INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

ELECTRONIC TELEMETERING RECEIVER TYPE IR-1

CAUTION Before putting receivers into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment.

APPLICATION

The type IR-1 receivers are operated by type IT-1 transmitters in Load Dispatching systems where important load indications are to be transmitted between stations. The electrical quantities measured and transmitted are usually megawatts or megavars. The measurements are made by the transmitters at the tie lines, substations or generating stations and are transmitted to the dispatcher's office for the purpose of dispatching and load control. The measurements are transmitted in the form of frequency over carrier channels, pilot wires microwave channels or telephone lines and received on the type IR-1 receivers. The purpose of the type IR-1 receivers is to convert the frequency into d-c milliampere and millivolt quantities so the transmitted measurements may be read on indicating meters and potentiometer recorders. Schematic connections between the transmitter and receiving units is shown in Fig. 1 and these connections illustrate, in a general way, the manner in which the units may be coordinated.

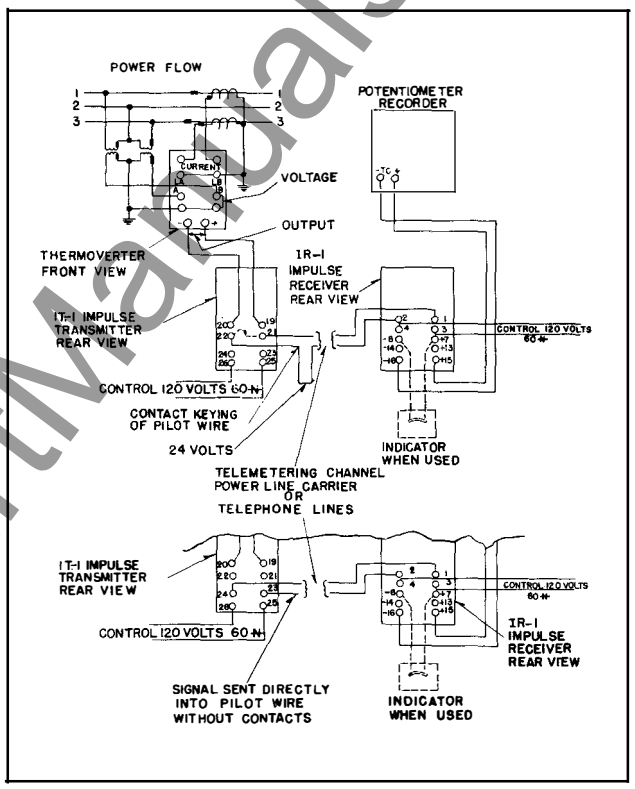

Fig. 1.—Schematic of Electronic Telemetering System.

CONSTRUCTION AND OPERATION

The receiver consists of a voltage regulator two thyratron tubes and two 6L6 tubes that alternately charge and discharge two fixed condensers all mounted in a single case. These circuits are used to convert the variable frequency from the transmitter into direct current milliamperes. This current is used to operate direct current indicating instruments or is passed thru a resistance coil to give a suitable millivolt drop for operating a potentiometer type of recorder. The scales of these instruments are marked in terms of the quantity measured by the transmitter.

The function of the receiver is to receive the signal of 15 to 35 cycles per second from the transmission channel and convert it to dc milliamperes and dc millivolts. The wave shape of the signal is of no special importance as the receiver will operate satisfactorily from dc impulses as well as from a sine

wave. The signal is received on the primary of a small input transformer (terminals 1 and 2). Its secondary voltage controls the firing of a set of tubes whose function is to charge two fixed condensers from a constant dc voltage source and then discharge them. The circuit is so arranged that the two condensers charge and discharge alternately. The average value of the dc current flowing through the condensers depends on the number of charges per second, hence this current varies directly with the frequency of the signal. The current can be measured at terminals 7 and 8.

The values of these currents for the different frequencies are:

15	25	35	cycles per second
.9	1.5	2.1	milliamperes

The above values are the same for all receivers but the millivolt values may be different. The millivolts are obtained by passing the current through resistance drop coils. This receiver is intended to operate potentiometer type recorders, but an indicating milliammeter may also be used if the spring is suppressed so that it indicates .9 milliamperes at the left end of the scale and 2.1 at the right end. Indicators which cannot be suppressed, such as the K-24 require a special receiver known as the IR-2 which will be explained in a later paragraph.

Figure 1 is a schematic wiring showing the components of the IR-1 receivers. The receiver is energized through a transformer from a 115 volt 60 cycle control circuit. The dc voltages that are required for the tube circuits are supplied from small rectifiers which are mounted inside the case. The two small rheostats are for adjusting the calibration. The one on the right is for milliamperes and the one on the left for millivolts.

CALIBRATION

Calibration of IR-1 Receivers Wired as per Fig. 2.

