**INSTALLATION • OPERATION • MAINTENANCE
I N S T R U C T I O N S****TYPE TC VOICE ADAPTER****Style 408C 020G 02****Style 408C 020G 01****APPLICATION**

The type TC Voice Adapter is used to provide a voice channel between type TC carrier sets at different locations. Simple "push-to-talk" operation is provided using a handset which can be plugged into jacks in the Voice Adapter or mounted on an associated switchboard panel.

CHARACTERISTICS

The TC Voice Adapter has sufficient gain to provide 30 to 50 per cent modulation of the carrier transmitter, with a normal speaking voice level. The received audio signal level is adjustable, through a volume control mounted on the Voice Adapter, up to approximately zero dbm level. When transmitting, the Voice Adapter circuit energizes the transmitter to an unmodulated level of 7.5 to 14 db less than for a relaying operation to allow satisfactory modulation.

CONSTRUCTION

The unit is mounted in a metal box chassis consisting of a cover and a frame. A 12-terminal plug on the back of the unit allows it to be plugged into a TC transmitter-receiver. With the exception of the telephone jacks, all electrical components are mounted on printed circuit board. Connections between this board and the 12-terminal plug are made through flexible leads. For maintenance purposes, the printed circuit board may be unfastened and swung out away from the chassis after removing the cover of the box.

OPERATION

The circuit consists of three grounded emitter transistor stages which include an RF amplifier, a power detector and an audio amplifier (see Internal Schematic). When receiving, the RF input signal passes from the coaxial cable connection on the Transmitter-Receiver, through a portion of the input filter into the receiver section of the Voice Adapter. The signal

is then fed through the level control R-1 to the RF amplifier Q-1. This stage is transformer coupled to the power detector circuit Q-2 which in turn drives the base of audio output stage Q-3. This base drive is applied through capacitor C-6 and relay contacts K-1A. The signal is amplified by transistor Q-3 and then transformer-coupled through T-2 to the telephone receiver line. This connection is made through relay contacts K-1B and K-1C. There is no AVC action in these receiver circuits, so it is necessary to adjust the input control R-1 for the best listening level.

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 modulator when transmitting. This is accomplished by relay K-1. Pressing the pushbutton on the test telephone energizes this relay and also closes the circuit which provides microphone current. The microphone output is applied to the base of amplifier Q-3 through capacitor C-7 and relay contacts K-1A. When relay K-1 is energized, contact K-1A is switched to select the speech input signal at capacitor C-7 and open the receiver circuits from capacitor C-6. Transistor Q-3 again serves as an amplifier and its output eventually reaches resistor R-119 and capacitor C-107 in the transmitter-receiver through relay contacts K-1B and K-1C. These same contacts disconnect the telephone receiver. Signal applied to the R-50 and C-14 combination will modulate the transmitter.

The carrier transmitter must be unblocked before it is possible to transmit the modulated carrier signal. This is accomplished by applying carrier-start voltage to the transmitter through contacts K-1D in the Voice Adapter. Energizing relay K-1 in the adapter closes contacts K-1D which supply carrier-start voltage to the transmitter-control circuit. This unblocks the emitter circuit of Q-103 in the transmitter which then permits transmission of carrier. The d-c voltage applied to this bleeder circuit by the adapter is about $\frac{1}{2}$ the voltage supplied when a relaying function occurs. Therefore, the unmodulated transmitter output

TYPE TC VOICE ADAPTER

when unblocked by the Voice Adapter is from 7.5 db to 14 db less than the output when unblocked for a relaying operation. This differential is necessary to provide proper blocking of speech when a relaying function occurs.

As previously mentioned, voice communication is a secondary function and does not interfere with the primary function of relaying. To accomplish this, it is necessary to block the audio output stage Q-3 on the adapter whenever a relaying function occurs. The D-C voltage which unblocks the carrier transmitter is also implied to the base of transistor Q-3 through a voltage-dividing network consisting of resistors R-20 and R-11, plus the diode CR-1.

When a relaying function occurs, the voltage developed across resistor R-11 is sufficiently high to drive the base of stage Q-3 positive with respect to the emitter and therefore, blocks the circuit. This action prevents the speech modulation of the carrier signal. Effectively, a voice conversation carried on over a relaying channel will be interrupted instantly when a relaying operation occurs.

On the other hand, as previously explained, the start voltage supplied by the adapter is less than half the start voltage supplied by the transmitter-receiver when a relaying operation occurs. Because of this difference in carrier-start voltages, the Voice Adapter when modulating, does not block stage Q-3. The voltage developed across resistor R-11 is not great enough to block transistor Q-3.

Telephone Usage

Telephone jacks are provided as an integral part of the adapter to accommodate a Westinghouse S#330 C678H04 noise cancelling handset. This telephone is an 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.

The side of the telephone plug marked "TOP" must be inserted into the corresponding socket marked "TOP" on the chassis of the adapter. Since this telephone has a noise cancelling handset, 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 directly into the telephone.

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 or the transmitting 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.

When used with supervisory equipment audio, block is performed through a supervisory preference contact. The jumper normally connecting terminals 4 and 17 on the transmitter-receiver is omitted and in its place is connected this contact. When a supervisory function is initiated, this contact opens, removing the B+ supplied to the adapter. Voice communication is interrupted when this occurs.

Adjustments

There are no adjustments to make on this unit other than the adjustment of the input control R-1, to a comfortable listening level. No control is provided for modulation. Adjustment of the relaying transmitter-receiver is not required.

