INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

ELECTRONIC TELEMETERING RECEIVER TYPE IR-2

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-2 telemetering receivers are to be used in conjunction with 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-2 receivers. The transmitted frequency is directly proportional to the magnitude of the quantity being measured. The full scale span is 15 to 35 cycles per second. The purpose of the type IR-2 receivers is to convert the frequency into d-c milliampere and millivolt quantities so that the transmitted measurements may be read on indicating meters and potentiometer recorders. Schematic connections between the transmitter and receiver units are shown in Fig. 1 and these connections illustrate, in a general way, the manner in which the units may be coordinated.

CONSTRUCTION AND OPERATION

The IR-2 receiver is a self-contained electronic unit mounted in an L-10 Flexitest case. The signal of 15 to 35 cycles per second from the transmission channel is converted to d-c milliamperes and d-c millivolts in the following manner. See Fig. 2. 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 0.25 mfd. fixed condensers from a constant d-c voltage source and then discharge them. The circuit is so arranged that the two condensers charge and discharge alternately.

The d-c voltage is obtained from small rectifiers, and is held constant by an OC-3 regulator tube. One of the 0.25 mfd. condensers is charged by a 2050 tube and then discharged by a 6L6 tube. The other 0.25 mfd. condenser is charged and discharged by a similar pair of tubes.

The average value of the d-c 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. It varies in a straight line from 0.9 to 2.1 milliamperes over the frequency range of 15 to 35 cycles per second. Several of the values are tabulated here.

15	25	35	cycles per second
.9	1.5	2.1	milliamperes

The above current values are the same for all receivers. Fig. 3 illustrates further the manner in which the current varies.

A switchboard type indicating meter can be connected to terminals 7 and 8 with its scale calibrated in megawatts or megavars, but the instrument requires a suppressed spring which is somewhat objectionable, especially in a

