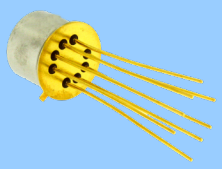
TO-5 RELAYS
ESTABLISHED RELIABILITY
MILITARY
DPDT



SERIES	RELAY TYPE
420/422	DPDT basic relay
420D/422D	DPDT relay with internal diode for coil transient suppression
420DD/422DD	DPDT relay with polarity reversal protection and coil transient suppression diode

DESCRIPTION

The magnetic-latching TO-5 relay, originally conceived and developed by Teledyne, has become one of the industry standards for low-level switching from dry circuit to 1 ampere. Designed for high-density PC board mounting, its small size and low coil power dissipation make the 420 and 422 relays some of the most versatile ultraminiature relays available.
The following unique construction features and manufacturing techniques provide excellent resistance to environmental extremes and overall high reliability:

- All welded construction.
- Unique uni-frame design providing high magnetic efficiency and mechanical rigidity.
- High force/mass ratios for resistance to shock and vibration.
- Advanced cleaning techniques provide maximum assurance of internal cleanliness.
- Precious metal alloy contacts material with gold plating assures excellent high current and dry circuit switching capabilities.

The Series 420D/422D and 420DD/422DD utilize discrete diodes for coil suppression and polarity reversal protection.

By virtue of its inherently low intercontact capacitance and contact circuit losses, these TO-5 relays have proven to be excellent ultraminiature RF switches for frequency ranges well into the UHF spectrum. A typical RF application for these TO-5 relays is in handheld radio receivers, wherein the combined features of good RF performance, small size, very low coil power dissipation and high reliability make it a preferred method of transmit-receive switching

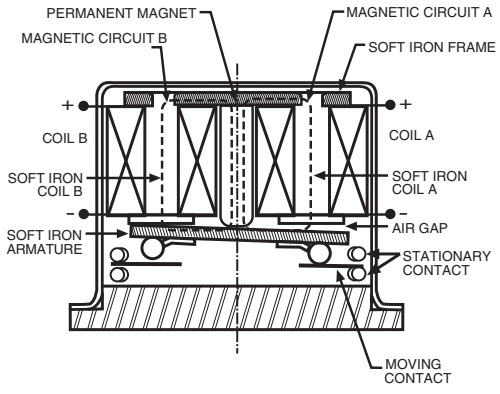
The Series 420/422 magnetic-latching relays are ideally suited for applications where power dissipation must be minimized. The relays can be operated with a short duration pulse. After the contacts have transferred, no external holding power is required.

The magnetic latching feature of the Series 420/422 relays provide a “memory” capability, since the relays will not reset upon removal of coil power.

ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS

Temperature (Ambient)	–65°C to +125°C
Vibration (Note 1)	30 g’s to 3000 Hz
Shock (Note 1)	100 g’s, 6ms half sine
Acceleration	50 g’s
Enclosure	Hermetically sealed
Weight	0.10 oz. (2.84g) max.
Reflow Temperature	260°C max. temp. 1 min. max

INTERNAL CONSTRUCTION



PART NUMBERING SYSTEM (5 & 6)

T²R Established Reliability Relays

ER 420 X M4 - 26 B / S Q

- ER — Established Reliability Designator
- 420 — Relay Series
- X — Ground Pin Option (See Appendix A)
- M4 — Pad Option (See Appendix A)
- 26 — Nominal Coil Voltage (5 = 5V) (12 = 12V) (26 = 26.5 V)
- B — Screening and Reliability Level (B)
- S — S = 0.187" Leads; No Suffix = 0.75" Leads
- Q — Q = Solder-Coated Leads (Sn60/Pb40); R = RoHS Compliant Solder (Sn99.7/Cu0.7); No Suffix = Gold-plated Leads

