INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TC VOICE ADAPTER
Style 899C673G02

CAUTION: It is recommended that the user of this equipment become thoroughly familiar with the information in this instruction leaflet before energizing the carrier assembly. Failure to observe this precaution may result in damage to the equipment.

APPLICATION

The type TC Voice Adapter is used to provide a voice channel between type TC power-line carrier sets at different locations. Push-to-talk operation is provided using a handset which can be plugged into a jack on the voice adapter, or a remote located jack which is wired to the voice adapter.

CHARACTERISTICS

When using the voice adapter for transmitting, the TC carrier transmitter operates at a reduced power output level than is used for relaying operation. This level is adjustable by a control marked CARRIER on the voice adapter. This adjustment should be set so that the carrier output level for voice transmission is – 6db below the relaying output level.

The voice adapter is designed to provide sufficient amplitude modulation of carrier. A modulation level control, marked MODULATION, is provided and should be set so that overmodulation does not occur.

The received audio signal level is adjustable, by a volume control located above the handset jack.

The voice adapter is designed to operate with a 3-wire handset with specifications as follows:

Style	Type	Transmitter	Receiver
203C206H01	Noise-Canceling	Carbon	Magnetic - 150Ω
203C206G01	Non/Noise Canceling	Carbon	Magnetic - 150Ω

For handset wiring diagram see Fig. 6.

Power Requirements

Voltage	45V.D.C.
Current Drain	
Transmit	70ma.
Receive	25ma.

CONSTRUCTION

The unit is mounted in a gray lacqured steel chassis which forms a box consisting of a cover and frame. The cover has two holes drilled in it for access to the carrier level and modulation level controls. The voice adapter components are mounted on a pair of double-decked printed circuit boards. The lower board is mounted to the case on four insulated posts. The jack block assembly and the 12-pin connector are mounted, beneath the lower board, on the case. The top board contains the adjustable resistors used for carrier and modulation level controls. The receiver volume control is mounted on the lower board. This control is operated using a knob which is projected through the cover and located above the handset jack. Drilled flanges on both sides of the voice adapter are provided to secure the voice adapter to the TC carrier set. See Fig. 1 for outline dimensions.

ACCESSORIES

1) Handsets

   Style 203C206H01 – noise canceling microphone

   Style 203C206G01 – non/noise canceling microphone

2) Remote telephone jack style 715B674G01

   When it is desired to have a telephone handset jack mounted in a remote location from the TC carrier set, as in switchboard applications, the above telephone jack may be used. See Fig. 2 for mounting details.

3) Remote telephone hookswitch - handset assembly

   a) For Wall mounting

      Style 205C162G03 – with noise canceling handset

Style 205C162G04 – with non/noise canceling handset

b) For panel mounting

Style 204C845G03 – with noise canceling handset

Style 204C845G04 – with non/noise canceling handset

When it is desired to have a telephone handset permanently mounted at a remote location, i.e., switchboard or side of desk, any of the above hookswitch – handset assemblies may be used. See Figs. 3, 4, and 5 for mounting dimensions and wiring details.

OPERATION

The Voice Adapter circuitry consists of three common emitter transistor stages performing as an r-f amplifier, detector and audio amplifier.

The r-f input signal, coming from the voice coil winding of FL-201 in the TC carrier Set is present at pin 1 on the voice adapter circuit board. From there it is fed through volume control R1, R2 and C2 to the base of Q1. Q1 amplifies the modulated carrier signal which is then applied through T1 to drive the detector stage Q2. Q2 is biased to operate as a power detector, whereby its output signal (junction of R9 and C6) is rectified and amplified. C5 filters out the carrier frequency and the remaining audio signal is fed through C6 and contact K1-A to Q3 which serves as an audio amplifier to drive the telephone handset receiver. The output of Q3 is transformer coupled through T2 to the handset receiver. There is no automatic volume control in this receiver circuitry. Therefore, it is necessary to adjust the input control R1 for a comfortable listening level while receiving.

The audio output stage Q-3 serves two functions. It is the output stage for the receiver section as previously explained and it also serves as the modulating amplifier when transmitting. Pressing the pushbutton on the telephone handset energizes relay K-1 and also closes the circuit which provides microphone current. The microphone speech output is applied through C14 to the modulation level control R25. Then it is coupled through C7 to the base of Q3 when relay K-1 is energized. Contact K-1A is switched to select the speech input signal at capacitor C-7 and opens the receiver circuit from capacitor C-6. Transistor Q-3 again serves as an amplifier and its output is applied to the TC Transmitter modulator circuitry. T2 serves to couple the signal at the proper impedance level required by the modulator circuitry. Contact K1-B closes the circuit to the modulator to permit modulation of carrier when the handset pushbutton is pressed.

The handset receiver is, at all times, connected to the center-tapped secondary of T2. This means that someone operating the voice adapter should hear their own voice while they are transmitting, and hear the person with whom they are communicating, while receiving. RF input control R1 should be adjusted for a comfortable listening level when receiving.

The carrier transmitter must be unblocked before it is possible to transmit the modulated carrier signal. This is accomplished by applying carrier start current to the transmitter through the Voice Adapter. Energizing relay K-1 in the adapter closes contact K-1D which supplies carrier start current to the TC transmitter. By adjusting this current, using R20, the proper reduced carrier level for voice communication can be obtained. If a relaying operation occurs during voice transmission the relaying carrier start voltage applied to the TC carrier set will cause the carrier output power to increase to its normal level. This carrier start voltage will also be present at circuit board term. 4 of the voice adapter and will cause current to flow through R23 and D1 which will reverse bias Q3 and prevent modulation of carrier during the relay operation. Under these conditions Q3 would cut off rapidly and the magnetic field built up in T2 will collapse causing a large transient voltage to be present it its windings. To prevent this transient voltage from affecting the operation of the carrier set during the relay operation, diode D4 is connected directly across the primary winding of T2 to short out this transient voltage.

When used with supervisory equipment, audio block is performed through supervisory preference contacts. The jumper normally connecting terminals 4 and 17 on the TC transmitter-receiver is removed and in its place is connected these contacts. These contacts open, removing the pos. DC supplied to the adapter unit when a supervisory function is initiated. Voice communication is interrupted when this occurs.

INSTALLATION

Connections for Relaying Channels

The adapter will perform satisfactorily with any of the relaying systems used to key the TC transmitter-

receiver unit. No internal wiring modifications are necessary in the adapter.

Pushing the button on the telephone unblocks the local transmitter which will result in an alarm signal at the remote terminal. This alarm will continue to ring until the operator at the receiving terminal inserts his telephone handset into J1 or the transmitter telephone pushbutton is released. The two stations are then ready to carry on a conversation. Because of the reduced RF output of the transmitter when unblocked by the adapter, it may, in some cases be necessary to use the carrier test button for ringing.

With the Voice Adapter plugged into the relaying equipment on a permanent basis and a remote handset jack or hookswitch assembly is used, it is best to wire the alarm cut-off contact of the remote jack assembly in series with the alarm relay contact. With these connections the alarm relay will operate whenever a signal is received but the circuit to the alarm device will be broken when the handset is inserted into the remote jack, or lifted off the hookswitch.

Preference for Supervisory Channels

Supervisory preference may be obtained by removing the jumper which connects terminals 4 and 17 on the TC transmitter-receiver unit, and connecting in its place the supervisory preference contacts.

Telephone Usage

A telephone jack is provided as an integral part of the adapter to accommodate a Westinghouse handset. This telephone is auxiliary and is not an integral part of the unit. It employs a push-to-talk button which must be pushed when transmitting and released when receiving. If the telephone has a noise canceling microphone, it is necessary to speak directly into the microphone. Talking over, or under the mouthpiece will result in severe attenuation of the speech signal. Optimum results can be achieved only by speaking direclty into the telephone. See Figure 10.

Settings and Adjustments

The rf input control R1 should be adjusted for a comfortable level when receiving voice transmission. Clockwise rotation will increase volume.

Carrier level control R20 should be set so that the carrier output power level of the TC set is 6 db below the normal relaying output level, when the handset pushbutton is pressed. For the procedure of making this measurement please refer in the TC Carrier Set instructions I.L. 41-944.31 to the section titled adjustments.

Modulation level control R25 should be adjusted after the carrier level control has been set as follows:

With an oscilloscope connected across the transmitter output terminals on the TC set, press handset pushbutton, speak directly into microphone and adjust oscilloscope to view modulation of carrier. The modulation level should now be adjusted at R25 so that over-modulation (cutting off of carrier) will only occur on loud peaks of voice power. Bright lines along the center (zero line) of the oscilloscope trace indicate over-modulation.

MAINTENANCE

General

Voltage and resistance values should be recorded in order to establish reference values which will be useful when checking the apparatus. In cases where a single adapter unit is used, with more than one set of relaying equipment, the voltage readings may vary depending upon the characteristics of the relaying unit.

Typical resistance measurements are recorded in Table 1. Do not plug the unit into the transmitter-receiver when making these measurements.

Typical dc voltage measurements are recorded in Table 2. The adapter unit is plugged into a TC Set and telephone handset into the adapter. The cover of the adapter must be removed in order to make these measurements.

Removal of Printed Circuit Boards

1. Loosen the screw securing the shaft support plate and allow the plate to swing clear.
2. Remove the 4 self-tapping screws holding the cover.
3. Lift cover off.
4. To remove top board, remove the 4 screws that hold top board to mounting posts on lower board.
5. Similarly to remove lower board (with or without top board mounted), remove 4 screws holding lower board to mounting posts on the case.

Assembly of Printed-Circuit Boards

For complete reassembly, reverse the steps described in the removal procedure.

TABLE 1
RESISTANCE MEASUREMENTS *

TEST POINT P105 Term. #	RESISTANCE (Ohms)
1	2.5K
2	Open
3	Open
4	13K
5	Open
6	Open
7	0
8	5.8K
9	Open
10	17
11	4.7K
12	Open
TP-1	4.7K
TP-2	3.7K

*These measurements are taken with respect to the DC negative terminal P105-7 or terminal number 6 on the circuit board. In all cases the negative lead of the ohmmeter was connected to this point. The voice adapter is removed from the TC carrier set and the telephone handset is not plugged in. All controls are set to maximum CW position.

TABLE 2
TYPICAL D.C. VOLTAGE MEASUREMENTS*

These measurements were taken under the following conditions:

1. Receive: Handset plugged in but pushbutton not pressed.
2. Transmit: Handset plugged in with pushbutton pressed.
3. Unblock: Handset plugged in with pushbutton pressed and TC Transmitter operating at full power.

Note: All measurements are taken with respect to d.c. negative (circuit board terminal no. 6).

Test Point	D.C. Voltage (Volts)		
Ckt. Bd. Term No.	Condition		
	(1)	(2)	(3)
1	0	1	0
2	.5	.52	.56
3	45	1.5(varies)	1.5(varies)
4(R20 max.cw)	0	14	20
4(R20 max.ccw)	0	7	20
5	0	0	0
7	0	0	0
8	45	45	45
TP-1	14.8	14.8	16.1
TP-2	15.5	15.5	15.5
Q1-Emitter	13	12.6	12.6
Q1-Base	12.2	12.2	12.2
Q1-Collector	0	0	0
Q2-Emitter	14.8	12.4	12.4
Q2-Base	14.2	14.1	14.1
Q2-Collector	.36	1.75	1.75
Q3-Emitter	15.4	15.3	15.5
Q3-Base	14.8	14.7	16.1
Q3-Collector	3.7	3.7	0

*Please note: These voltage measurements are typical and may vary for each unit.

ELECTRICAL PARTS LIST

SYMBOL	DESCRIPTION	STYLE
C1	.25 mf ±20% 200V.D.C. Paper	187A624H02
C2	.1 mf ±20% 200V.D.C. Paper	187A624H01
C3	.25 mf ±20% 200V.D.C. Paper	187A624H02
C4	12 mf ±10% 25V.D.C. Tantalum	862A530H05
C5	.1 mf ±20% 200V.D.C. Paper	187A624H01
C6	12 mf ±10% 35V.D.C. Tantalum	862A530H05
C7	.01 mf ±10% 200V.D.C. Paper	764A278H10
C9	.01 mf ±10% 200V.D.C. Paper	764A278H10
C10	22 mf ±10% 35V.D.C. Tantalum	184A661H16
C11	47 mf ±10% 50V.D.C. Tantalum	863A530H01
C12	22 mf ±10% 35V.D.C. Tantalum	184A661H16
C14	1.0 mf ±20% 200V.D.C. Paper	187A624H04
R1	2.5K ±30% ¼W Pot	330C598H01
R2	1K ±5% ½W	184A763H27
R3	3.9K ±5% ½W	184A763H41
R4	1K ±5% ½W	184A763H27
R5	2.2K ±10% ½W	187A641H35
R6	39K ±5% ½W	184A763H65
R7	3.3K ±5% ½W	184A763H39
R8	2.2K ±10% ½W	187A641H35
R9	270 ohms ±5% ½W	184A763H13
R10	1K ±5% ½W	184A763H27
R11	20K ±5% ½W	184A763H58
R12	560 ohms ±2% ½W	629A531H26
R15	680 ohms ±2% ½W	629A531H28
R16	1K ±5% 5W	763A129H07
R18	6.8K ±5% ½W	184A763H47
R20	10K ±20% ¼W Pot.	629A430H10
R21	470 ohms ±10% ½W	187A641H19
R23	2.4K ±5% ½W	184A763H36
R25	1K ±20% ¼W Pot.	629A430H11
R26	33 ohms ±10% ½W	187A640H13
R27	1K Thermistor	182A879H01
Q1, Q2, Q3	2N4356	849A441H02
T1	10K/400 ohms	714B666G01
T2	25K/600 ohms C.T.	879A875H01
D1, D3, D4	1N457A	184A855H07
Z2	1N3024B 15V ±5%	188A302H16
Z3	1N965B 15V ±5%	186A797H08
K1	48V 1K Coil Relay	330C588H01
P1	12-Connector Plug	187A671H01
J1	Jack Block Assembly	861A790G03

