mS
W, X & M Enclosures —
100 g for 6 mS
T Enclosure (In Track) —
**50 g for 11 mS**

**Vibration, Sinusoidal*** —
Z & Y Enclosures —
30 g 70-3000Hz
W, X & M Enclosures —
20 g 70-3000Hz
T Enclosure (Socket Mounted in Track) —
20 g 500-3000 Hz

**Vibration, Random*** —
Z & Y Enclosures —
0.4 $g^2$/Hz 50-2000Hz
T, W, X & M Enclosures —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1000 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 250 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests —
50 MΩ Min.

**Operate Time at Nominal Voltage** — 6 ms or less

**Release Time at Nominal Voltage** — 6 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 25 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 78 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 400 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 400 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 1275 Ω | 36.0 | 2.5 | 14.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVERVOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.

## FCB-405 Series, 5 Amperes, 4PDT (Continued)

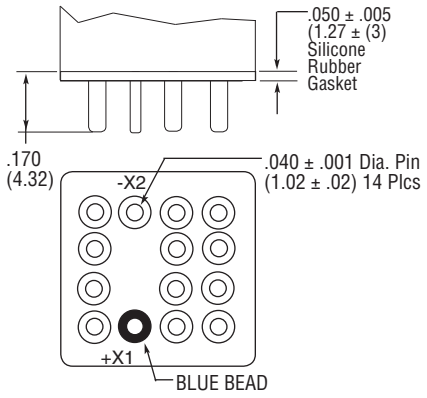
Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

### Terminals

**CODE "A"**

**Socket Pins - All DC Coils**

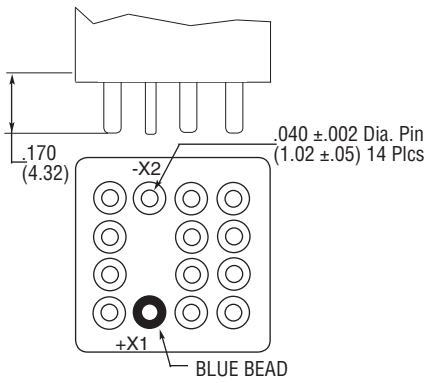
PIN TERMINALS ARE GOLD PLATED




**CODE "B"**

**Solder Pin Terminals**

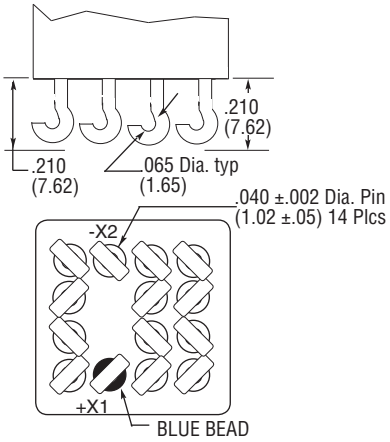
PIN TERMINALS TIN/LEAD PLATED




**CODE "C"**

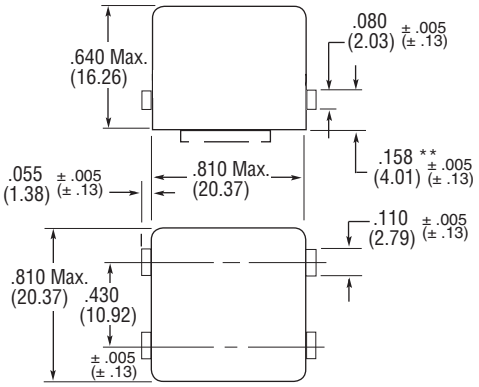
**Solder Hook Terminals**

HOOK TERMINALS TIN/LEAD PLATED




**CODE "T"**

M83536/6-025
(REFERENCE ONLY)




** Measured from surface of header

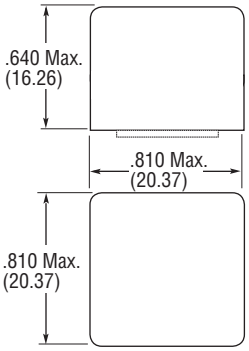
**Enclosures**

All Enclosures have cupro-Nickel cans bright acid tin/lead plated after assembly to terminal headers.

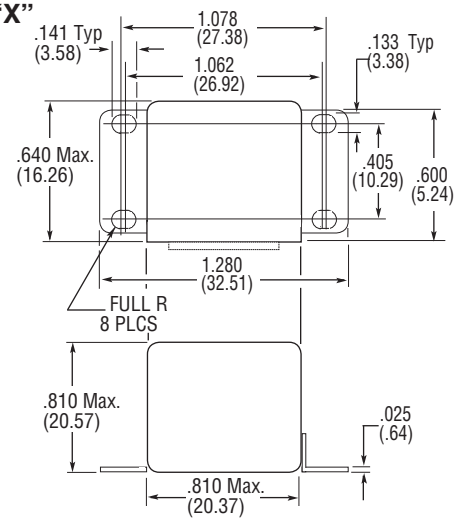
Dimensions: Inches ± .010 (mm ± .25)

**Code "T" used only with track-mounted Sockets. Requires code "A" pin terminals. Gasket is included in the socket assembly.**

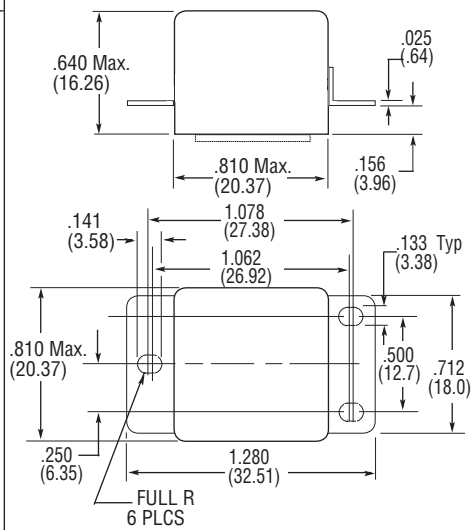
**CODE "Z"**



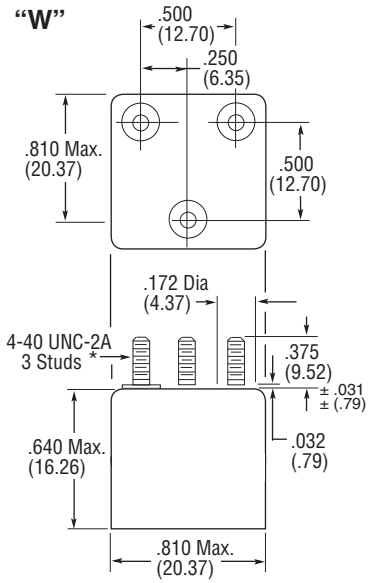

**CODE "X"**




**CODE "Y"**



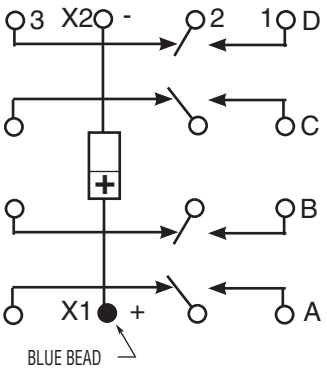

**CODE "W"**



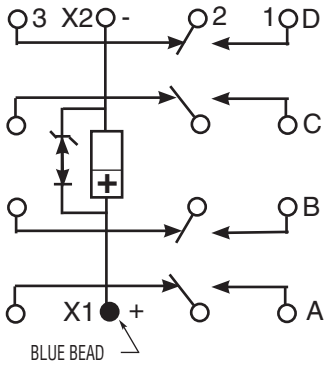
## FCB-405 Series, 5 Amperes, 4PDT (Continued)

### Terminal Wiring

**DC Coils**



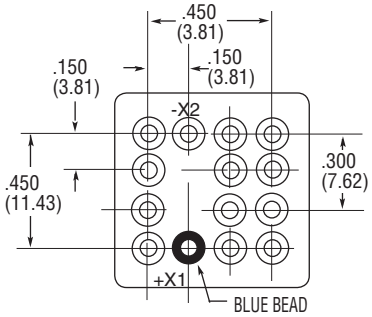

**DC Coils with Transient Suppression**




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

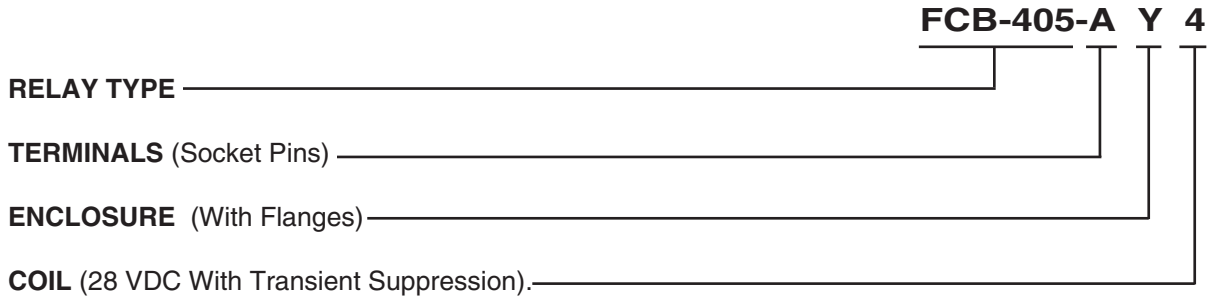
Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.



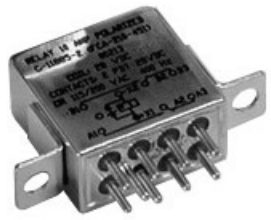

**TERMINAL VIEW**

### HOW TO ORDER




* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## FCA-210 Series, 10 Amperes, DPDT



### Product Facts

- Hermetically Sealed
- All Welded Construction
- Balanced Force
- Permanent Magnet Drive
- Contacts — Silver Cadmium Oxide with Gold Plating
- Coils for DC, 50 to 400Hz and 400Hz AC
- Weight 1.6 ounces max. (45.4 grams)
- Qualified to M83536/9, /10

The Series FCA-210 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state. This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other versions of this relay:

**FCA-410** — 10 Ampere 4PDT Relay

**FCA-610** — 10 Ampere 6 PDT Relay

**Available:**

**FCA-215** — 15 Ampere DPDT Relay, Has the same specifications as the FCA-210 except is rated at 15 amps. (Commercial Only)

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 115VAC 400Hz | 115/200VAC 3Ø | |
|---|---|---|---|---|---|
| | | | | 400Hz | 60Hz* |
| Resistive | 100 | 10 | 10 | 10 | 2.5 |
| Inductive | 20 | 8 | 8 | 8 | 2.5 |
| Motor | 100 | 4 | 4 | 4 | 2.0 |
| Lamp | 100 | 2 | 2 | 2 | 1 |

*60 Hz loads rated for 10,000 operations

**Overload Current** — 40 AMPS DC, 60 AMPS 400Hz
**Rupture Current** — 50 AMPS DC, 80 AMPS 400Hz
**Contact Make Bounce** —1 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 10 Amps** — INITIAL 0.100 VOLTS
**End of Life** — 0.125 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude** — 300,000 Feet

**Shock*** —
Z, Y, & X Enclosures —
200 g for 6 mS
W & M Enclosures (Stud Mtg.) —
100 g for 6 mS

**Vibration, Sinusoidal*** —
Z, Y, & X Enclosures —
30 g 33-3000Hz
W & M Enclosures (Stud Mtg.) —
20 g 33-3000Hz

**Vibration, Random*** —
Z, Y, & X Enclosures —
0.4 $g^2$/Hz 50-2000Hz
W & M Enclosures (Stud Mtg.) —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1250 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 350 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests — 50 MΩ Min.

**Operate Time at Nominal Voltage** —
DC Relays — 10 ms or less
AC Relays — 15 ms or less

**Release Time at Nominal Voltage** —
DC Relays — 10 ms or less
AC Relays — 50 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. AC Amps (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 20 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 80 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 320 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 320 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 920 Ω | 32.0 | 2.5 | 14.0 |
| 6 | 28 | 400Hz | 180 mA | 22.0 | 1.25 | 10.0 |
| 7 | 28 | 50/400Hz | 100 mA | 22.0 | 1.25 | 10.0 |
| 8 | 115 | 400 Hz | 40 mA | 90.0 | 5.0 | 40.0 |
| 9 | 115 | 50/400 Hz | 30 mA | 95.0 | 5.0 | 40.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C; AC COIL MAX. CURRENT AT NOMINAL VOLTAGE.
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVERVOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.
E. COILS AVAILABLE FOR OTHER VOLTAGES AND FOR AC 50/60HZ.

NOTE: Only DC Coil Models are QPL Approved.

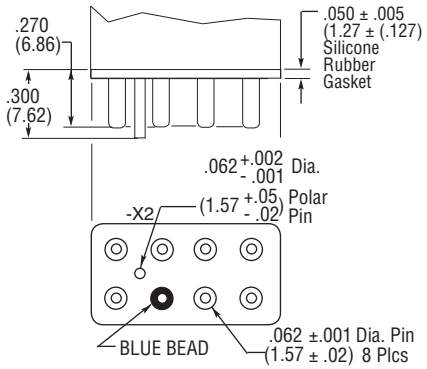
## FCA-210 Series, 10 Amperes, DPDT (Continued)

Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

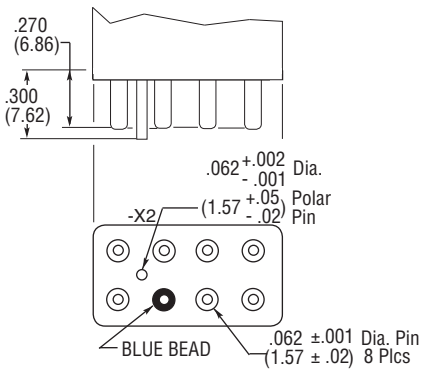
### Terminals

SOCKET PINS ARE GOLD PLATED
POLARIZING PINS ARE TIN/LEAD PLATED
CIRCUIT BOARD PINS ARE TIN/LEAD PLATED
DIMENSIONS EXCEPT AS NOTED:
INCHES ± .010 (MILLIMETERS ± .25)

**CODE "A" Socket Pins - All DC Coils**

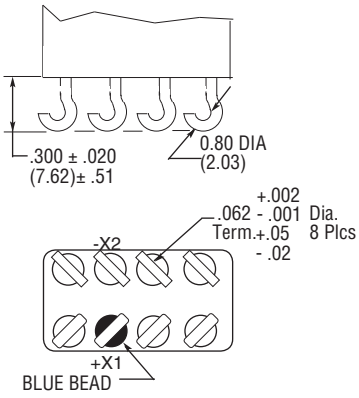



**CODE "B" Circuit Board Pins - All DC Coils**

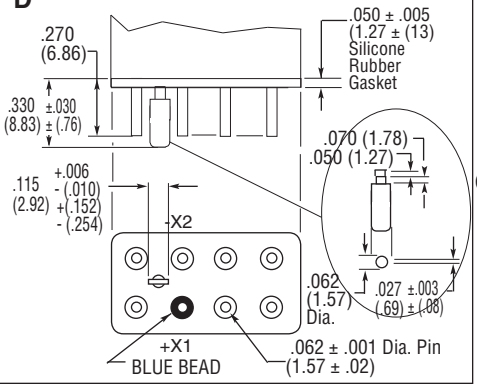



**CODE "C" Solder Hook Terminals**

HOOK TERMINALS TIN/LEAD PLATED

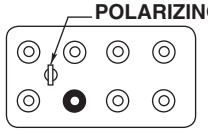



**CODE "D" Socket Pins 115 VAC**

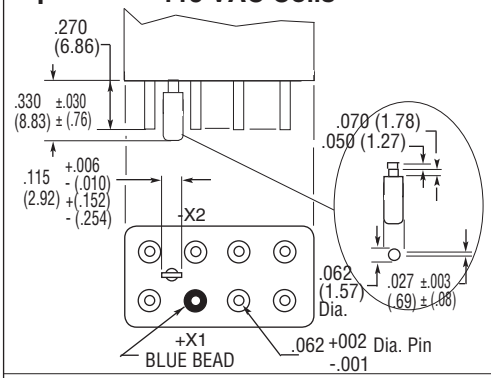



**CODE "E" Socket Pins 28 VAC Coils**

Same as Code "D" Except polarizing Pin turned 90˚ to this plane.