Military Qualified (JAN) Relays

J 422 X M - 26 P M / Q

- J — Military (JAN) Designator
- 422 — Relay Series
- X — Ground Pin Option (See Appendix A)
- M — Pad Option (See Appendix A)
- 26 — Nominal Coil Voltage (5 = 5V) (12 = 12V) (26 = 26.5 V)
- P — P = 0.187" Leads; No Suffix = 0.75" Leads
- M — Screening and Reliability Level (M)
- Q — Q = Solder-Coated Leads (Sn60/ Pb40); No Suffix = Gold-Plated Leads

GENERAL ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted) (Notes 2 &3)

Contact Arrangement	2 Form C (DPDT)
Rated Duty	Continuous
Contact Resistance	0.125 ohm max. before life; 0.225 ohm max. after life at 0.5A/28Vdc (measured 1/8" from header)
Contact Load Rating (DC)	Resistive: 1 A / 28 Vdc Inductive: 200 mA/ 28 Vdc (320mH) Lamp: 100 mA / 28 Vdc (320mH) Low level: 10 to 50 µA @ 10 to 50 mV
Contact Load Rating (AC)	Resistive: 250 mA / 115Vac, 60 and 400 Hz (Case not grounded) 100 mA / 115 Vac, 60 and 400 Hz (Case grounded)
Contact Life Ratings	10,000,000 cycles (typical) at low level 1,000,000 cycles (typical) at 0.5 A / 28 Vdc resistive 100,000 cycles min. at all other loads specified above
Contact Overload Rating	2 A / 28 Vdc Resistive (100 cycles min.)
Coil Operating Power	290 milliwatts typical at nominal rated voltage @ 25°C
Contact Carry Rating	Contact Factory
Operate Time	420/422, 420D/422D: 1.5 msec max. at nominal rated coil voltage
	420DD/422DD: 2.0 ms max. at nominal rated coil voltage
Contact Bounce	2.0 ms max
Minimum Operate Pulse	4.5 ms width @ rated voltage
Intercontact Capacitance	0.4 pf typical
Insulation Resistance	10,000 MΩ min. between mutually isolated terminals
Dielectric Strength	500 V_{rms} / 60 Hz @ atmospheric pressure
	125 V_{rms} / 60 Hz @ 70,000 ft
Negative Coil Transient 420D/422D, 420DD/422DD	1.0 V_{dc} Max.
Diode P.I.V. 420D/422D, 420DD/422DD	100 V_{dc} Min.

PERFORMANCE CURVES (Note 2)

TYPICAL RF PERFORMANCE

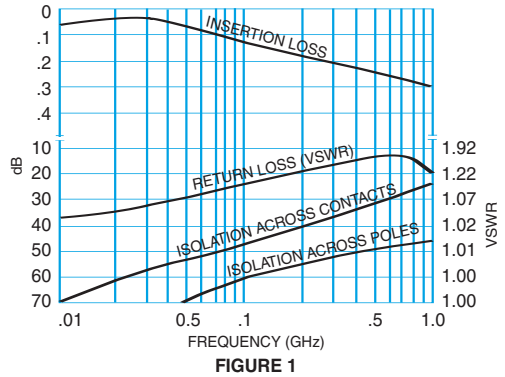


FIGURE 1

TYPICAL DC CONTACT RATING (RESISTIVE)