MAINTENANCE

Voltage and resistance values should be recorded in order to establish reference values which will be useful when checking the apparatus.

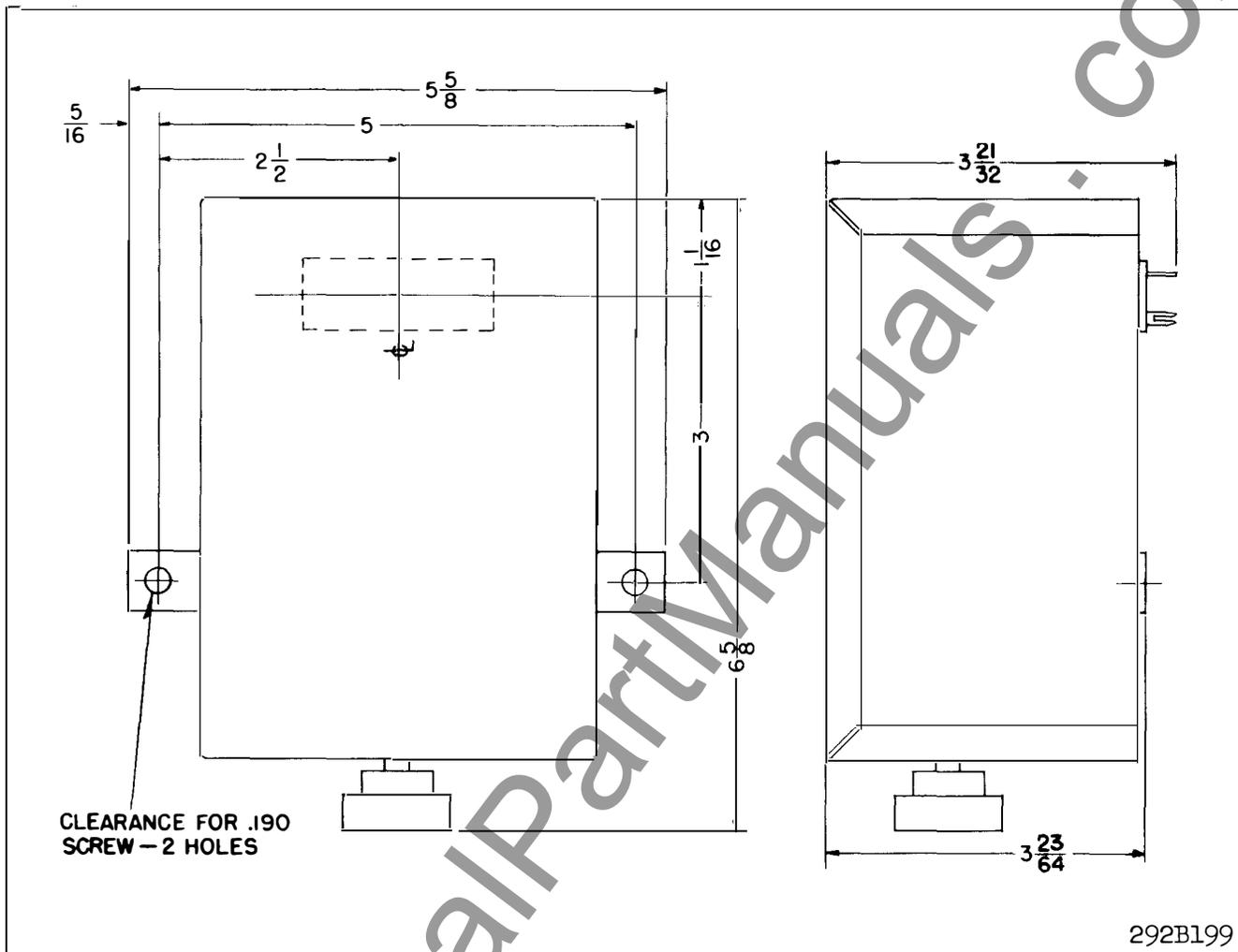


Fig. 2 Outline - Type TC Voice Adapter.