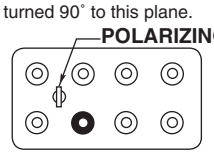



**CODE "F" Circuit Board Pins 115 VAC Coils**



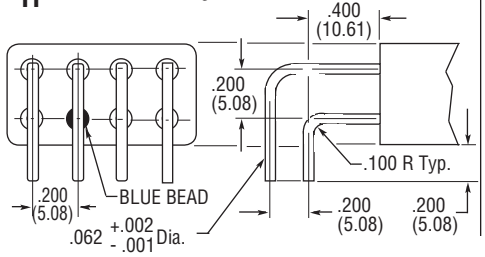

**CODE "G" Circuit Board Pins 28 VAC Coils**

Same as Code "F" Except polarizing Pin turned 90˚ to this plane.




**CODE "H" 90˚ Solder Pins**

All Pins Bright Acid Tin/lead



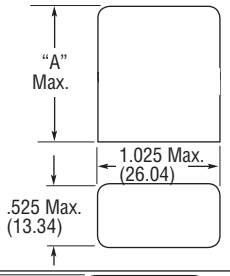

### Enclosures

All Enclosures have Cupro-Nickel Cans bright acid tin/lead plated after assembly to terminal headers.

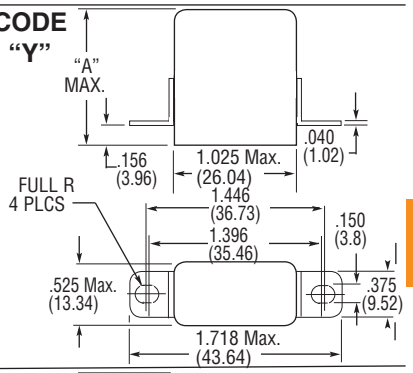
Dimensions: Inches ± .010 (mm ± .25)

**"A"** AC Coils 1.125 in. (28.57) Max.
DC Coils 1.010 in. (25.65) Max.

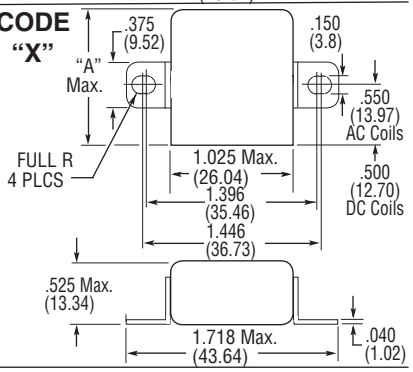
**CODE "Z"**



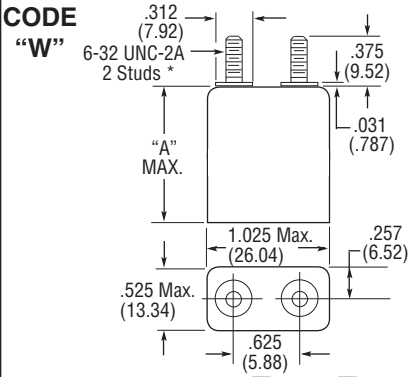

**CODE "Y"**




**CODE "X"**




**CODE "W"**

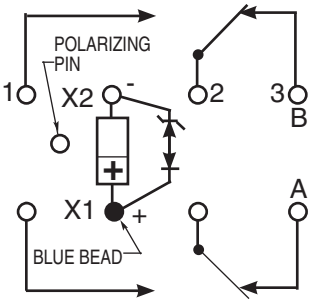



*Metric threads available, To specify use M in place of W

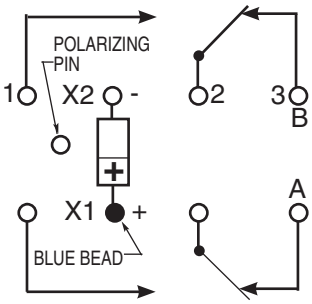
## FCA-210 Series, 10 Amperes, DPDT (Continued)

### Terminal Wiring

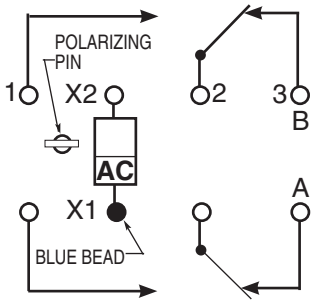
**DC Coils with Transient Suppression**



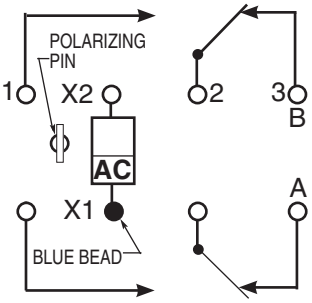

**DC Coils**




**AC Coils 115 VAC**



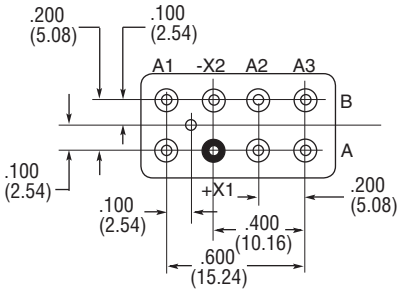

**AC Coils 28 VAC**




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




**TERMINAL VIEW**

### HOW TO ORDER

**FCA-215-**
**FCA-210-A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins, DC Coil)

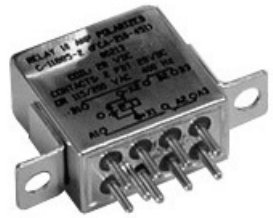
**ENCLOSURE** (With Flanges)

**COIL** (28 VDC With Transient Suppression).

**NOTE: Only DC coil models are QPL Approved**

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## FCA-212 Series, 12 Amperes, DPDT



### Product Facts

- Hermetically Sealed
- All Welded Construction
- Balanced Force
- Permanent Magnet Drive
- Contacts — Silver Cadmium Oxide with Gold Plating
- Coils for DC, 50 to 400Hz and 400Hz AC
- Weight 1.6 ounces max. (45.4 grams)

The Series FCA-212 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state.

This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other versions of this relay:

**FCA-412** — 12 Amp 4PDT Relay

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 115VAC 400Hz | 115/200VAC 3Ø | |
|---|---|---|---|---|---|
| | | | | 400Hz | 60Hz* |
| Resistive | 100 | 12 | 12 | 12 | 2.5 |
| Inductive | 20 | 8 | 8 | 8 | 2.5 |
| Motor | 100 | 4 | 4 | 4 | 2.0 |
| Lamp | 100 | 2 | 2 | 2 | 1 |

*60 Hz loads rated for 10,000 operations

**Overload Current — 40 AMPS DC, 60 AMPS 400Hz**
**Rupture Current — 50 AMPS DC, 80 AMPS 400Hz**
**Contact Make Bounce** —1 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 12 Amps** — INITIAL 0.150 VOLTS
**End of Life** — 0.175 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude — 300,000 Feet**

**Shock*** —
Z, Y, & X Enclosures —
200 g for 6 mS
W & M Enclosures (Stud Mtg.) —
100 g for 6 mS

**Vibration, Sinusoidal*** —
Z, Y, & X Enclosures —
30 g 33-3000Hz
W Enclosure —
20 g 33-3000Hz

**Vibration, Random*** —
Z, Y, & X Enclosures —
0.4 $g^2$/Hz 50-2000Hz
W & M Enclosures (Stud Mtg.) —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1250 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 350 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests —
50 MΩ Min.

**Operate Time at Nominal Voltage** —
DC Relays — 10 ms or less
AC Relays — 15 ms or less

**Release Time at Nominal Voltage** —
DC Relays — 10 ms or less
AC Relays — 50 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. AC Amps (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 20 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 80 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 320 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 320 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 920 Ω | 32.0 | 2.5 | 14.0 |
| 6 | 28 | 400Hz | 180 mA | 22.0 | 1.25 | 10.0 |
| 7 | 28 | 50/400Hz | 100 mA | 22.0 | 1.25 | 10.0 |
| 8 | 115 | 400 Hz | 40 mA | 90.0 | 5.0 | 40.0 |
| 9 | 115 | 50/400 Hz | 30 mA | 95.0 | 5.0 | 40.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C; AC COIL MAX. CURRENT AT NOMINAL VOLTAGE.
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVERVOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.
E. COILS AVAILABLE FOR OTHER VOLTAGES AND FOR AC 50/60HZ.

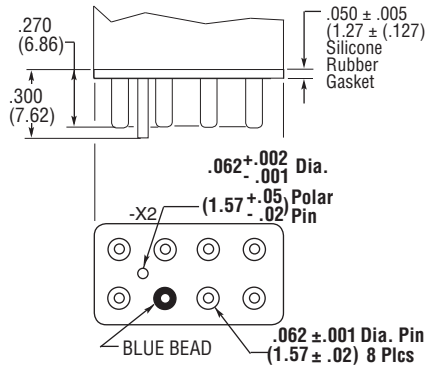
## FCA-212 Series, 12 Amperes, DPDT (Continued)

Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

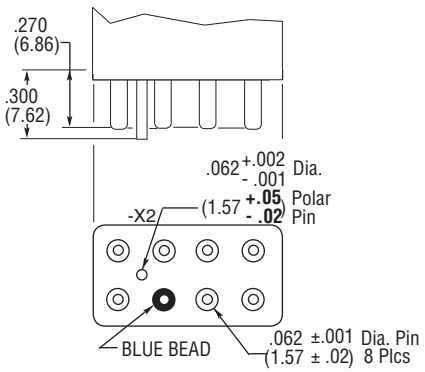
### Terminals

SOCKET PINS ARE GOLD PLATED
POLARIZING PINS ARE TIN/LEAD PLATED
CIRCUIT BOARD PINS ARE TIN/LEAD PLATED
DIMENSIONS EXCEPT AS NOTED:
INCHES ± .010 (MILLIMETERS ± .25)

**CODE "A" Socket Pins - All DC Coils**

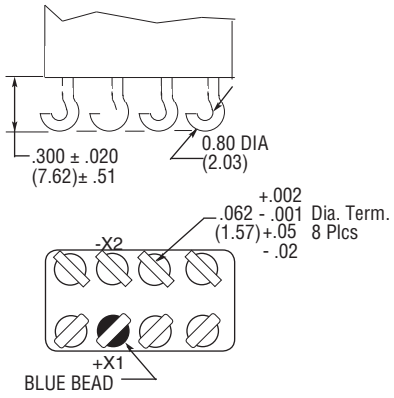



**CODE "B" Circuit Board Pins - All DC Coils**

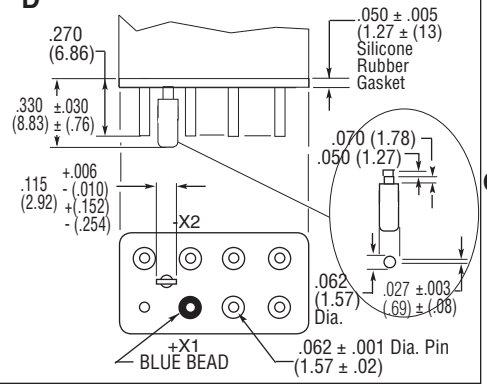



**CODE "C" Solder Hook Terminals**

HOOK TERMINALS TIN/LEAD PLATED

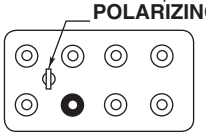



**CODE "D" Socket Pins 115 VAC**

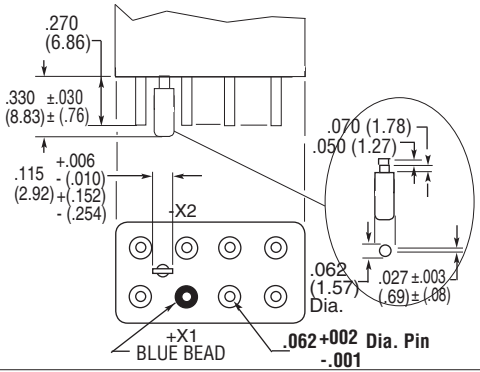



**CODE "E" Socket Pins 28 VAC Coils**

Same as Code "D" Except polarizing Pin turned 90˚ to this plane.

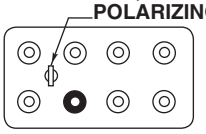



**CODE "F" Circuit Board Pins 115 VAC Coils**



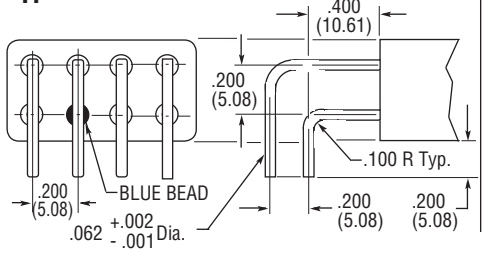

**CODE "G" Circuit Board Pins 28 VAC Coils**

Same as Code "F" Except polarizing Pin turned 90˚ to this plane.




**CODE "H" 90˚ Solder Pins**

All Pins Bright Acid Tin/lead



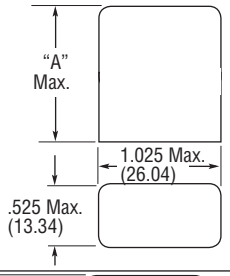

### Enclosures

All Enclosures have Cupro-Nickel Cans bright acid tin/lead plated after assembly to terminal headers.

