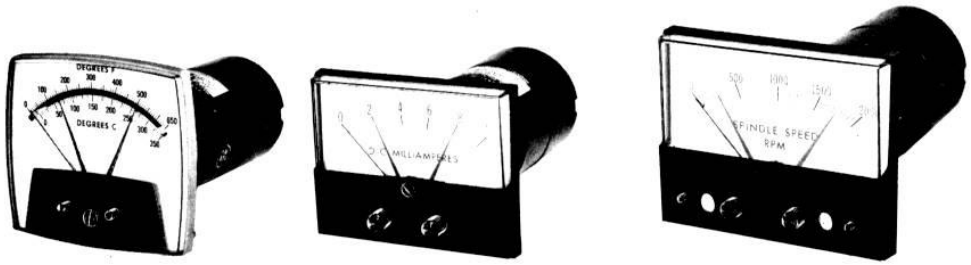
INSTALLATION AND OPERATION

955-242D
2/98

195 & 196 SERIES
METER RELAY CONTROLLERS



195 SERIES
Dual Setpoint

196 SERIES
Dual Setpoint

196 SERIES
Dual Setpoint
with Manual Reset

Fig. 1 - 195 and 196 SERIES METER RELAYS

INTRODUCTION

These instructions cover the installation of 195 Series Meter Relays in three sizes and 196 Series Meter Relays in two sizes.

195 and 196 Series Meter Relays consist of two separate units, an indicator-setpoint unit and a control unit. The indicator-setpoint unit is basically an electrical indicating panel instrument to which control point indication and initiation has been added. The indicator-setpoint unit has control point adjustment knob(s), control point indication pointer(s), light sensor(s), lamp and light shield. The control unit consists of a DPDT load relay for each setpoint and supplies power to the lamp and light sensor(s) in the indicator-setpoint unit.

OPERATION

Operation is based on the characteristics of a light-sensitive solid-state sensor, which is electrically CLOSED (shorted) with light incident upon it and is electrically OPEN when shielded from the light. One of these sensors is attached to each setpointer and is connected to a transistorized switch circuit which triggers the coil of a load relay. The light shield, carried by the indicating mechanism, controls admission of light to the sensor, causing the load relay(s) to be energized or de-energized strictly in accordance with the POSITION of the indicating pointer with respect to the setpointer(s).

For ON/OFF control action (automatic reset), as shipped from the factory, the sequence of operations is as follows: The setpoint(s) (low = blue, red = high) are positioned at desired points on the scale by use of knobs located in the indicator front. With power connected to the control unit, operation of the load relay(s) is in accordance with the POSITION of the indicating pointer as shown in Table 1.

TABLE 1
MODE OF OPERATION OF RELAY(S)

INST. POINTER RELATIVE TO SETPOINTS	HIGH (RED) SETPOINT		LOW (BLUE) SETPOINT	
	LIGHT-SENSOR	LOAD RELAY	LIGHT-SENSOR	LOAD RELAY
Downscale (LEFT) from Setpoint(s)	LIGHT	ENERGIZED	DARK	DE-ENERGIZED
Between Setpoint(s)	LIGHT	ENERGIZED	LIGHT	ENERGIZED
Upscale (RIGHT) from Setpoint(s)	DARK	DE-ENERGIZED	LIGHT	ENERGIZED

MANUAL RESET

FRONT PANEL - The 4½-inch size 196 Series Meter Relay can be supplied with build-in manual reset push buttons on the face of the instrument. The unit shown in Fig. 1 has a double setpoint; however, a single setpoint (high or low setpoint) can also be supplied. The manual reset provides an alarm light adjacent to the push button which illuminates when the setpoint is tripped. The alarm light is extinguished and the load relay is energized when the manual reset push button on the front panel is pressed and the indicating pointer is in a position to admit light to the sensor to provide the control action indicated in Table 1.

EXTERNAL (User Supplied) - All sizes of 195 and 196 Series Meter Relays can be wired for manual reset action by the connection of user-supplied momentary contact switch(es) to the appropriate terminals and by the removal of jumper(s) as indicated in Fig. 2. Thus, when the relay is tripped, the load relay(s) cannot be re-energized again until (a) the indicating pointer is in a position to admit light to the sensor per Table 1 and (b) the external (normally open) momentary push-button switch is pressed.

IMPORTANCE OF PERIODIC OPERATIONAL CHECKS

Operational reliability can be increased by periodic testing of the meter relay as described below:

1. The setpoint tripping function should be tested periodically. Each setpoint on a two-set unit should be tested separately since each setpoint has its own circuitry. The simple test consists of manually rotating each setpointer beyond the instrument indicating pointer to determine if the output relay contact opens or closes as it should.

2. Determine that the mechanism pointer drops freely to 0 and returns to its original scale position without any hesitation or signs of sticking by removing and returning the input signal to the instrument.

The frequency of such periodic operational checks should be determined by the user based on his application and the potential impact of a meter relay malfunction. An instrument which fails to meet the above checks should be removed for service by qualified instrument service personnel.

The adjustment potentiometers on the small transistor switch circuit board inside the indicator-setpoint unit are sealed at the factory and should not be readjusted.

CAUTION

Improper adjustment of the potentiometers could result in setpoint trip failure (relay continuously energized) regardless of pointer position.

SPECIFICATIONS

SETPOINT COINCIDENCE ERROR: ± 2% F.S.