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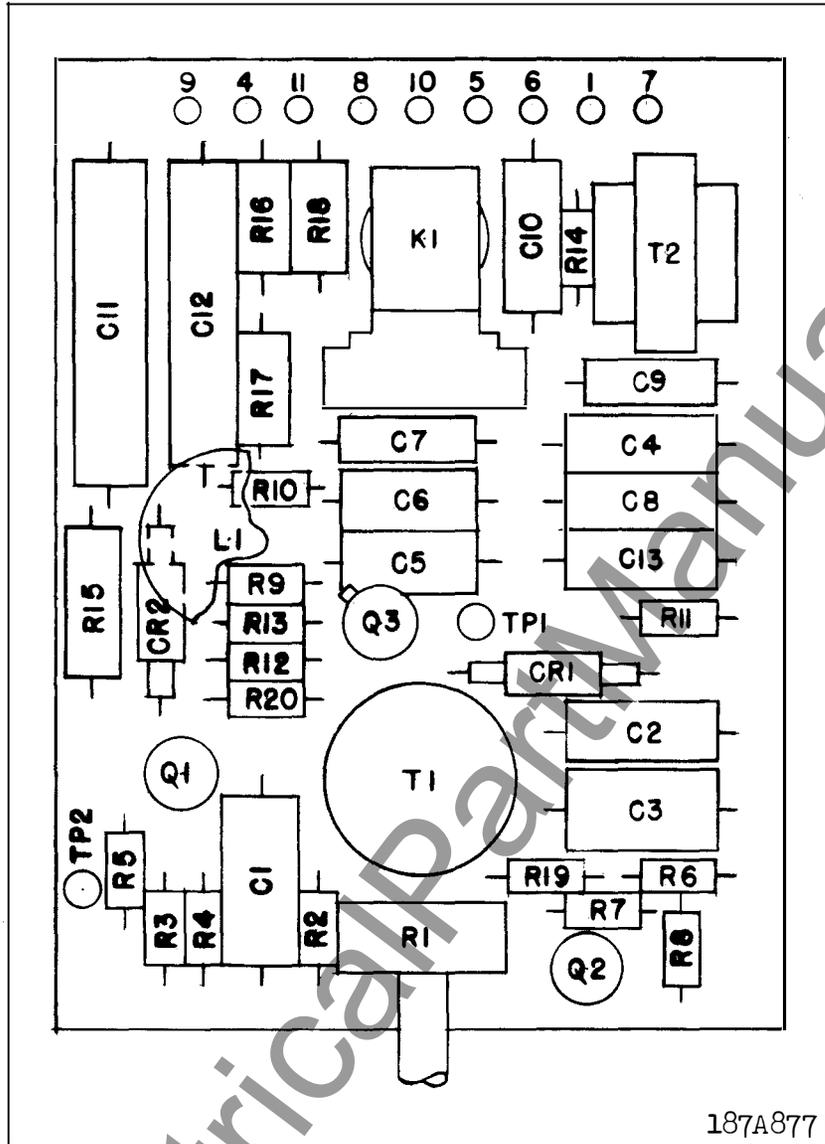


Fig. 3 Printed Circuit Board Component Location - Type TC Voice Adapter

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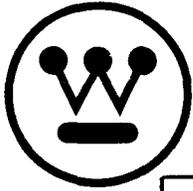
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**INSTALLATION • OPERATION • MAINTENANCE
I N S T R U C T I O N S****TYPE TC VOICE ADAPTER****Style 408C 020G 02****Style 408C 020G 01****APPLICATION**

The type TC Voice Adapter is used to provide a voice channel between type TC carrier sets at different locations. Simple "push-to-talk" operation is provided using a handset which can be plugged into jacks in the Voice Adapter or mounted on an associated switchboard panel.

CHARACTERISTICS

The TC Voice Adapter has sufficient gain to provide 30 to 50 per cent modulation of the carrier transmitter, with a normal speaking voice level. The received audio signal level is adjustable, through a volume control mounted on the Voice Adapter, up to approximately zero dbm level. When transmitting, the Voice Adapter circuit energizes the transmitter to an unmodulated level of 7.5 to 14 db less than for a relaying operation to allow satisfactory modulation.

CONSTRUCTION

The unit is mounted in a metal box chassis consisting of a cover and a frame. A 12-terminal plug on the back of the unit allows it to be plugged into a TC transmitter-receiver. With the exception of the telephone jacks, all electrical components are mounted on printed circuit board. Connections between this board and the 12-terminal plug are made through flexible leads. For maintenance purposes, the printed circuit board may be unfastened and swung out away from the chassis after removing the cover of the box.

OPERATION

The circuit consists of three grounded emitter transistor stages which include an RF amplifier, a power detector and an audio amplifier (see Internal Schematic). When receiving, the RF input signal passes from the coaxial cable connection on the Transmitter-Receiver, through a portion of the input filter into the receiver section of the Voice Adapter. The signal

is then fed through the level control R-1 to the RF amplifier Q-1. This stage is transformer coupled to the power detector circuit Q-2 which in turn drives the base of audio output stage Q-3. This base drive is applied through capacitor C-6 and relay contacts K-1A. The signal is amplified by transistor Q-3 and then transformer-coupled through T-2 to the telephone receiver line. This connection is made through relay contacts K-1B and K-1C. There is no AVC action in these receiver circuits, so it is necessary to adjust the input control R-1 for the best listening level.

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 modulator when transmitting. This is accomplished by relay K-1. Pressing the pushbutton on the test telephone energizes this relay and also closes the circuit which provides microphone current. The microphone output is applied to the base of amplifier Q-3 through capacitor C-7 and relay contacts K-1A. When relay K-1 is energized, contact K-1A is switched to select the speech input signal at capacitor C-7 and open the receiver circuits from capacitor C-6. Transistor Q-3 again serves as an amplifier and its output eventually reaches resistor R-119 and capacitor C-107 in the transmitter-receiver through relay contacts K-1B and K-1C. These same contacts disconnect the telephone receiver. Signal applied to the R-50 and C-14 combination will modulate the transmitter.

The carrier transmitter must be unblocked before it is possible to transmit the modulated carrier signal. This is accomplished by applying carrier-start voltage to the transmitter through contacts K-1D in the Voice Adapter. Energizing relay K-1 in the adapter closes contacts K-1D which supply carrier-start voltage to the transmitter-control circuit. This unblocks the emitter circuit of Q-103 in the transmitter which then permits transmission of carrier. The d-c voltage applied to this bleeder circuit by the adapter is about $\frac{1}{2}$ the voltage supplied when a relaying function occurs. Therefore, the unmodulated transmitter output

Supersedes I.L. 41-944.4D

*Denotes change from superseded issue

EFFECTIVE JUNE 1969

TYPE TC VOICE ADAPTER

when unblocked by the Voice Adapter is from 7.5 db to 14 db less than the output when unblocked for a relaying operation. This differential is necessary to provide proper blocking of speech when a relaying function occurs.