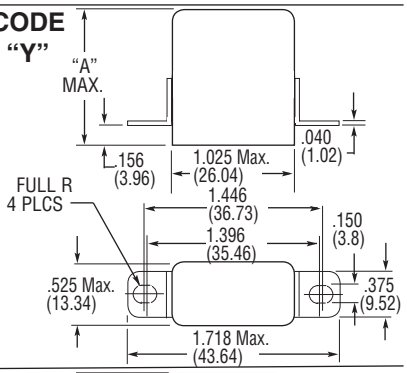
Dimensions: Inches ± .010 (mm ± .25)

**"A"** AC Coils 1.125 in. (28.57) Max.
DC Coils 1.010 in. (25.65) Max.

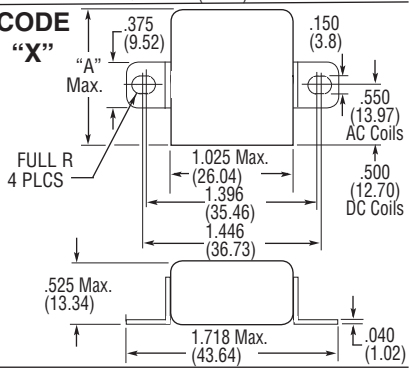
**CODE "Z"**



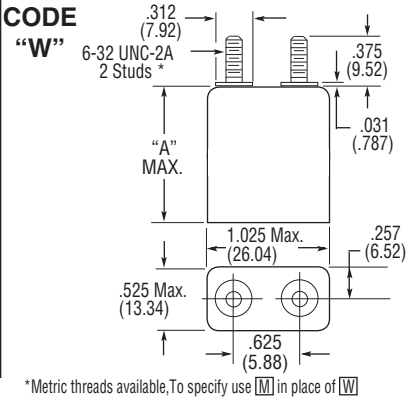

**CODE "Y"**




**CODE "X"**




**CODE "W"**

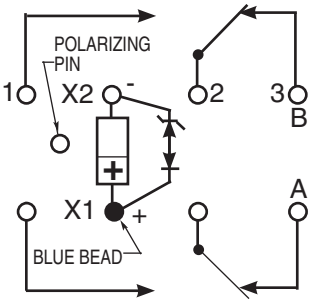



*Metric threads available,To specify use M in place of W

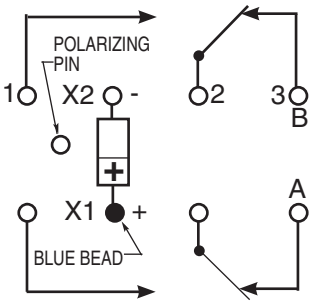
## FCA-212 Series, 12 Amperes, DPDT (Continued)

### Terminal Wiring

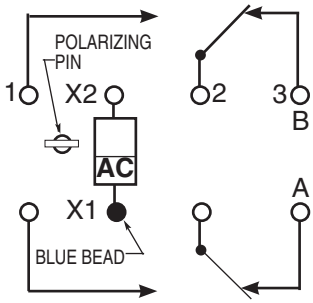
**DC Coils with Transient Suppression**



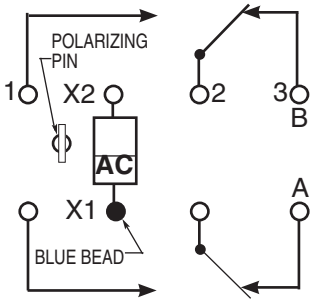

**DC Coils**




**AC Coils 115 VAC**



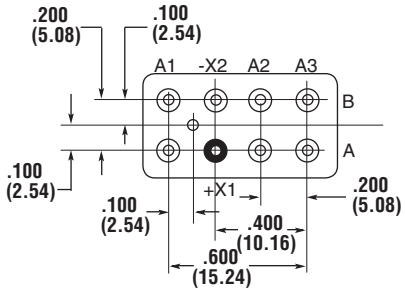

**AC Coils 28 VAC**




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




TERMINAL VIEW

### HOW TO ORDER

**FCA-212-A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins, DC Coil)

**ENCLOSURE** (With Flanges)

**COIL** (28 VDC With Transient Suppression).

## FCA-410 Series, 10 Amperes, 4PDT

### Product Facts

- **Hermetically Sealed**
- **All Welded Construction**
- **Balanced Force**
- **Permanent Magnet Drive**
- **4PDT switching in one inch cube**
- **Contacts — Silver Cadmium Oxide with Gold Plating**
- **Coils for DC and AC 50 to 400Hz or 400Hz**
- **Weight 2.72 ounces max. (77 grams max.)**
- **Qualified to M83536/15, /16**

The Series FCA-410 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state. This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture 2-pole and 6-pole versions of this relay.

**FCA-210** — 10 Amp DPDT Relay

**FCA-610** — 10 Amp 6PDT Relay

**Available**

**FCA-415** — 15 Amp 4PDT, Has the same specifications as the FCA-410 except is rated at 15 amps. (Commercial Only)

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 120VAC 400Hz | 120/200VAC | |
|---|---|---|---|---|---|
| | | | | 400Hz-3Ø | 60Hz-3Ø* |
| Resistive | 100 | 10 | 10 | 10 | 2.5 |
| Inductive | 20 | 8 | 8 | 8 | 2.5 |
| Motor | 100 | 4 | 4 | 4 | 2.0 |
| Lamp | 100 | 2 | 2 | 2 | 1.0 |

*60 Hz loads rated for 10,000 operations

**Overload Current** — 40 AMPS DC, 60 AMPS 400Hz
**Rupture Current** — 50 AMPS DC, 80 AMPS 400Hz
**Contact Make Bounce** —1 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 10 Amps** — INITIAL 0.100 VOLTS
**End of Life** — 0.125 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude** — 300,000 Feet

**Shock*** —
Z & Y Enclosures —
200 g for 6 mS
W, X & M Enclosures —
100 g for 6 mS

**Vibration, Sinusoidal*** —
Z & Y Enclosures —
0.12 DA 10 to 70Hz
30 g 70 to 3000Hz
W, X & M Enclosures —
0.12 DA 10 to 57Hz
20 g 57 to 3000Hz

**Vibration, Random*** —
Z & Y Enclosures —
0.4 $g^2$/Hz 50-2000Hz
W, X & M Enclosures —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1250 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 350 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests — 50 MΩ Min.

**Operate Time at Nominal Voltage** —
DC Relays — 15 ms or less
AC Relays — 20 ms or less

**Release Time at Nominal Voltage** —
DC Relays — 15 ms or less
AC Relays — 50 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. AC Amps (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 18 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 70 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 290 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 290 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 865 Ω | 32.0 | 2.5 | 14.0 |
| 6 | 28 | 400Hz | 225 mA | 22.0 | 1.25 | 10.0 |
| 7 | 28 | 50/400Hz | 120 mA | 22.0 | 1.25 | 10.0 |
| 8 | 115 | 400 Hz | 40 mA | 90.0 | 5.0 | 40.0 |
| 9 | 115 | 50/400 Hz | 30 mA | 95.0 | 5.0 | 40.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C; AC COIL MAX. CURRENT AT NOMINAL VOLTAGE.
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVER-VOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.
E. COILS AVAILABLE FOR OTHER VOLTAGES AND FOR AC 50/60HZ.

**NOTE:** Only DC Coil Models are QPL Approved.

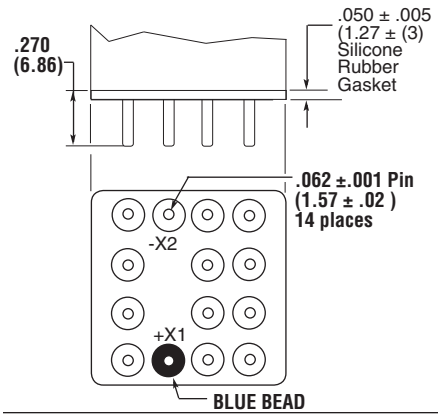
## FCA-410 Series, 10 Amperes, 4PDT (Continued)

Below are shown the standard terminal types and the enclosures available. Note that the pin configuration for coil connections is determined by the coil supply voltage. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25) except as noted.

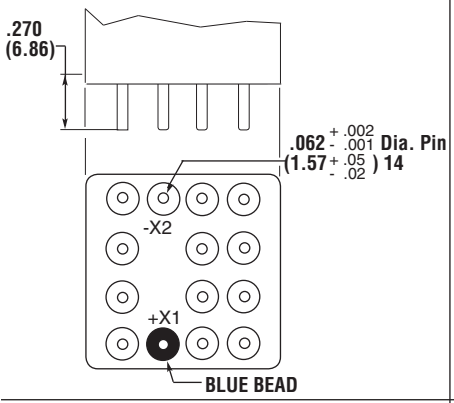
### Terminals

Terminals on 0.200 centers.
Coil terminals: X1-X2.
Socket Pins are Gold Plated.
Circuit Board Pins are Tin/Lead Plated.

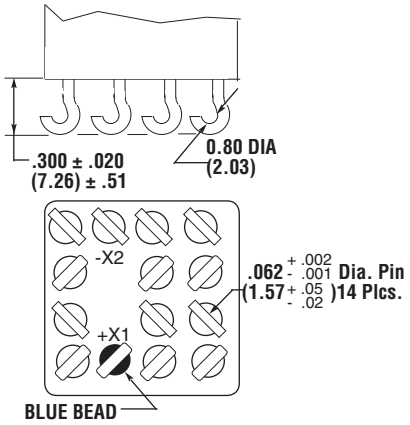
**CODE "A"**
**Socket Pins-All DC Coils**



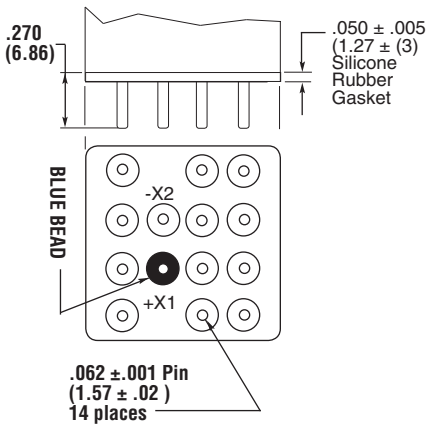

**CODE "B"**
**Circuit Board Pins-All DC Coils**




**CODE "C"**
**Solder Hooks-AC or DC Coils**




**CODE "D"**
**Socket Pins-115 VAC Coils**

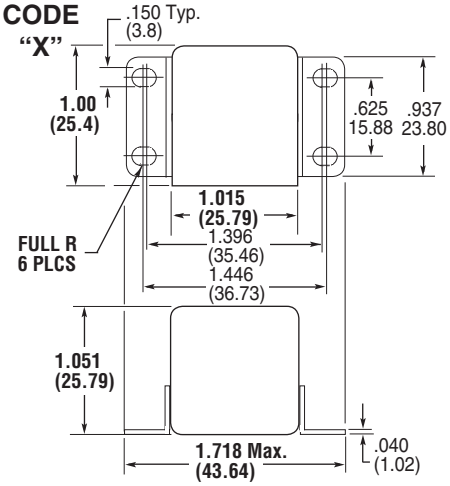



**SEE NEXT PAGE**

**FOR MORE COIL**

**TERMINAL OPTIONS**

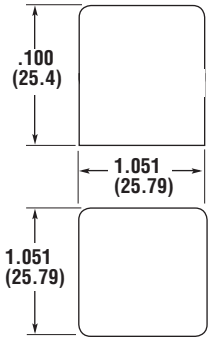
**CODE "X"**



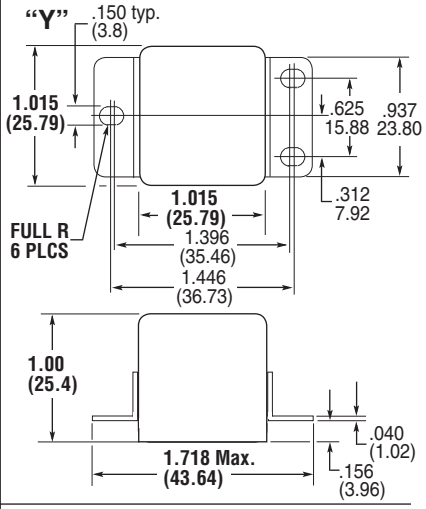

### Enclosures

All Enclosures have cupro-Nickel cans bright acid tin/lead plated after assembly to terminal headers.

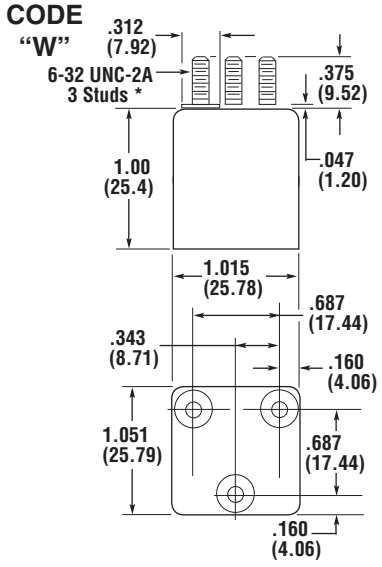
**CODE "Z"**




**CODE "Y"**




**CODE "W"**

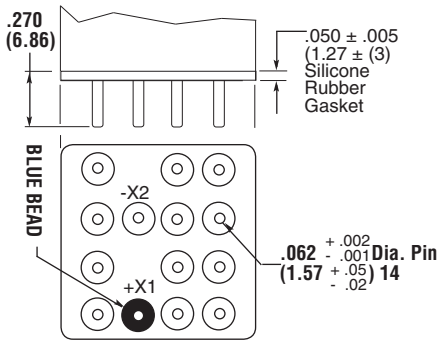



*Metric threads available,To specify use M in place of W

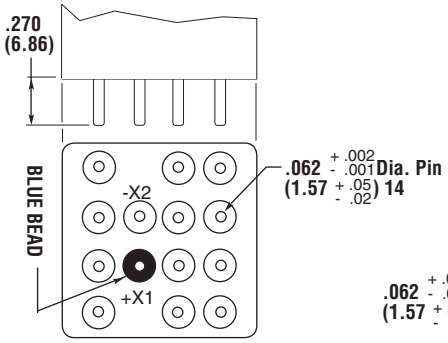
## FCA-410 Series, 10 Amperes, 4PDT (Continued)

### Terminals (Continued)

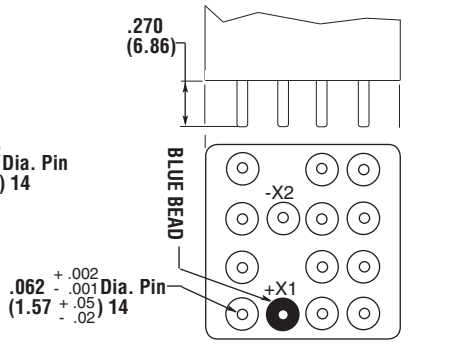
**CODE "E"**
**Socket Pins- 28 VAC Coils**




**CODE "F"**
**Circuit Board Pins-115 VAC Coils**

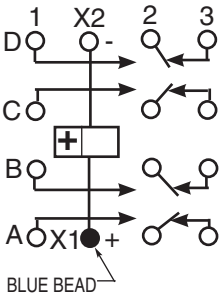



**CODE "G"**
**Circuit Board Pins- 28 VAC Coils**

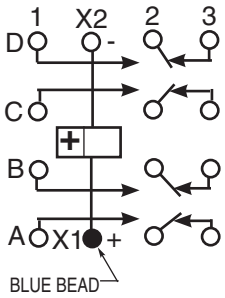



### Terminal Wiring

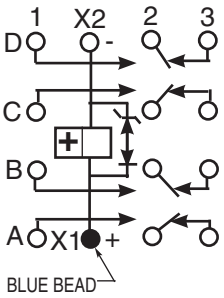
**A & B Pin Terminal**
**All DC Coils**



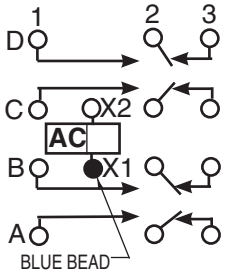

**C Hook Terminal**
**All AC & DC Coils**



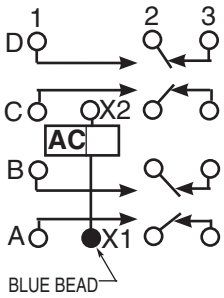

**Transient Suppression**
**Cir.**




**D & F Pin Terminal**
**115 VAC Coils**



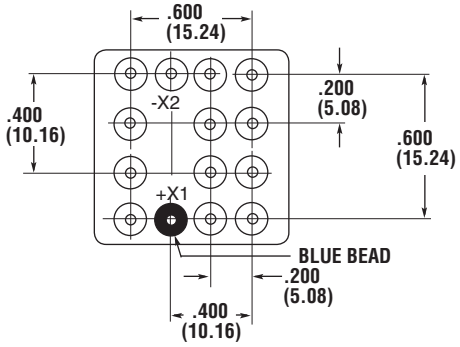

**E & G Pin Terminal**
**28 VAC Coils**




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




TERMINAL VIEW

### HOW TO ORDER

**FCA-415-**
**FCA-410 A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins)

**ENCLOSURE** (With Flanges)

**COIL** (28 VDC With Transient Suppression).
**NOTE: Only DC coil models are QPL Approved**

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## FCA-125 Series, 25 Amperes, SPDT

### Product Facts

- Hermetically Sealed
- All Welded Construction
- Balanced Force
- Permanent Magnet Drive
- Contacts — Silver Cadmium Oxide with Gold Plating
- Coils for DC, 50 to 400Hz and 400Hz AC
- Weight 1.6 ounces max. (45.4 grams)
- Qualified to M6106/19, M83536/36, /37

The Series FCA-125 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state.