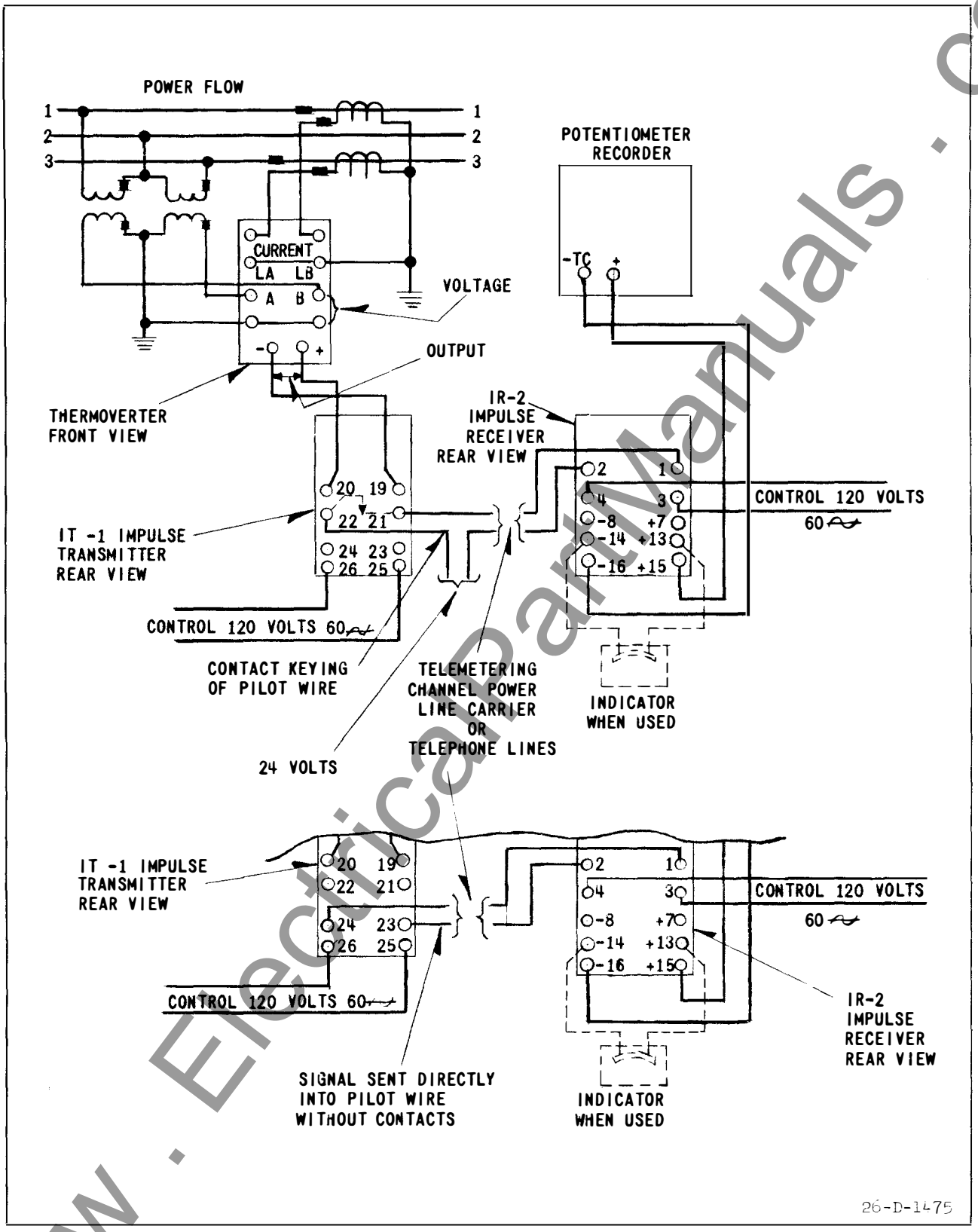

Fig. 1—External Schematic Of The Electronic Telemetering System.