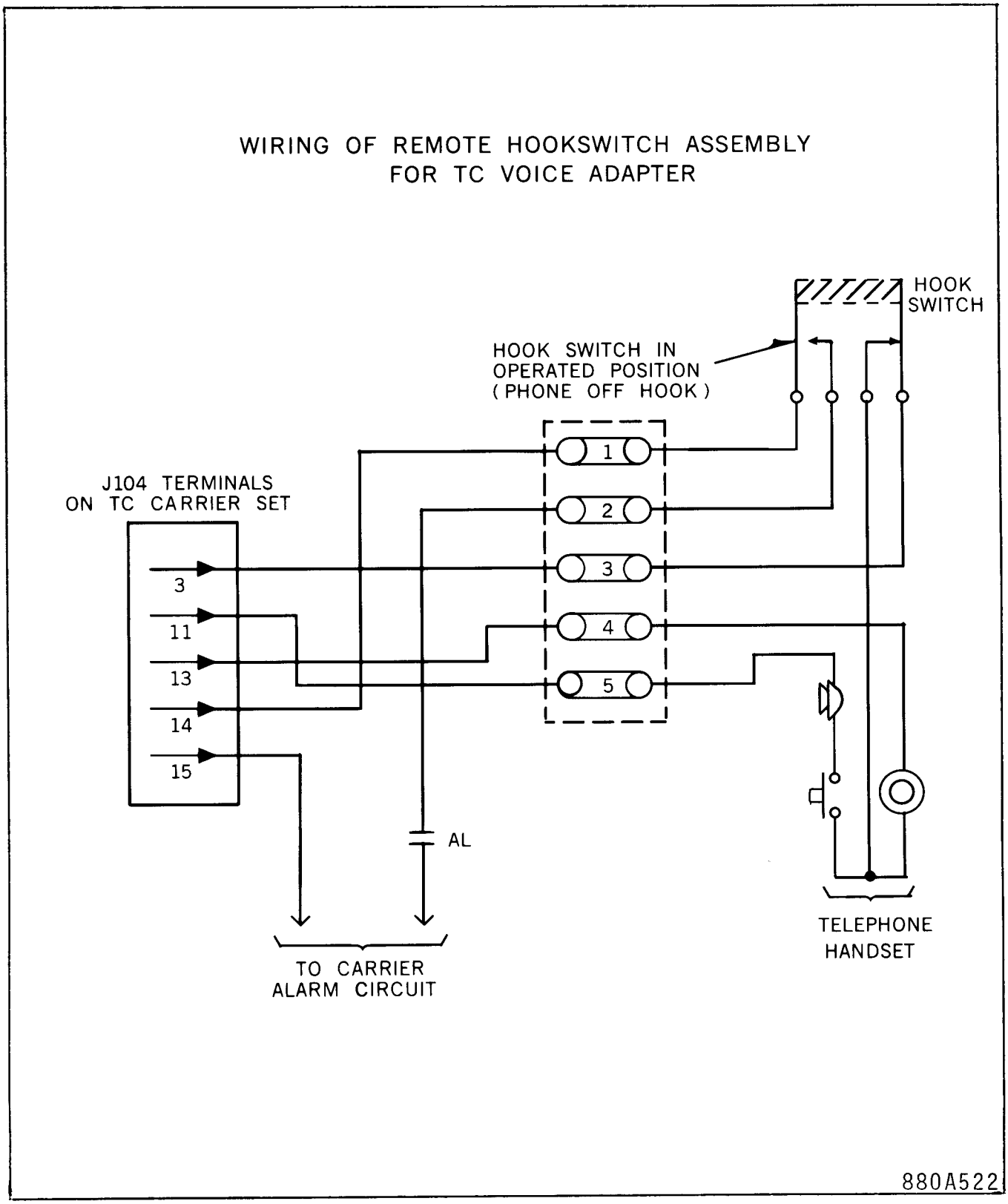


Fig. 5 Telephone hookswitch Assembly Internal Schematic are Wiring.

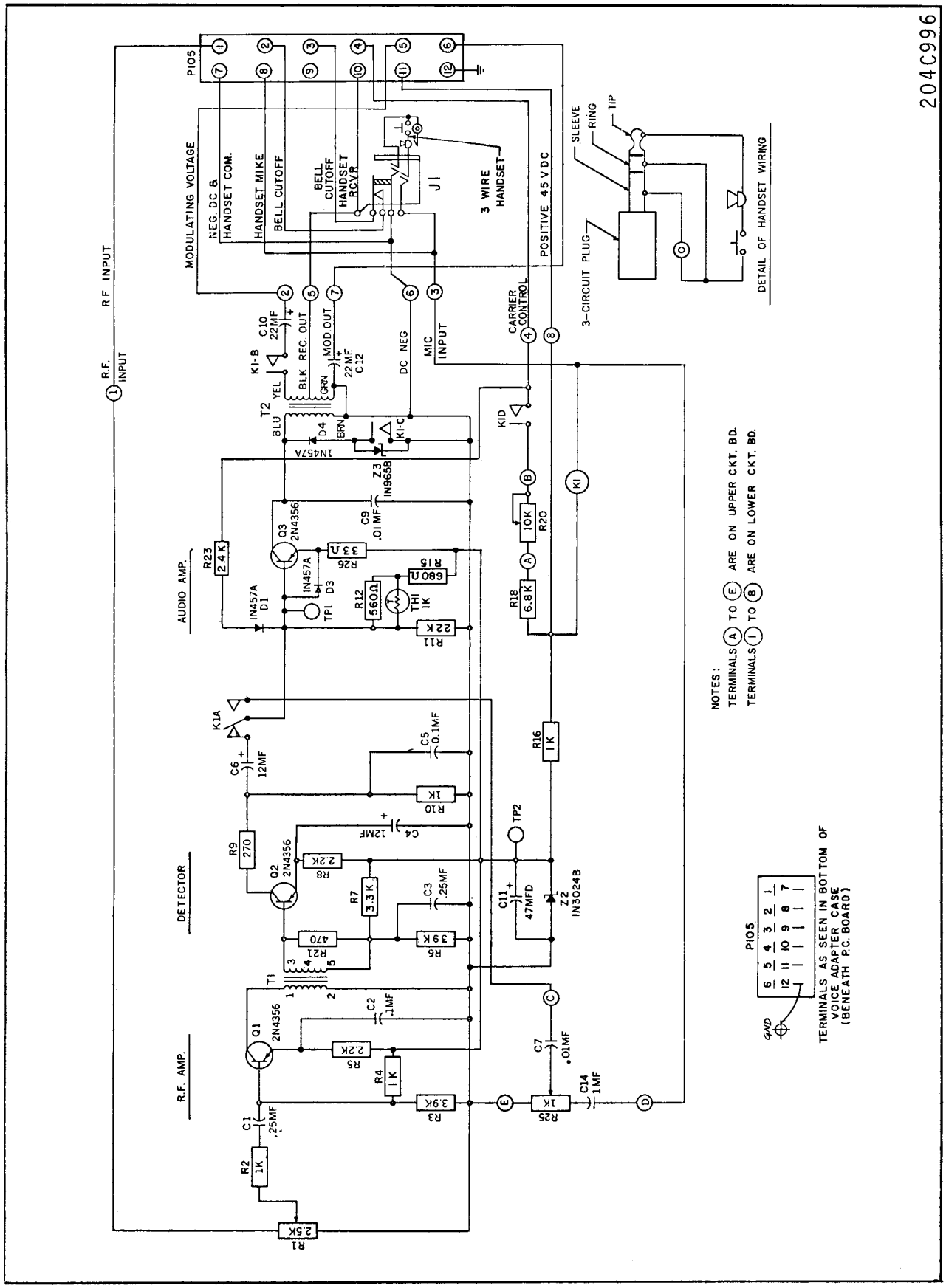


Fig. 6 Voice Adapter Internal Schematic

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TC VOICE ADAPTER
Style 899C673G02

CAUTION: It is recommended that the user of this equipment become thoroughly familiar with the information in this instruction leaflet before energizing the carrier assembly. Failure to observe this precaution may result in damage to the equipment.

APPLICATION

The type TC Voice Adapter is used to provide a voice channel between type TC power-line carrier sets at different locations. Push-to-talk operation is provided using a handset which can be plugged into a jack on the voice adapter, or a remote located jack which is wired to the voice adapter.

CHARACTERISTICS

When using the voice adapter for transmitting, the TC carrier transmitter operates at a reduced power output level than is used for relaying operation. This level is adjustable by a control marked CARRIER on the voice adapter. This adjustment should be set so that the carrier output level for voice transmission is – 6db below the relaying output level.

The voice adapter is designed to provide sufficient amplitude modulation of carrier. A modulation level control, marked MODULATION, is provided and should be set so that overmodulation does not occur.

The received audio signal level is adjustable, by a volume control located above the handset jack.

The voice adapter is designed to operate with a 3-wire handset with specifications as follows:

Style	Type	Transmitter	Receiver
203C206H01	Noise-Canceling	Carbon	Magnetic - 150Ω
203C206G01	Non/Noise Canceling	Carbon	Magnetic - 150Ω

For handset wiring diagram see Fig. 6.

Power Requirements

Voltage	45V.D.C.
Current Drain	
Transmit	70ma.
Receive	25ma.

CONSTRUCTION

The unit is mounted in a gray lacqured steel chassis which forms a box consisting of a cover and frame. The cover has two holes drilled in it for access to the carrier level and modulation level controls. The voice adapter components are mounted on a pair of double-decked printed circuit boards. The lower board is mounted to the case on four insulated posts. The jack block assembly and the 12-pin connector are mounted, beneath the lower board, on the case. The top board contains the adjustable resistors used for carrier and modulation level controls. The receiver volume control is mounted on the lower board. This control is operated using a knob which is projected through the cover and located above the handset jack. Drilled flanges on both sides of the voice adapter are provided to secure the voice adapter to the TC carrier set. See Fig. 1 for outline dimensions.

ACCESSORIES

1) Handsets

   Style 203C206H01 – noise canceling microphone

   Style 203C206G01 – non/noise canceling microphone

2) Remote telephone jack style 715B674G01

   When it is desired to have a telephone handset jack mounted in a remote location from the TC carrier set, as in switchboard applications, the above telephone jack may be used. See Fig. 2 and 6 for mounting and wiring details.

3) Remote telephone hookswitch - handset assembly

   a) For Wall mounting

      Style 205C162G01 – with noise canceling handset

Style 205C162G02 – with non/noise canceling handset

b) For panel mounting

Style 204C845G03 – with noise canceling handset

Style 204C845G04 – with non/noise canceling handset

When it is desired to have a telephone handset permanently mounted at a remote location, i.e., switchboard or side of desk, any of the above hookswitch – handset assemblies may be used. See Figs. 3, 4, and 5 for mounting dimensions and wiring details.

OPERATION

The Voice Adapter circuitry consists of three common emitter transistor stages performing as an r-f amplifier, detector and audio amplifier.

The r-f input signal, coming from the voice coil winding of FL-201 in the TC carrier Set is present at pin 1 on the voice adapter circuit board. From there it is fed through volume control R1, R2 and C2 to the base of Q1. Q1 amplifies the modulated carrier signal which is then applied through T1 to drive the detector stage Q2. Q2 is biased to operate as a power detector, whereby its output signal (junction of R9 and C6) is rectified and amplified. C5 filters out the carrier frequency and the remaining audio signal is fed through C6 and contact K1-A to Q3 which serves as an audio amplifier to drive the telephone handset receiver. The output of Q3 is transformer coupled through T2 to the handset receiver. There is no automatic volume control in this receiver circuitry. Therefore, it is necessary to adjust the input control R1 for a comfortable listening level while receiving.

The audio output stage Q-3 serves two functions. It is the output stage for the receiver section previously explained and it also serves as the modulating amplifier when transmitting. Pressing the pushbutton on the telephone handset energizes relay K-1 and also closes the circuit which provides microphone current. The microphone output is applied through C14 to the modulation level control R25. Then it is coupled through C7 to the base of Q3 when relay K-1 is energized. Contact K-1A is switched to select the speech input signal at capacitor C-7 and opens the receiver circuit from capacitor C-6. Transistor Q-3 again serves as an amplifier and its output is applied to the TC Transmitter modulator circuitry. T2 serves to couple the signal at the proper impedance level required by the modulator circuitry. Contact K1-B closes the circuit to the modulator to permit modulation of carrier when the handset pushbutton is pressed.

The handset receiver is, at all times, connected to the center-tapped secondary of T2. This means that someone operating the voice adapter should hear their own voice while they are transmitting, and hear the person with whom they are communicating, while receiving. RF input control R1 should be adjusted for a comfortable listening level when receiving.

The carrier transmitter must be unblocked before it is possible to transmit the modulated carrier signal. This is accomplished by applying carrier start current to the transmitter through the Voice Adapter. Energizing relay K-1 in the adapter closes contact K-1D which supplies carrier start current to the TC transmitter. By adjusting this current, using R20, the proper reduced carrier level for voice communication can be obtained. If a relaying operation occurs during voice transmission the relaying carrier start voltage applied to the TC carrier set will cause the carrier output power to increase to its normal level. This carrier start voltage will also be present at circuit board term. 4 of the voice adapter and will cause current to flow through R23 and D1 which will reverse bias Q3 and prevent modulation of carrier during the relay operation. Under these conditions Q3 would cut off rapidly and the magnetic field built up in T2 will collapse causing a large transient voltage to be present it its windings. To prevent this transient voltage from affecting the operation of the carrier set during the relay operation, diode D4 is connected directly across the primary winding of T2 to short out this transient voltage.

When used with supervisory equipment, audio block is performed through supervisory preference contacts. The jumper normally connecting terminals 4 and 17 on the transmitter-receiver is removed and in its place is connected these contacts. These contacts open, removing the pos. DC supplied to the adapter unit when a supervisory function is initiated. Voice communication is interrupted when this occurs.

INSTALLATION

Connections for Relaying Channels

The adapter will perform satisfactorily with any of the relaying systems used to key the TC transmitter-

receiver unit. No internal wiring modifications are necessary in the adapter.

Pushing the button on the telephone unblocks the local transmitter which will result in an alarm signal at the remote terminal. This alarm will continue to ring until the operator at the receiving terminal inserts his telephone handset into J1 or the transmitter telephone pushbutton is released. The two stations are then ready to carry on a conversation. Because of the reduced RF output of the transmitter when unblocked by the adapter, it may, in some cases be necessary to use the carrier test button for ringing.

With the Voice Adapter plugged into the relaying equipment on a permanent basis and a remote handset jack or hookswitch assembly is used, it is best to wire the alarm cut-off contact of the remote jack assembly in series with the alarm relay contact. With these connections the alarm relay will operate whenever a signal is received but the circuit to the alarm device will be broken when the handset is inserted into the remote jack, or lifted off the hookswitch.

Preference for Supervisory Channels

Supervisory preference may be obtained by removing the jumper which connects terminals 4 and 17 on the TC transmitter-receiver unit, and connecting in its place the supervisory preference contacts.

Telephone Usage

A telephone jack is provided as an integral part of the adapter to accommodate a Westinghouse handset. This telephone is auxiliary and is not an integral part of the unit. It employs a push-to-talk button which must be pushed when transmitting and released when receiving. If the telephone has a noise canceling microphone, it is necessary to speak directly into the microphone. Talking over, or under the mouthpiece will result in severe attenuation of the speech signal. Optimum results can be achieved only by speaking direclty into the telephone. See Figure 10.