This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other versions of this relay:

**FCA-325** — 25 Ampere 3PDT Relay

**FCAC-325** — 25 Ampere 3PST-NO Relay with 2 amp SPDT auxiliary

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 115VAC 400Hz | 115VAC 60Hz* |
|---|---|---|---|---|
| Resistive | 50 | 25 | 25 | 10 |
| Inductive | 10 | 12 | — | 10 |
| Inductive | 20 | — | 15 | — |
| Motor | 50 | 10 | 10 | 8 |
| Lamp | 50 | 5 | 5 | — |

*60 Hz loads rated for 10,000 operations

**Overload Current** — 50 AMPS DC, 80 AMPS 400Hz
**Rupture Current** — 60 AMPS DC, 100 AMPS 400Hz
**Contact Make Bounce** —1 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 25 Amps** — INITIAL 0.150 VOLTS
**End of Life** — 0.175 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude** — 300,000 Feet

**Shock*** —
Z, Y, & X Enclosures —
200 g for 6 mS
W & M Enclosures (Stud Mtg.) —
100 g for 6 mS

**Vibration, Sinusoidal*** —
Z, Y, & X Enclosures —
30 g 33-3000Hz
W & M Enclosures (Stud Mtg.) —
20 g 33-3000Hz

**Vibration, Random*** —
Z, Y, & X Enclosures —
0.4 $g^2$/Hz 50-2000Hz
W & M Enclosures (Stud Mtg.) —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1250 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 350 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests —
50 MΩ Min.

**Operate Time at Nominal Voltage** —
DC Relays — 10 ms or less
AC Relays — 15 ms or less

**Release Time at Nominal Voltage** —
DC Relays — 10 ms or less
AC Relays — 50 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. AC Amps (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 20 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 80 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 320 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 320 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 920 Ω | 32.0 | 2.5 | 14.0 |
| 6 | 28 | 400Hz | 180 mA | 22.0 | 1.25 | 10.0 |
| 7 | 28 | 50/400Hz | 100 mA | 22.0 | 1.25 | 10.0 |
| 8 | 115 | 400 Hz | 40 mA | 90.0 | 5.0 | 40.0 |
| 9 | 115 | 50/400 Hz | 30 mA | 95.0 | 5.0 | 40.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C; AC COIL MAX. CURRENT AT NOMINAL VOLTAGE.
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVERVOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.
E. COILS AVAILABLE FOR OTHER VOLTAGES AND FOR AC 50/60HZ.

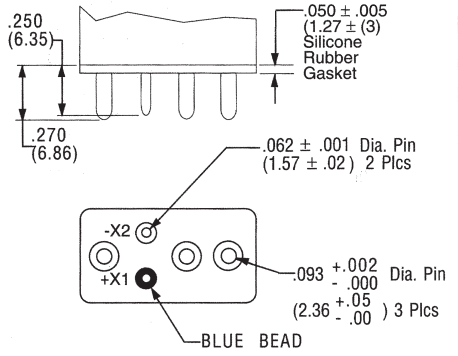
**NOTE:** Only DC Coil Models are QPL Approved.

## FCA-125 Series, 25 Amperes, SPDT (Continued)

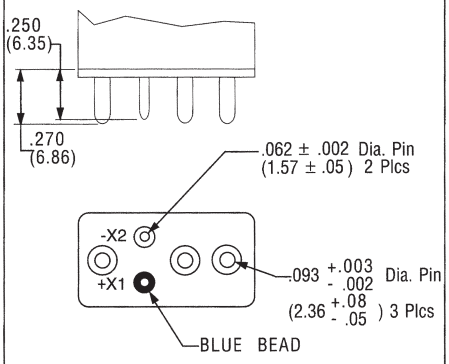
Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

### Terminals

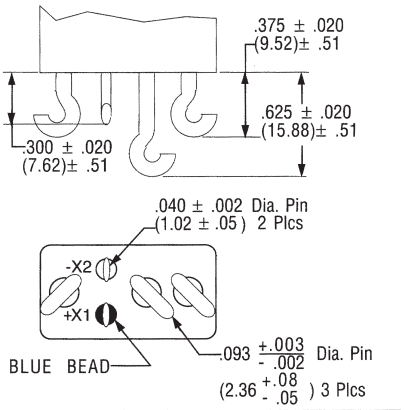
**CODE "A"**
**Socket Pins - All DC Coils**
PIN TERMINALS ARE GOLD PLATED



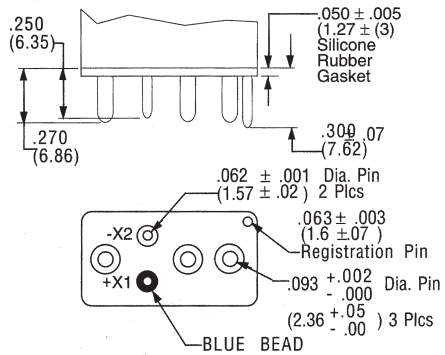

**CODE "B"**
**Solder Pin Terminals**
PIN TERMINALS TIN/LEAD PLATED




**CODE "C"**
**Solder Hook Terminals**
HOOK TERMINALS TIN/LEAD PLATED




**CODE "D"**
**Socket Pins - All AC Coils**
PIN TERMINALS ARE GOLD PLATED



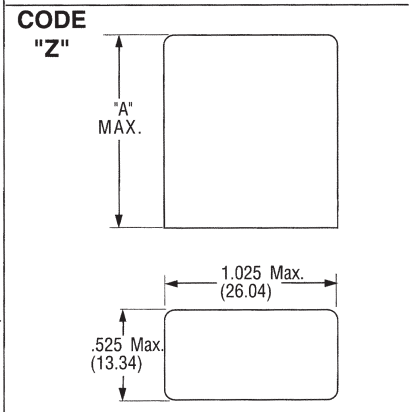

### Enclosures

All Enclosures have cupro-Nickel cans bright acid tin/lead plated after assembly to terminal headers.

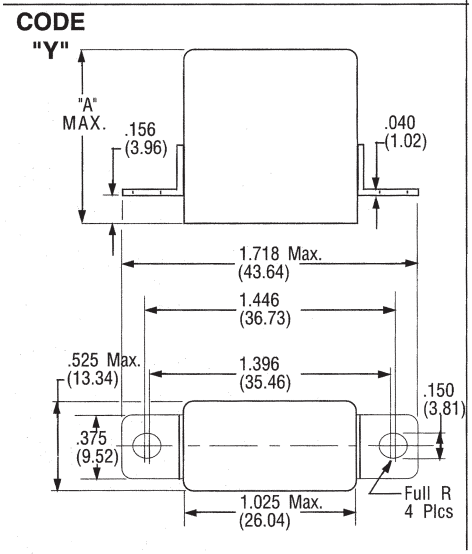
Dimensions: Inches ± .010 (mm ± .25)

**"A"** - AC Coils 1.125 in. (31.91) Max
DC Coils 1.010 in. (28.65) Max..

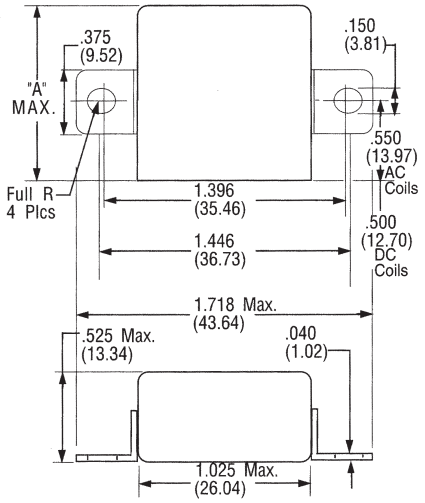
**CODE "Z"**



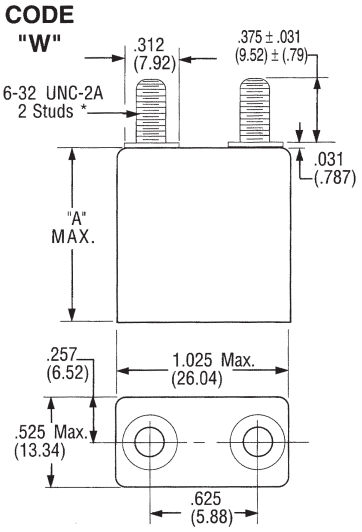

**CODE "Y"**




**CODE "X"**




**CODE "W"**

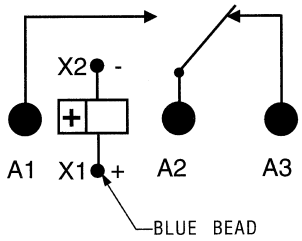



*Metric threads available.
To specify use M in place of W

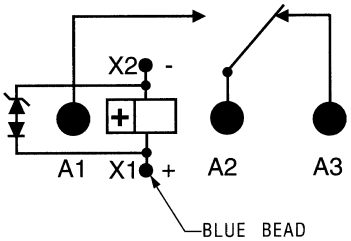
## FCA-125 Series, 25 Amperes, SPDT (Continued)

### Terminal Wiring

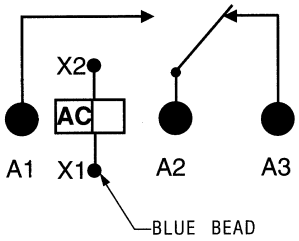
DC COILS




DC COILS WITH TRANSIENT SUPPRESSION



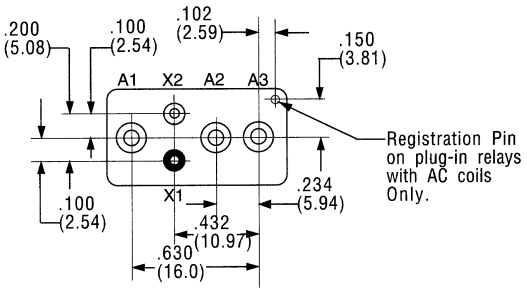

AC COILS




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




TERMINAL VIEW

### HOW TO ORDER

**FCA-125-A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins, DC Coil)

**ENCLOSURE** (With Flanges)

**COIL** (28 VDC With Transient Suppression).

**NOTE: Only DC coil models are QPL Approved**

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

# CII FC-325 Series Relays

## Product Facts

- Non-latching Hermetically Sealed Relay
- Corrosion protected metal can
- All welded construction.
- 1.5 inch cube enclosure
- 0.452 lbs
- Excellent for switching harsh inductive, motor, and lamp loads
- -70°C to +125°C temperature range
- 80,000 feet altitude rating
- 28 Vdc or 115 Vac coils
- Solder hook or terminal block configurations
- Qualified to MS27418 specifications
- Higher current ratings than standard M83536 mid-range relays
- 3-Pole 25A Contacts (FORM X) Switching in 1.5 inch$^3$
- Main contacts are suitable for use in 360-800 Hz variable frequency application

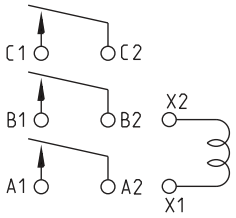
## Applications

- Launch Systems
- Power Distribution
- Fuel Pumps
- Guidance and Navigation Systems
- Aircraft Galley/Cabin Equipment
- Weapons Systems
- Ground Support Equipment

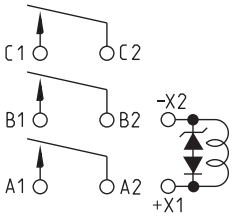
FC-325 Series relays from TE Connectivity (TE) are hermetically sealed devices designed for harsh inductive, motor, and lamp load applications in aerospace, defense, and marine markets.

Configured as a 3PST/NO (DM), the double make/break contact design of the CII FC-325 Series relays offer higher capability than comparable relays in the market. It shares the load across two contact sets, resulting in less wear and tear on the relay. This provides stable performance and extends the relay's life. The relay's all welded design creates a reliable alternative to similar solder sealed relays in the market.

### Circuit Diagram




DC Nonsuppressed and AC Coils




DC Suppressed Coils

## General Specifications

**Temperature Rating** — -70˚C to + 125˚C

**Altitude** — 80,000 Feet

**Shock** — 50 g/11 ms

**Sinusoidal Vibration** — 10 g/5 to 1000 H2

## Electrical

**Dielectric Strength at Sea Level: Coil to Case** — 1250 Vrms

**All Other Points** — 1500 Vrms

**Dielectric Strength at 80,000 ft (25,000 m)** — 500 Vrms (all points)

**Insulation Resistance at 500 Vdc: Initial** — 100 MΩ min.

**After Life or Environmental Test** — 50 MΩ min.

**Contact Voltage Drop at Nominal Current:**

**Initial Value** — 150 mV max.
**After Life** — 175 mV max.

## Operational

**Operate Time at Nominal Voltage:**
**AC** — 25 ms max.
**DC** — 20 ms max.

**Release Time at Nominal Voltage:**
**AC** — 50 ms max.
**DC** — 10 ms max.

**Bounce Time at Nominal Voltage** — 2 ms max.

### Coil Characteristics

| Code | 115 Vac 50/60 Hz | 115 Vac 400 Hz | 28 Vdc | 28 Vdc (Suppresed) |
|---|---|---|---|---|
| Nominal operating voltage | 115 | 115 | 28 | 28 |
| Maximum operating voltage | 122 | 122 | 32 | 32 |
| Maximum pick-up voltage over temperature range | 95 | 95 | 18 | 18 |
| Maximum pick-up voltage over temperature range (Continuous Current test) | 108 | 108 | 22.5 | 22.5 |
| Drop-out voltage over temperature range | 5.0 | 5.0 | 1.5 | 1.5 |
| Coil current at +25° C (amperes) | .06 | .055 | - | - |
| Coil resistance - DC Coils (*) | - | - | 160 | 160 |
| Back EMF Suppression to (VDC) | - | - | - | 42 |

### Contact Characteristics

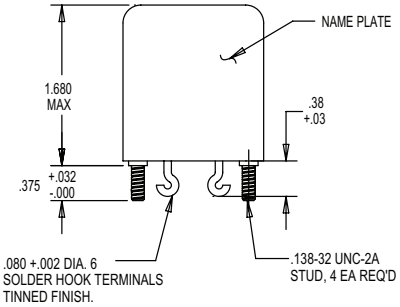
| Load Type | Life Cycles | Current Rating (A) | | | | |
|---|---|---|---|---|---|---|
| | | 28 Vdc | 115 Vac, 1 Phase Power | | 115/200 Vac, 3 Phase Power | |
| | | | 400 Hz | 50/60 Hz | 400 Hz | 50/60 Hz |
| Resistive | 50,000 | 25 | 25 | 25 | 25 | 25 |
| Inductive | 10,000 | 15 | 25 | 25 | 25 | 25 |
| Motor | 50,000 | 20 | 20 | 12 | 20 | 12 |
| Lamp | 50,000 | 10 | 10 | 10 | 10 | 10 |
| Mechanical Life, Reduced Current | 200,000 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 |

* For other coil votages consult factory.