REPEATABILITY: 0.3% F.S.

CURRENT INPUT SIGNALS:
For current ranges above 20 mA AC, an auxiliary transformer must be used, except for models with self-contained 5 ampere range. Digits 5 and 6 in the meter relay part number designate internal or external transformer. LS indicates internal current transformer. HF indicates external transformer required.

VOLTAGE INFLUENCE: 0.75% max. change with 10 volt change (from 117VAC reference).

INDICATING POINTER TRAVEL: The indicating pointer will indicate accurately above or below either setpoints.

LOAD RELAY: a. Three-pole double-throw for each setpoint. Only two poles/setpoint available for external connections. (See external connections - Fig. 2.) Only one pole/setpoint available on self-contained manual reset models.

b. Contact Rating: 5 amperes AC non-inductive at 120 VAC; 5 amperes DC non-inductive at 28 VDC.

CAUTION

The output relay contacts are silver and silver cadmium oxide for reliable operation in non-inductive circuits up to 5 amperes at 120 VAC or 28 VDC. Normal energy levels of voltage and current aid in breaking down non-conductive contact surface films. Therefore, use of the meter relay contacts is not recommended at low energy levels for applications such as millivolt signal circuits or logic circuits. Contact performance will vary depending on the meter relay environment.

MOUNTING POSITION:

Indicator Setpoint Unit:
Standard: Scale vertical
Optional: Any with special calibration

Control Unit: No position influence

AC POWER SUPPLY FOR CONTROL UNIT: (See note below)

Minimum	Nominal	Maximum
107V, 50/60 Hz	117VAC, 50/60 Hz, 7 VA Max. for either single or double setpoint unit	127V, 50/60 Hz

NOTE: If the load being controlled causes a voltage drop of more than 2 volts in the AC supply for the meter relay, the meter relay supply should be taken from a different source to prevent "hunting" of the control system.

CONTROL POINT BAND: Less than 1% F.S.

FREQUENCY INFLUENCE: 0.3% max. change, 60 to 45HZ or 60 to 65 Hz.

CONTROL ACTION: Automatic on/off action (Automatic Alarm Rest). If alarm or limit control action (Manual Alarm Reset) is desired, the user can provide it by removing jumper wires and adding momentary-contact or push-button switches as shown in Fig. 2. If built-in manual reset option id supplied and automatic reset is desired, connect jumpers across Terminals 1, 2 and 3 per Fig. 2.

LAMP: Expected file five years. Output relay becomes de-energized on lamp failure and setpoint trip does not operate. This failure is normally self indicating.

DIELECTRIC TEST: Live parts to face and panel - 2600 volts RMS.

INSTALLATION

MOUNTING

NOTE: All drilling of the panel should be completed before the unit is mounted. (See Figures 6, 7, 8, 9 10, 11 and 12.)

195 and 196 Series Meter Relays are sturdily constructed and will withstand reasonable amounts of vibration and handling. If panel vibration is enough to cause false pointer indication, or if severe mechanical shock is expected in operation or shipping, mount the control unit separately to reduce the affect of the length and weight of the combined assembly.

CAUTION

Control unit identity number must be as noted on the setpoint unit rating plate.

The indicator-setpoint unit contains its own shielding and can be mounted on magnetic or non-magnetic panels without special calibration.

The 3½ and 4½-inch sizes may be mounted as a unit (see Figures 7, 8, 9, 10, 11 and 12) or the control unit may be mounted separately from the indicator-setpoint unit. (See Fig. 6 for separate mounting of the control unit.) The 2½-inch size (195 Series only) requires separate mounting of the control unit with a bracket and a connection cable, which are furnished with this size. (See Fig. 6.)

ACCESSORIES FOR OPTIONAL REMOTE CONTROL UNIT

Accessory kits for installing the control unit remotely are available:

NOTE: Kits described below cannot be used on meter relays with self-contained manual resets.

KIT - Part No. 1125-425 - This kit contains plug, socket, wiring connection diagram, bracket and hardware for the meter relay. The user must supply and construct the cable of the desired length by soldering the insulated cable leads to plug and socket. The wire gauge of the cable must be selected to provide each conductor with a resistance of 0.1Ω or less. The following table can be used as a guide for this 0.1Ω-per-lead determination.

AWG SIZE	MAX CABLE LENGTH
18	19 feet
20	12 feet
22	7 feet
24	4.5 feet
26	3.0 feet

KIT - Part No. 1125-426- This kit contains a six-foot cable with plug and socket connectors soldered to the cable, plus bracket and hardware. (This kit is furnished as standard with 2½-inch meter relays.)

CONNECTIONS - All wiring must comply with local codes, regulations and ordinances. No internal fusing is provided in the meter relay.

DO NOT MAKE CONNECTIONS WHILE POWER IS APPLIED TO EITHER THE POWER TERMINALS, THE CONTROL UNIT RELAY TERMINALS OR THE MEASUREMENT TERMINALS.

INDICATOR-SETPOINT UNIT

Connections to the circuit being measured are made at terminal studs on the back of the case of the indicator-setpoint unit. (See Fig. 4.) The left hand terminal (rear view) is always positive. The contact surface of nuts, washers and cable terminals must be thoroughly clean to ensure good contact.