Settings and Adjustments

The rf input control R1 should be adjusted for a comfortable level when receiving voice transmission. Clockwise rotation will increase volume.

Carrier level control R20 should be set so that the carrier output power level of the TC set is 6 db below the normal relaying output level, when the handset pushbutton is pressed. For the procedure of making this measurement please refer in the TC Carrier Set instructions I.L. 41-944.31 to the section titled adjustments.

Modulation level control R25 should be adjusted after the carrier level control has been set as follows:

With an oscilloscope connected across the transmitter output terminals on the TC set, press handset pushbutton, speak directly into microphone and adjust oscilloscope to view modulation of carrier. The modulation level should now be adjusted at R25 so that over-modulation (cutting off of carrier) will only occur on loud peaks of voice power. Bright lines along the center (zero line) of the oscilloscope trace indicate over-modulation.

MAINTENANCE

General

Voltage and resistance values should be recorded in order to establish reference values which will be useful when checking the apparatus. In cases where a single adapter unit is used, with more than one set of relaying equipment, the voltage readings may vary depending upon the characteristics of the relaying unit.

Typical resistance measurements are recorded in Table 1. These measurements are referenced to the pins of plug P-105. Do not plug the unit into the transmitter-receiver when making these measurements.

Typical dc voltage measurements are recorded in Table 2. The adapter unit is plugged into a TC Set and telephone handset into the adapter. The cover of the adapter must be removed in order to make these measurements.

Removal of Printed Circuit Boards

1. Loosen the screw securing the shaft support plate and allow the plate to swing clear.
2. Remove the 4 self-tapping screws holding the cover.
3. Lift cover off.
4. To remove top board, remove the 4 screws that hold top board to mounting posts on lower board.
5. Similarly to remove lower board (with or without top board mounted), remove 4 screws holding lower board to mounting posts on the case.

Assembly of Printed-Circuit Boards

For complete reassembly, reverse the steps described in the removal procedure.

TABLE 1
RESISTANCE MEASUREMENTS *

TEST POINT P105 Term. #	RESISTANCE (Ohms)
1	2.5K
2	Open
3	Open
4	13K
5	Open
6	Open
7	0
8	5.8K
9	Open
10	17
11	4.7K
12	Open
TP-1	4.7K
TP-2	3.7K

*These measurements are taken with respect to the DC negative terminal P105-7 or terminal number 6 on the circuit board. In all cases the negative lead of the ohmmeter was connected to this point. The voice adapter is removed from the TC carrier set and the telephone handset is not plugged in. All controls are set to maximum CW position.

TABLE 2
TYPICAL D.C. VOLTAGE MEASUREMENTS*

These measurements were taken under the following conditions:

1. Receive: Handset plugged in but pushbutton not pressed.
2. Transmit: Handset plugged in with pushbutton pressed.
3. Unblock: Handset plugged in with pushbutton pressed and TC Transmitter operating at full power.

Note: All measurements are taken with respect to d.c. negative (circuit board terminal no. 6).

Test Point	D.C. Voltage (Volts)		
Ckt. Bd. Term No.	Condition		
	(1)	(2)	(3)
1	0	1	0
2	.5	.52	.56
3	45	1.5(varies)	1.5(varies)
4(R20 max.cw)	0	14	20
4(R20 max.ccw)	0	7	20
5	0	0	0
7	0	0	0
8	45	45	45
TP-1	14.8	14.8	16.1
TP-2	15.5	15.5	15.5
Q1-Emitter	13	12.6	12.6
Q1-Base	12.2	12.2	12.2
Q1-Collector	0	0	0
Q2-Emitter	14.8	12.4	12.4
Q2-Base	14.2	14.1	14.1
Q2-Collector	.36	1.75	1.75
Q3-Emitter	15.4	15.3	15.5
Q3-Base	14.8	14.7	16.1
Q3-Collector	3.7	3.7	0

*Please note: These voltage measurements are typical and may vary for each unit.

ELECTRICAL PARTS LIST

SYMBOL	DESCRIPTION	STYLE
C1	.25 mf ±20% 200V.D.C. Paper	187A624H02
C2	.1 mf ±20% 200V.D.C. Paper	187A624H01
C3	.25 mf ±20% 200V.D.C. Paper	187A624H02
C4	12 mf ±10% 25V.D.C. Tantalum	862A530H05
C5	.1 mf ±20% 200V.D.C. Paper	187A624H01
C6	12 mf ±10% 35V.D.C. Tantalum	862A530H05
C7	.01 mf ±10% 200V.D.C. Paper	764A278H10
C9	.01 mf ±10% 200V.D.C. Paper	764A278H10
C10	22 mf ±10% 35V.D.C. Tantalum	184A661H16
C11	47 mf ±10% 50V.D.C. Tantalum	863A530H01
C12	22 mf ±10% 35V.D.C. Tantalum	184A661H16
C14	1.0 mf ±20% 200V.D.C. Paper	187A624H04
R1	2.5K ±30% ¼W Pot	330C598H01
R2	1K ±5% ½W	184A763H27
R3	3.9K ±5% ½W	184A763H41
R4	1K ±5% ½W	184A763H27
R5	2.2K ±10% ½W	187A641H35
R6	39K ±5% ½W	184A763H65
R7	3.3K ±5% ½W	184A763H39
R8	2.2K ±10% ½W	187A641H35
R9	270 ohms ±5% ½W	184A763H13
R10	1K ±5% ½W	184A763H27
R11	22K ±10% ½W	187A641H59
R12	560 ohms ±2% ½W	629A531H26
R15	680 ohms ±2% ½W	629A531H28
R16	1K ±5% 5W	763A129H07
R18	6.8K ±5% ½W	184A763H47
R20	10K ±20% ¼W Pot.	629A430H10
R21	470 ohms ±10% ½W	187A641H19
R23	2.4K ±5% ½W	184A763H36
R25	1K ±20% ¼W Pot.	629A430H11
R26	33 ohms ±10% ½W	187A640H13
Q1, Q2, Q3	2N4356	849A441H02
T1	10K/400 ohms	714B666G01
T2	25K/600 ohms C.T.	879A875H01
D1, D3, D4	1N457A	184A855H07
Z2	1N3024B 15V ±5%	188A302H16
Z3	1N965B 15V ±5%	186A797H08
K1	48V 1K Coil Relay	330C588H01
P1	12-Connector Plug	187A671H01
J1	Jack Block Assembly	861A790G03

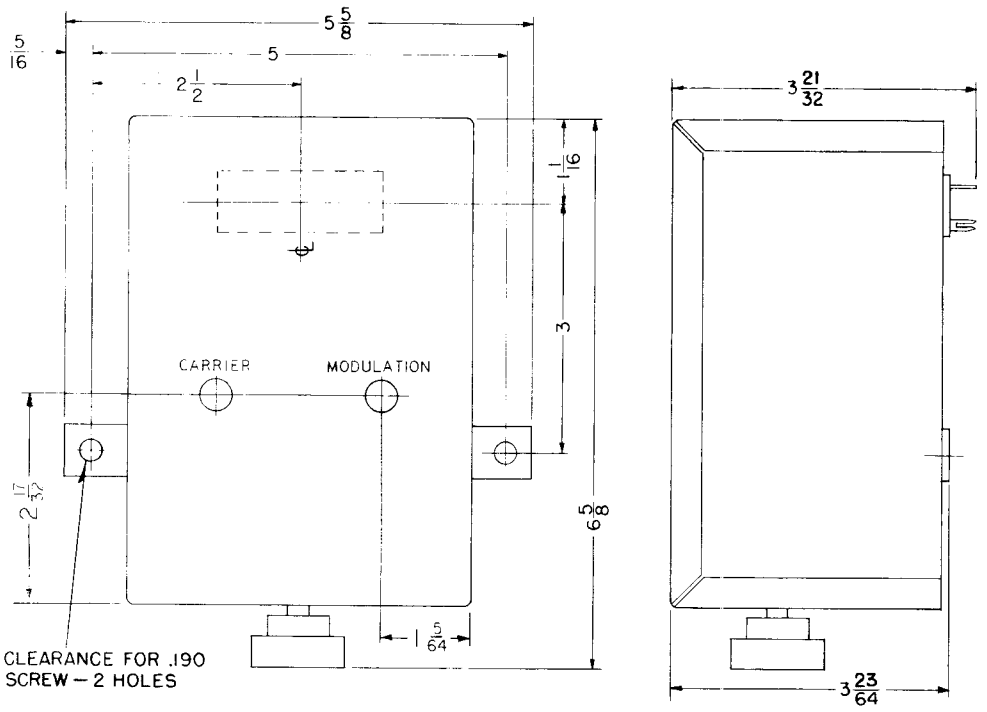


Fig. 1 Voice Adapter Outline Dimensions

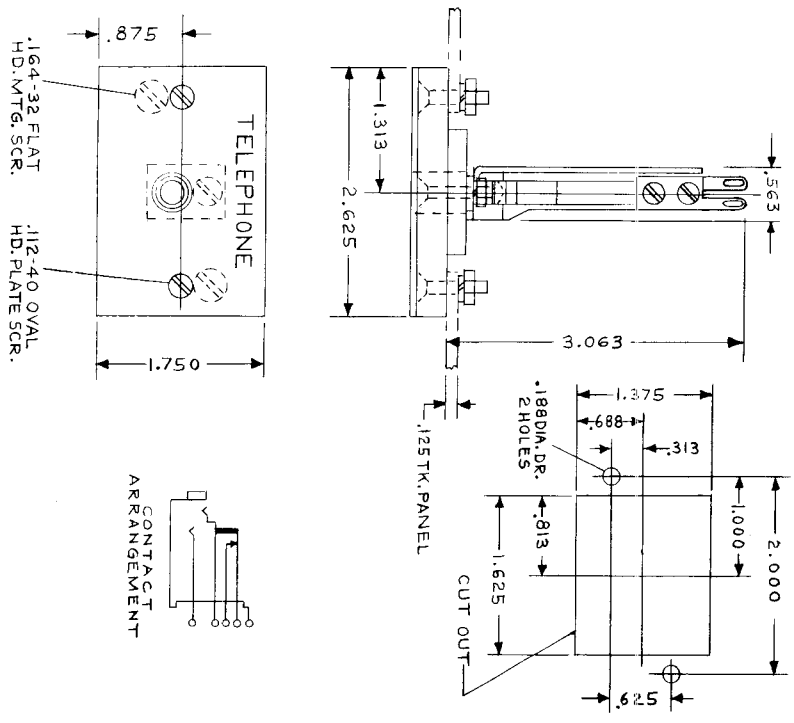


Fig. 2 Remote-Telephone Jack Assembly.