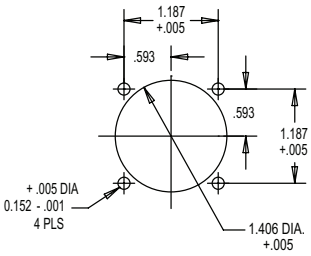
## CII FC-325 Series Relays (Continued)

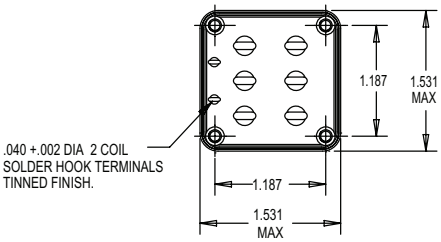
### Dimensions

### Solder Hook Terminals (Shown with Mounting Studs)

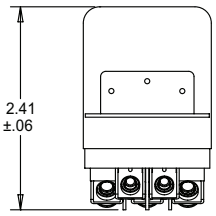


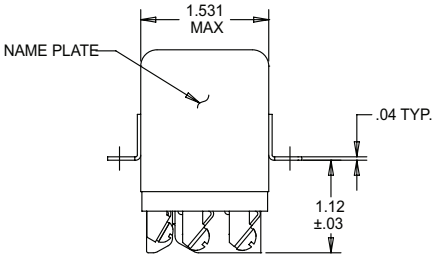

**Mounting Layout**



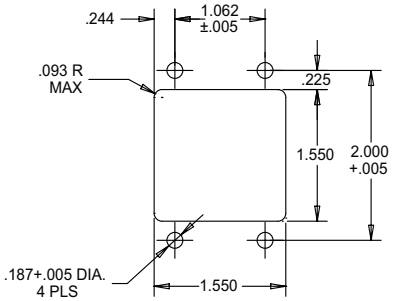



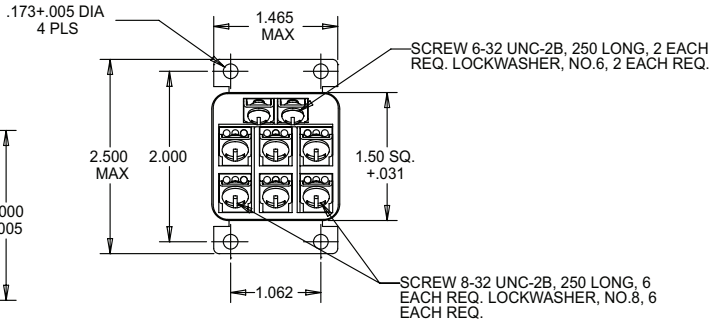

### Screw Terminals (Shown with Mounting Bracket)




**Mounting Layout**




Tolerances are ±.010 unless otherwise noted.

### Part Numbers

| Coil | Terminal | Mounting | Mil Spec | Comml Part No. | Part No. |
|---|---|---|---|---|---|
| 28 Vdc | Solder Hook | Stud | MS27418-1B | FC-325-CW3 | FC-325-2 |
| | Screw | Bracket | MS27418-2B | FC-325-SY3 | FC-325-5 |
| 28 Vdc (Suppressed) | Solder Hook | Stud | MS27418-1D | FC-325-CW4 | FC-325-7 |
| | Screw | Bracket | MS27418-2D | FC-325-SY4 | FC-325-8 |
| 115 Vac, 50/60 Hz | Solder Hook | Stud | MS27418-1C | FC-325-CW9 | FC-325-3 |
| | Screw | Bracket | MS27418-2C | FC-325-SY9 | FC-325-6 |
| 115 Vac, 400 Hz | Solder Hook | Stud | MS27418-1A | FC-325-CW8 | FC-325-1 |
| | Screw | Bracket | MS27418-2A | FC-325-SY8 | FC-325-4 |

Custom configurations are available. Consult TE.

## FCA-325 Series, 25 Amperes, 3PDT

### Product Facts

- Hermetically Sealed
- All Welded Construction
- Balanced Force
- Permanent Magnet Drive
- Contacts — Silver Cadmium Oxide with Gold Plating
- Coils for DC, 50 to 400Hz and 400Hz AC
- Weight 2.89 ounces max. (82 grams)
- Qualified to M83536/32, /33

The Series FCA-325 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state.

This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other versions of this relay:

**FCA-125** – 25 Amp SPDT Relay

**FCAC-325** — 25 Ampere 3PST-NO Relay with 2 amp SPDT auxiliary

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x $10^3$ | 28 VDC | 115VAC 400Hz | 115/200VAC | |
|---|---|---|---|---|---|
| | | | | 400Hz-3Ø | 60Hz-3Ø* |
| Resistive | 50 | 25 | 25 | 25 | 2.5 |
| Inductive | 10 | 12 | — | — | 2.5 |
| Inductive | 20 | — | 15 | 15 | — |
| Motor | 50 | 10 | 10 | 10 | 2.0 |
| Lamp | 50 | 5 | 5 | 5 | 1.0 |

*60 Hz loads rated for 10,000 operations

**Overload Current** — 50 AMPS DC, 80 AMPS 400Hz
**Rupture Current** — 60 AMPS DC, 100 AMPS 400Hz
**Contact Make Bounce** —1 MILLISECOND AT NOMINAL VOLTAGE
**Max. Contact Drop at 25 Amps** — INITIAL 0.150 VOLTS
**End of Life** — 0.175 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude** — 300,000 Feet

**Shock*** —
Z, Y, & V Enclosures —
200 g for 6 mS
W, X & M Enclosures —
100 g for 6 mS

**Vibration, Sinusoidal*** —
Z, Y, & V Enclosures —
30 g 33-3000Hz
W, X & M Enclosures —
20 g 33-3000Hz

**Vibration, Random*** —
Z, Y, & V Enclosures —
0.4 $g^2$/Hz 50-2000Hz
W, X & M Enclosures —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1250 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 350 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests —
50 MΩ Min.

**Operate Time at Nominal Voltage** —
DC Relays — 15 ms or less
AC Relays — 20 ms or less

**Release Time at Nominal Voltage** —
DC Relays — 15 ms or less
AC Relays — 50 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. AC Amps (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 18 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 70 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 290 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 290 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 865 Ω | 32.0 | 2.5 | 14.0 |
| 6 | 28 | 400Hz | 225 mA | 22.0 | 1.25 | 10.0 |
| 7 | 28 | 50/400Hz | 120 mA | 22.0 | 1.25 | 10.0 |
| 8 | 115 | 400 Hz | 40 mA | 90.0 | 5.0 | 40.0 |
| 9 | 115 | 50/400 Hz | 30 mA | 95.0 | 5.0 | 40.0 |

A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C; AC COIL MAX. CURRENT AT NOMINAL VOLTAGE.
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVER-VOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.
E. COILS AVAILABLE FOR OTHER VOLTAGES AND FOR AC 50/60HZ.

**NOTE:** Only DC Coil Models are QPL Approved.

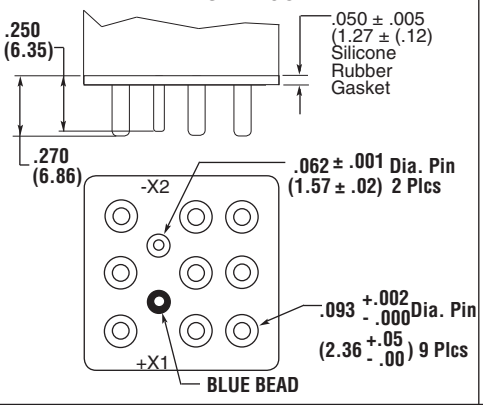
## FCA-325 Series, 25 Amperes, 3PDT (Continued)

Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

### Terminals

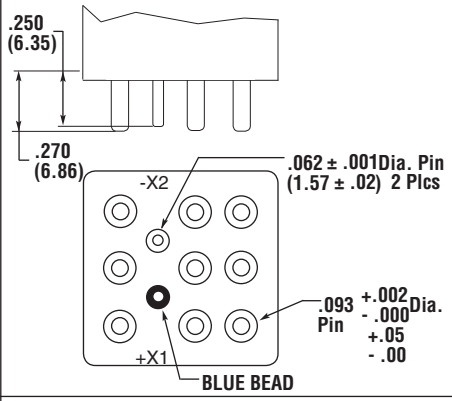
**CODE "A" Socket Pins - All DC Coils**

PIN TERMINALS ARE GOLD PLATED



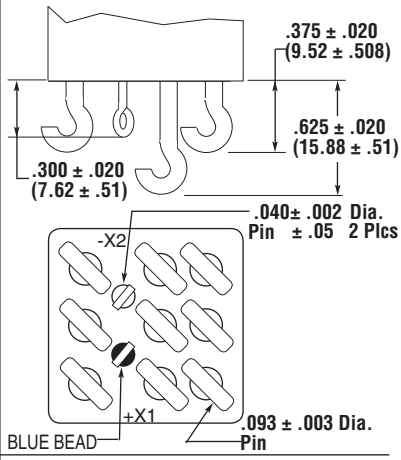

**CODE "B" Solder Pin Terminals**

PIN TERMINALS TIN/LEAD PLATED

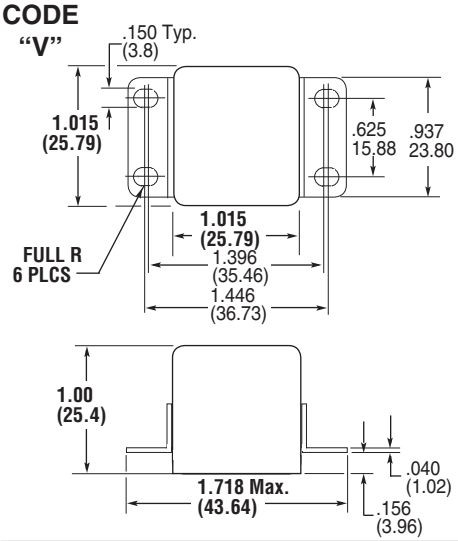



**CODE "C" Solder Hook Terminals**

HOOK TERMINALS TIN/LEAD PLATED




**CODE "V"**



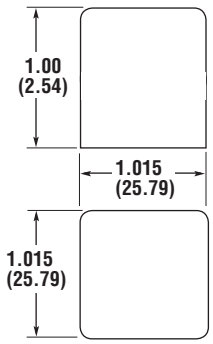

**Enclosures**

All Enclosures have cupro-Nickel cans bright acid tin/lead plated after assembly to terminal headers.

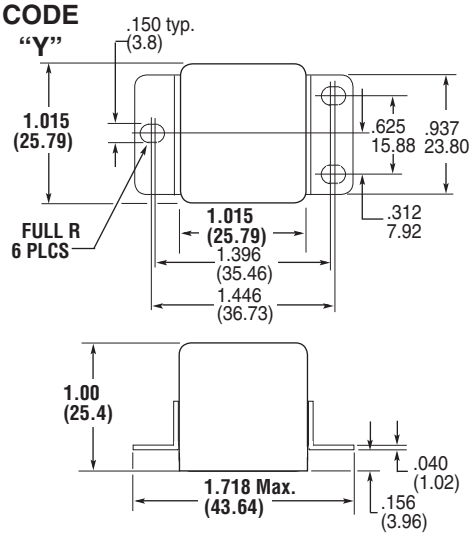
Dimensions: Inches ± .010 (mm ± .25)

**For socket pin terminals: specify "Y" enclosures with DC coils and "V" enclosures with AC coils.**

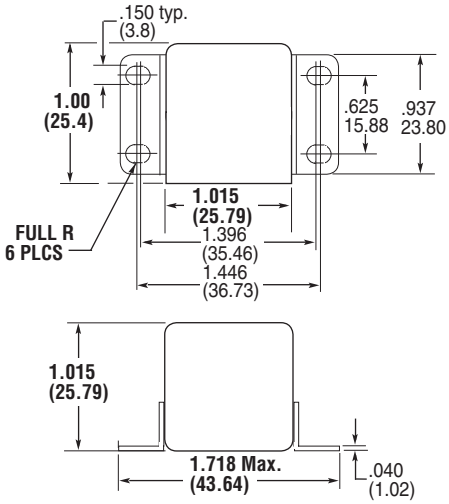
**CODE "Z"**



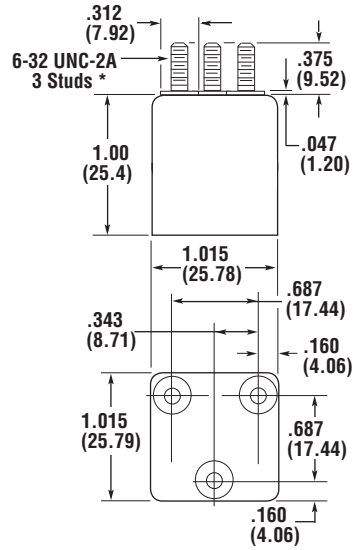

**CODE "Y"**




**CODE "X"**




**CODE "W"**

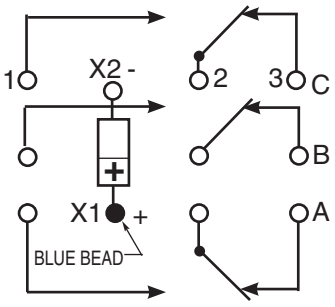



*Metric threads available, To specify use M in place of W

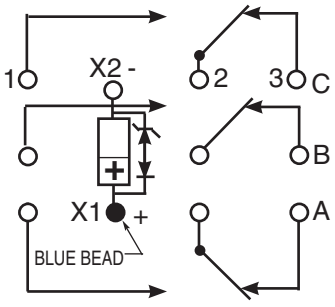
## FCA-325 Series, 25 Amperes, 3PDT (Continued)

### Terminal Wiring

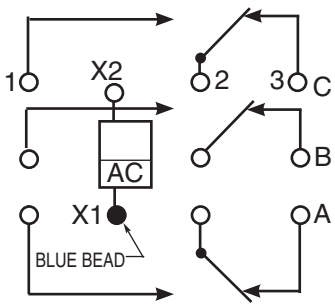
**DC Coils**




**DC Coils with Transient Suppression**



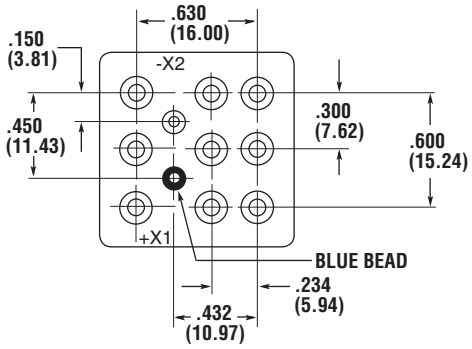

**AC Coils**




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




TERMINAL VIEW

### HOW TO ORDER

**FCA-325-A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins, DC Coil)

**ENCLOSURE** (With Flanges)

**COIL** (28 VDC With Transient Suppression).

**NOTE: Only DC coil models are QPL Approved**

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

# FCAC-325 Series, 25 Amperes, 3PST-NO with 2 Amp SPDT Auxiliary Contacts

## Product Facts

- **Hermetically Sealed**
- **All Welded Construction**
- **Balanced Force**
- **Permanent Magnet Drive**
- **Contacts — Silver Cadmium Oxide with Gold Plating**
- **Coils for DC, 50 to 400Hz and 400Hz AC**
- **Weight 2.89 ounces max. (82grams)**