The dc current which is established by the charging and discharging of the .2 mfd. condensers is adjusted as follows:

Connect a dc milliammeter to terminals 7 and 8 (positive terminal of milliameter to terminal 7). The maximum current will not exceed three milliamperes, hence a meter of three or five milliamperes full scale will be satisfactory. The disconnect link on the front of the rheostat panel shorts terminals 7 and 8 when it points left. It should be moved to the right to permit the current to pass through the milliammeter. After the test is completed the link should be moved back to the left position, unless the ammeter is to be left permanently in the circuit.

The frequency signal varies from 15 to 35 cycles per second and is applied to terminals 1 and 2. The input level of the signal is not critical but should not be less than 25 nor more than 50 volts RMS. When the receiver is in calibration, the frequency values and their corresponding milliamperes are:

15	25	35	cycles per second
.9	1.5	2.1	milliamperes

The rheostat for adjusting the milliamperes to their correct values, is located on the right side of the rheostat panel. Assume for example, that the signal is 25 cps; then the rheostat must be adjusted until the current is 1.5 milliamperes. As the scale distribution is linear, no further adjustment is required for the other scale points. The rheostat on the left side of the panel is to be used for adjusting the zero point of the potentiometer recorder. Before making this adjustment, the milliampere adjustment just previously mentioned must be correctly made; as the millivolt calibration depends on the accuracy of the current and the resistance values of the drop coils.

Assume for example that an IR-1 receiver is to have the following calibration:

15	25	35	cycles per second
-100	0	+100	millivolts

The resistance value of the drop coil for the above range is 166.6 ohms. The base frequency is 25 cycles per second and at this frequency the current is 1.5 milliamperes. 1.5 milliamperes passing through 166.6 ohms gives a