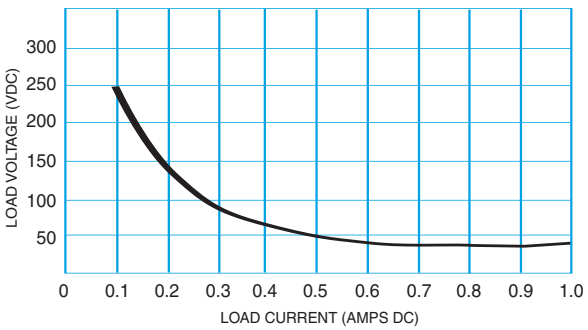


FIGURE 2

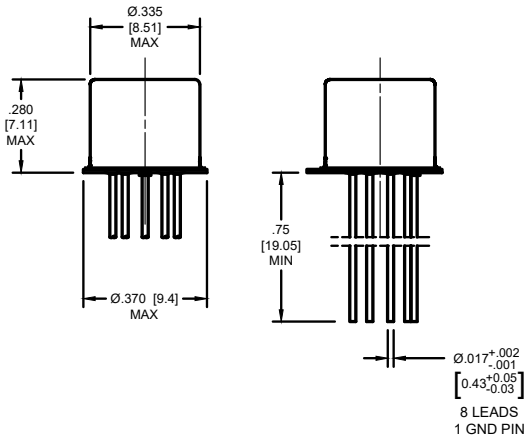
DETAILED ELECTRICAL SPECIFICATIONS (-65°C to +125°C unless otherwise noted) (Notes 3)

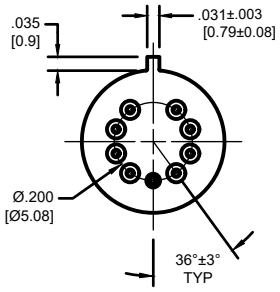
PART NUMBERS		420/422-5 420D/422D-5 420DD/422DD-5	420/422-12 420D/422D-12 420DD/422DD-12	420/422-26 420D/422D-26 420DD/422DD-26
Coil Voltage	Nom.	5.0	12.0	26.5
	Max.	6	16.0	32.0
Coil Resistance (Ohms ±10% @25°C)	420/422, 420D/420D	61	500	2000
	420DD/422DD (Note 4)	48	500	2000
Coil Curent (mAdc@25°C) (420DD/422DD Series only)	Min.	75.8	20.0	11.6
	Max.	104.2	25.5	14.4
Set & Reset Voltage (V_{dc}, Max.)	420/422, 420D/422D	3.5	9.0	18.0
	420DD/422DD	4.5	10.0	19.0

NOTES:

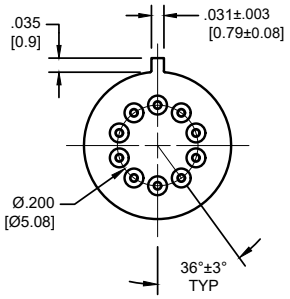
1. Relay contacts will exhibit no chatter in excess of 10 µsec or transfer in excess of 1 µsec.
2. “Typical” characteristics are based on available data and are best estimates. No on-going verification tests are performed.
3. Unless otherwise specified, parameters are initial values.
4. reference only for 420DD and 422D. Coil resistance not directly measurable at relay terminals due to internal series semiconductor
5. Unless otherwise specified, relays will be supplied with gold-plated leads.
6. The slash and characters appearing after the slash are not marked on the relay.
7. Screened HI-REL versions available. Contact factory.

OUTLINE DIMENSIONS





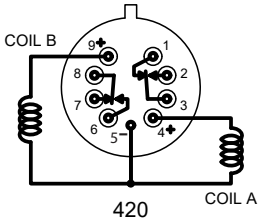
420



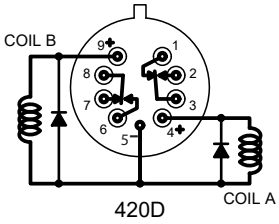
422

DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS)