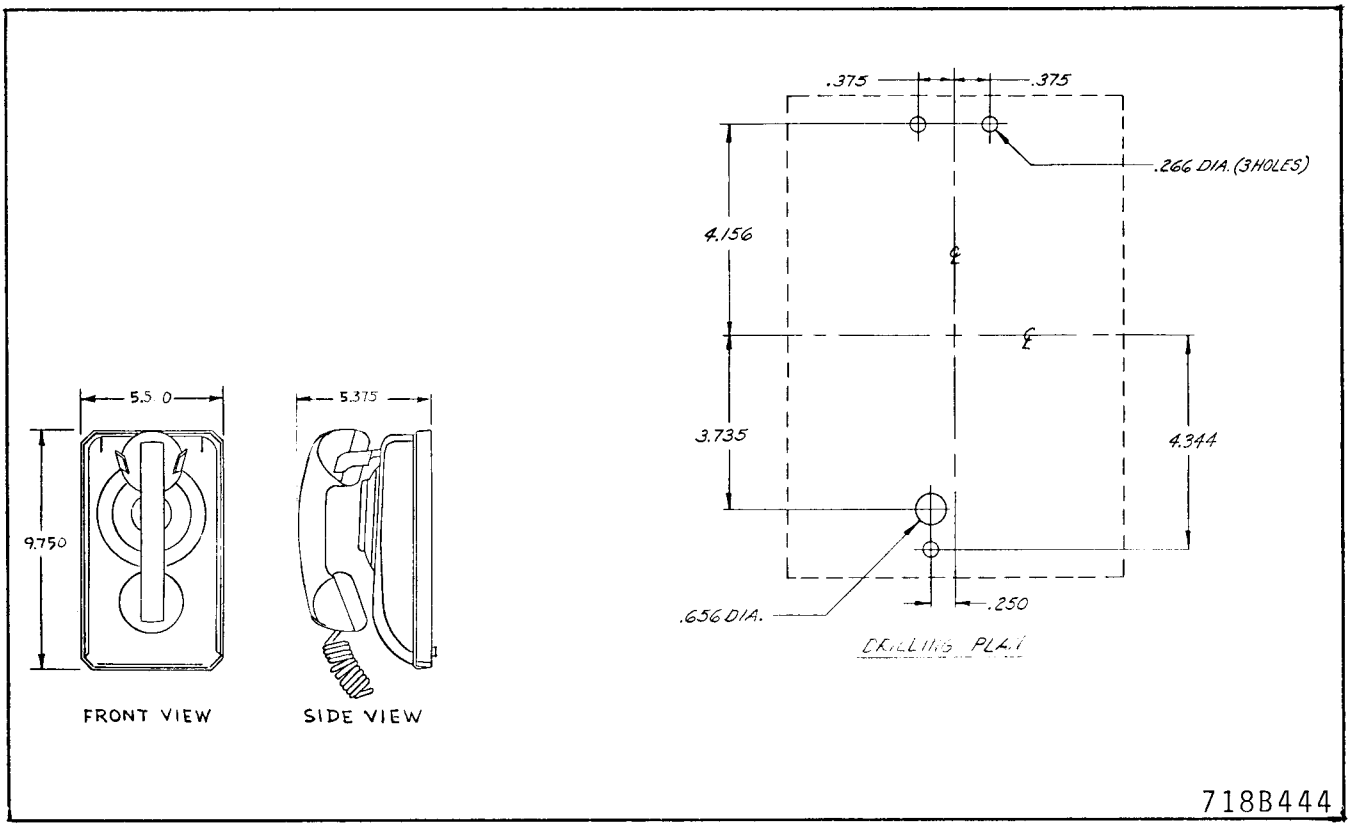


Fig. 3 Outline Dimensions for Wall mounted Hookswitch

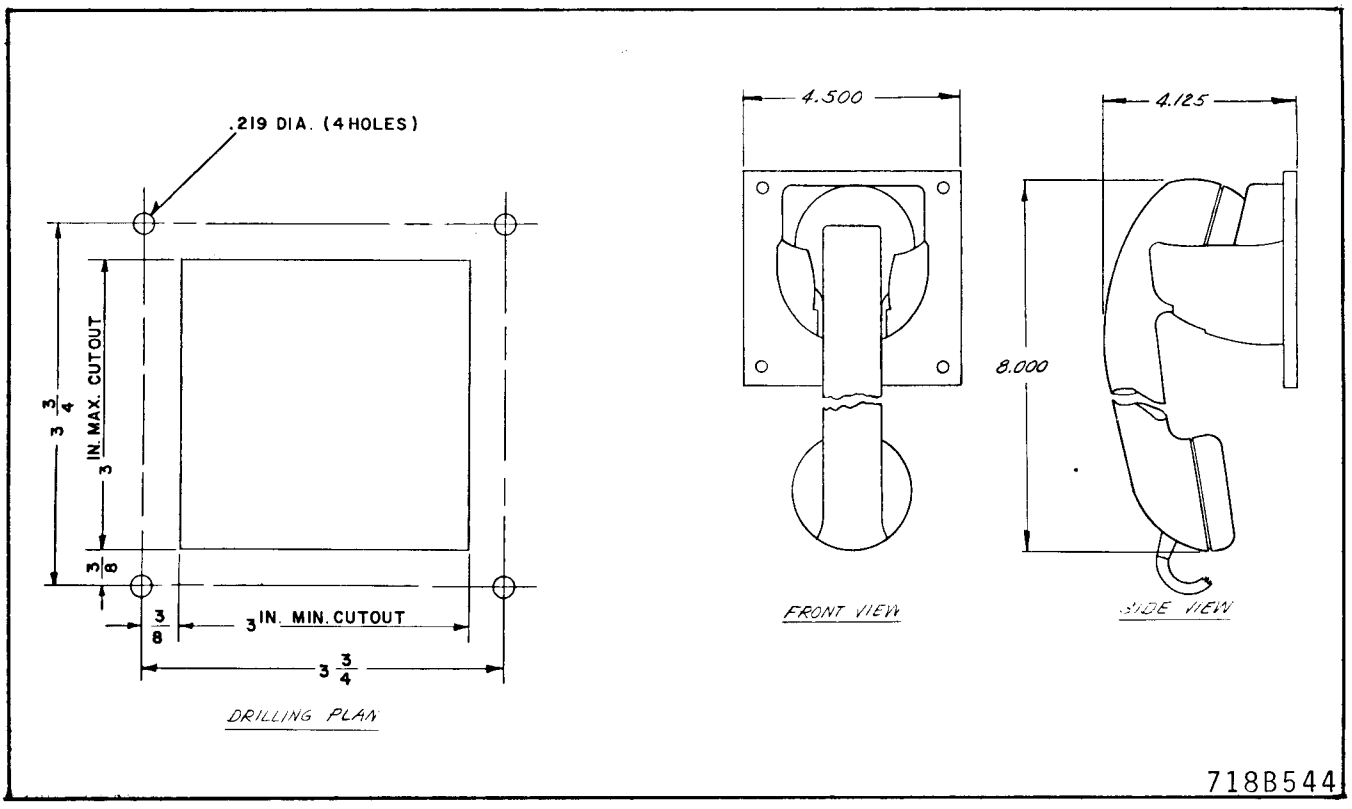


Fig. 4 Outline Dimensions for Panel mounted Hookswitch

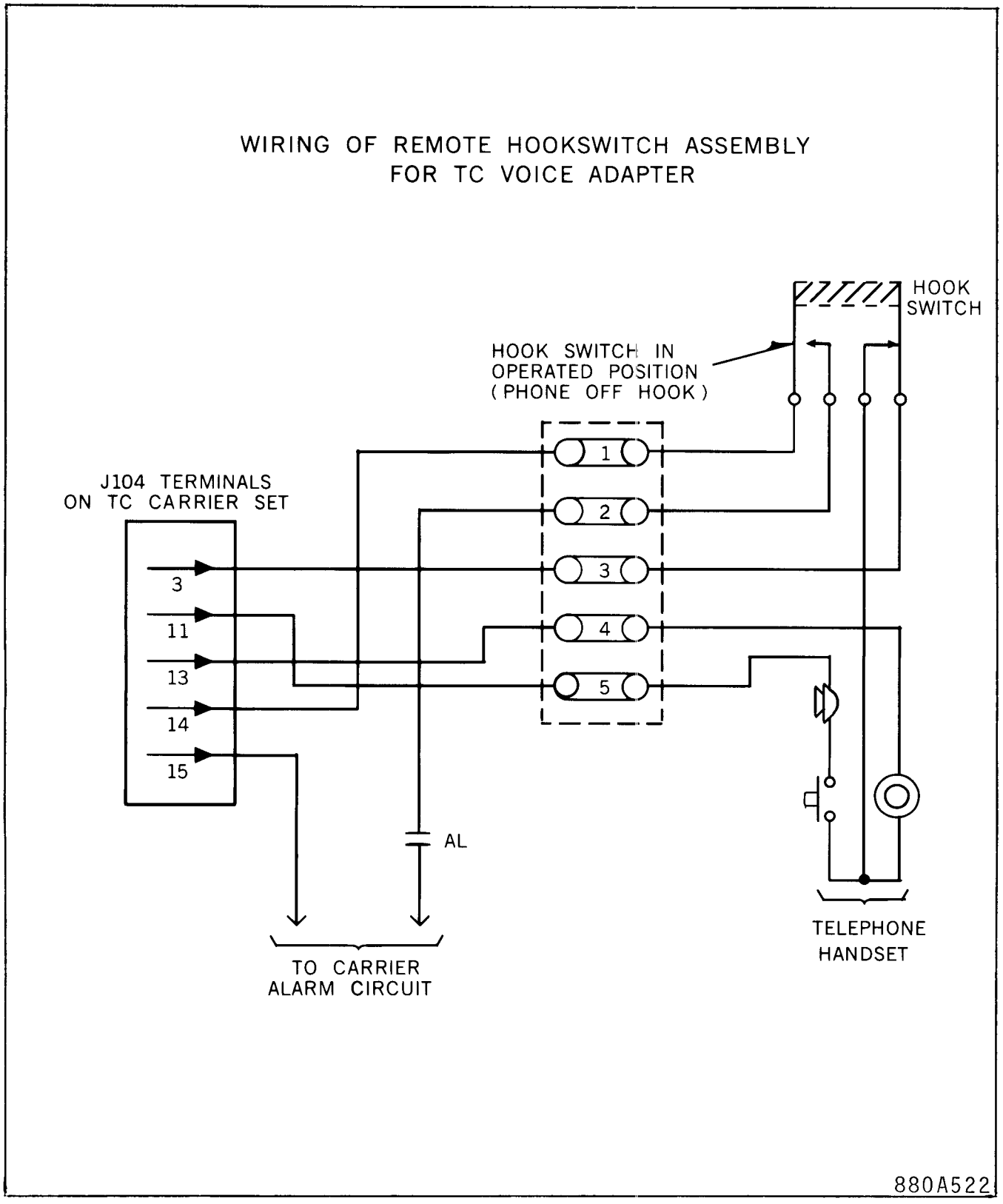


Fig. 5 Telephone hookswitch Assembly Internal Schematic are Wiring.

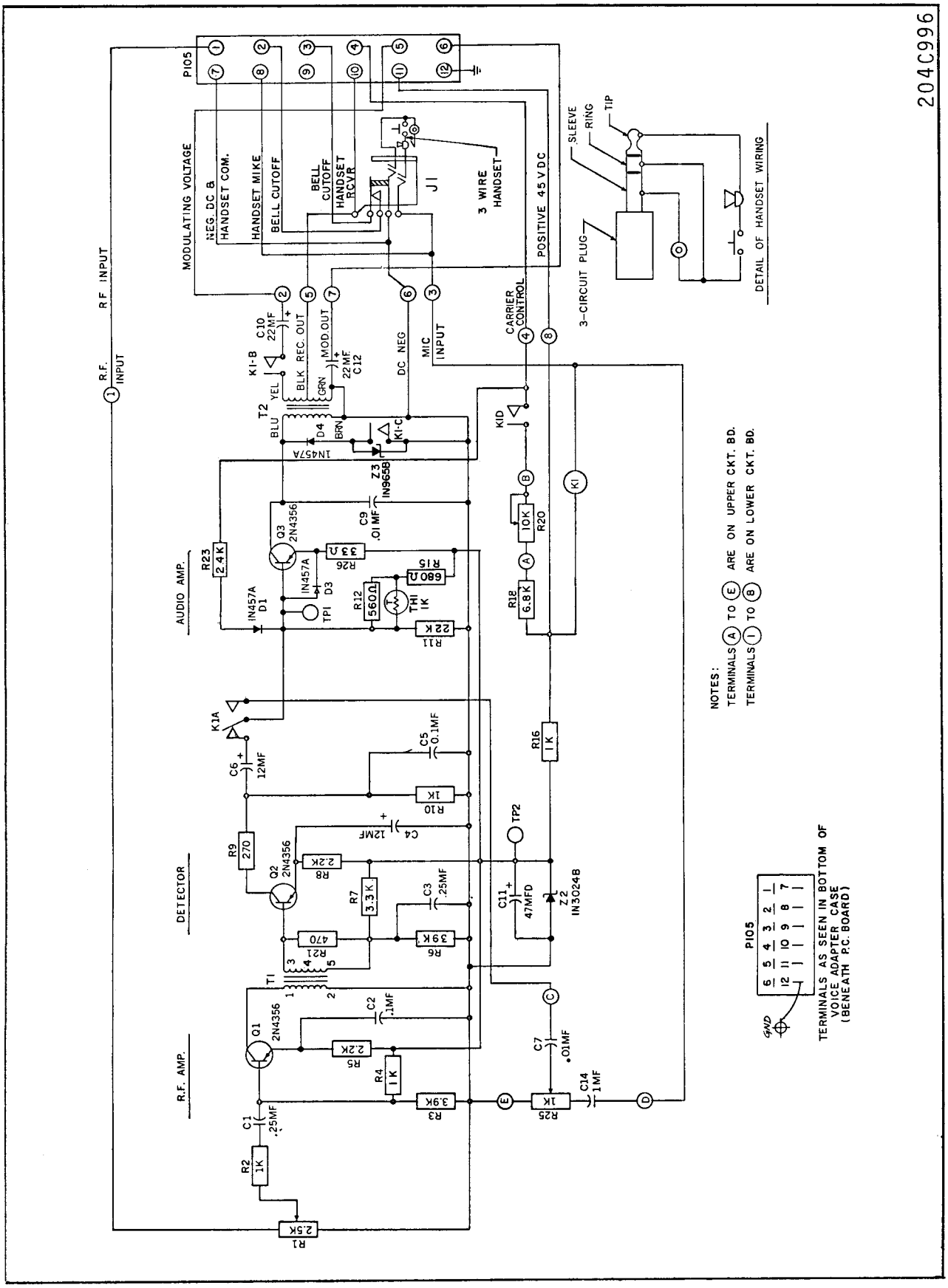


Fig. 6 Voice Adapter Internal Schematic

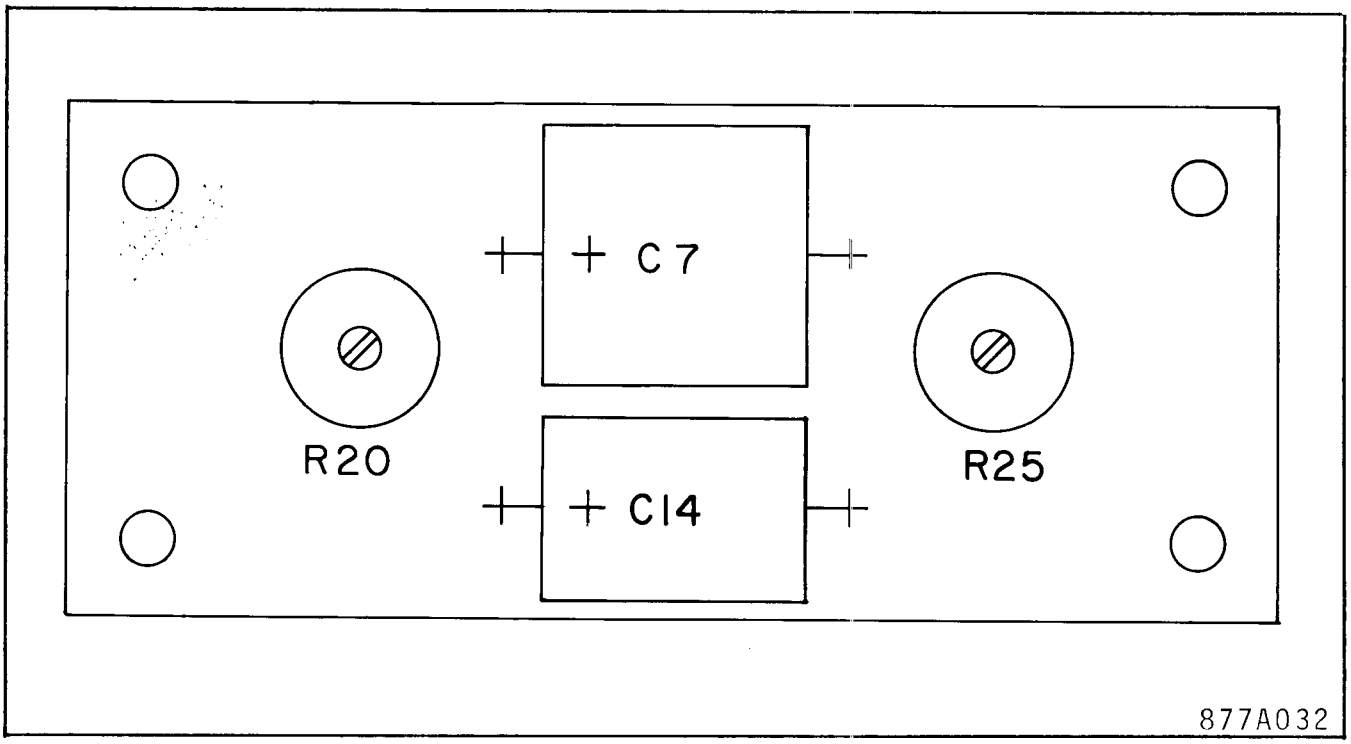


Fig. 7 Component Location (Upper Board)