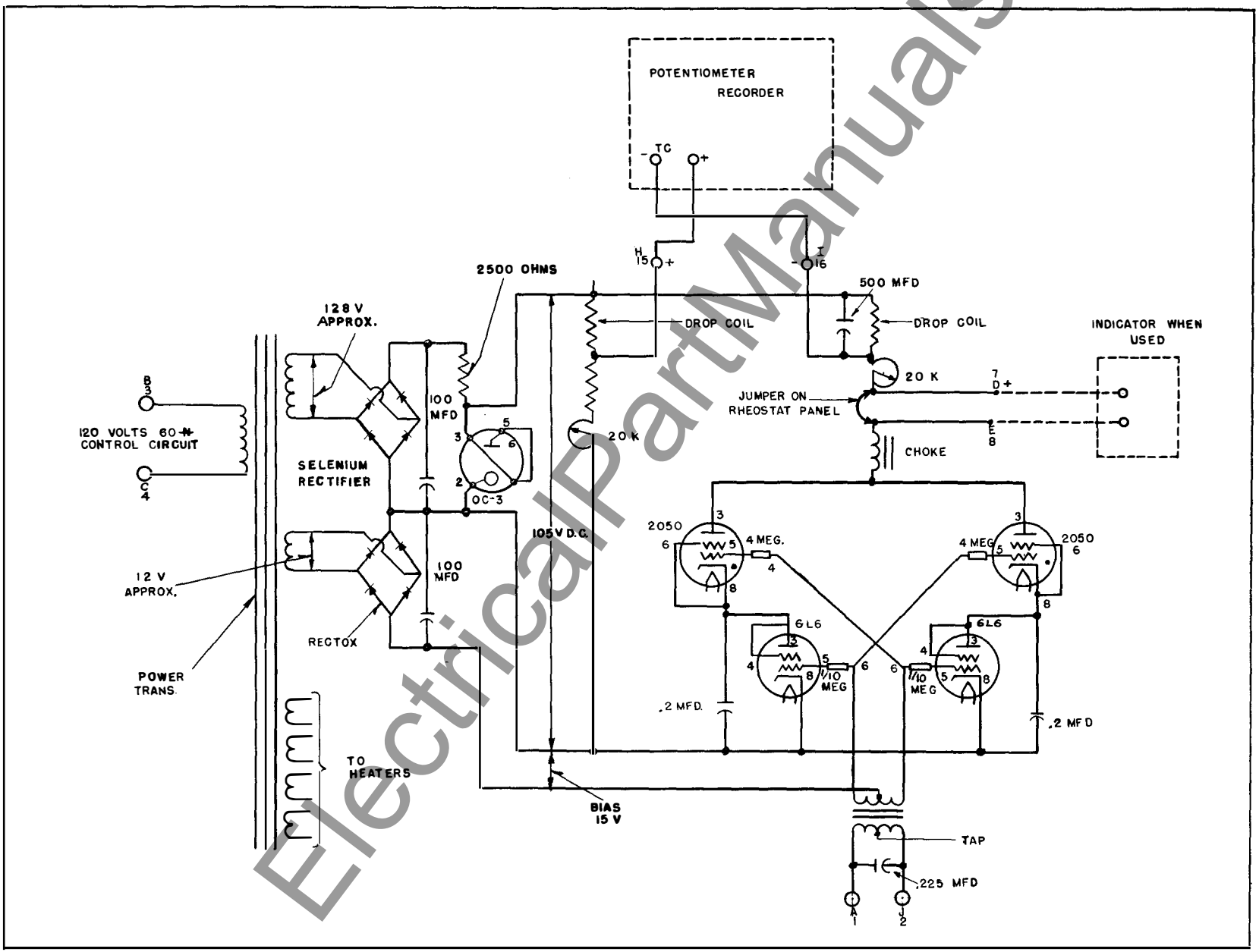

Fig. 2.—Internal Schematic of IR-1 Receiver.

drop of 250 millivolts, but at the base frequency, zero millivolts are required. To obtain this, the left hand rheostat is used to adjust current through another drop coil until its drop is also 250 millivolts. When so adjusted the millivolt drop across terminals 15 and 16 equals zero. See Fig. 2. If now the frequency is raised to 35 cps, the current through the right hand drop coil becomes 2.1 milliamperes and the drop 2.1 x 166.6 = 350 millivolts. The difference between 350 of the right hand coil and 250 of the left hand coil is 100 which is the correct calibration.

The above was for a center zero application having a base of 25 cps. For most left zero applications the base is 15 cps and the current through the drop coil is .9 milliamperes.

The following table gives the drop coil resistance values for different millivolt calibrations. In each case the complete scale is 15 to 35 cps.

MILLIVOLTS			OHMS
-50	0	+50	83.3
-60	0	+60	100.
-80	0	+80	133.3
-100	0	+100	166.6
-150	0	+150	250.0
0		+50	41.6
0		+60	50.0
0		+80	66.6
0		+100	83.3
0		+150	125.0
0		+200	166.6

Instruments Used in Calibration

The dc milliammeter which is used to check the current between terminals 7 and 8 must measure .9 to 2.1 milliamperes. A meter having a full scale of 3 or 5 milliamperes will be satisfactory. The resistance should be low, 20 ohms or less. If there is a switchboard indicator permanently connected to terminals 7 and 8, it may be used as a standard.

The instrument connected across terminals 15 and 16 must be of the potentiometer type. It must draw no current when in balance.

Type IR-2 Receiver

The IR-2 is a modified form of the IR-1 and is intended primarily for operating type K-24 indicating milliammeters. Because of the long scale of the K-24, its spring cannot be suppressed. The terminal arrangement of the IR-2 is the same as for the IR-1. The K-24 indicator is to be connected to terminals 13 and 14 instead of 7 and 8. This arrangement leaves terminals 7 and 8 available for checking the .9 to 2.1 milliamps as was explained under the calibration of the IR-1. A potentiometer recorder, if used will be connected across terminals 15 and 16, as was done in the IR-1 but its drop coil will not be supplied unless so stated in the order. A special diagram will supplement the instruction leaflet for each order of the IR-2.

RECEIVER IN TYPE FT CASE

The type FT cases are dust-proof enclosures combining receiver components and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are six case sizes, designated as S10, S20, M10, M20, L10, L20. S refers to the small; M the medium; and L, the large size chassis frame. The numbers refer to the possible number of test switch positions, 10 or 20.

Removing Chassis

To remove the chassis, first remove the cover which exposes the receiver components and test switches for inspection and testing. Next open all switches. With all the switches fully opened, grasp the two cam action latch arms and pull outward. Using the latch arms as handles, pull the chassis out of the case. The chassis can be set on a test bench in a normal upright position as well as on its top, back or sides for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order.

Electrical Circuits

The electrical circuits are as follows: Each terminal in the base connects thru a test switch to the receiver components in the chassis as shown on the internal schematic diagrams. The receiver terminal is identified by numbers marked on both the inside and outside of the base. The test switch positions are identified by letters marked on the top and bottom surface of the moulded blocks. These letters can be seen when the chassis is removed from the case.

The potential and control circuits thru the relay are disconnected from the external circuit by opening the associated test switches.

The receivers can be tested in service, in the case but with the external circuits isolated or out of the case as follows:

Testing in Service

For testing in service, the voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

Testing in the Case

For testing in the case the ten circuit test plug can be inserted in the contact jaws, with all blades in the full open position. This connects the receiver components to a set of binding posts and completely isolates the receiver circuits from the external connections by means of an insulating barrier on the plug. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the receiver components by #2 test clip leads instead of the test plug.

Testing Out of Case

For testing out of the case receiver components may be tested by using the ten circuit test plug or by #2 test clip leads as described above. The factory calibration is made with the chassis in the case and removing the chassis from the case will change the calibration values of some receivers by a small percentage. It is recommended that the relay be checked in position as a final check on calibration.