The Series FCAC-325 relay is a polarized single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state. This results in appreciably increased contact pressure in both states over that of a spring return nonpolar design. We also manufacture other versions of this relay:

**FCA-125** — 25 Ampere SPDT Relay

**FCA-325** — 25 Ampere DPDT Relay

### Contact Rating — Amperes Ratings Are Continuous Duty

| Type of Load | Life (Min.) Cycles x10³ | 28 VDC | | 115VAC 400Hz | | 115/200VAC 400Hz-3Ø | 115/200VAC 60Hz-3Ø* |
|---|---|---|---|---|---|---|---|
| | | Main | Aux. | Main | Aux. | | |
| Resistive | 50 | 25 | 2 | 25 | 2 | 25 | 2.5 |
| Inductive | 10 | 12 | 1 | — | — | — | 2.5 |
| Inductive | 20 | — | — | 15 | 1 | 15 | — |
| Motor | 50 | 10 | — | 10 | — | 10 | 2.0 |
| Lamp | 50 | 5 | .5 | 5 | .5 | .5 | 1.0 |

*60 Hz loads rated for 10,000 operations

**Overload Current** — 50 AMPS DC, 80 AMPS 400Hz
**Rupture Current** — 60 AMPS DC, 100 AMPS 400Hz
**Contact Make Bounce** —1 MILLISECOND AT NOMINAL VOLTAGE
**Auxiliary Contact Bounce** — 4 MILLISECONDS MAX.
**Max. Contact Drop at 25 Amps** — INITIAL 0.150 VOLTS
**End of Life** — 0.175 VOLTS

### General Specifications

**Temperature Rating** —
-70˚C TO + 125˚C

**Altitude** — 300,000 Feet

**Shock*** —
Z, Y, & V Enclosures —
200 g for 6 mS
W, X & M Enclosures —
100 g for 6 mS

**Vibration, Sinusoidal*** —
Z, Y, & VEnclosures —
30 g 33-3000Hz
W, X & M Enclosures —
20 g 33-3000Hz

**Vibration, Random*** —
Z, Y, & V Enclosures —
0.4 $g^2$/Hz 50-2000Hz
W, X & M Enclosures —
0.2 $g^2$/Hz 50-2000Hz

**Dielectric Strength** —
At Sea Level —
All circuits to ground and circuit to circuit — 1250 V rms
Coil to ground — 1000 V rms
At 80,000 Feet — 350 V rms

**Insulation Resistance** —
Initial (500 VDC) — 100 MΩ Min.
After Life or Environmental Tests —
50 MΩ Min.

**Operate Time at Nominal Voltage** —
DC Relays — 15 ms or less
AC Relays — 10 ms or less

**Release Time at Nominal Voltage** —
DC Relays — 15 ms or less
AC Relays — 50 ms or less

* Max. contact opening under vibration or shock 10 microseconds

### Coil Data

| Coil Code | Nominal Voltages | Freq. Hz | DC Res. AC Amps (B) | Over Temperature Range | | |
|---|---|---|---|---|---|---|
| | | | | Pickup or Below Volts | Dropout or Above Volts | Must Hold Voltage (C) |
| 1 | 6 | DC | 18 Ω | 4.5 | 0.3 | 2.5 |
| 2 | 12 | DC | 70 Ω | 9.0 | 0.75 | 4.5 |
| 3 | 28 | DC | 290 Ω | 18.0 | 1.5 | 7.0 |
| 4 (A) | 28 | DC | 290 Ω | 18.0 | 1.5 | 7.0 |
| 5 | 48 | DC | 865 Ω | 32.0 | 2.5 | 14.0 |
| 6 | 28 | 400Hz | 225 mA | 22.0 | 1.25 | 10.0 |
| 7 | 28 | 50/400Hz | 120 mA | 22.0 | 1.25 | 10.0 |
| 8 | 115 | 400 Hz | 40 mA | 90.0 | 5.0 | 40.0 |
| 9 | 115 | 50/400 Hz | 30 mA | 95.0 | 5.0 | 40.0 |

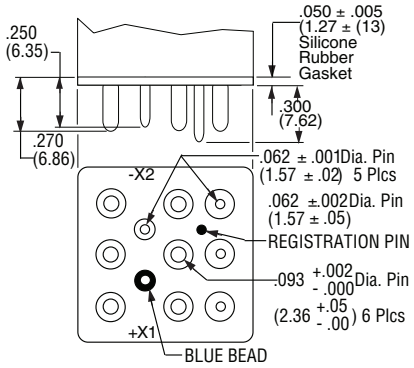
A. CODE 4 COILS HAVE BACK EMF SUPPRESSION TO 42 VOLTS MAX.
B. DC COIL RESISTANCE ± 10% AT 25˚C; AC COIL MAX. CURRENT AT NOMINAL VOLTAGE.
C. RELAY WILL STAY IN PICKED-UP STATE DOWN TO MUST HOLD VOLTAGES SHOWN.
D. MAX. OVERVOLTAGE: 6 & 12 VDC COILS 120% OF NOMINAL; ALL OTHERS 110% OF NOMINAL.
E. COILS AVAILABLE FOR OTHER VOLTAGES AND FOR AC 50/60HZ.

## FCAC-325 Series (Continued)

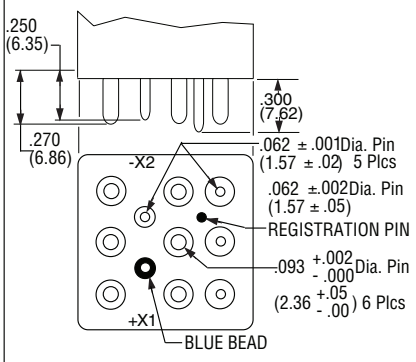
Below are shown the standard terminal types and the enclosures available. Specify the assembly as indicated under How To Order. Dimensions are shown in inches ± .010 and (Millimeters ± .25).

### Terminals

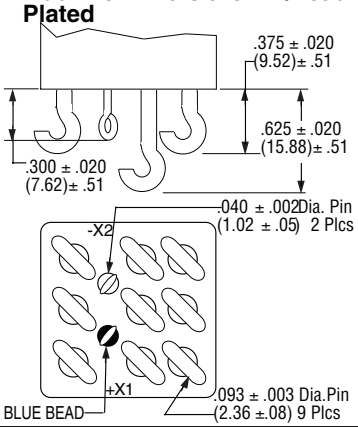
**CODE "A"**
**Socket Pin Terminals**
**Pin Terminals are Gold Plated**



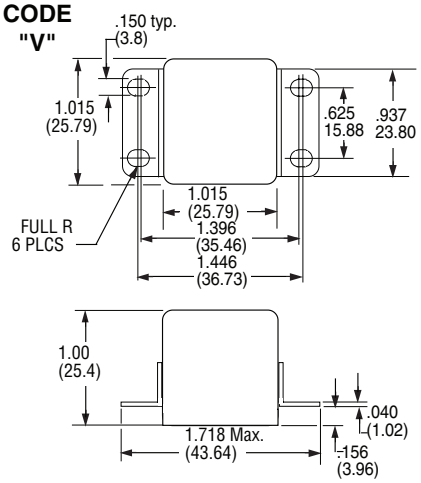

**CODE "B"**
**Solder Pin Terminals**
**Pin Terminals are Tin/Lead Plated**



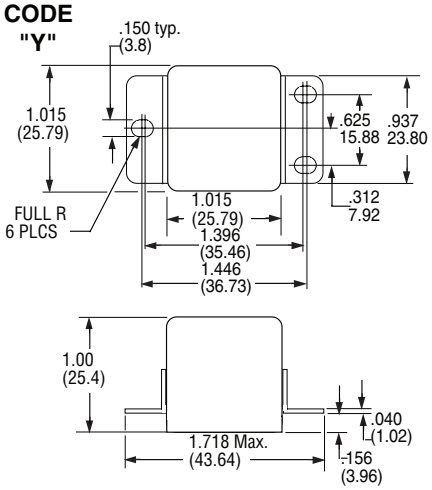

**CODE "C"**
**Solder Hook Terminals**
**Hook Terminals are Tin/Lead Plated**




**CODE "V"**




**CODE "Y"**



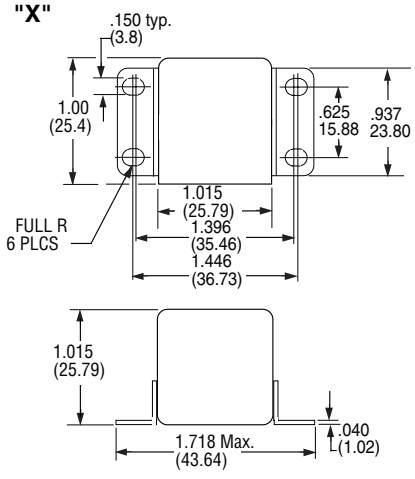

## ENCLOSURES

All Enclosures have cupro-Nickel cans bright acid tin/lead plated after assembly to terminal headers.

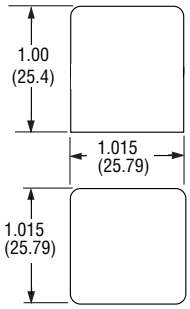
Dimensions: Inches ± .010 (mm ± .25)

**For socket pin terminals: specify "Y" enclosures with DC coils and "V" enclosures with AC coils.**

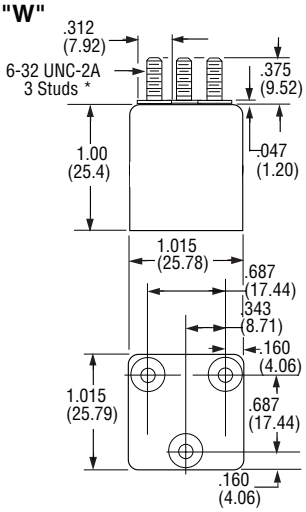
**CODE "X"**




**CODE "Z"**



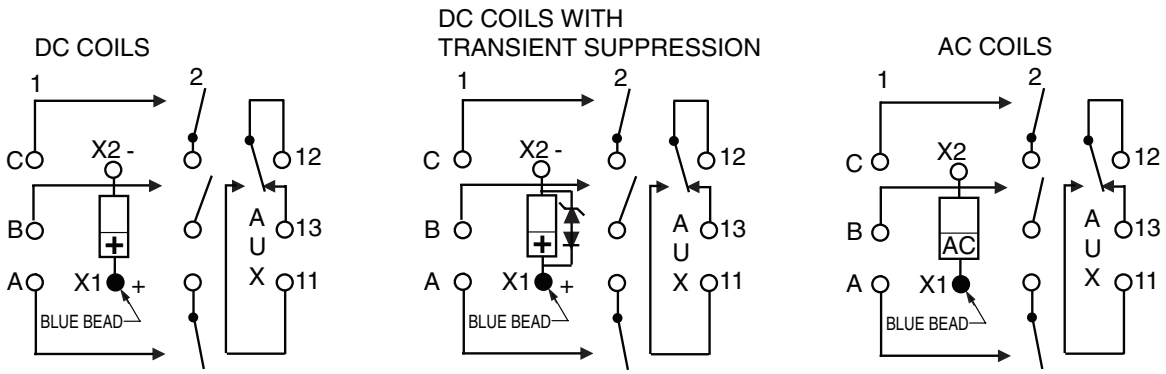

**CODE "W"**




*Metric threads available, To specify use M in place of W

## FCAC-325 Series (Continued)

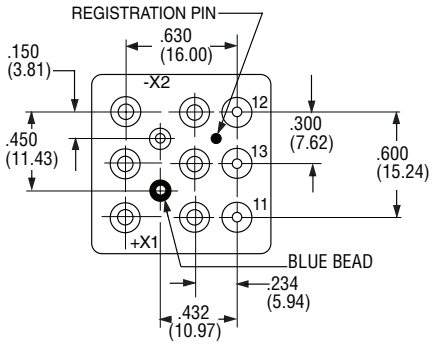
### Terminal Wiring




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




**TERMINAL VIEW**

### HOW TO ORDER

**FCAC-325 -A Y 4**

**RELAY TYPE**

**TERMINALS** (Socket Pins, DC Coil)

**ENCLOSURE** (With Flanges and DC Coil)

**COIL** (28 VDC With Transient Suppression)

# FCA-150 Series, 50 Amps, 1PST/NO (DM) Relay

## Product Facts

- 50,000 cycles under resistive load
- Corrosion-protected, hermetically sealed metal enclosure
- -70° to +125°C temperature range
- Rated for altitude to 300,000 ft. in high-vibration, high-shock environments
- 1 Form X (SPST-NO-DM) contact
- Meets MIL-PRF-6106 requirements
- 50 A switching capability
- Balanced force design
- One cubic inch in size
- <90 grams total weight
- Non-latching relay
- Available with 1 Form C (SPDT) 2 A auxiliary contact
- 6, 12 and 28 Vdc coils available
- Optional transient suppression

The FCA-150 series relay from TE Connectivity (TE) is a polarized, single-side stable design, where the flux from a permanent magnet provides the armature holding force in the deactivated state, and its flux path is switched and combined with the coil flux in the operated state. This results in appreciably increased contact force in both states over that of a spring return non-polarized design. The FCAC-150 series has a 1 Form C (SPDT) auxiliary contact set rated at 2 A. Designed and built to perform under the most demanding environmental conditions, FCA-150 series relays withstand such changing environmental factors as temperature, altitude, shock, vibration, and salt spray. Minimum mechanical life expectancy is 50,000 cycles under resistive load.