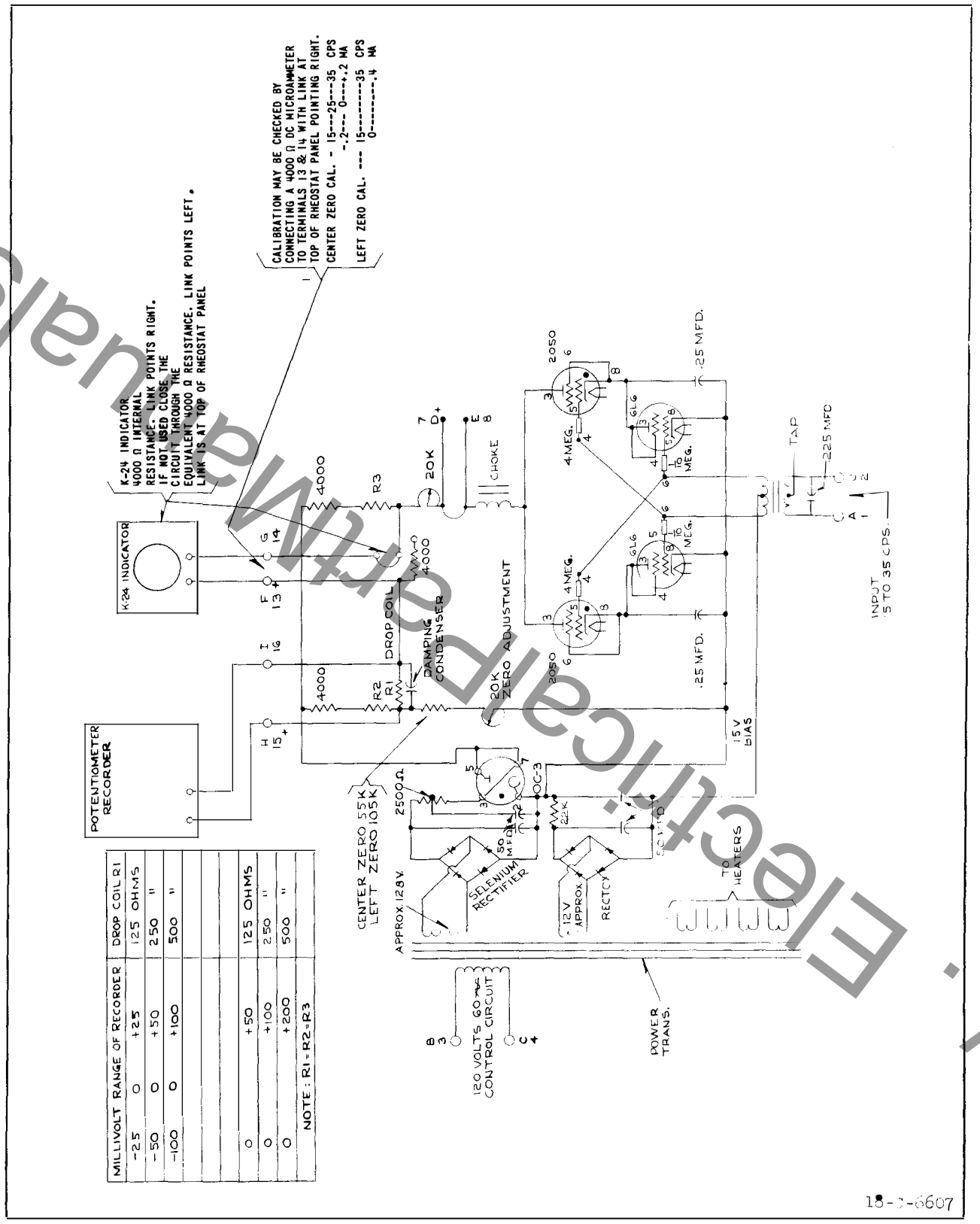

Fig. 2—Internal Schematic Of IR-2 Receiver.

long scale meter such as the K-24. Only suppressed spring instruments could be used with the type IR-1 receiver. In order to overcome this objectionable feature the circuit was modified and the receiver is now designated as the IR-2. The IR-2 uses the same outline and drilling plans as the IR-1. It performs all the functions of the IR-1, and it can all accommodate a nonsuppressed instrument such as the type K-24. The nonsuppressed instrument is connected across a bridge circuit as shown in Fig. 2, and directly in series with it is connected the drop coil which supplies the millivolts to a potentiometer recorder. The indicating meter which is usually a K-24 must have a resistance of 4000 ohms. If it does not it must be padded until it does.

The K-24 will always cover a total span of 400 microamperes for the frequency range of 15 to 35 cps. It will span 400 microamperes regardless of the location of the zero point on the scale, that is, a left zero meter operates from 0 to +400 microamperes and a center zero meter from -200 to 0 +200 microamperes.

CALIBRATION AND ADJUSTMENTS

Calibration of the IR-2 receivers wired per Fig. 2. The direct current which is established by the charging and discharging of the 0.25 mfd condensers is adjusted as follows. Connect a d-c microammeter to terminals 13 and 14 (positive terminal of microammeter to terminal 14). The resistance of this meter must be 4000 ohms. If the microammeter used is less than 4000 ohms, it must be padded with an external series resistance to that value. The maximum current will not exceed 500 microamperes; hence a meter of 500 microamperes full scale will be satisfactory. The disconnect link on the lower front of the rheostat panel shorts terminals 7 and 8 when it points left. It should remain in this position throughout the calibration procedure as well as during actual operation. Calibration is no longer checked at terminals 7 and 8.

Energize the receiver from a 120 volts 60 cycle source and with zero signal applied at the input terminals 1 and 2, adjust the rheostat on the left side of the panel for the required bias current on the microammeter connected to terminals 13 and 14. The value of this bias current depends upon whether the receiver is to be calibrated for left-zero indication or center-zero indication. For left-zero calibration, adjust the left-hand rheostat for 300 microamperes on the microammeter. For center-zero calibration adjust the rheostat for 500 microamperes on the microammeter.

After setting the proper bias, disconnect the microammeter and apply a signal at the input terminals 1 and 2. The input level of the signal is not critical but it should not be less that 20 volts RMS nor more than 50 volts RMS. The frequency of the signal applied to the input should be 15 cycles for left-zero calibrations and 25 cycles for center-zero calibrations. Reconnect the microammeter with its positive terminal to terminal 13 of the receiver. Adjust the right-hand rheostat until no current flows through the microammeter at an input of 15 cycles for left-zero receivers or at an input of 25 cycles for center-zero receivers. Since the scale distribution is linear, no further adjustment is required for the other scale points. However, the other scale points may be checked by using the following table.

Left-Zero Calibration

0 --------+200-------- +400 Microamperes
15 --------- 25 -------- 35 Cycles per second

Center-Zero Calibration

-200---------- 0 ---------+200 Microamperes
12 ----------25 -------- 35 Cycles per second

Example 1 - Assume the IR-2 receiver is to be calibrated for left zero as follows:

0 ----------+50 Millivolts
15 ---------- 35 Cycles per second

As previously stated the span across the scale of the meter connected to terminals 13 and 14 will always be 400 microamperes. With a 15 cycle input the meter reads zero. If the frequency is raised to 35 cycles per second, the meter will now read 400 microamperes.