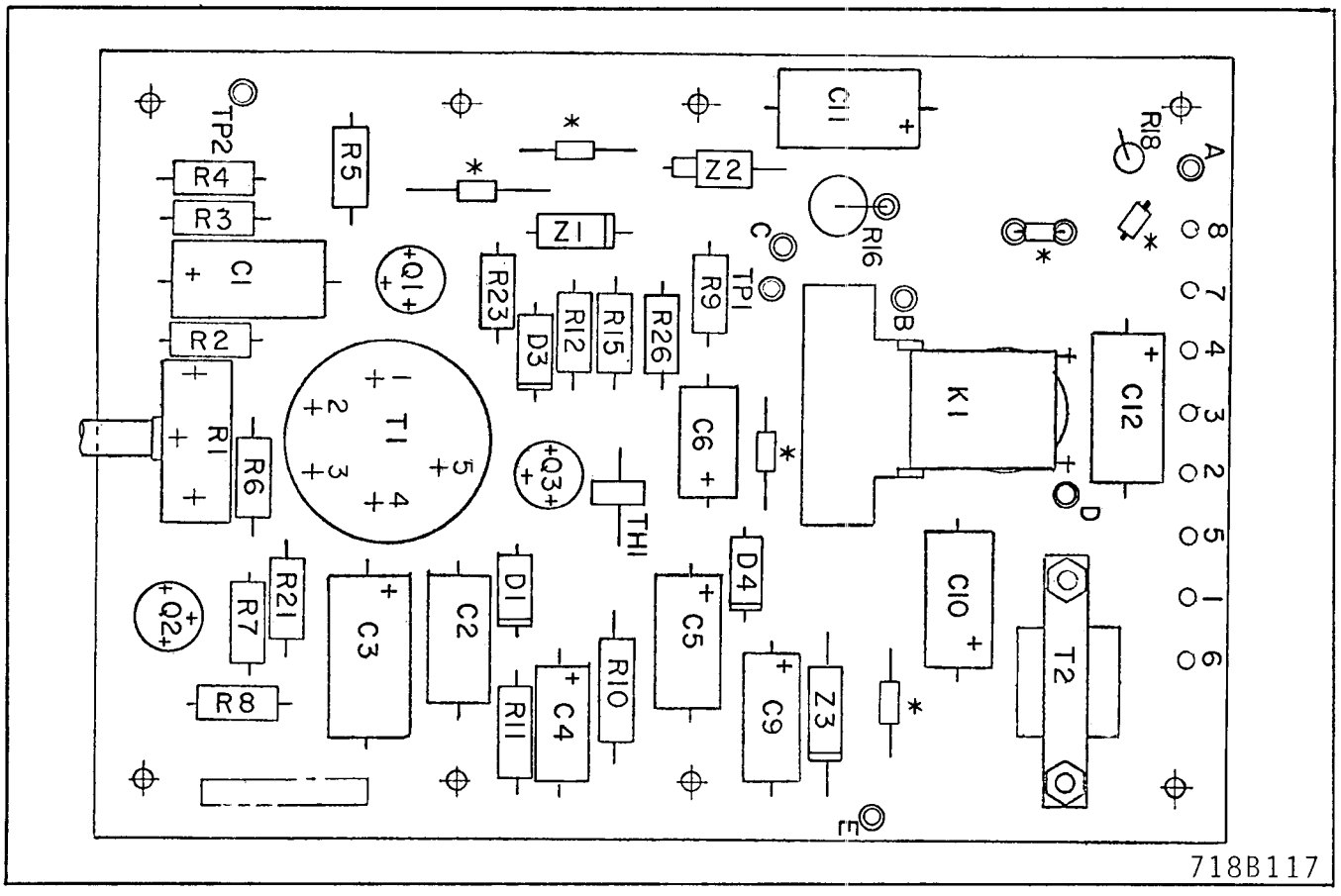
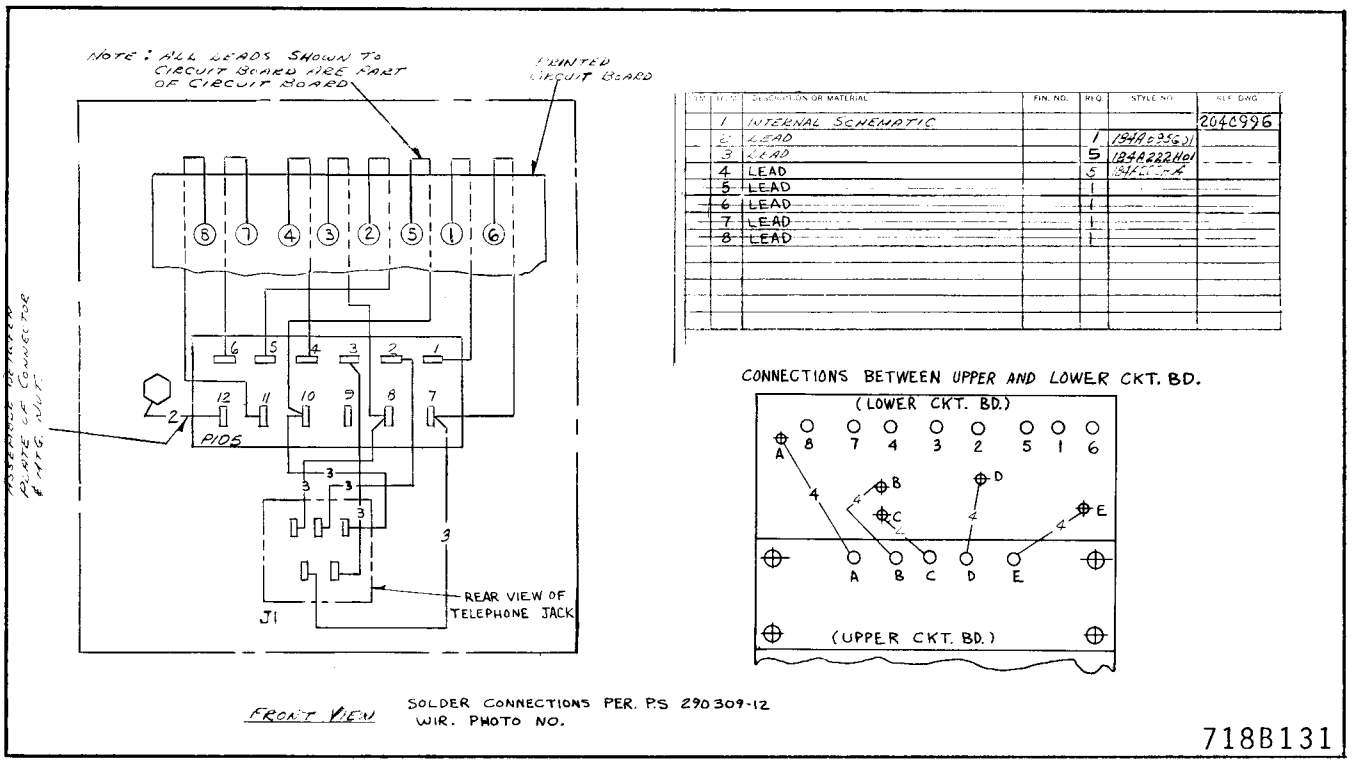


Fig. 8 Component Location (Lower Board)



ITEM	DESCRIPTION OR MATERIAL	FIN. NO.	REQ.	STYLE NO.	REF. DWG.
1	INTERNAL SCHEMATIC				2040996
2	LEAD		1	1949B356G01	
3	LEAD		5	1B4A222H01	
4	LEAD		5	[illegible]	
5	LEAD		1		
6	LEAD		1		
7	LEAD		1		
8	LEAD		1		

Fig. 9 Wiring Diagram

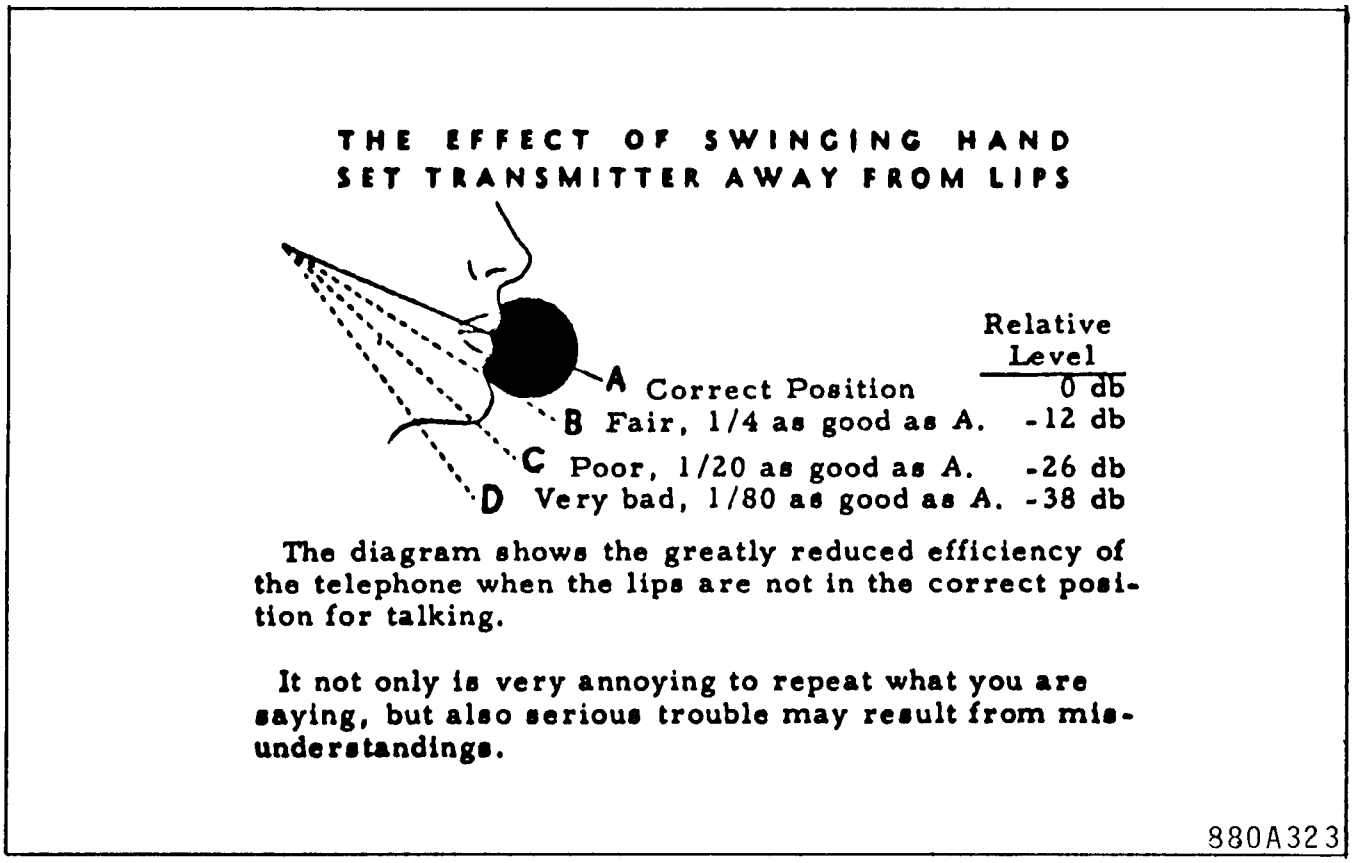


Fig. 10 Proper Usage of the noise-cancelling handset

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE TC VOICE ADAPTER
Style 899C673G02

CAUTION: It is recommended that the user of this equipment become thoroughly familiar with the information in this instruction leaflet before energizing the carrier assembly. Failure to observe this precaution may result in damage to the equipment.

APPLICATION

The type TC Voice Adapter is used to provide a voice channel between type TC power-line carrier sets at different locations. Push-to-talk operation is provided using a handset which can be plugged into a jack on the voice adapter, or a remote located jack which is wired to the voice adapter.

CHARACTERISTICS

When using the voice adapter for transmitting, the TC carrier transmitter operates at a reduced power output level than is used for relaying operation. This level is adjustable by a control marked CARRIER on the voice adapter. This adjustment should be set so that the carrier output level for voice transmission is – 6db below the relaying output level.

The voice adapter is designed to provide sufficient amplitude modulation of carrier. A modulation level control, marked MODULATION, is provided and should be set so that overmodulation does not occur.

The received audio signal level is adjustable, by a volume control located above the handset jack.

The voice adapter is designed to operate with a 3-wire handset with specifications as follows:

Style	Type	Transmitter	Receiver
203C206H01	Noise-Canceling	Carbon	Magnetic - 150Ω
203C206G01	Non/Noise Canceling	Carbon	Magnetic - 150Ω

For handset wiring diagram see Fig. 6.

Power Requirements

Voltage	45V.D.C.
Current Drain	
Transmit	70ma.
Receive	25ma.

CONSTRUCTION

The unit is mounted in a gray lacqured steel chassis which forms a box consisting of a cover and frame. The cover has two holes drilled in it for access to the carrier level and modulation level controls. The voice adapter components are mounted on a pair of double-decked printed circuit boards. The lower board is mounted to the case on four insulated posts. The jack block assembly and the 12-pin connector are mounted, beneath the lower board, on the case. The top board contains the adjustable resistors used for carrier and modulation level controls. The receiver volume control is mounted on the lower board. This control is operated using a knob which is projected through the cover and located above the handset jack. Drilled flanges on both sides of the voice adapter are provided to secure the voice adapter to the TC carrier set. See Fig. 1 for outline dimensions.

ACCESSORIES

1) Handsets

   Style 203C206H01 – noise canceling microphone

   Style 203C206G0i – non/noise canceling microphone

2) Remote telephone jack style 715B674G01

   When it is desired to have a telephone handset jack mounted in a remote location from the TC carrier set, as in switchboard applications, the above telephone jack may be used. See Fig. 2 and 6 for mounting and wiring details.

3) Remote telephone hookswitch - handset assembly

   a) For Wall mounting

      Style 205C162G01 – with noise canceling handset

Style 205C162G02 - with non/noise canceling handset

b) For panel mounting

Style 204C845G03 – with noise canceling handset

Style 204C845G04 - with non/noise canceling handset

When it is desired to have a telephone handset permanently mounted at a remote location, i.e., switchboard or side of desk, any of the above hookswitch – handset assemblies may be used. See Figs. 3, 4, and 5 for mounting dimensions and wiring details.

OPERATION

The Voice Adapter circuitry consists of three common emitter transistor stages performing as an r-f amplifier, detector and audio amplifier.

The r-f input signal, coming from the voice coil winding of FL-201 in the TC carrier Set is present at pin 1 on the voice adapter circuit board. From there it is fed through volume control R1, R2 and C2 to the base of Q1. Q1 amplifies the modulated carrier signal which is then applied through T1 to drive the detector stage Q2. Q2 is biased to operate as a power detector, whereby its output signal (junction of R9 and C6) is rectified and amplified. C5 filters out the carrier frequency and the remaining audio signal is fed through C6 and contact K1-A to Q3 which serves as an audio amplifier to drive the telephone handset receiver. The output of Q3 is transformer coupled through T2 to the handset receiver. There is no automatic volume control in this receiver circuitry. Therefore, it is necessary to adjust the input control R1 for a comfortable listening level while receiving.