Connections between the indicator-setpoint unit and the control unit are made through built-in connector and socket when the control unit is mounted "piggy-back" on the indicator-setpoint unit (3½- and 4½-inch size) or by a prewired cable assembly for the 2½-inch size or when the unit is mounted remotely with other sizes.

AUXILIARY CURRENT TRANSFORMER

All 2½-inch meter relays and some other models with 20 mAAC signal input range require an auxiliary current transformer.

CAUTION

These models must not be connected without the auxiliary current transformer.

The transformer (Part No. 2062-150) is rated for 20 mA output with 5 amperes input with burden of 2.5VA. See Figures 13 and 16 for connections and dimensions. Models requiring this transformer are identified by HF in digits 5 and 6 of the part number (example: V312-HFCD-00).

Other models have an internal 5 ampere current transformer. These models do not require the auxiliary current transformer (example: V312-LSCD-00).

CONTROL UNIT

Terminals for the 117 VAC, 60 Hz power supply for the double-pole, double-throw relays (one per setpoint) and for the alarm or limit control action are on the back of the control unit. Each terminal is supplied with a No. 6-32 pan head machine screw. (See Figures 2 and 3 for terminal layout.)

The relay terminals are entirely passive and are completely isolated from either the measured circuit or the power supply circuit. (See Table 1 and Figure 2 for relay operation.)

ADJUSTMENTS

The following zero adjustments may be necessary in some cases due to a shift in zero position because of shock in transportation. The meter relay should be in its operating position when any such adjustment is made.

AMMETERS and VOLTMETERS

1. Zero on scale - Check mechanical zero: adjust pointer to zero with zero signal applied.

2. Suppressed zero - Apply end-scale signal and adjust pointer to correct indication.

ADJUSTMENT OF CONTROL POINT

This adjustment is made using the knob(s) mounted on the front of the indicator. The setting of the control point(s) is indicated by the position of the setpointer. Control action will occur as the indicating pointer passes over the setpointer(s)' scale position.

The setpointer(s) may be adjusted from zero to full scale and do not interfere with the indicating pointer. Double setpointers may be positioned to within two angular degrees of each other which is approximately 2% of full scale. Unless otherwise specified on the order, the operation of the setpoints may overlap when the setpoints are brought to their minimum mechanical distance apart.

For best accuracy, allow at least ten minutes warm-up (with lamp energized) before making final setpoint adjustment. This improves the accuracy approximately 0.5%. To check setpoint accuracy, the nominal supply voltage must be used.

MAINTENANCE

CAUTION DO NOT REMOVE RED LABELS OR USE METALLIC PROBES TO ADJUST CONTROL POINT THROUGH HOLES IN THE SIDE OF INDICATOR-SETPOINT UNIT (FRONT UNIT). INTERNAL COMPONENTS MAY BE AT DANGEROUS POTENTIALS. THIS ADJUSTMENT SHOULD BE DONE BY FACTORY OR AUTHORIZED PERSONNEL.

To clean the plastic window, wash it with soap and water. To remove grease or oil, use kerosene sparingly. DO NOT use acetone, benzine, carbon tetrachloride, fire extinguisher fluids, lacquer thinners or window sprays containing these solvents since they will smear or soften the plastic window.

Wipe the window periodically with a clean, damp chamois. Do not rub with a dry cloth as this is likely to cause scratches and to build up an electrostatic charge which will cause erroneous readings. After cleaning, an antistatic agent should be applied to the window to neutralize any electrostatic charges.

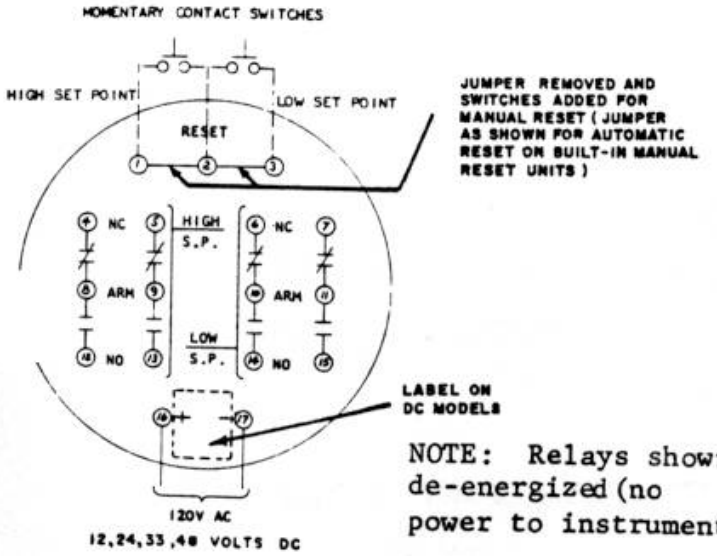
PARTS REPLACEMENT

The 195 and 196 Series Meter Relays utilize a special lamp with leads attached to the lamp and lamp holder assembly (LFE Part No. 1207-246). These replacement parts can be ordered through any authorized LFE distributor or modification center. The lamp is selected and adjusted in the lamp holder at the factory and substitutions should not be made.

In the event of lamp failure, the lamp assembly can be replaced when the control unit is detached from the rear of the indicator-setpoint unit, or the cable plug from the remotely mounted control unit is disconnected. Then, the lamp-access plate (see Fig. 4) must be removed (screws are beneath adhesive labels) to expose the lamp holder which can be pulled out.