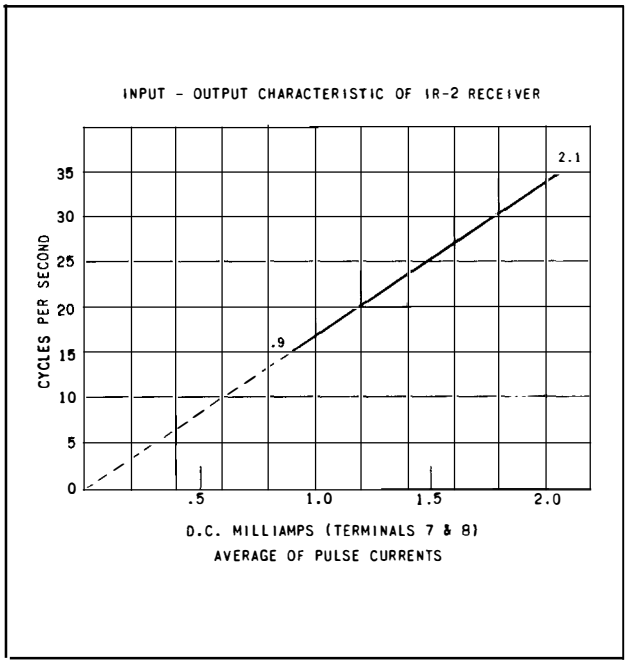

Fig. 3—Input-Output Characteristic Of IR-2 Receiver.

Since the same current passes through the drop coil, the drop coil must have a resistance of 125 ohms to give a 50 millivolt drop.

Example 2 - Assume the IR-2 receiver is to be calibrated for center zero as follows:

-50 --------- 0 -------- +50 Millivolts
15 ---------25 ------- 35 Cycles per second

Here again the span across the scale of the meter is 400 microamperes but the zero has been shifted to the 25 cycle point and the meter reads (-200) - 0 - (+200) microamperes. The drop coil must have a resistance of 250 ohms to give a drop of 100 millivolts (-50 to +50).

Damping of Meters

The direct current supplied to the meters by the IR-2 receiver is pulsating, and although the meters accurately indicate the average value, there may be appreciable vibration of the pointers at the low frequency end of the scale. Therefore damping may be necessary.

The shape of the pulse is shown in Fig. 3. The pulse rate varies directly with the frequency. With 15 cycles per second on the input transformer, there are 30 d-c pulses per second through the meters, and with 35 cycles per second there are 70 d-c pulses per second.

Damping for the recorder is attained by placing condensers directly across the drop coil. These condensers are mounted inside of the IR-2 case. The K-24 indicator has sufficient inherent damping so it does not require any condensers.

Some indicating meters, particularly the portable type, may vibrate appreciably at the low frequency end of the scale, and if desired, it can be damped by placing condensers directly across the meter terminals. If the meter has a resistance of 50 ohms or less, satisfactory damping can usually be obtained with a low voltage 500 mfd, electrolytic condenser. If it has a resistance of 4000 ohms then 8 mfd. should be sufficient.

Instruments Used In Calibration

The d-c milliammeter which is used to check the current between terminals 13 and 14 must measure 0 to 400 microamperes. A meter having a full scale of 500 microamperes will be satisfactory. The resistance should be 4000 ohms. The resistance cannot be higher. If the resistance is less than 4000 ohms, it should be padded to that value.

The recorder connected across terminals 15 and 16 must be of the potentiometer type. It must draw no current when in balance. The switchboard microammeter used across terminals 13 and 14 must have a resistance of 4000 ohms.

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.