The audio output stage Q-3 serves two functions. It is the output stage for the receiver section previously explained and it also serves as the modulating amplifier when transmitting. Pressing the pushbutton on the telephone handset energizes relay K-1 and also closes the circuit which provides microphone current. The microphone output is applied through C14 to the modulation level control R25. Then it is coupled through C7 to the base of Q3 when relay K-1 is energized. Contact K-1A is switched to select the speech input signal at capacitor C-7 and opens the receiver circuit from capacitor C-6. Transistor Q-3 again serves as an amplifier and its output is applied to the TC Transmitter modulator circuitry. T2 serves to couple the signal at the proper impedance level required by the modulator circuitry. Contact K1-B closes the circuit to the modulator to permit modulation of carrier when the handset pushbutton is pressed.

The handset receiver is, at all times, connected to the center-tapped secondary of T2. This means that someone operating the voice adapter should hear their own voice while they are transmitting, and hear the person with whom they are communicating, while receiving. RF input control R1 should be adjusted for a comfortable listening level when receiving.

The carrier transmitter must be unblocked before it is possible to transmit the modulated carrier signal. This is accomplished by applying carrier start current to the transmitter through the Voice Adapter. Energizing relay K-1 in the adapter closes contact K-1D which supplies carrier start current to the TC transmitter. By adjusting this current, using R20, the proper reduced carrier level for voice communication can be obtained. If a relaying operation occurs during voice transmission the relaying carrier start voltage applied to the TC carrier set will cause the carrier output power to increase to its normal level. This carrier start voltage will also be present at circuit board term. 4 of the voice adapter and will cause current to flow through R23 and D1 which will reverse bias Q3 and prevent modulation of carrier during the relay operation. Under these conditions Q3 would cut off rapidly and the magnetic field built up in T2 will collapse causing a large transient voltage to be present it its windings. To prevent this transient voltage from affecting the operation of the carrier set during the relay operation, diode D4 is connected directly across the primary winding of T2 to short out this transient voltage.

When used with supervisory equipment, audio block is performed through supervisory preference contacts. The jumper normally connecting terminals 4 and 17 on the transmitter-receiver is removed and in its place is connected these contacts. These contacts open, removing the pos. DC supplied to the adapter unit when a supervisory function is initiated. Voice communication is interrupted when this occurs.

INSTALLATION

Connections for Relaying Channels

The adapter will perform satisfactorily with any of the relaying systems used to key the TC transmitter-

receiver unit. No internal wiring modifications are necessary in the adapter.

Pushing the button on the telephone unblocks the local transmitter which will result in an alarm signal at the remote terminal. This alarm will continue to ring until the operator at the receiving terminal inserts his telephone handset into J1 or the transmitter telephone pushbutton is released. The two stations are then ready to carry on a conversation. Because of the reduced RF output of the transmitter when unblocked by the adapter, it may, in some cases be necessary to use the carrier test button for ringing.

With the Voice Adapter plugged into the relaying equipment on a permanent basis and a remote handset jack or hookswitch assembly is used, it is best to wire the alarm cut-off contact of the remote jack assembly in series with the alarm relay contact. With these connections the alarm relay will operate whenever a signal is received but the circuit to the alarm device will be broken when the handset is inserted into the remote jack, or lifted off the hookswitch.

Preference for Supervisory Channels

Supervisory preference may be obtained by removing the jumper which connects terminals 4 and 17 on the TC transmitter-receiver unit, and connecting in its place the supervisory preference contacts.

Telephone Usage

A telephone jack is provided as an integral part of the adapter to accommodate a Westinghouse handset. This telephone is auxiliary and is not an integral part of the unit. It employs a push-to-talk button which must be pushed when transmitting and released when receiving. If the telephone has a noise canceling microphone, it is necessary to speak directly into the microphone. Talking over, or under the mouthpiece will result in severe attenuation of the speech signal. Optimum results can be achieved only by speaking direclty into the telephone. See Figure 10.

Settings and Adjustments

The rf input control R1 should be adjusted for a comfortable level when receiving voice transmission. Clockwise rotation will increase volume.

Carrier level control R20 should be set so that the carrier output power level of the TC set is 6 db below the normal relaying output level, when the handset pushbutton is pressed. For the procedure of making this measurement please refer in the TC Carrier Set instructions I.L. 41-944.31 to the section titled adjustments.

Modulation level control R25 should be adjusted after the carrier level control has been set as follows:

With an oscilloscope connected across the transmitter output terminals on the TC set, press handset pushbutton, speak directly into microphone and adjust oscilloscope to view modulation of carrier. The modulation level should now be adjusted at R25 so that over-modulation (cutting off of carrier) will only occur on loud peaks of voice power. Bright lines along the center (zero line) of the oscilloscope trace indicate over-modulation.

MAINTENANCE

General

Voltage and resistance values should be recorded in order to establish reference values which will be useful when checking the apparatus. In cases where a single adapter unit is used, with more than one set of relaying equipment, the voltage readings may vary depending upon the characteristics of the relaying unit.

Typical resistance measurements are recorded in Table 1. These measurements are referenced to the pins of plug P-105. Do not plug the unit into the transmitter-receiver when making these measurements.

Typical dc voltage measurements are recorded in Table 2. The adapter unit is plugged into a TC Set and telephone handset into the adapter. The cover of the adapter must be removed in order to make these measurements.

Removal of Printed Circuit Boards

1. Loosen the screw securing the shaft support plate and allow the plate to swing clear.
2. Remove the 4 self-tapping screws holding the cover.
3. Lift cover off.
4. To remove top board, remove the 4 screws that hold top board to mounting posts on lower board.
5. Similarly to remove lower board (with or without top board mounted), remove 4 screws holding lower board to mounting posts on the case.

Assembly of Printed-Circuit Boards

For complete reassembly, reverse the steps described in the removal procedure.

TABLE 1
RESISTANCE MEASUREMENTS *

TEST POINT P105 Term. #	RESISTANCE (Ohms)
1	2.5K
2	Open
3	Open
4	13K
5	Open
6	Open
7	0
8	5.8K
9	Open
10	17
11	4.7K
12	Open
TP-1	4.7K
TP-2	3.7K

*These measurements are taken with respect to the DC negative terminal P105-7 or terminal number 6 on the circuit board. In all cases the negative lead of the ohmmeter was connected to this point. The voice adapter is removed from the TC carrier set and the telephone handset is not plugged in. All controls are set to maximum CW position.

TABLE 2
TYPICAL D.C. VOLTAGE MEASUREMENTS*

These measurements were taken under the following conditions:

1. Receive: Handset plugged in but pushbutton not pressed.
2. Transmit: Handset plugged in with pushbutton pressed.
3. Unblock: Handset plugged in with pushbutton pressed and TC Transmitter operating at full power.

Note: All measurements are taken with respect to d.c. negative (circuit board terminal no. 6).

Test Point	D.C. Voltage (Volts)		
Ckt. Bd. Term No.	Condition		
	(1)	(2)	(3)
1	0	1	0
2	.5	.52	.56
3	45	1.5(varies)	1.5(varies)
4(R20 max.cw)	0	14	20
4(R20 max.ccw)	0	7	20
5	0	0	0
7	0	0	0
8	45	45	45
TP-1	14.8	14.8	16.1
TP-2	15.5	15.5	15.5
Q1-Emitter	13	12.6	12.6
Q1-Base	12.2	12.2	12.2
Q1-Collector	0	0	0
Q2-Emitter	14.8	12.4	12.4
Q2-Base	14.2	14.1	14.1
Q2-Collector	.36	1.75	1.75
Q3-Emitter	15.4	15.3	15.5
Q3-Base	14.8	14.7	16.1
Q3-Collector	3.7	3.7	0

*Please note: These voltage measurements are typical and may vary for each unit.

ELECTRICAL PARTS LIST

SYMBOL	DESCRIPTION	STYLE
C1	.25 mf ±20% 200V.D.C. Paper	187A624H02
C2	.1 mf ±20% 200V.D.C. Paper	187A624H01
C3	.25 mf ±20% 200V.D.C. Paper	187A624H02
C4	12 mf ±10% 25V.D.C. Tantalum	862A530H05
C5	.1 mf ±20% 200V.D.C. Paper	187A624H01
C6	12 mf ±10% 35V.D.C. Tantalum	862A530H05
C7	.01 mf ±10% 200V.D.C. Paper	764A278H10
C9	.01 mf ±10% 200V.D.C. Paper	764A278H10
C10	22 mf ±10% 35V.D.C. Tantalum	184A661H16
C11	47 mf ±10% 50V.D.C. Tantalum	863A530H01
C12	22 mf ±10% 35V.D.C. Tantalum	184A661H16
C14	1.0 mf ±20% 200V.D.C. Paper	187A624H04
R1	2.5K ±30% ¼W Pot	330C598H01
R2	1K ±5% ½W	184A763H27
R3	3.9K ±5% ½W	184A763H41
R4	1K ±5% ½W	184A763H27
R5	2.2K ±10% ½W	187A641H35
R6	39K ±5% ½W	184A763H65
R7	3.3K ±5% ½W	184A763H39
R8	2.2K ±10% ½W	187A641H35
R9	270 ohms ±5% ½W	184A763H13
R10	1K ±5% ½W	184A763H27
R11	22K ±10% ½W	187A641H59
R12	560 ohms ±2% ½W	629A531H26
R15	680 ohms ±2% ½W	629A531H28
R16	1K ±5% 5W	763A129H07
R18	6.8K ±5% ½W	184A763H47
R20	10K ±20% ¼W Pot.	629A430H10
R21	470 ohms ±10% ½W	187A641H19
R23	2.4K ±5% ½W	184A763H36
R25	1K ±20% ¼W Pot.	629A430H11
R26	33 ohms ±10% ½W	187A640H13
Q1, Q2, Q3	2N4356	849A441H02
T1	10K/400 ohms	714B666G01
T2	25K/600 ohms C.T.	879A875H01
D1, D3, D4	1N457A	184A855H07
Z2	1N3024B 15V ±5%	188A302H16
Z3	1N965B 15V ±5%	186A797H08
K1	48V 1K Coil Relay	330C588H01
P1	12-Connector Plug	187A671H01
J1	Jack Block Assembly	861A790G03

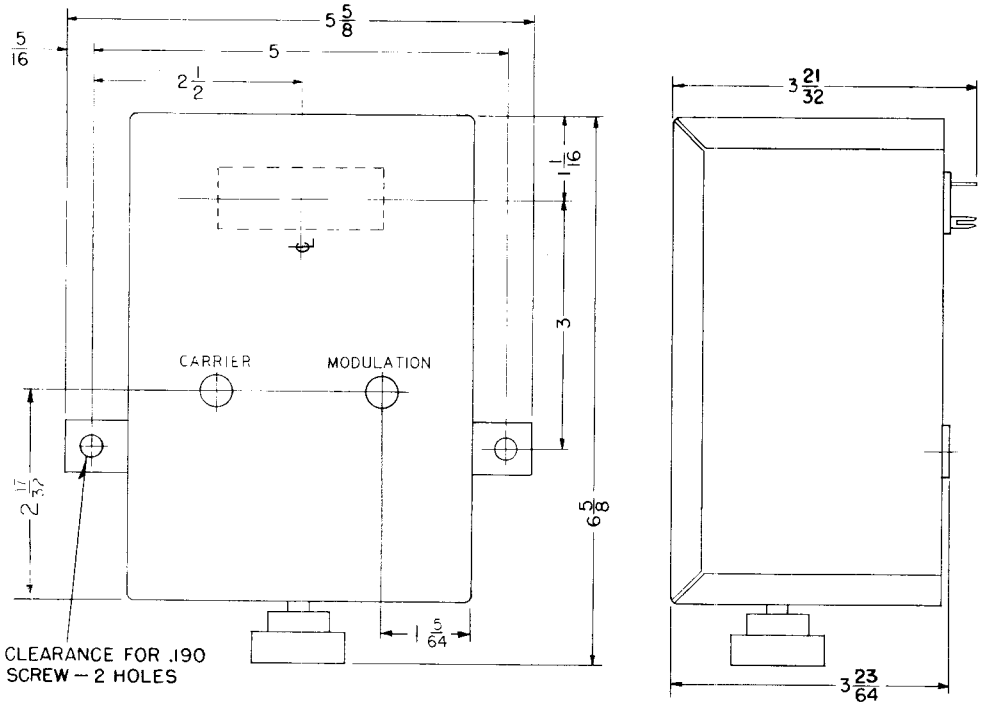


Fig. 1 Voice Adapter Outline Dimensions

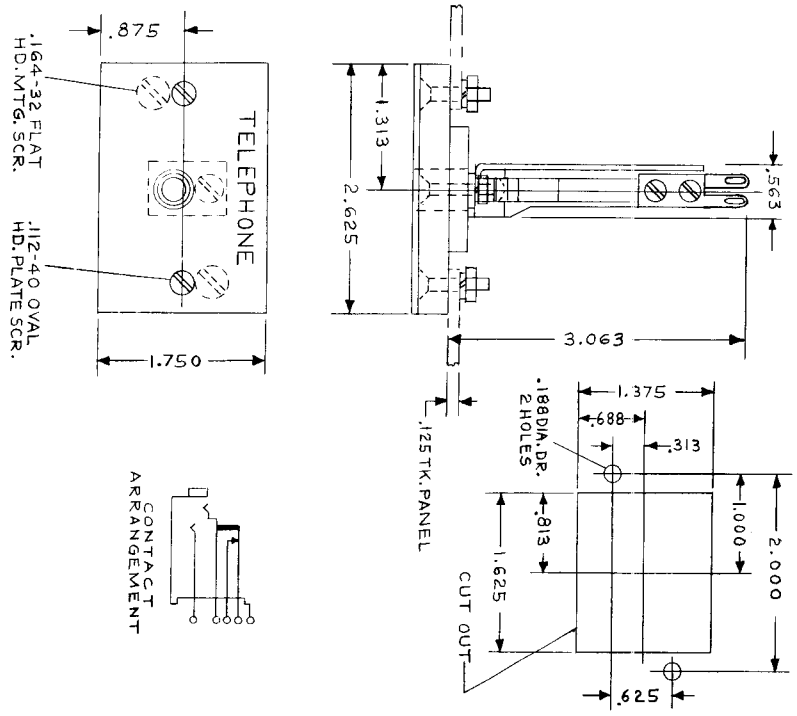


Fig. 2 Remote-Telephone Jack Assembly.