PART NO. 1207-246 LAMP AND HOLDER -- The part No. 1207-246 lamp has been fixed in the lamp holder at the factory such that the filament will be in the correct position when the keyed assembly is inserted in the indicator-setpoint unit. Make sure the lamp-lead terminals are engaged by the screws when the lamp access cover is replaced. (NOTE: If relay operation is not within ±2% of setpoint index, the lamp holder position must be rotated 180°.)

REASSEMBLY - After the new lamp assembly has been installed, make sure that the lamp access plate is replaced (and screws are tight) before the cable plug from the remotely located unit is reconnected or the control unit is reassembled on the rear of the indicator-setpoint unit.



NOTE: Relays shown de-energized (no power to instrument)

Fig. 2 - Control Unit External Connections.

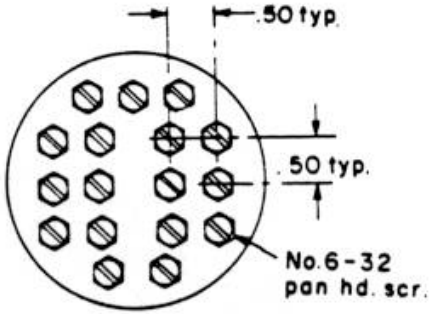


Fig. 3 - Rear View of control unit showing spacing of screw-type connections.

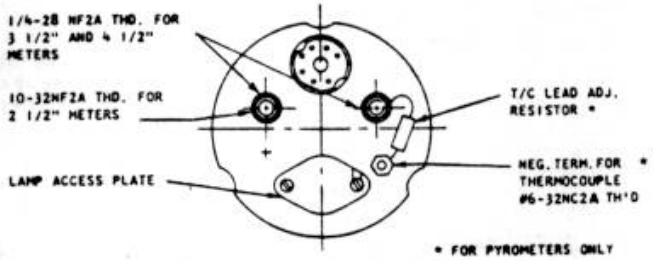


Fig. 4 - Typical rear view of indicator setpoint unit.

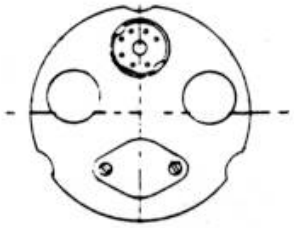


Fig. 5 Typical rear view of indicator-setpoint unit.