## Performance Data

### Electrical Characteristics

**Initial Insulation Resistance** — 100 MΩ, minimum, at 500 Vdc, between each pin and case

**Insulation Resistance After Life or Environmental Test** — 50 MΩ, minimum, at 500 Vdc, between each pin and case

**Dielectric Strength at Sea Level:**

Contacts to Ground and Between Contacts — 1250 Vrms, 60 Hz

Coil to Ground — 1000 Vrms, 60 Hz

Dielectric Strength at 80,000 ft (25,000 m) — 500 Vrms, 60 Hz (all points)

### Environmental

**Ambient Temperature Range, Operating**— 70°C to +125°C

**Altitude**— 300,000 ft

**Shock Resistance**— 50 G, 11 ms

**Vibration Resistance, Sinusoidal**— 20 G, 75-3000 Hz

## Specifications

**Contact Data**

| | | | | |
|---|---|---|---|---|
| Contact Form | 1 Form X (SPST-NO-DM) | | | |
| Contact Rating in Amps (Continuous Duty) | | | | |
| | Type of Load | Life (Min.) Cycles | 28 Vdc | |
| | Resistive | 50,000 | 50 | |
| | Inductive (L/R=5ms) | 20,000 | 20 | |
| | Motor | 200,000 | 20 | |
| | None | 100,000 | – | |
| Overload Current (Resistive) | 200 A, 50 cycles | | | |
| Max. Contact Drop at 10A | Initial 150mV; After Life 175mV | | | |
| Operate Time at Nominal Voltage | 15ms | | | |
| Release Time | 15ms | | | |
| Bounce Time | 1ms | | | |

**Coil Data**

| Coil Code | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Nominal Operating Voltage (Vdc) | 6 | 12 | 28 | 28 |
| Maximum Operating Voltage (Vdc) | 7.3 | 14.5 | 29 | 29 |
| Maximum Pick-Up Voltage at +125°C | 4.5 | 9 | 18 | 18 |
| Maximum Pick-Up Voltage at +125°C, continuous current test (Vdc) | 5.7 | 11.25 | 22.5 | 22.5 |
| Drop-Out Voltage at +125°C | 0.3 – 2.5 | 0.75 – 4.5 | 1.5 – 7.0 | 1.5 – 7.0 |
| Maximum Coil Current at +25°C (mA) | .50 | .26 | .15 | .15 |
| Back EMF Suppressed to (Vdc) (Max) | N/A | N/A | N/A | -42 |
| Coil Resistance ±10% | 18Ω | 70Ω | 290Ω | 290Ω |

## FCA-150 Series, 50 Amps, 1PST/NO (DM) Relay (Continued)

### Specifications

| | |
|---|---|
| **Electrical Data** | |
| Initial Insulation Resistance (note 1) | 100 megohms, minimum, at 500Vdc, between each pin and case |
| Insulation Resistance After Life or Environmental Test (note 1) | 50 megohms, minimum, at 500Vdc, between each pin and case |
| Dielectric Strength At Sea Level | |
| Contacts to Ground and Between Contacts | 1,250Vrms, 60 Hz. |
| Coil to Ground | 1,000Vrms, 60 Hz. |
| Dielectric Strength at 80,000 ft (25,000m), All Points (note 4) | 500Vrms, 60 Hz |
| **Environmental Data** | |
| Ambient Temperature Range, Operating | -70°C to +125°C |
| Altitude | 300,000 feet |
| Shock Resistance | 50 G's, 11 ms. |
| Vibration Resistance, Sinusoidal | 20 G's, 75-3000Hz. |
| **Mechanical Data** | |
| Approximate Weight | 3.2 oz. (90g) Max. |

**NOTES**

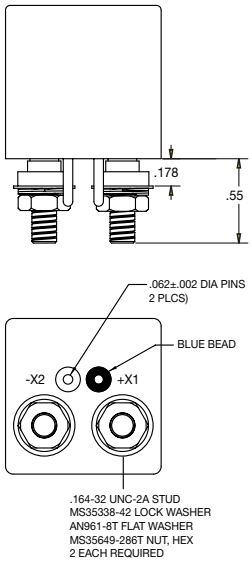
1. All wired terminals must be connected together during this test. Dielectric withstanding voltage and insulation resistance are measured between all mutually insulated wired terminals and between all these terminals and case.

### Terminals

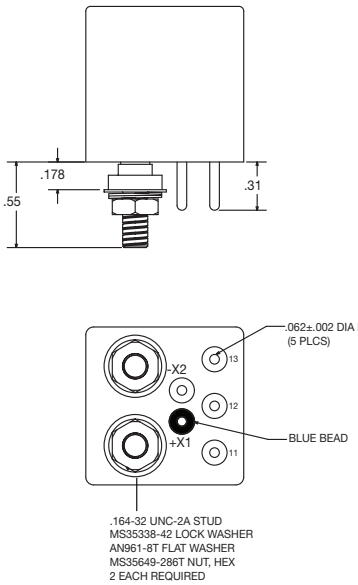
#### CODE "B"

**Solder Pin Terminals** — Tin/Lead Plated

FCA-150



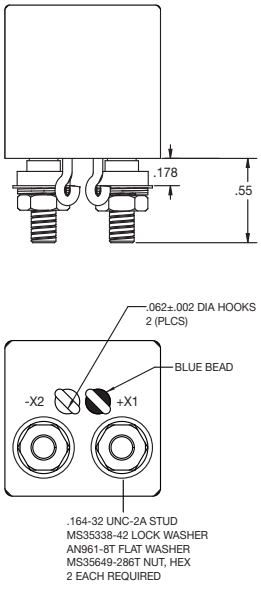

FCAC-150



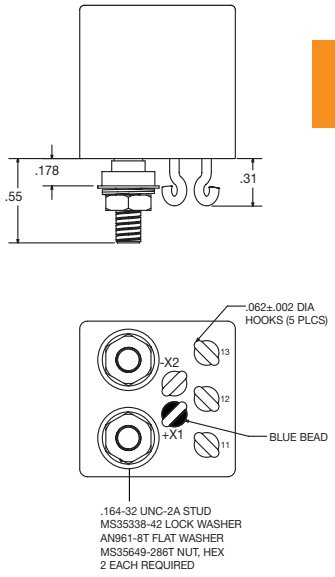

#### CODE "C"

**Solder Hook Terminals** — Tin/Lead Plated

FCA-150



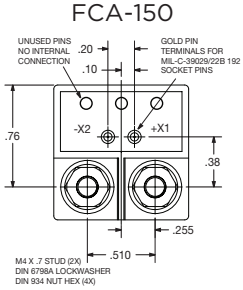

FCAC-150



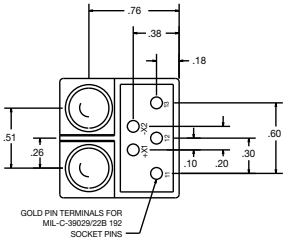

#### CODE "K"

**Terminal Shield**

FCA-150




FCAC-150



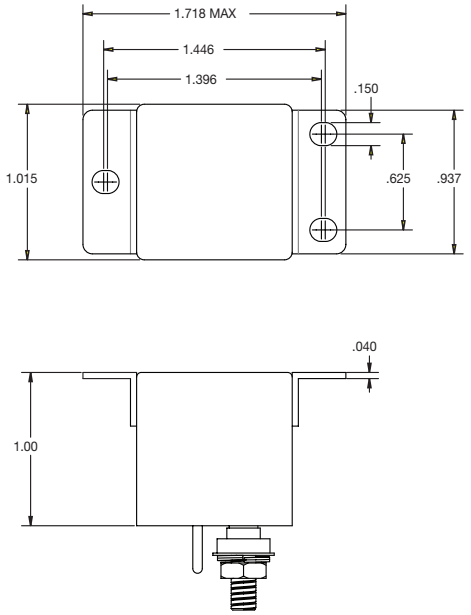
## FCA-150 Series, 50 Amps, 1PST/NO (DM) Relay (Continued)

### Outline Dimensions

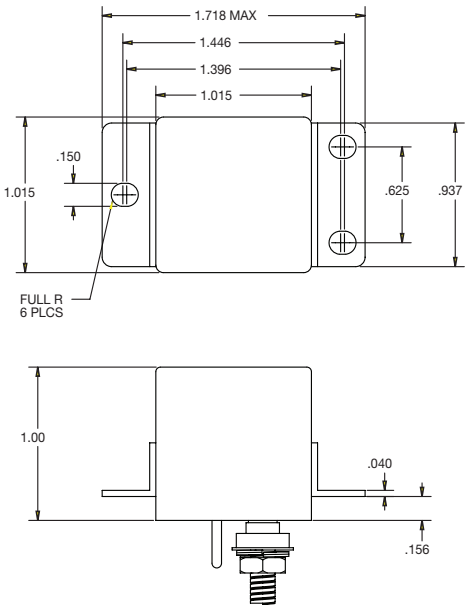
The standard terminal types and enclosures are illustrated below with dimensions in inches ± 0.010 and (millimeters ±0.25).

#### Enclosures

**CODE "U"**




**CODE "Y"**

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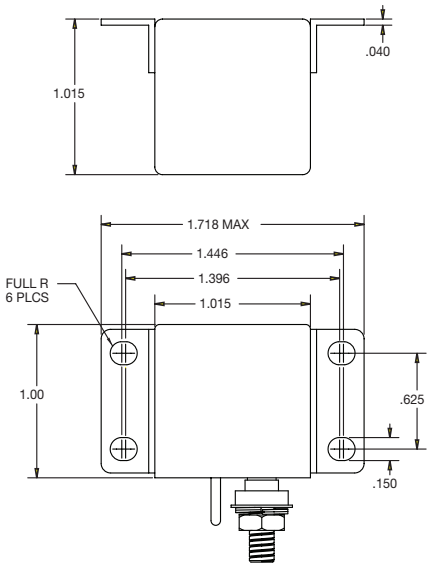
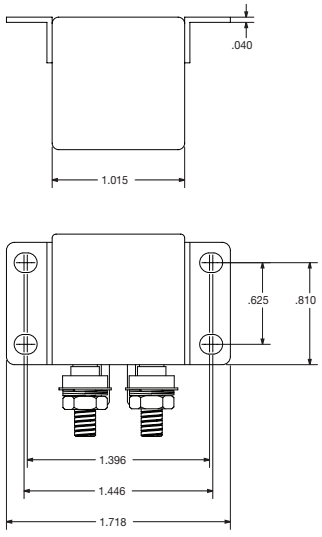
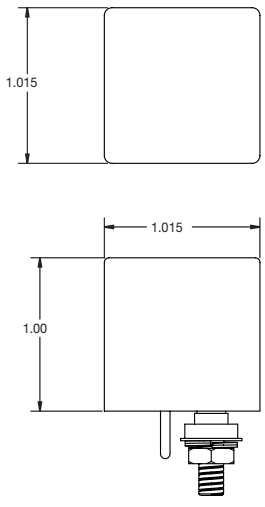



**CODE "R"**




**CODE "Z"**

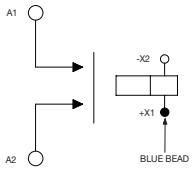


## FCA-150 Series, 50 Amps, 1PST/NO (DM) Relay (Continued)

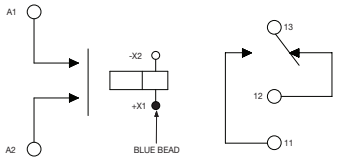
### Terminal Wiring

**DC Coils**

FCA-150

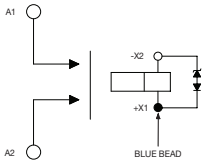



FCAC-150

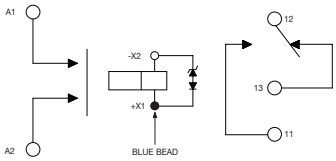



DC Coils with Transient Suppression

FCA-150




FCAC-150



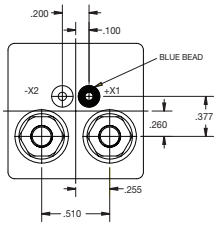

**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

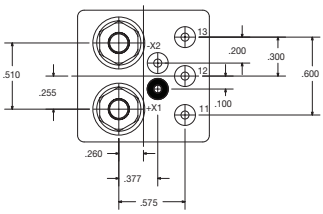
Terminal designations are for reference only and do not appear on the header.

**Terminal View**

FCA-150




FCAC-150




### How to Order

FCA-150 - B Y 3

**Series And Contact Arrangement**

- **FCA-150** 1 Form X Main Contacts
- **FCAC-150** 1 Form X Main Contacts and 1 Form C Auxiliary Contacts

**Terminals** (see drawings for details)

- **B** Solder Pin Coil Terminals, Stud Power Terminals
- **C** Solder Hook Coil Terminals, Stud Power Terminals
- **K** Terminal Block, Stud Power Terminals

**Enclosure** (see drawings for details)

- **R** Horizontal Flange Mount, Rotated
- **U** Flush Vertical Flange Mount
- **X** Horizontal Flange Mount
- **Y** Raised Vertical Flange Mount
- **Z** No Mount

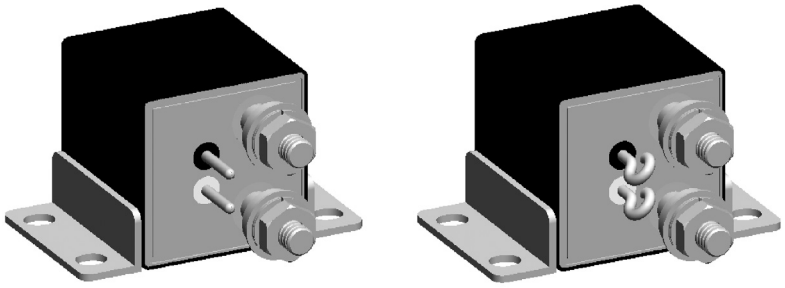
**Coil Voltage** (NOMINAL)

- **1** 6 VDC
- **2** 12 VDC
- **3** 28 VDC
- **4** 28 VDC Nominal, with Back EMF Suppression

## FCA-150NC Series, 50 Amps, 1PST/NC (DB) Relay

### Product Facts

- Non latching hermetically sealed relay
- Balanced force design
- Hermetically sealed, corrosion protected metal can
- All welded construction
- 6, 12 and 28Vdc coils available.
- Weight 90 grams
- Designed and built in accordance to MIL-PRF-6106



### Specifications

| General Characteristics | | | | |
|---|---|---|---|---|
| Temperature range | | | -70° C to +125° C | |
| Altitude | | | 300,000 feet | |
| Dielectric strength at sea level<br>- Contacts to ground and between contacts<br>- Coil to ground | | | <br>1250 Vrms / 60 Hz<br>1000 Vrms / 60 Hz | |
| Dielectric strength at altitude 25000 m (80,000 ft) (all points) | | | 500 Vrms / 60 Hz | |
| Initial insulation resistance at 500 Vdc | | | 100 MΩ min. | |
| Initial insulation after life or environmental test | | | 50 MΩ min. | |
| Sinusoidal vibration | | | 20g / 75 to 3000 Hz | |
| Shock | | | 50g / 11 ms | |
| Operate time at nominal voltage | | | 15 ms max. | |
| Release time | | | 15 ms max. | |
| Bounce time | | | 1 ms max. | |
| Contact voltage drop at nominal current<br>-initial value<br>-after life | | | <br>150 mV max.<br>175 mV max. | |
| **Coil Data** | | | | |
| Coil Code | 1 | 2 | 3 | 4(A) |
| Nominal Operating Voltage (Vdc) | 6 | 12 | 28 | 28 |
| Maximum Operating Voltage (Vdc) | 7.3 | 14.5 | 29 | 29 |
| Maximum Pick-Up Voltage at +125°C | 4.5 | 9 | 18 | 18 |
| Maximum Pick-Up Voltage at +125°C, continuous current test (Vdc) | 5.7 | 11.25 | 22.5 | 22.5 |
| Drop-Out Voltage at +125°C | 0.3 – 2.5 | 0.75 – 4.5 | 1.5 – 7.0 | 1.5 – 7.0 |
| Maximum Coil Current at +25°C (mA) | .50 | .26 | .15 | .15 |
| Back EMF Suppressed to (Vdc) | N/A | N/A | N/A | -42 |
| Coil Resistance | 18Ω | 70Ω | 290Ω | 290Ω |

**For other coil voltages, consult factory.**

## FCA-150NC Series, 50 Amps, 1PST/NC (DB) Relay (Continued)

### Contact Electrical Characteristics

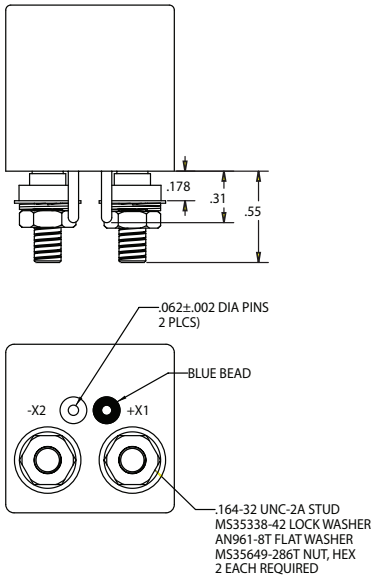
| Contact Type | Rated Current | Rated Voltage |
|---|---|---|
| Main Contact | 50A | 28Vdc |
| **Minimum Operating cycles** | **Contact rating per pole and load type MAIN Contact** | **Load Currents in Amps** |
| 50,000 cycles | Resistive load | 50 |
| 20,000 cycles | Inductive load (L/R=5ms) | 20 |
| 20,000 cycles | Motor load | 20 |
| 50 cycles | Resistive overload | 200 |
| 100,000 cycles | No Load | |