As previously mentioned, voice communication is a secondary function and does not interfere with the primary function of relaying. To accomplish this, it is necessary to block the audio output stage Q-3 on the adapter whenever a relaying function occurs. The D-C voltage which unblocks the carrier transmitter is also implied to the base of transistor Q-3 through a voltage-dividing network consisting of resistors R-20 and R-11, plus the diode CR-1.

When a relaying function occurs, the voltage developed across resistor R-11 is sufficiently high to drive the base of stage Q-3 positive with respect to the emitter and therefore, blocks the circuit. This action prevents the speech modulation of the carrier signal. Effectively, a voice conversation carried on over a relaying channel will be interrupted instantly when a relaying operation occurs.

On the other hand, as previously explained, the start voltage supplied by the adapter is less than half the start voltage supplied by the transmitter-receiver when a relaying operation occurs. Because of this difference in carrier-start voltages, the Voice Adapter when modulating, does not block stage Q-3. The voltage developed across resistor R-11 is not great enough to block transistor Q-3.

Telephone Usage

Telephone jacks are provided as an integral part of the adapter to accommodate a Westinghouse S#330 C678H04 noise cancelling handset. This telephone is an 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.

The side of the telephone plug marked "TOP" must be inserted into the corresponding socket marked "TOP" on the chassis of the adapter. Since this telephone has a noise cancelling handset, 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 directly into the telephone.

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 or the transmitting 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.

When used with supervisory equipment audio, block is performed through a supervisory preference contact. The jumper normally connecting terminals 4 and 17 on the transmitter-receiver is omitted and in its place is connected this contact. When a supervisory function is initiated, this contact opens, removing the B+ supplied to the adapter. Voice communication is interrupted when this occurs.

Adjustments

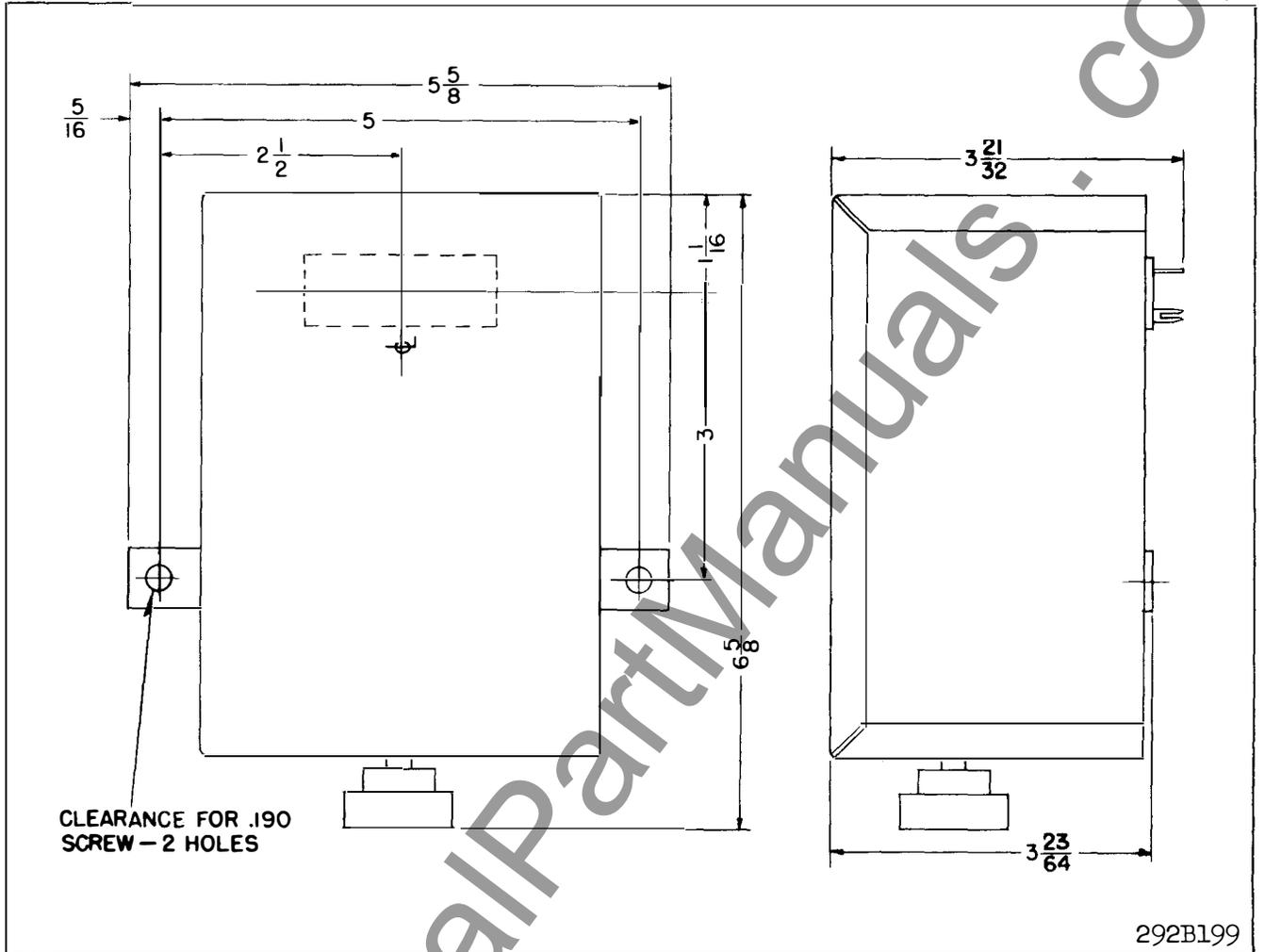
There are no adjustments to make on this unit other than the adjustment of the input control R-1, to a comfortable listening level. No control is provided for modulation. Adjustment of the relaying transmitter-receiver is not required.