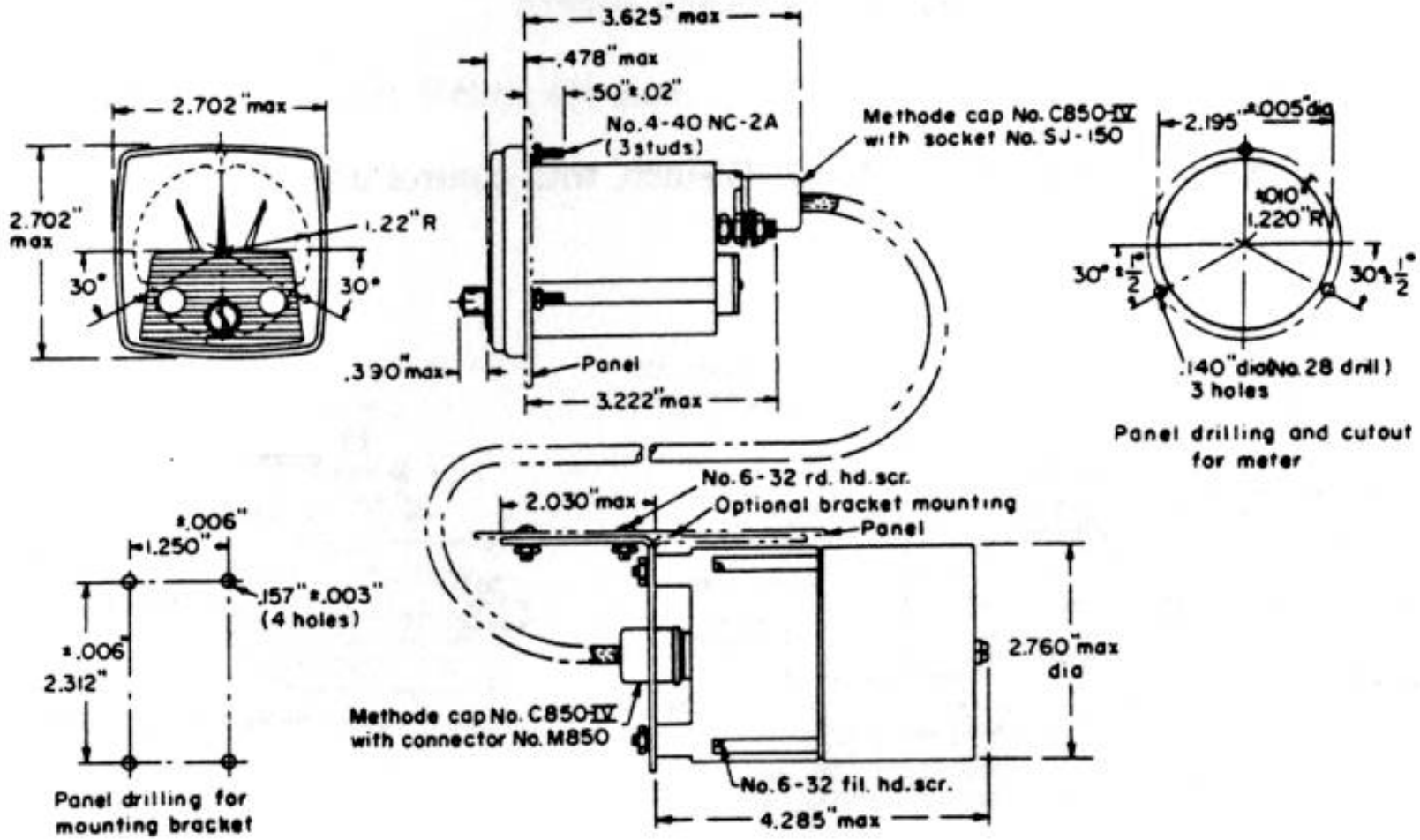


Fig. 6 - 195 Series Meter Relay, 2½-inch with remote mounted control unit due to small meter size. Remote mounting is the same for all 195 and 196 Series if desired.

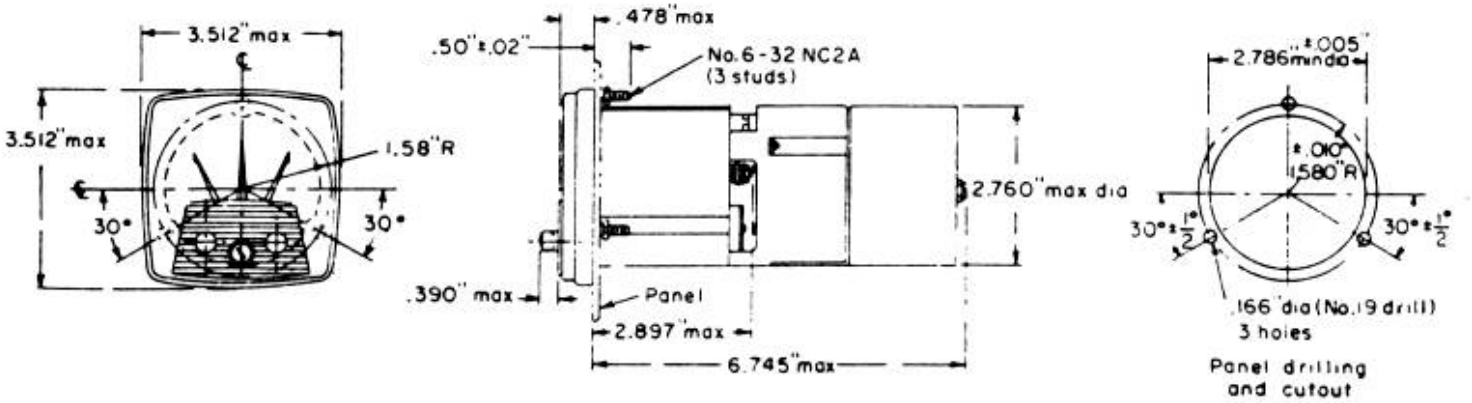
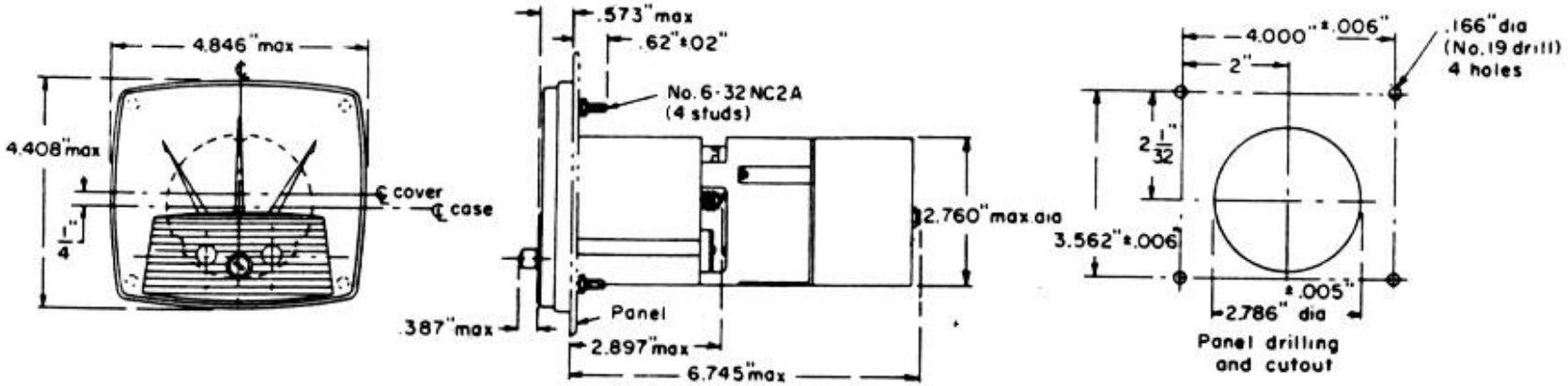
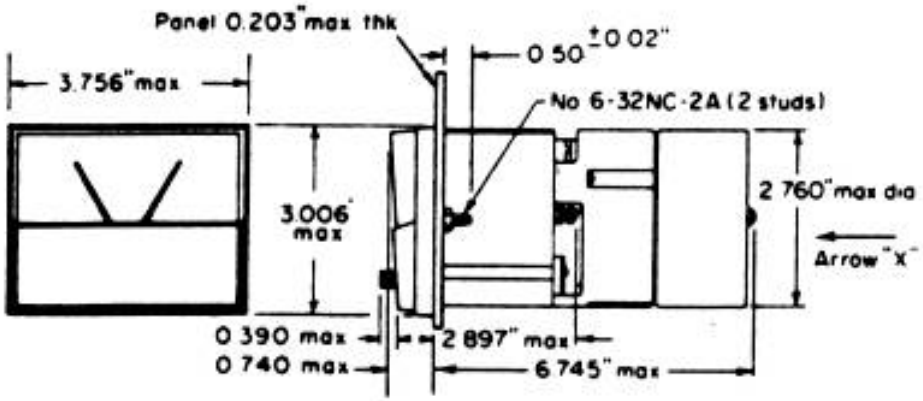