**All endurance ratings are subject to validation - consult factory**

### Terminals

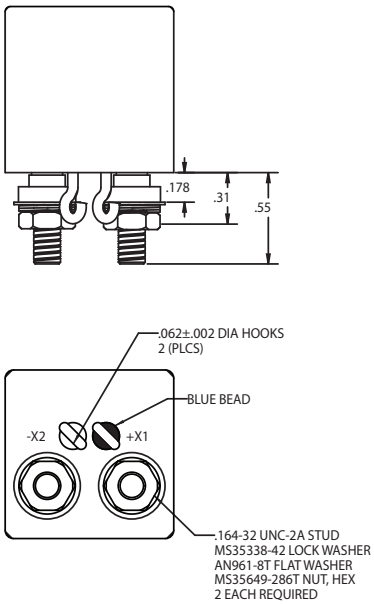
**CODE "B"**

**Solder Pin Terminals**
Tin/Lead Plated



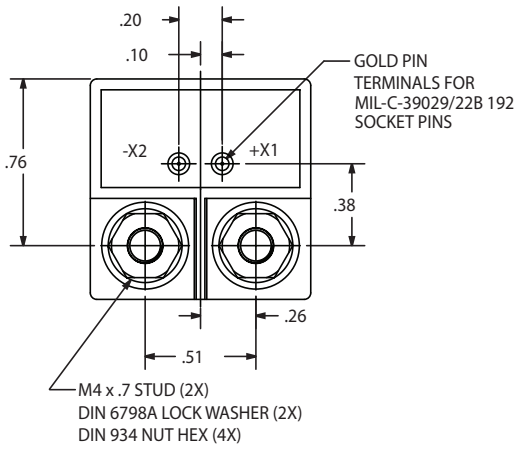

**CODE "C"**

**Solder Hook Terminals**
Tin/Lead Plated




**CODE "K"**

**Terminal Shield**



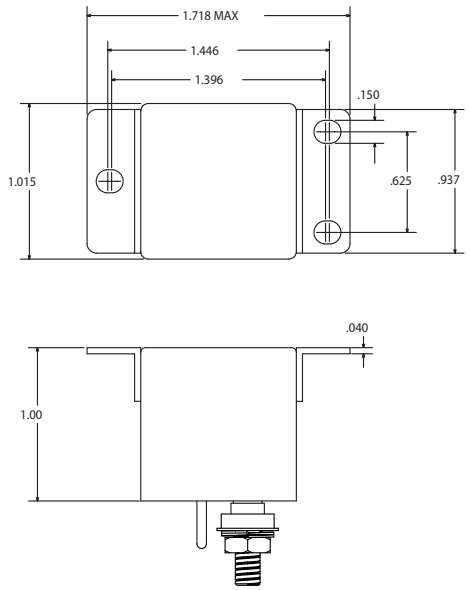
## FCA-150NC Series, 50 Amps, 1PST/NC (DB) Relay (Continued)

### Outline Dimensions

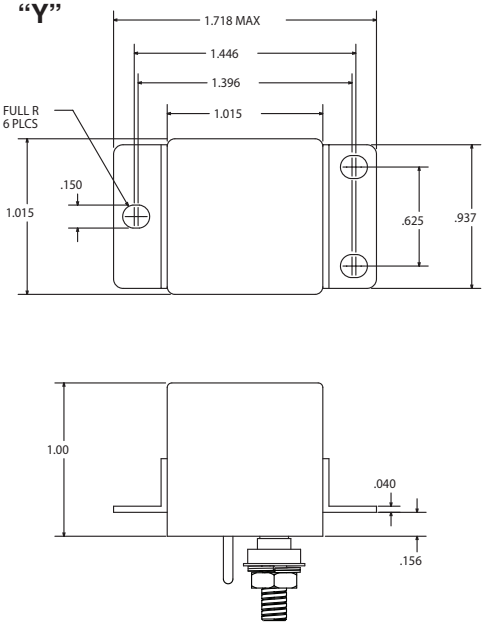
The standard terminal types and enclosures are illustrated below with dimensions in inches ± 0.010 and (millimeters ±0.25).

#### Enclosures

**CODE "U"**




**CODE "Y"**

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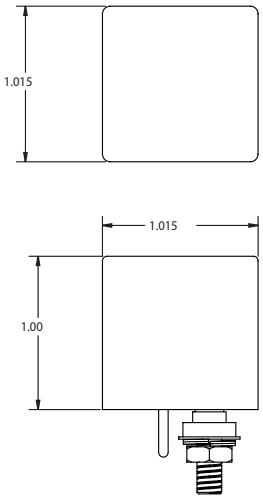


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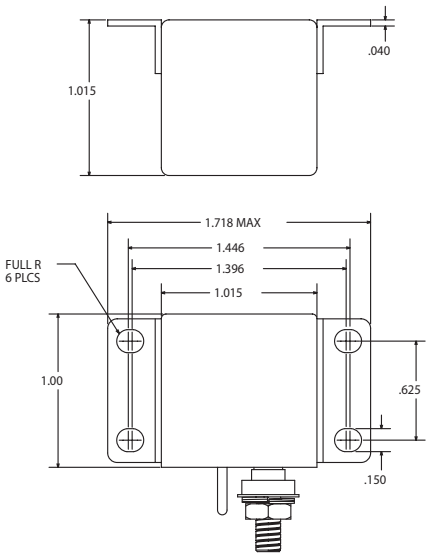


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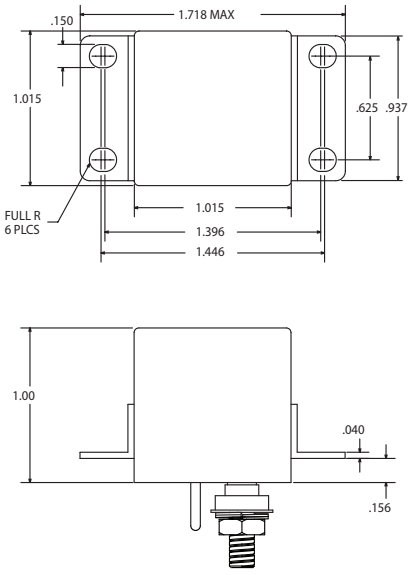
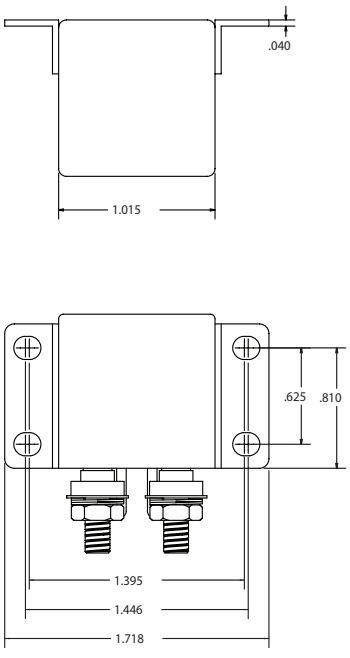


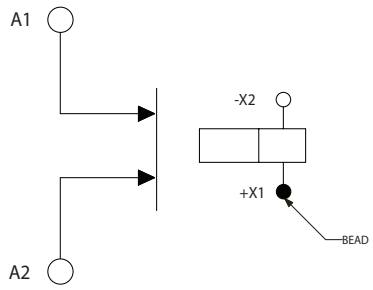

**CODE "R"**



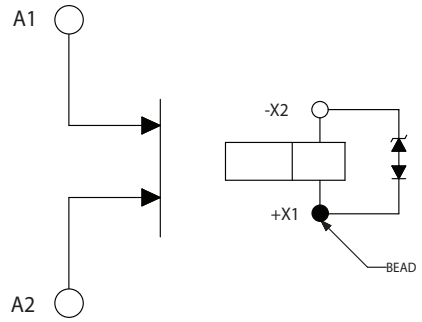
## FCA-150NC Series, 50 Amps, 1PST/NC (DB) Relay (Continued)

### Terminal Wiring

**DC Coils**



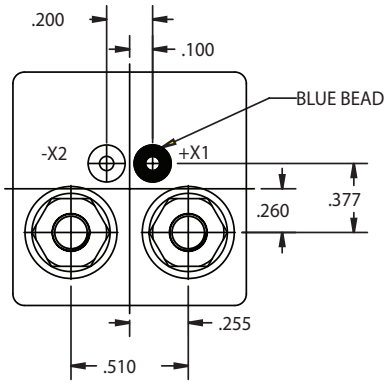

**DC Coils with Transient Suppression**




**NOTE:** Polarity must be observed with DC coil supply. Relay is polarized with a permanent magnet and will not operate or be damaged by reverse polarity.

Diodes used in transient suppression and in AC rectifier circuits have peak inverse voltage rating of 600 VDC minimum. Zener diodes have a minimum rating of 1 watt.

Terminal designations are for reference only and do not appear on the header.




TERMINAL VIEW

### PART NUMBERING SYSTEM

| FCA - 150NC | B | Y | 4 |
|---|---|---|---|

RELAY TYPE

TERMINALS

ENCLOSURE

COIL

## Selection and Application Guide

**This selection and application guide is suggested practices from ARP (Aerospace Recommended Practice) 4005 Concerning proper performance of relays.**

**Caution:**
The use of any coil voltage less than the rated coil voltage may compromise the operation of the relay. Choosing the proper relay depends primarily on matching the relay to the load, power supply, and environment. Selection should be limited to items that meet the following requirements:

**A.** **Contacts** must be rated for the load. Current rating, type of load (resistive, lamp, motor, inductive, and so forth), impedance range, voltage rating, DC or AC, frequency, single phase or polyphase, polyphase load balance, and type of switching or transfer should all be considered. Each of the following switching and transfer functions places a different requirement on each of the relay contacts and must be considered when selecting a relay with the proper contact rating:
(1) On-Off Switching - DC, single phase or polyphase
(2) Motor Reversing (AC or DC)
(3) Transferring load between phases of same source
(4) Transferring load between unsynchronized AC sources

**B.** **Power supply characteristics** must be taken into account. Voltage regulation, variations in frequency, ripples and spikes, as well as steady state conditions, should be included. If more than one power supply is involved, not only must each be suitable but interaction between them also should be investigated.

**C.** **Coil (or coils)** should be rated so as to have proper operation under all anticipated conditions.

**D.** **Consideration of environmental conditions** anticipated throughout the service of life, as well as those expected during storage and transportation before installing the relays in equipment, is mandatory. Electrical parameters, environmental factors, mechanical stresses, and compatibility are among the categories for which the relay must be reviewed.

**E.** **The circuit in which the relay is used,** the interlocking feature employed, the wiring harness, and the associated components should all be reviewed for assuring mutual suitability.

**F.** **Relays should be hard wired** whenever possible, to avoid the need for additional contact points associated with the relay plug-in socket arrangement. (Plug-in types should be considered for quick turnaround times).

**G.** **To permit "safe" isolation** of relay circuit in the OFF condition, and better eliminate an electrical shock hazard, an electromechanical switching device should be placed between the positive terminal of the power source and relay coil.

**H.** **Proper transistor control** of the relay coil requires a stable |reference voltage. This can be done by connecting the plus side of the coil to the positive side of the power source, the minus side of the relay coil to the collector of an NPN transistor, the emitter of the transistor to the grounded side of the power source, and the transistor base to the control voltage. For example, see MIL-R-28776/1.

**I.** **Any switching device** controlling the relay coil circuit must be capable of withstanding, without damage, the sum of the maximum coil circuitry voltage and the peak value of transient voltage that results when the coil circuit is opened; for example, a switch controlling a relay coil that is supplied with a 28V DC line and subjected to a transient voltage suppressed to 42V must be capable of withstanding 28V + 42V or a 70V surge without damage.

**J.** **In selecting solid state electronic switching devices** to control relay coil circuits, care must be used in selecting a solid state device with a leakage current (in the "off state") that is sufficiently low to permit the relay to drop out.

**K.** **Control of the relay coil circuit** by other than step-function switching may invalidate published relay performance properties such as pickup and dropout voltages, pickup, dropout, and bounce times.

NOTE:
**TE Connectivity Does Not Manufacture Relay Sockets.**

This Socket to Relay cross reference is provided for additional design assistance. Several of TE Authorized Distributors carry relay sockets for your convenience. Relay sockets come with a variety of profiles, mounting styles, and mounting hardware options, so please contact the relay socket supplier of your choice or one of our Authorized Distributors who carry relay sockets for additional information.

## Cross Reference - Socket to Relay

| Military Socket P/N | Relay Part Number | Relay Type |
|---|---|---|
| M12883/40-01<br>M12883/40-05<br>M12883/40-07<br>M12883/40-11<br>M12883/40-13<br>M12883/40-17<br>M12883/40-19<br>M12883/40-23 | M83536/15-022<br>M83536/16-006, 014, 031, 034 | 4 Pole, 10 Amp |
| M12883/40-02<br>M12883/40-08<br>M12883/40-14<br>M12883/40-20 | FCA-410-DY8 (Catalog Version)<br>FCA-410-DY9 (Catalog Version) | 4 Pole, 10 Amp, AC |
| M12883/41-01<br>M12883/41-04<br>M12883/41-06<br>M12883/41-09<br>M12883/41-11<br>M12883/41-14<br>M12883/41-16<br>M12883/41-19 | M83536/9-006, 015, 024, 035<br>M83536/10-006, 015, 024, 034, 038 | 2 Pole, 10 Amp |
| M12883/41-02<br>M12883/41-07<br>M12883/41-12<br>M12883/41-17 | FCA-210-DY8 (Catalog Version)<br>FCA-210-DY9 (Catalog Version) | 2 Pole, 10 Amp, AC |
| M12883/44-01 | M83536/5-006, 014, 022, 030<br>M83536/6-006, 014, 022, 032 | 4 Pole, 5 Amp |
| M12883/45-01 | M83536/1-006, 015, 024, 033<br>M83536/2-006, 015, 024, 035 | 2 Pole, 5 Amp |
| M12883/47-01<br>M12883/47-04<br>M12883/47-07<br>M12883/47-10 | FCA-610-AY3 (Catalog Version)<br>FCA-610-AY4 (Catalog Version) | 6 Pole, 10 Amp |
| M12883/47-02<br>M12883/47-05<br>M12883/47-08<br>M12883/47-11 | FCA-610-DY8 (Catalog Version) | 6 Pole, 10 Amp<br>AC |
| M12883/48-01<br>M12883/48-02<br>M12883/48-03<br>M12883/48-04 | M83536/32-003L<br>M83536/33-003L | 3 Pole, 25 Amp |
| M12883/48-05<br>M12883/48-06<br>M12883/48-07<br>M12883/48-08 | FCA-325-AV8 (Catalog Version)<br>FCA-325-AV9 (Catalog Version) | 3 Pole, 25 Amp<br>AC |
| M12883/52-01 | M83536/2-028 | 2 Pole, 5 Amp<br>Track Mount |
| M12883/52-02 | M83536/6-025 | 4 Pole, 5 Amp<br>Track Mount |
| M12883/55-01<br>M12883/55-02 | M6106/19-004, 007, 012, 017, 022 | 1 Pole, 25 Amp |

## Engineering Notes