MAINTENANCE

Voltage and resistance values should be recorded in order to establish reference values which will be useful when checking the apparatus.

ELECTRICAL PARTS LIST

CIRCUIT SYMBOL	DESCRIPTION	STYLE NUMBER	CIRCUIT SYMBOL	DESCRIPTION	STYLE NUMBER
CAPACITORS			TRANSISTORS		
C-1	0.25 μ f \pm 20%, 200VDC, Paper	186A624H02	Q-1	2N274	187A270H01
C-2	9.1 μ f \pm 20%, 100VDC	187A624H01	Q-2	2N274	187A270H01
C-3	Same as C-1		Q-3	2N525	184A638H13
C-4	10 μ f, -10% + 100% 50VDC	330C556H42	RESISTORS		
C-5	Same as C-2		R-1	2.5K, \pm 30%, 1/4 W, Pot.	330C598H01
C-6	Same as C-4		R-2	1K, \pm 5%, 1/2W	184A763H27
C-7	.01 μ f, \pm 10% 300VDC	330C661H36	R-3	3.9K \pm 5%, 1/2W	184A763H41
C-8	Same as C-4		R-4	560 Ohms, \pm 10%, 1/2 W	187A641H21
C-9	Same as C-7		R-5	2.2K, \pm 10%, 1/2W	187A641H35
C-10	Same as C-4		R-6	39K, \pm 5%, 1/2 W	184A763H65
C-11	100 μ f, -10% + 100%, 25VDC	330C565H32	R-7	Same as R-2	
C-12	50 μ f, -10%, + 100%, 50VDC	330C556H34	R-8	Same as R-5	
C-13	Same as C-4		R-9	270 Ohms, \pm 5%, 1/2W	184A763H13
DIODES			R-10	Same as R-2	
CR-1	IN63	584C433H02	R-11	22K, \pm 10%, 1/2 W	187A641H59
CR-2	IN63	584C433H02	R-12	820 Ohms, \pm 5%, 1/2 W	184A763H25
JACKS			R-13	150 Ohms, \pm 10%, 1/2 W	187A641H07
J-1	Telephone Jack	1472868	R-14	220 Ohms, \pm 10%, 1/2 W	187A641H11
J-2	Telephone Jack	1472868	R-15	1K, \pm 10%, 2 W	187A642H27
RELAY			R-16	470 Ohms, \pm 10%, 1/2 W	187A641H19
K-1	48V, 1000-Ohm Coil, 4 Transfer contacts	330C588H01	R-17	270 Ohms, \pm 5%. 1W	187A643H24
REACTOR			R-18	3.9K, \pm 5%, 1W for style 408C020G01	187A643H41
L-1	50-mh Shunt Reactor	187A876G01	R-18	12K, \pm 5%, 12 for style 408C020G02	187A643H51
PLUG			R-19	470 Ohms, \pm 10%, 1/2W	187A641H19
P-105	12 Circuit Voice Adapter Plug	187A671H01	R-20	2.4K, \pm 5%, 1/2W	187A763H36
			TRANSFORMERS		
			T-1	Impedance Ratio 250/300 Ohms	1962697
			T-2	25K/600 Ohms	330C590H01



292B199

Fig. 2 Outline - Type TC Voice Adapter.