Fig. 7 - 195 Series Meter Relay, 3½-inc, with control unit rear mounted



FOR A.C. POWERED MODELS

Fig. 8 - 195 Series Meter Relay, 4½-inch, with control unit mounted



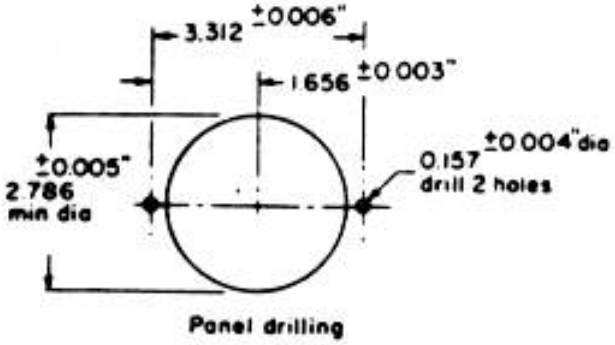
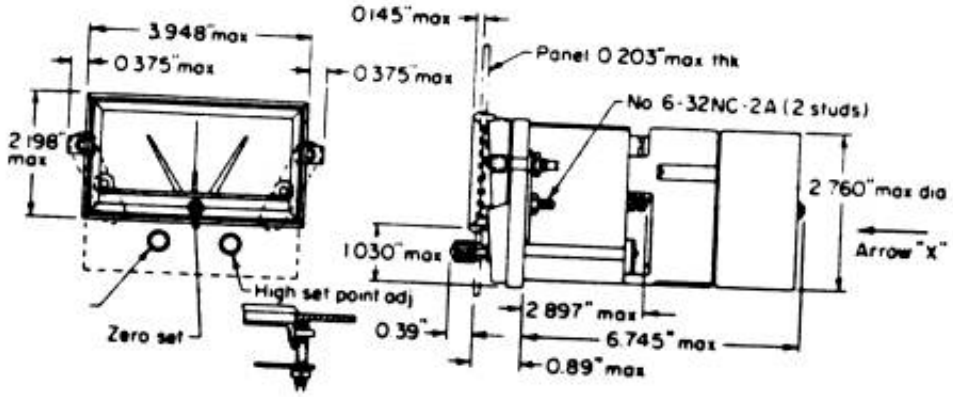
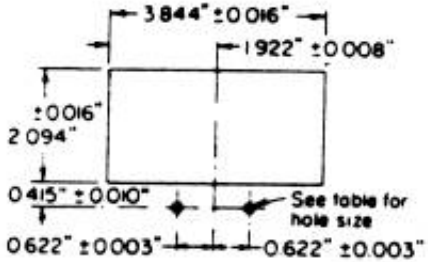


Fig. 9 - 196 Series Meter Relay, 3½-inch, front mounted.