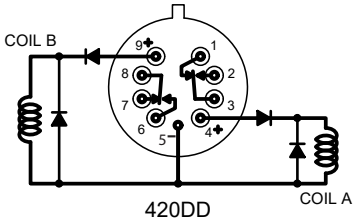
SCHEMATIC DIAGRAMS



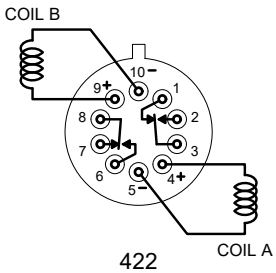
420



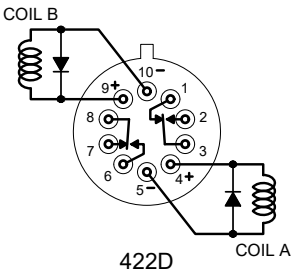
420D



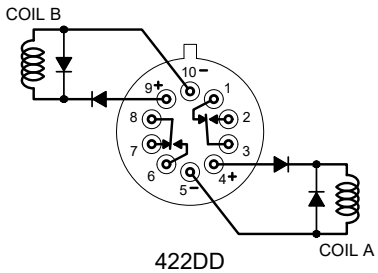
420DD



422

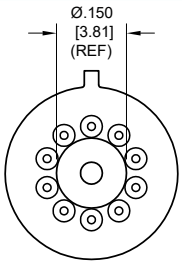
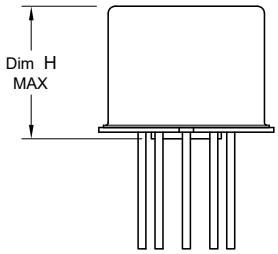


422D

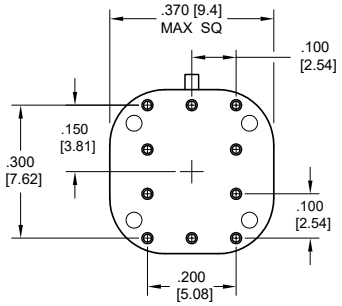
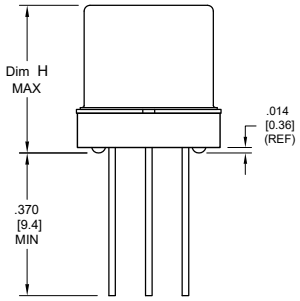


422DD

APPENDIX A : Spacer Pads, Spreader Pads, and Groun Pin Positions

Pad designation and bottom view dimensions	Height	For use with the follow-ing:	Dim. H Max.
 "M4" Spacer Pad for TO-5		ER420, J420, ER422, J422	.305 (7.75)

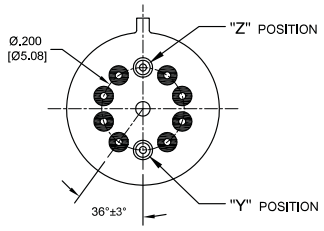
Notes:
1. Spacer pad material: Polyester film.
2. To specify an "M4" spacer pad, refer to the mounting variants portion of the part numbering example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is ± .010" (.25 mm).
5. Add 10 mΩ to the contact resistance shown in the datasheet.
6. Add 0.01 oz. (0.25 g) to the weight of the relay assembly shown in the datasheet.

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 "M" Spreader Pad 5/ 6/		ER420, J420, J422, ER422, 722	.398 (10.11)

Notes:
1. Spreader pad material: Diallyl Phthalate.
2. To specify an "M" spreader pad, refer to the mounting variants portion of the part number example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is ± .010" (0.25 mm).

5/. Add 25 mΩ to the contact resistance shown in the datasheet.

6/. Add .01 oz. (0.25 g) to the weight of the relay assembly shown in the datasheet.



TO-5 Relays:
ER412, ER412T, ER422, ER432, ER432T, 712, 712TN, 400H, 400K, 400V, RF300, RF303, RF312, RF332, RF700, RF703

○ Indicates ground pin position

● Indicates glass insulated lead position

◎ Indicates ground pin or lead position depending on relay type

NOTES
1. Terminal views shown
2. Dimensions are in inches (mm)
3. Tolerances: ± .010 (±.25) unless otherwise specified
4. Ground pin positions are within .015 (0.38) dia. of true position
5. Ground pin head dia., 0.035 (0.89) ref: height 0.010 (0.25) ref.
6. Lead dia. 0.017 (0.43) nom.