Removing Chassis

To remove the chassis, first remove the

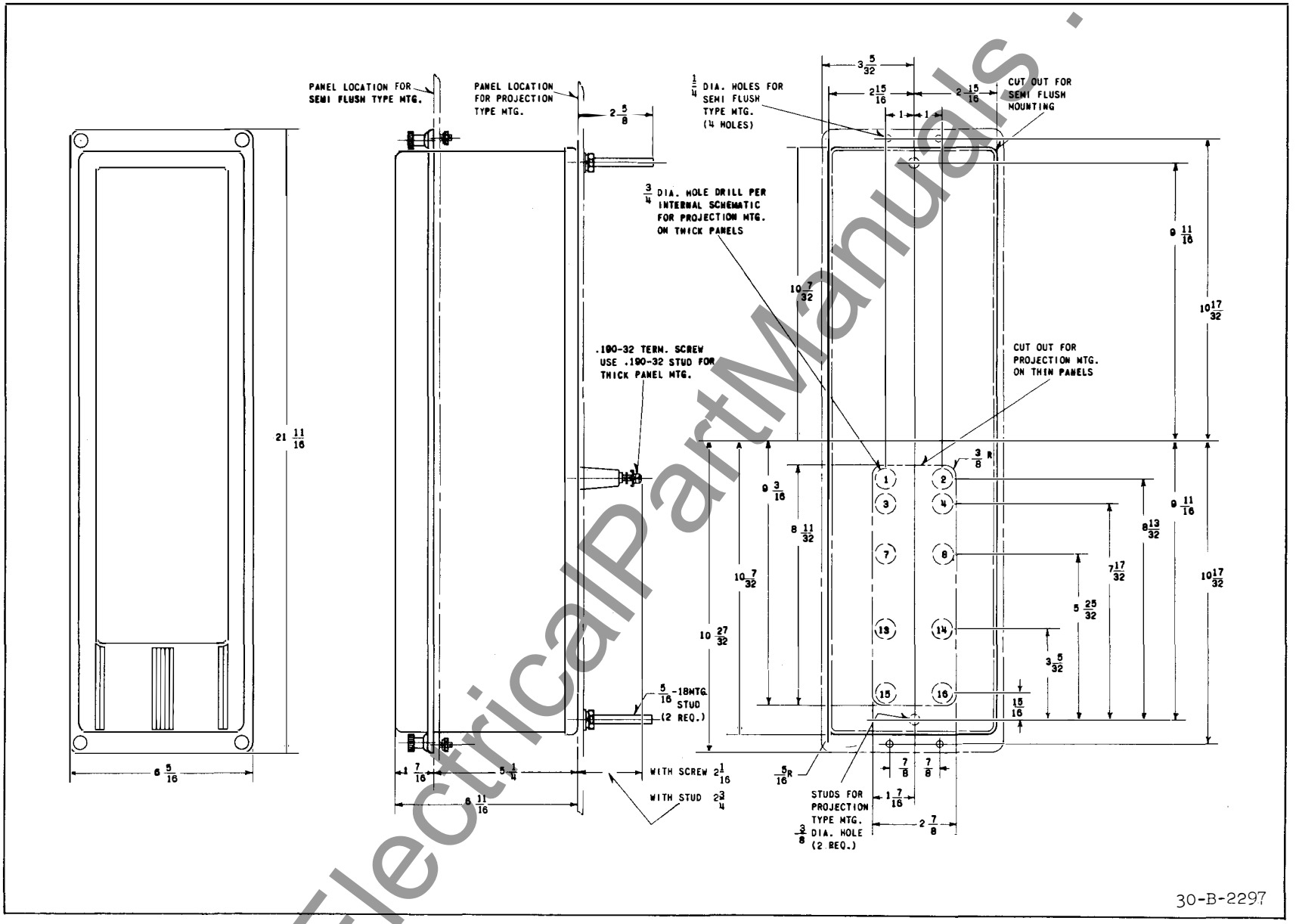

Fig. 4—Outline Dimensions And Drilling Plans For The IR-2 Receiver. For Reference Only.

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 connect through 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 molded blocks. These letters can be seen when the chassis is removed from the case.

The potential and control circuits through 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 jaw 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 given under "Calibration and Adjustments" should be followed.

ELECTRICAL REQUIREMENTS

The power consumption will be 15 watts at 40% power factor from a 120 volt, 60 cps., control circuit across terminals 3 and 4. The receiver input from the telemetering channel across terminals 1 and 2 is 25 volts RMS and 15 to 35 CPS. The receiver will operate over a wide range of input signal strength, from 15 to 65 volts RMS, but it is recommended that the signal be kept near 25 volts. The approximate impedance of the input circuit is 30,000 ohms.

If the receiver is to be operated from keyed direct current, the battery supply should be 24 volts.

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.

WESTINGHOUSE ELECTRIC CORPORATION
METER DIVISION • NEWARK, N.J.
Printed in U. S. A.