Panel cut-out

Description	Hole size
Finger adj knob	0.25
Screw driver adj knob	0.38

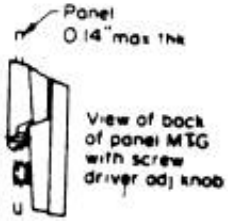


Fig. 10 - 196 Series Meter Relay, 3½-inch, window mounted

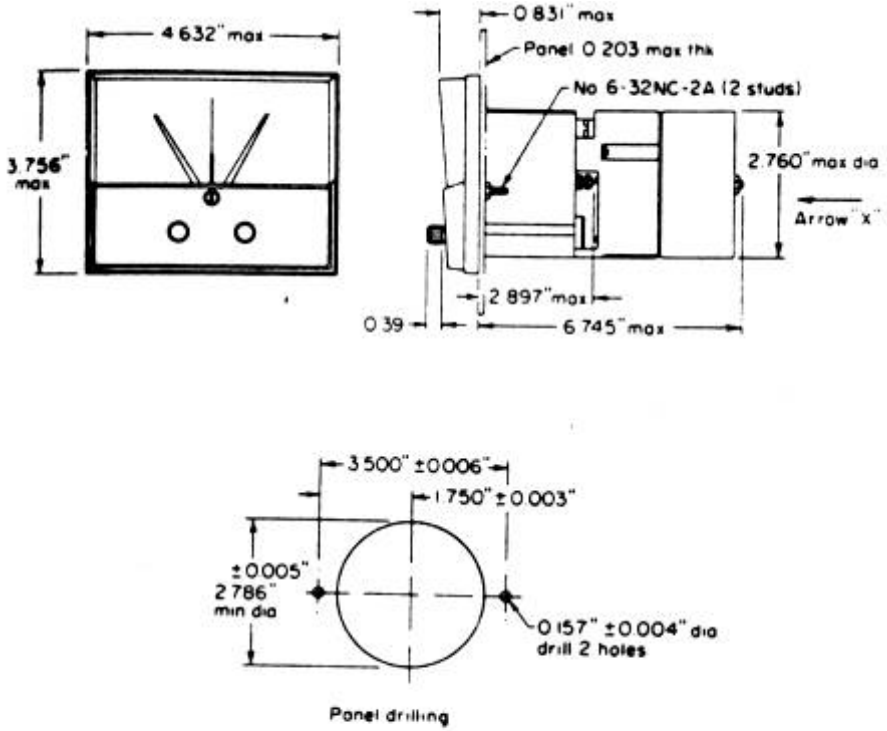


Fig. 11 - 196 Series Meter Relay, 4½-inch, front mounted

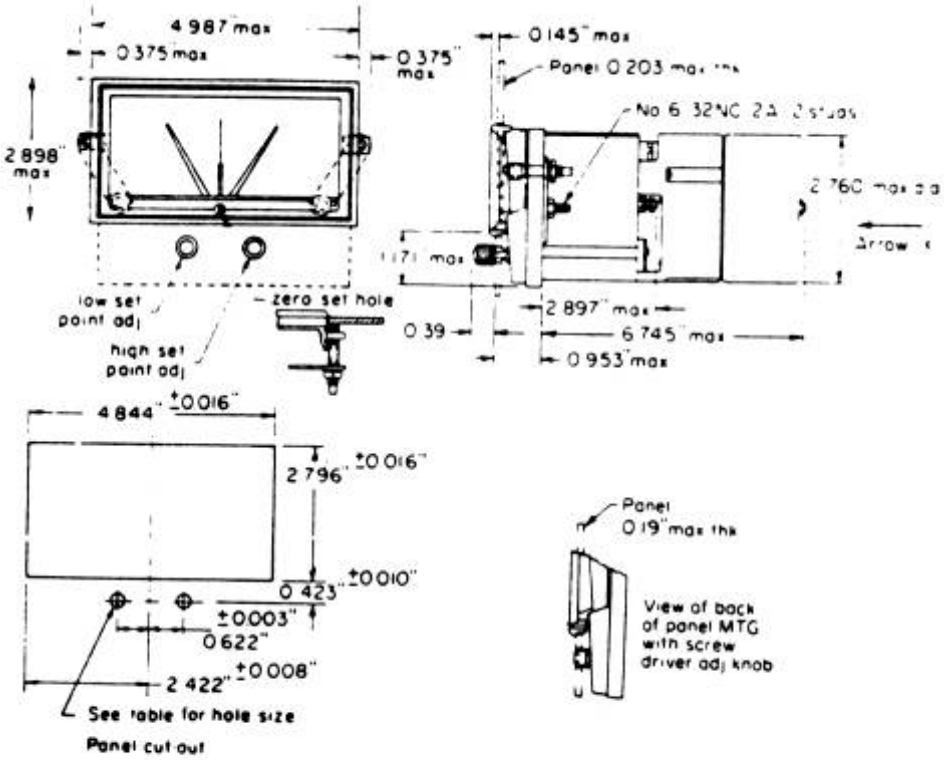


Fig. 12 - 196 Series Meter Relay, 4½-inch, window mounted