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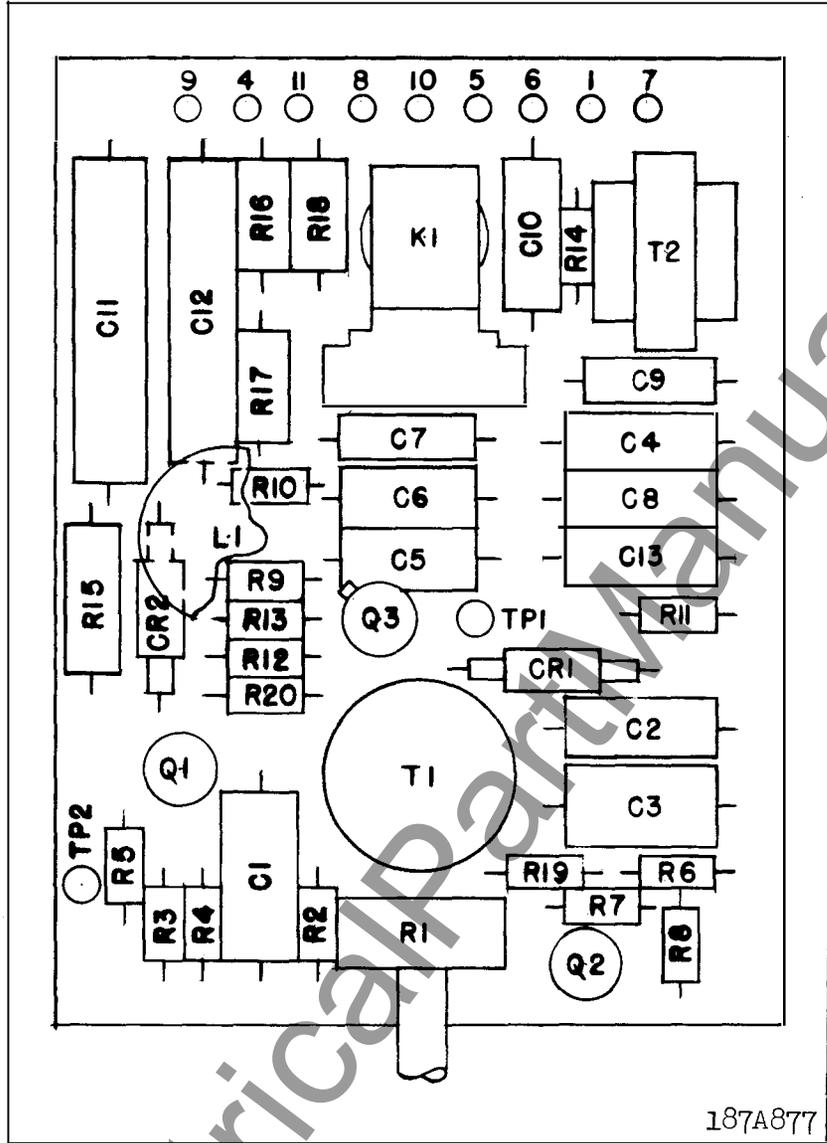


Fig. 3 Printed Circuit Board Component Location - Type TC Voice Adapter

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CHARACTERISTICS

The TC Voice Adapter has sufficient gain to provide 30 to 50 per cent modulation of the carrier transmitter, with a normal speaking voice level. The received audio signal level is adjustable, through a volume control mounted on the Voice Adapter, up to approximately zero dbm level. When transmitting, the Voice Adapter circuit energizes the transmitter to an unmodulated level of 7.5 to 14 db less than for a relaying operation to allow satisfactory modulation.

CONSTRUCTION

The unit is mounted in a metal box chassis consisting of a cover and a frame. A 12-terminal plug on the back of the unit allows it to be plugged into a TC transmitter-receiver. With the exception of the telephone jacks, all electrical components are mounted on printed circuit board. Connections between this board and the 12-terminal plug are made through flexible leads. For maintenance purposes, the printed circuit board may be unfastened and swung out away from the chassis after removing the cover of the box.

OPERATION

The circuit consists of three grounded emitter transistor stages which include an RF amplifier, a power detector and an audio amplifier (see Internal Schematic). When receiving, the RF input signal passes from the coaxial cable connection on the Transmitter-Receiver, through a portion of the input filter into the receiver section of the Voice Adapter. The signal

is then fed through the level control R-1 to the RF amplifier Q-1. This stage is transformer coupled to the power detector circuit Q-2 which in turn drives the base of audio output stage Q-3. This base drive is applied through capacitor C-6 and relay contacts K-1A. The signal is amplified by transistor Q-3 and then transformer-coupled through T-2 to the telephone receiver line. This connection is made through relay contacts K-1B and K-1C. There is no AVC action in these receiver circuits, so it is necessary to adjust the input control R-1 for the best listening level.

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The carrier transmitter must be unblocked before it is possible to transmit the modulated carrier signal. This is accomplished by applying carrier-start voltage to the transmitter through contacts K-1D in the Voice Adapter. Energizing relay K-1 in the adapter closes contacts K-1D which supply carrier-start voltage to the transmitter-control circuit. This unblocks the emitter circuit of Q-103 in the transmitter which then permits transmission of carrier. The d-c voltage applied to this bleeder circuit by the adapter is about $\frac{1}{2}$ the voltage supplied when a relaying function occurs. Therefore, the unmodulated transmitter output

Supersedes I.L. 41-944.4C

*Denotes changed from superseded issue

EFFECTIVE DECEMBER 1968

TYPE TC VOICE ADAPTER

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When a relaying function occurs, the voltage developed across resistor R-11 is sufficiently high to drive the base of stage Q-3 positive with respect to the emitter and therefore, blocks the circuit. This action prevents the speech modulation of the carrier signal. Effectively, a voice conversation carried on over a relaying channel will be interrupted instantly when a relaying operation occurs.

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Adjustments

There are no adjustments to make on this unit other than the adjustment of the input control R-1, to a comfortable listening level. No control is provided for modulation. Adjustment of the relaying transmitter-receiver is not required.