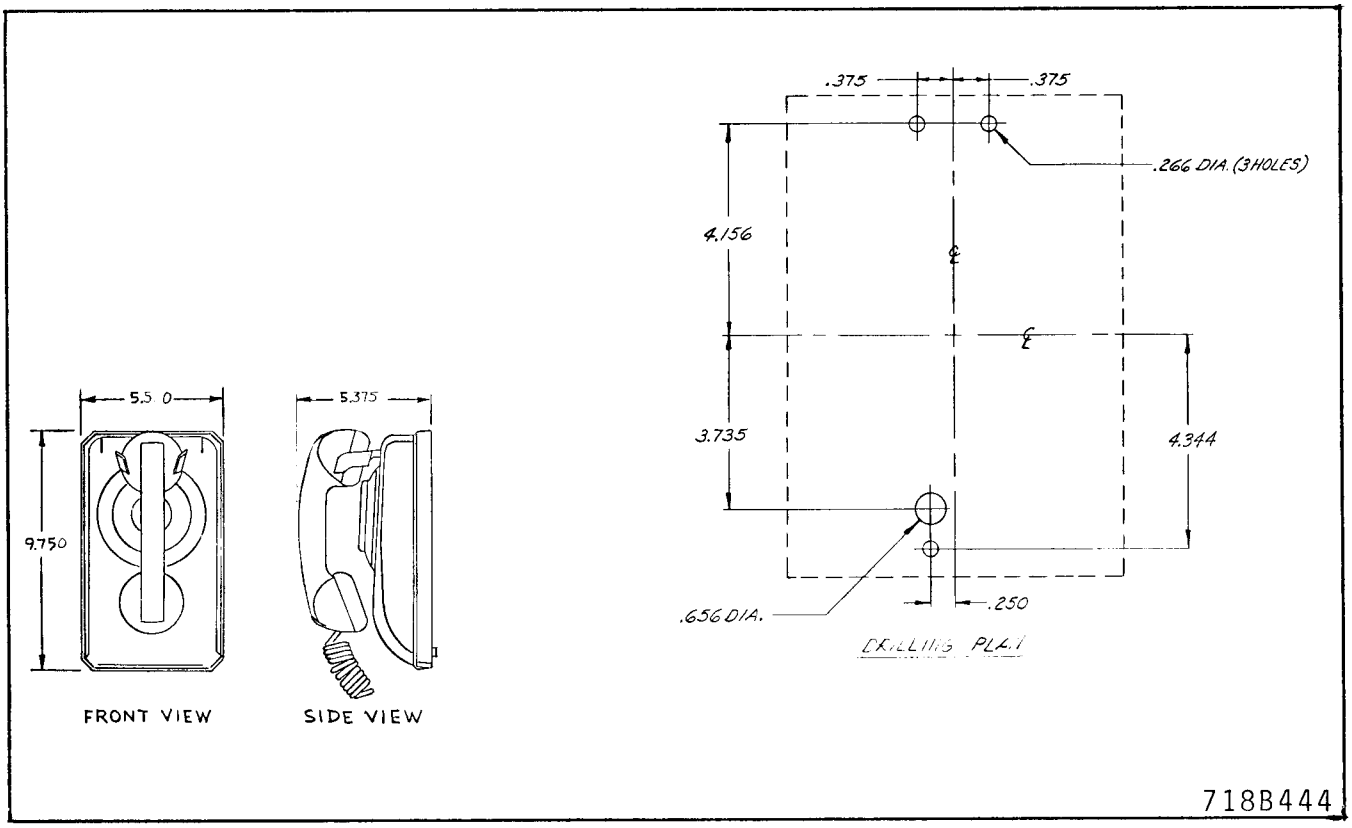


Fig. 3 Outline Dimensions for Wall mounted Hookswitch

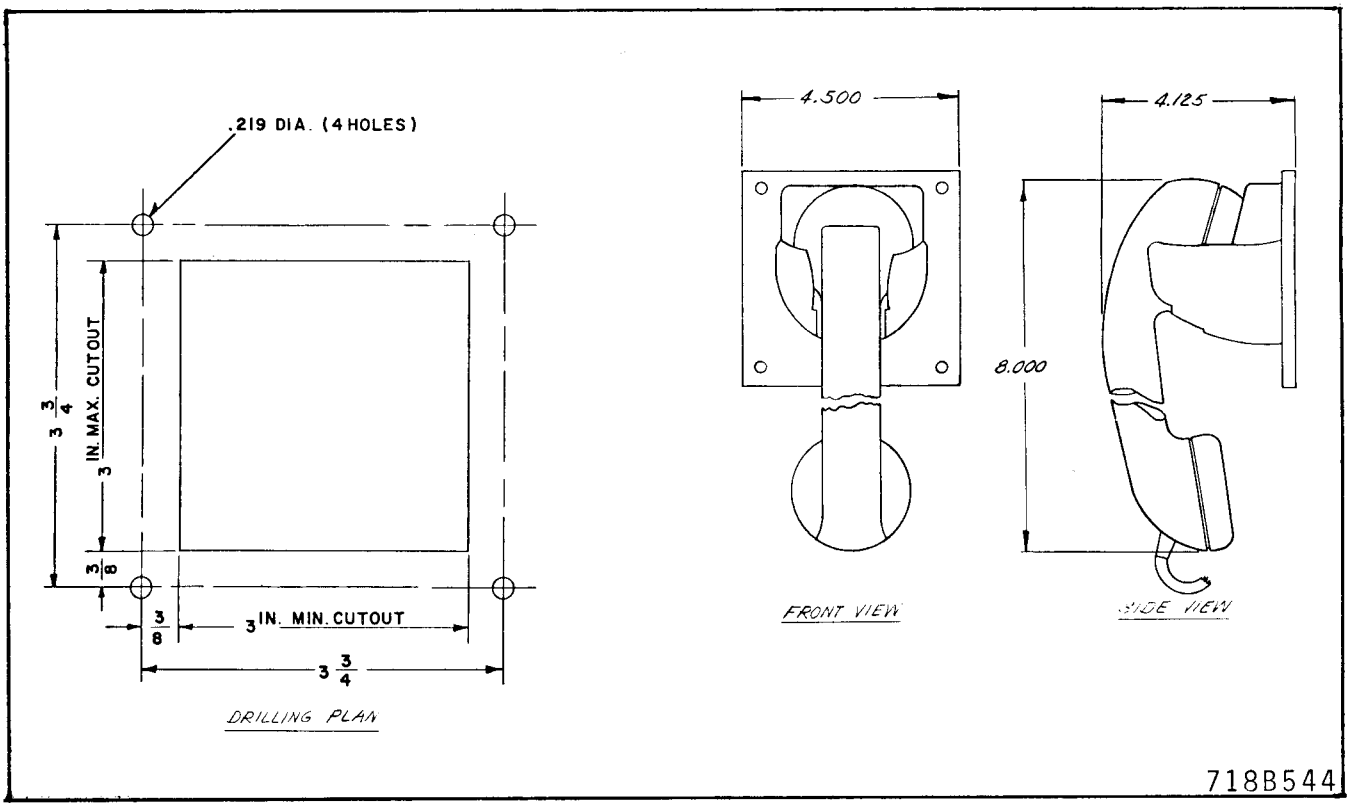


Fig. 4 Outline Dimensions for Panel mounted Hookswitch

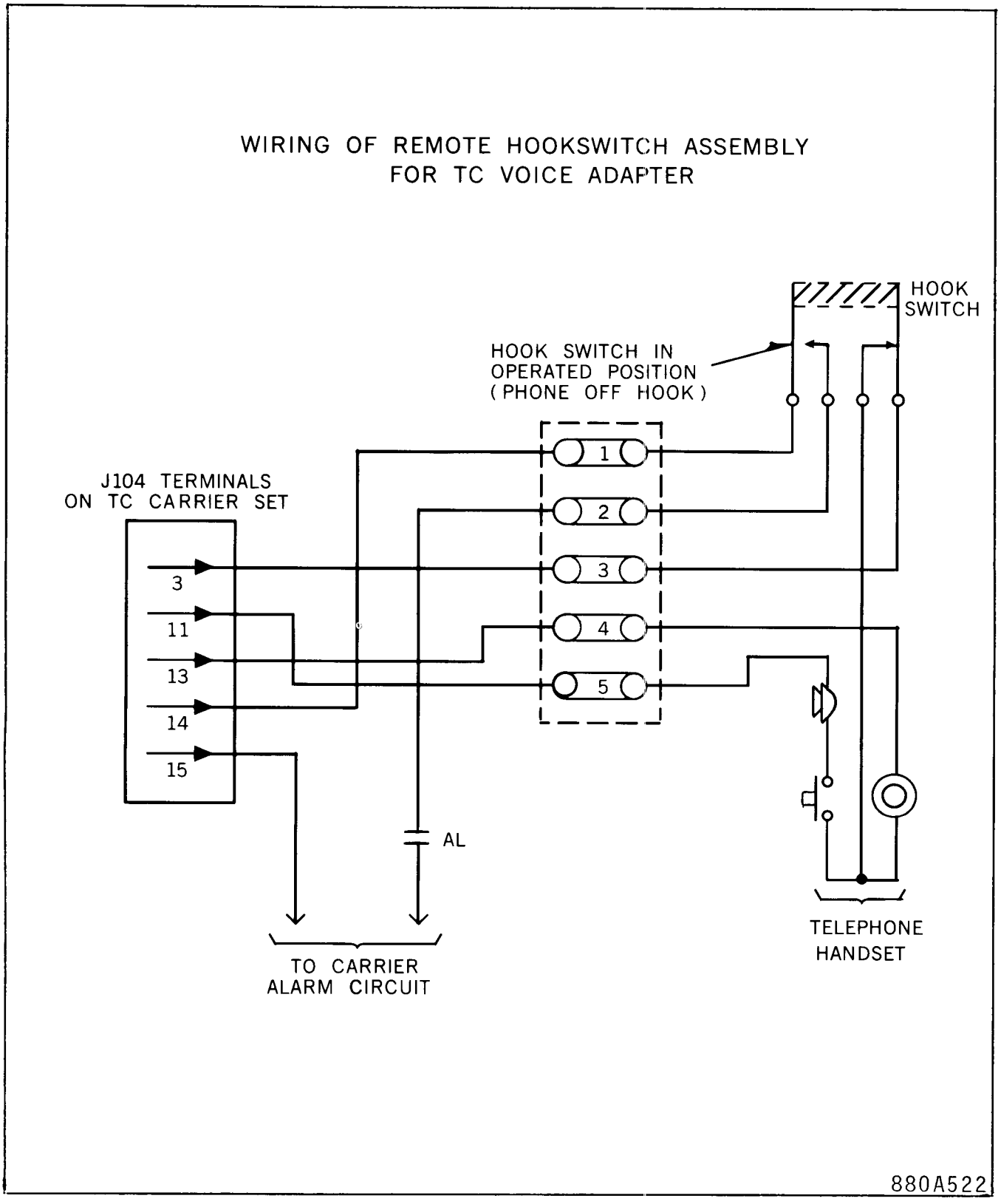


Fig. 5 Telephone hookswitch Assembly Internal Schematic are Wiring.