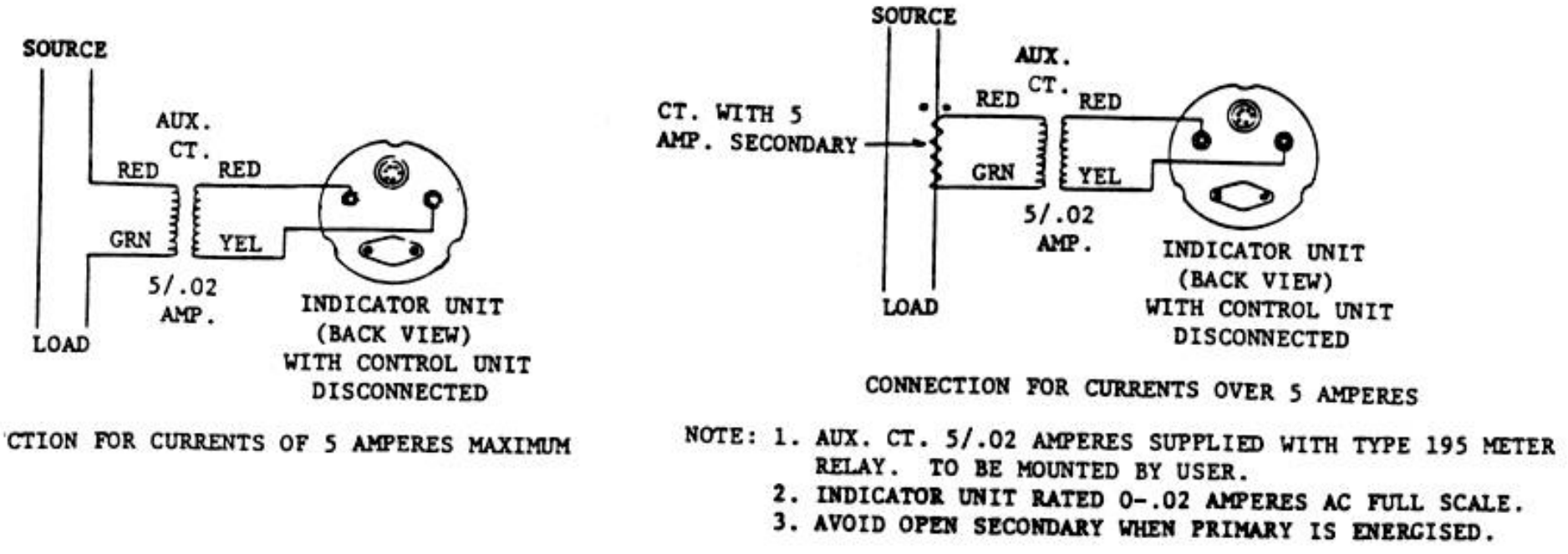


Fig. 13 - External connections for Meter Relay with current transformer

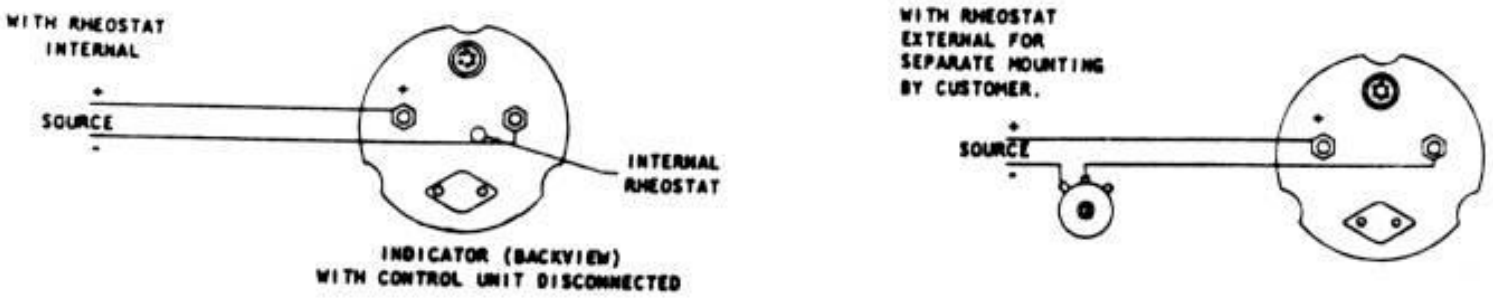


Fig 14 - External connections for Meter Relay with rheostat

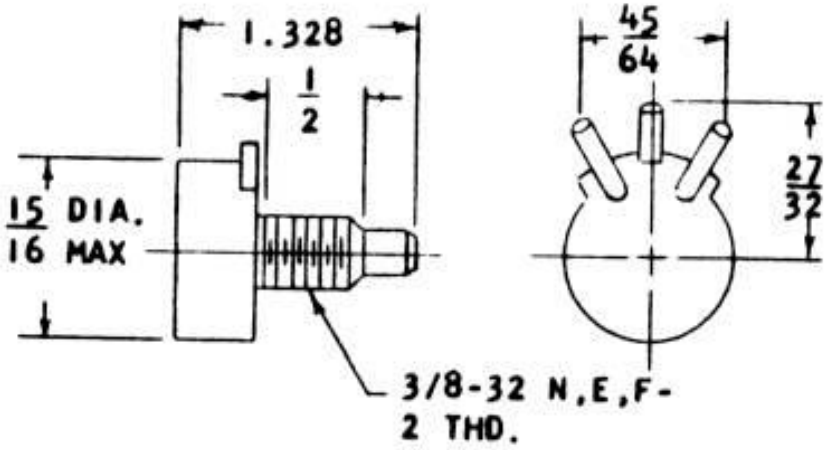


Fig 15 - External rheostat for Meter Relay

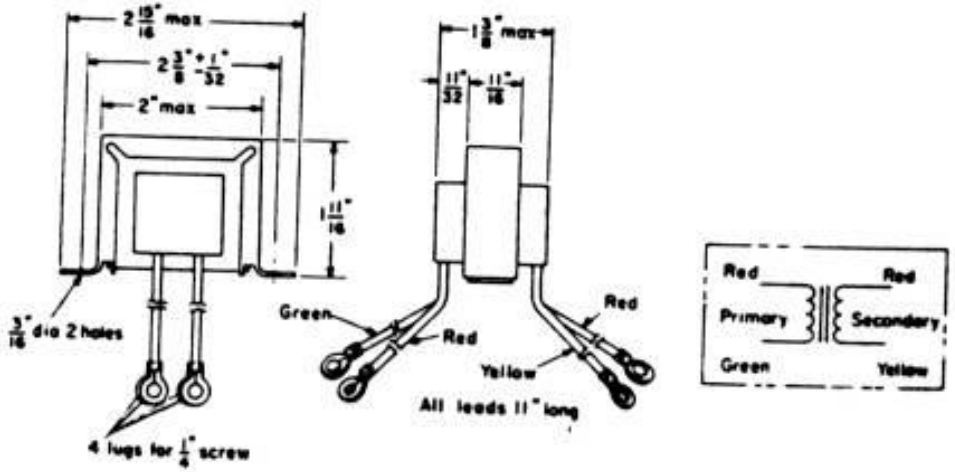


Fig 16 - Step-down current transformer for Meter Relay