MAINTENANCE

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L-1	50-mh Shunt Reactor	187A876G01	R-18	12K, \pm 5%, 12 for style 408C020G02	187A643H51
PLUG			R-19	470 Ohms, \pm 10%, 1/2W	187A641H19
P-105	12 Circuit Voice Adapter Plug	187A671H01	R-20	2.4K, \pm 5%, 1/2W	187A763H36
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			T-1	Impedance Ratio 250/300 Ohms	1962697
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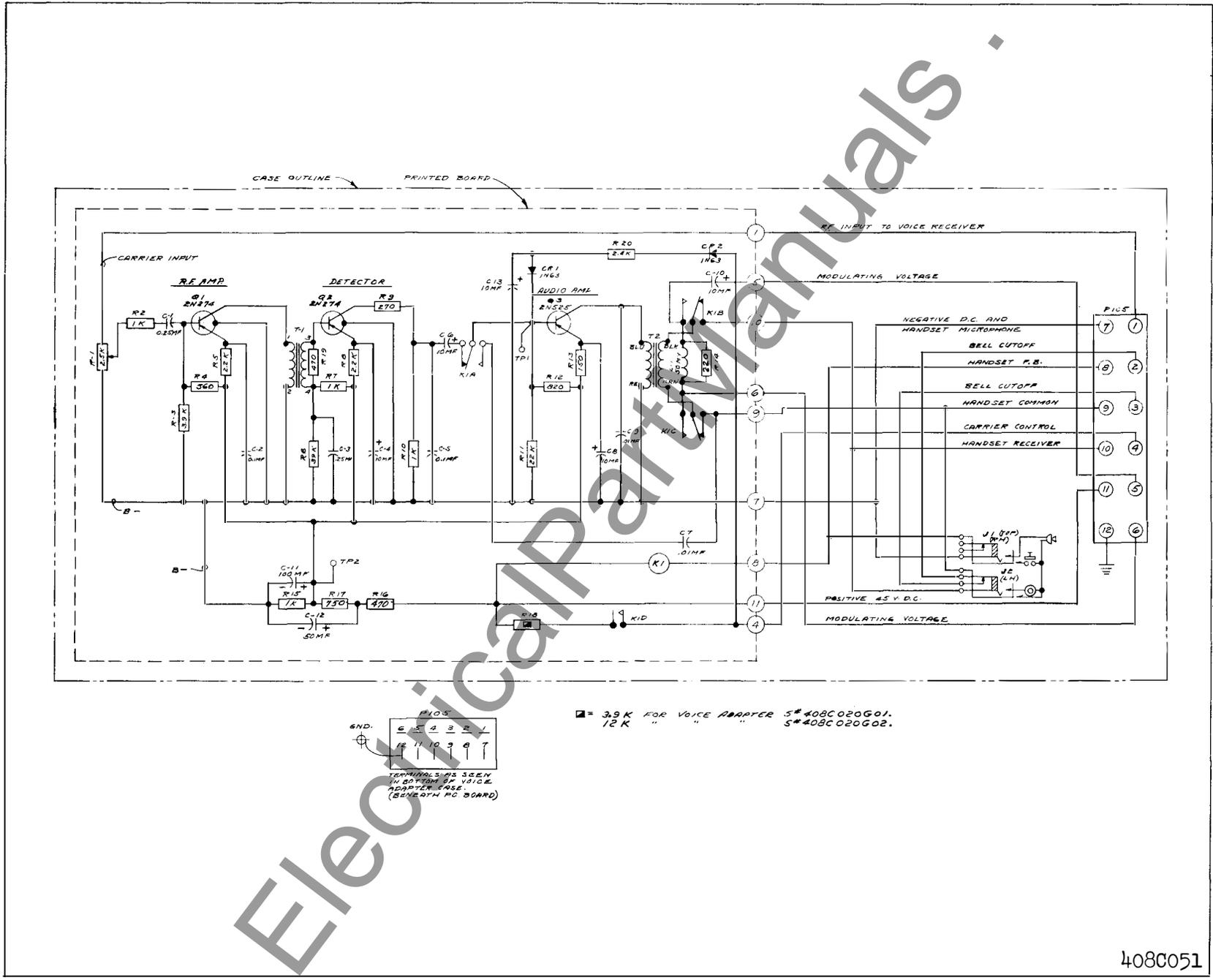
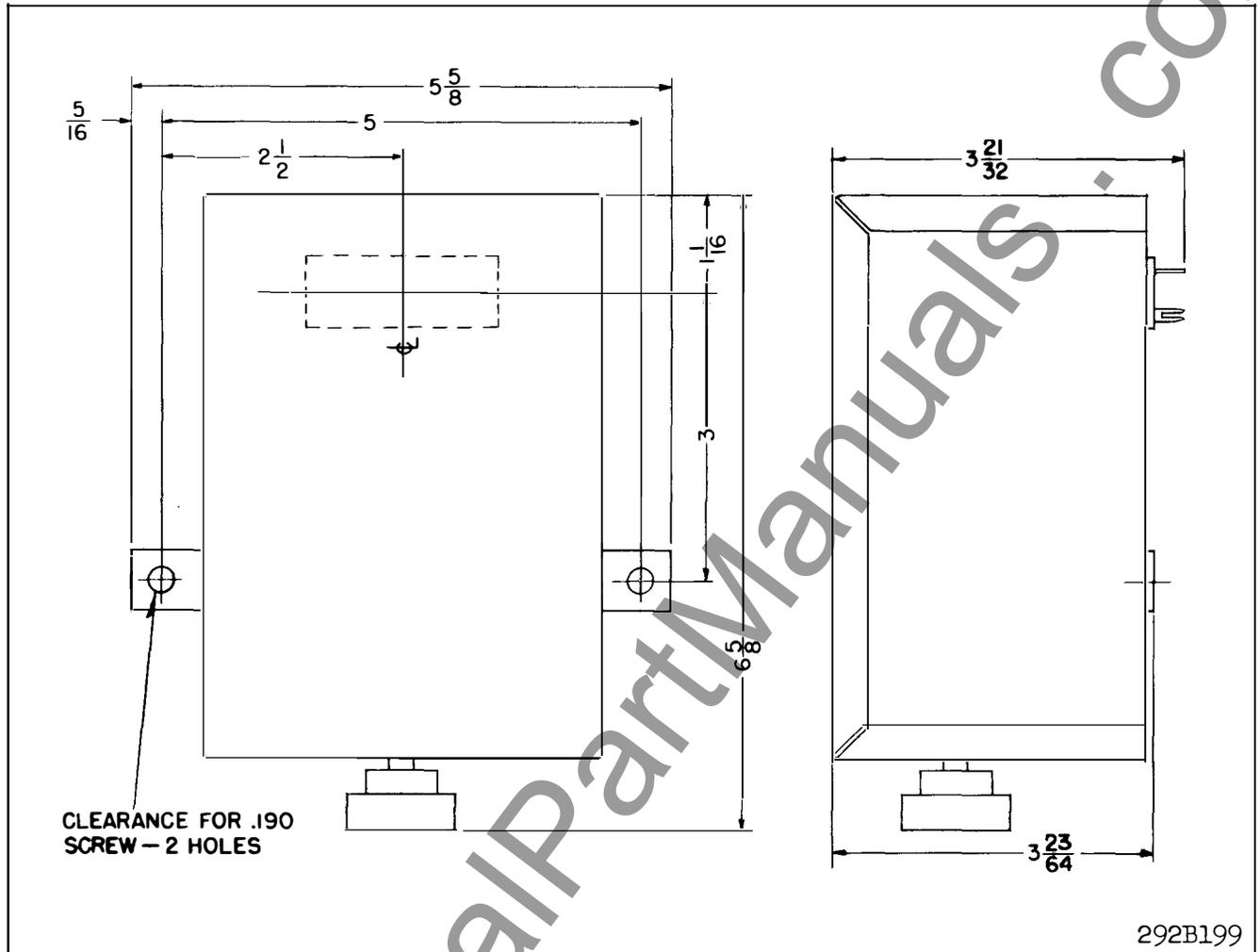