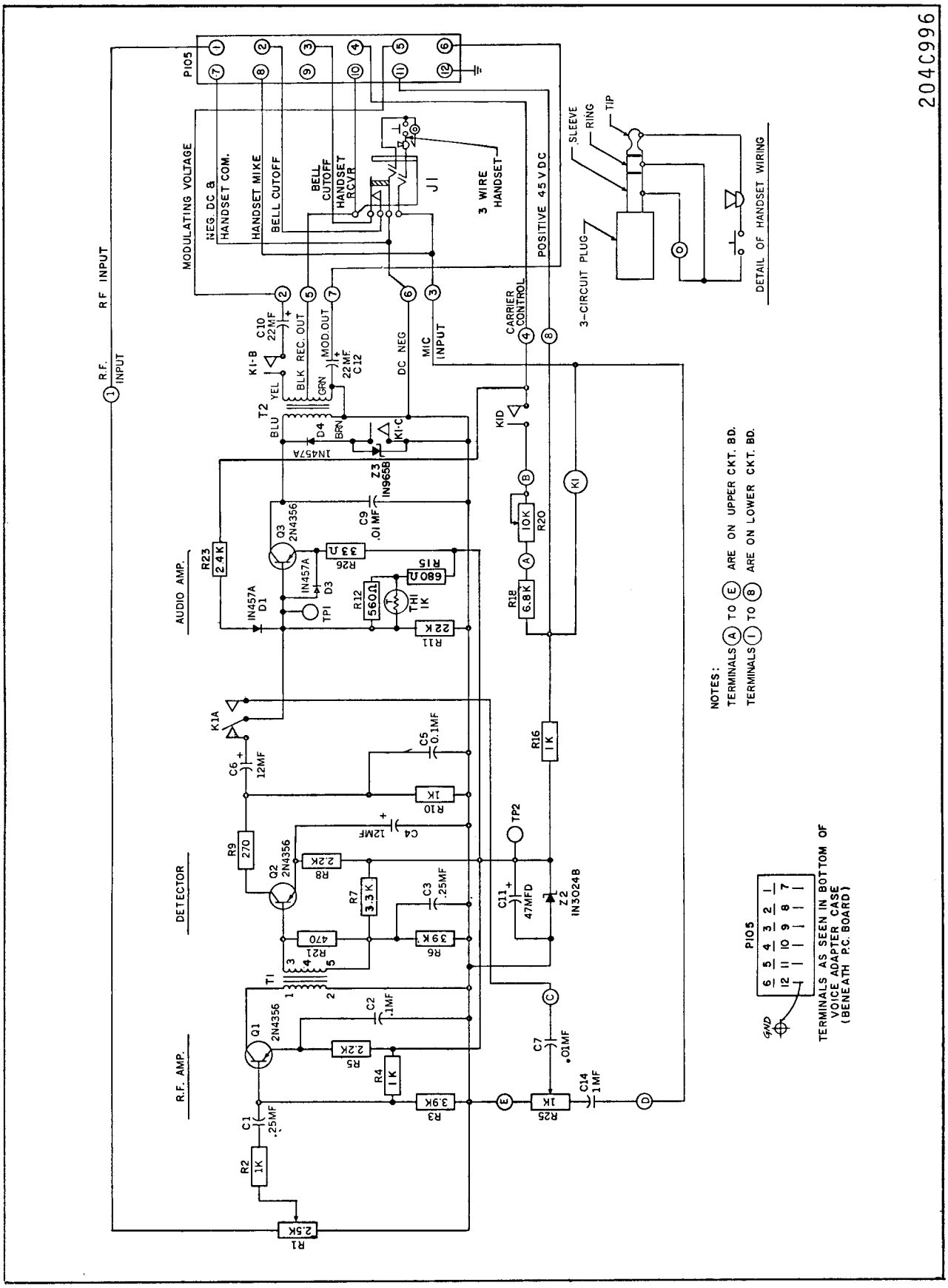


Fig. 6 Voice Adapter Internal Schematic

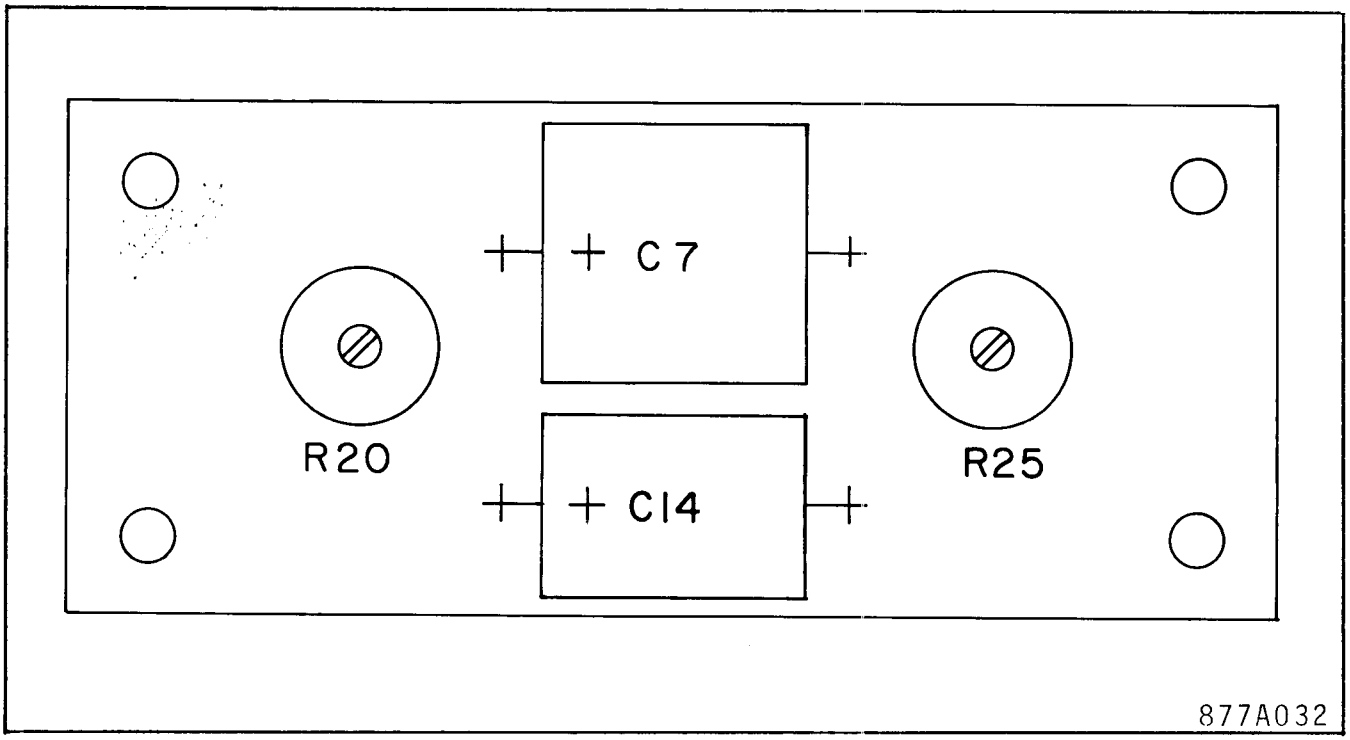


Fig. 7 Component Location (Upper Board)

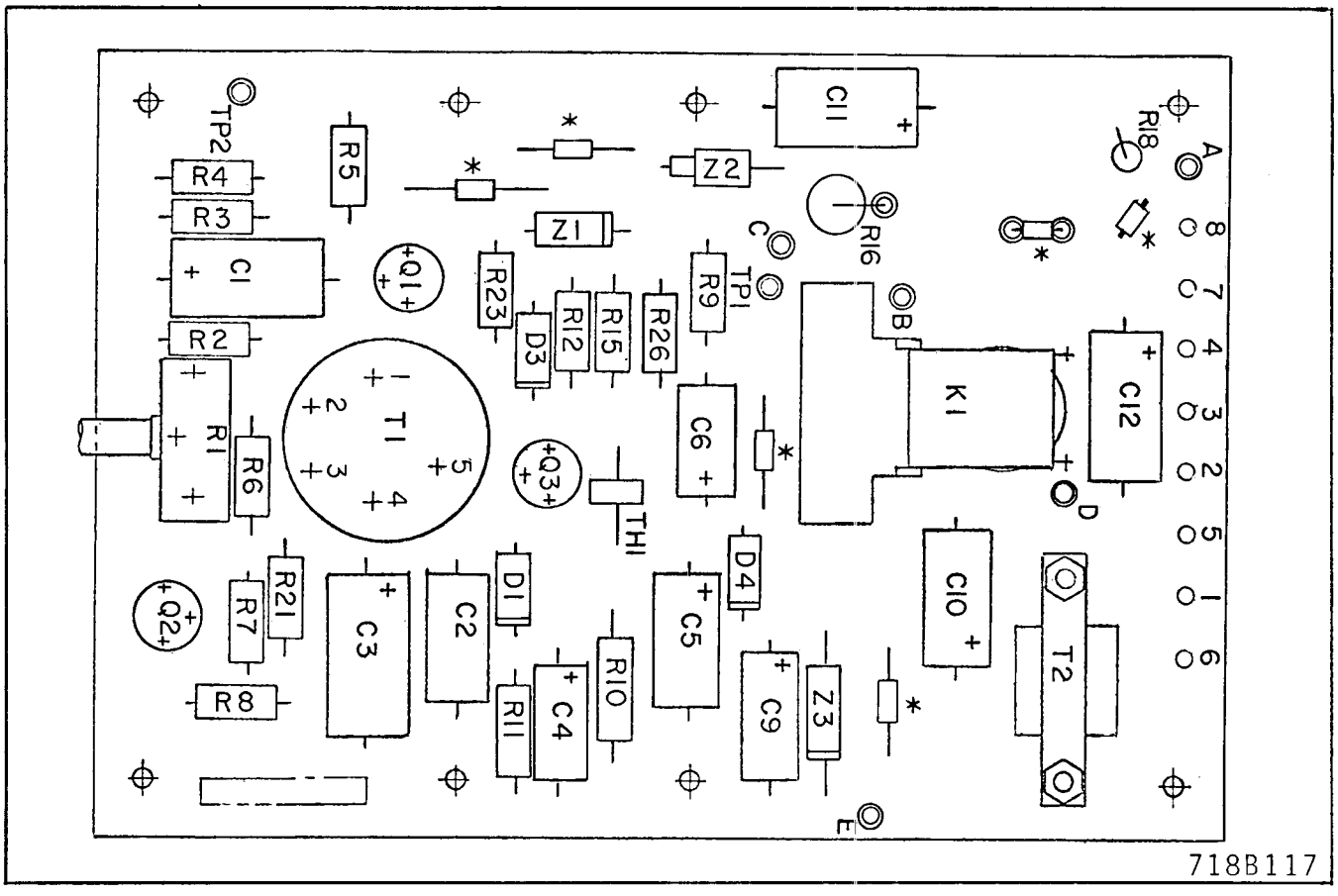


Fig. 8 Component Location (Lower Board)

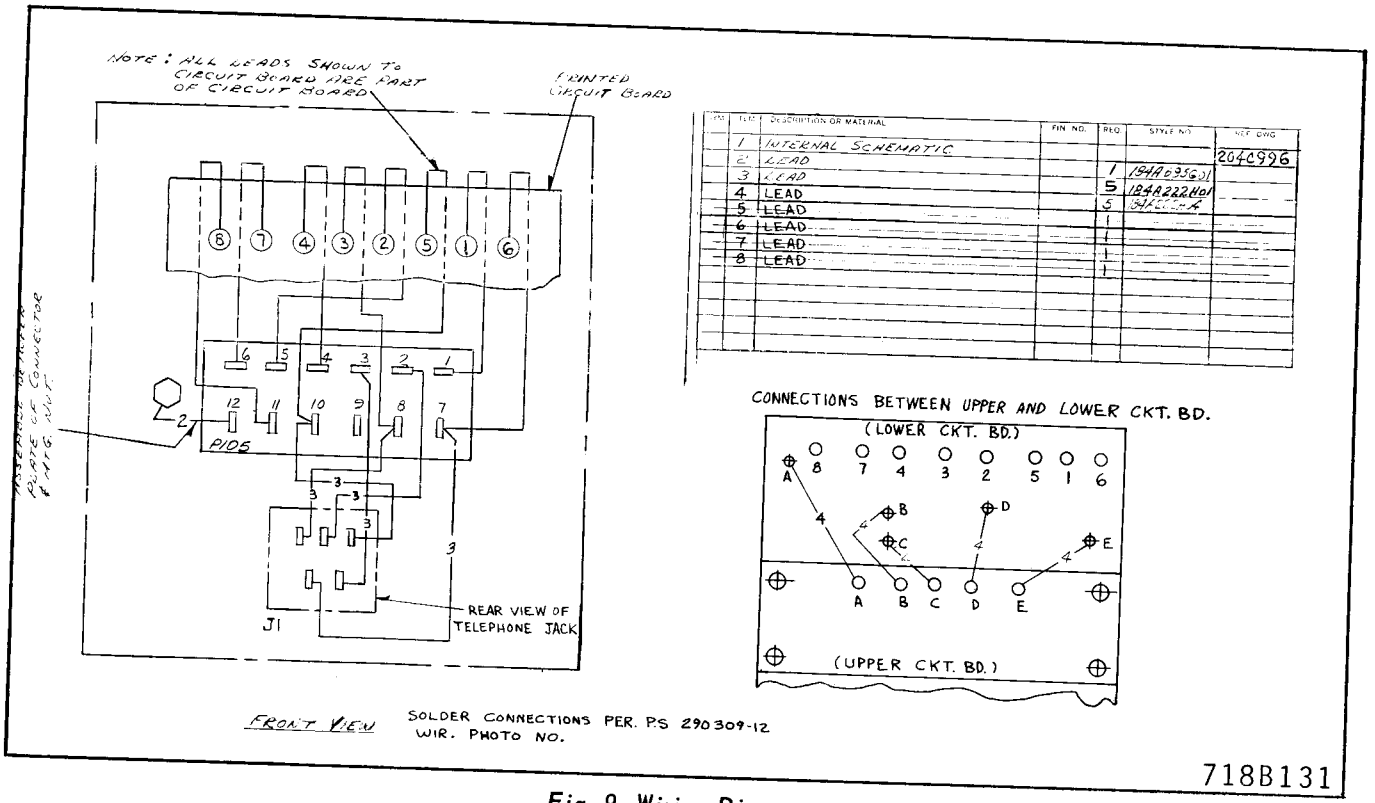


Fig. 9 Wiring Diagram

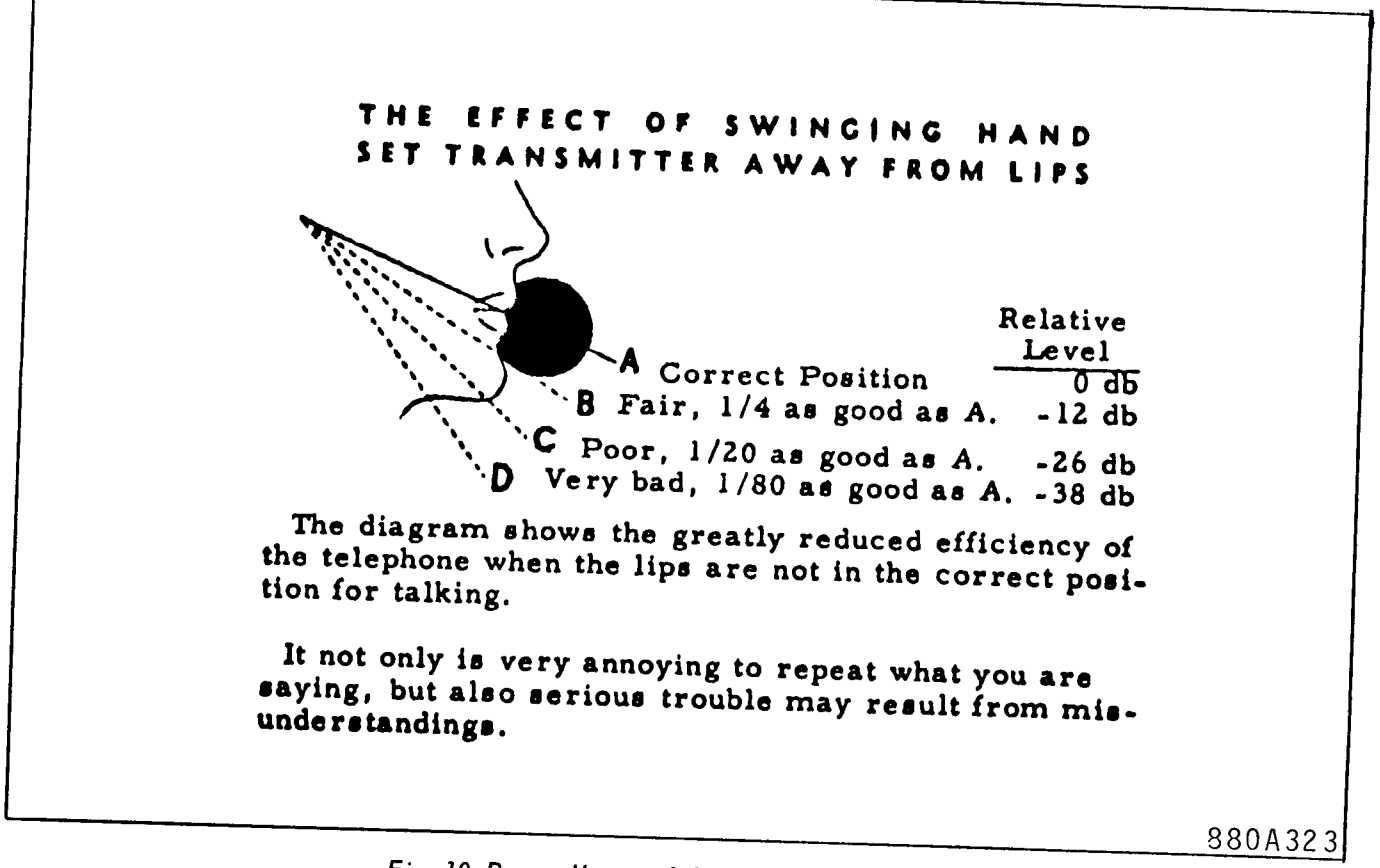
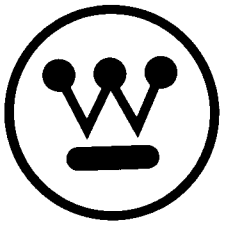


Fig. 10 Proper Usage of the noise-cancelling handset



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