INSTALLATION

The receivers should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the receiver vertically by means of the two mounting studs. Either of these studs may be utilized for grounding the receiver. The electrical connections may be made direct to the terminals by means of screws for steel panel mounting or to terminal studs furnished with the receiver for ebony asbestos or slate panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the studs and then turning the proper nuts with a wrench.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this receiver have been made at the factory and should not be disturbed after receipt by the customer. If the adjustments have been changed, the receiver taken apart for repairs, or if it is desired to check the adjustments at regular maintenance periods the instructions below should be followed.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

Receiver Input

25 volts RMS, 15 to 35 cps across terminals 1 and 2. Internal impedance 50,000 ohms.

Power Consumption

Receiver 15 watts at 40% power factor.

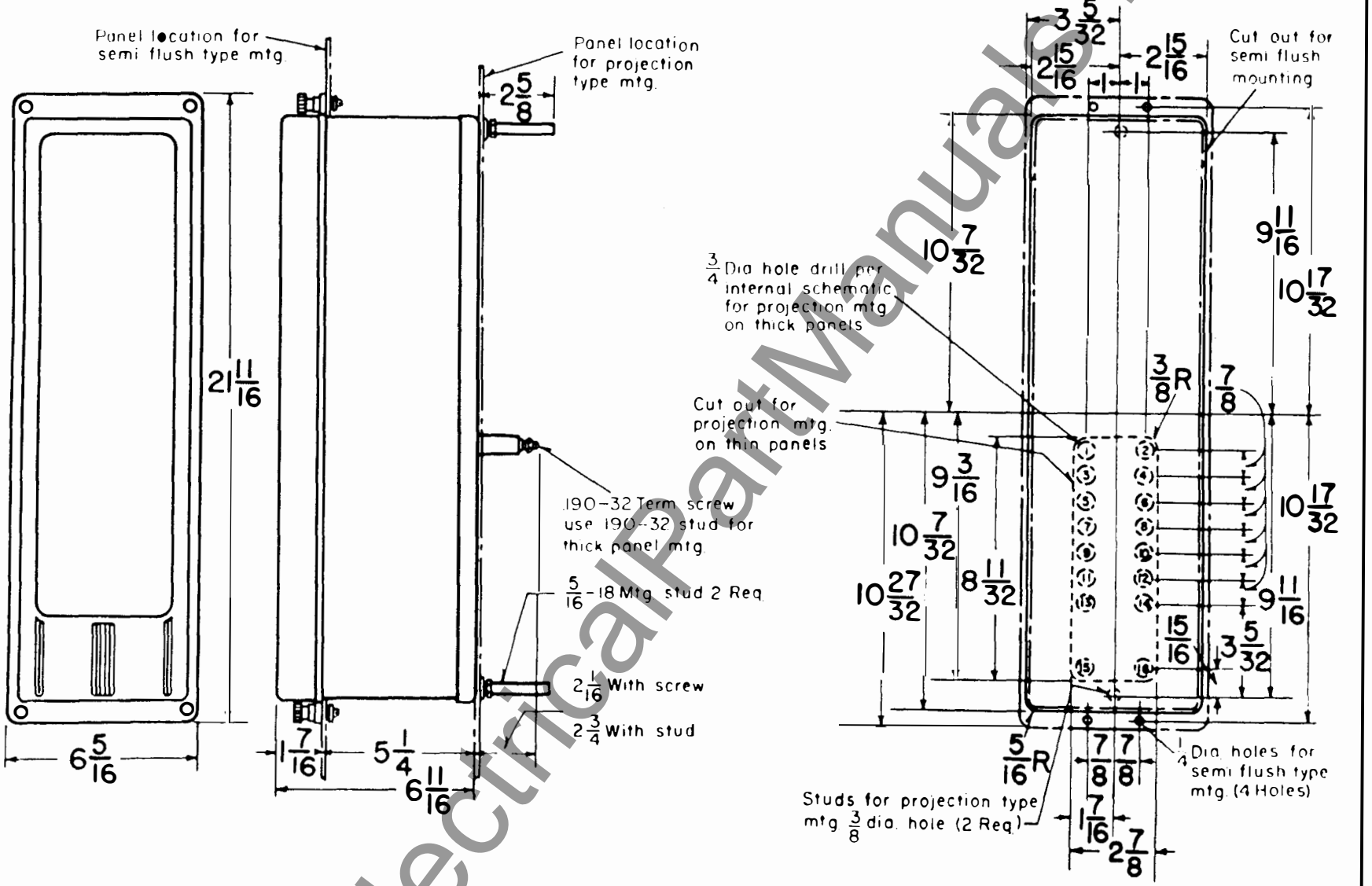

Fig. 3—Outline Dimensions and Drilling Plan for IR-1 Receiver. For Reference Only.

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