Fig. 1 Internal Schematic - Type TC Voice Adapter.



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Fig. 2 Outline - Type TC Voice Adapter.

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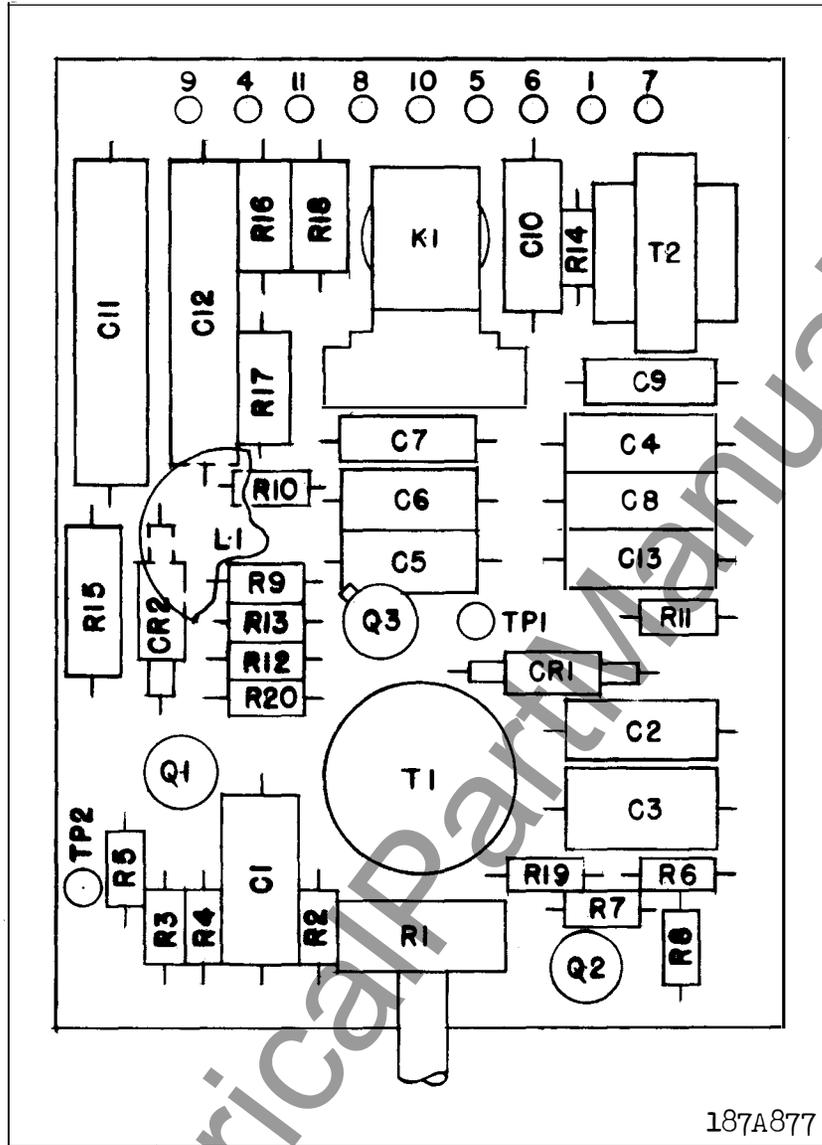


Fig. 3 Printed Circuit Board Component Location-Type TC Voice Adapter

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