****

CV-2455 documentation...

The CV-2455 is the teletype converter for the PRC-47 radio set. In the mid-1960s, Collins built the 700C-1 which is the commercial version of the CV-2455. The 700C-1 was meant for use with the 618U-1 (commercial PRC-47).

This documentation comes courtesy of Dick Dillman, who has the manual for the 700C-1. I do not know exactly what differences there are between the 700C-1 and the CV-2455, but they appear to be very similar.

****

Some notes here...

****

Apparently the 700C-1 and early CV-2455 units were set up MARK HIGH, with both transmit & receive tone frequencies like this:
MARK = 2425 CPS
SPACE = 1575 CPS

There is a Marine Corp MI (Modification Instruction) which changes the CV-2455 to MARK LOW status, with transmit & receive tone frequencies like this:
MARK = 1575 CPS
SPACE = 2425 CPS

This schematic included here reflects the original 700C-1 configuration, which seems to be MARK HIGH.

If your CV-2455 has an MI number engraved on it's cover, then it likely was modified to MARK LOW status, but later units were apparently manufactured as MARK LOW units and do not carry this engraved number.

****

There is an error in this schematic - be sure to read the included errata sheet and mark this schematic accordingly.

(The errata sheet has nothing to do with the MARK LOW modification - it just corrects an error in the schematic.)

****

If you have any documentation on the CV-2455, then please get in touch with me at:

Dave Ross N7EPI ross@hypertools.com 360/465-2117

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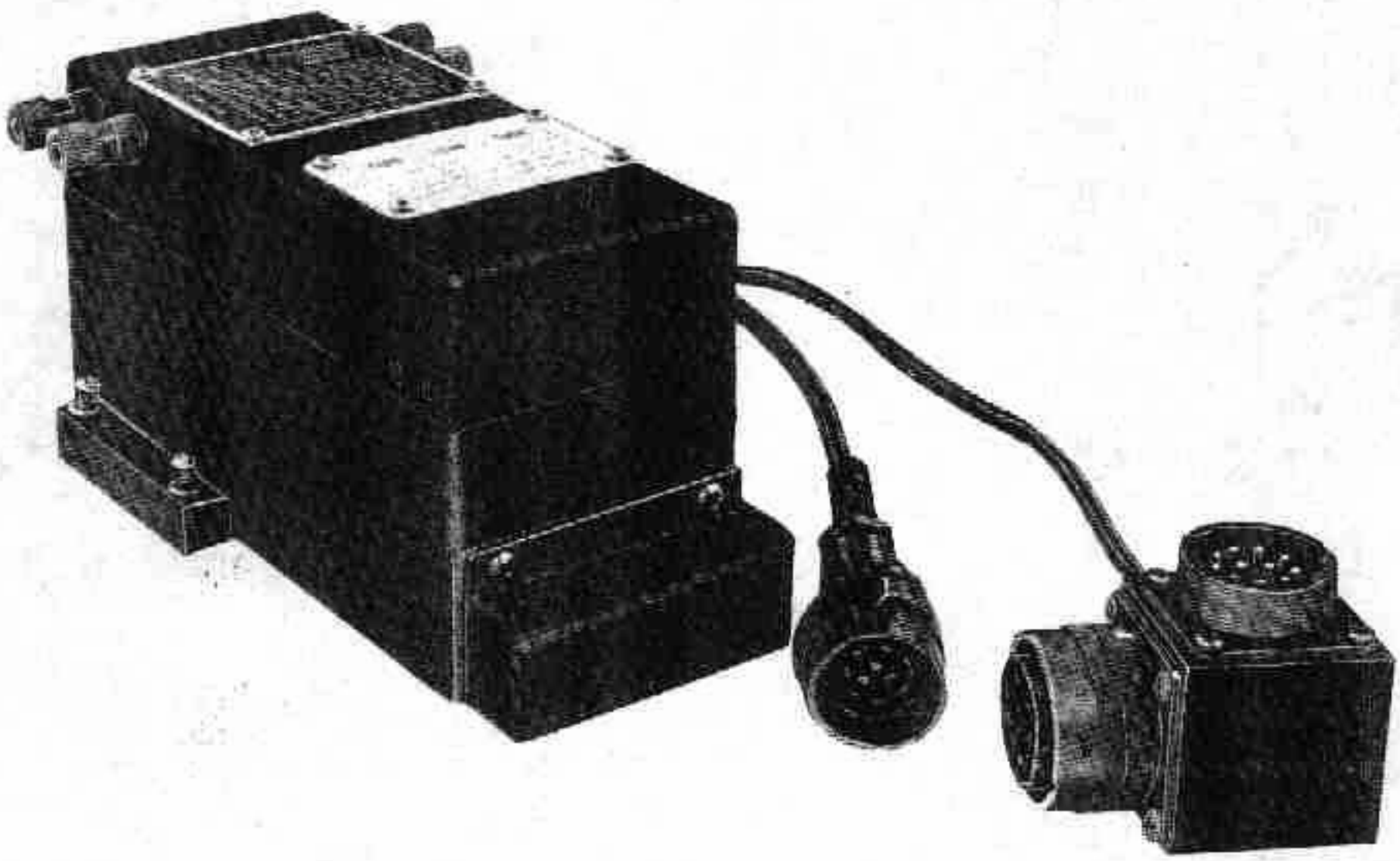


Figure 1-1. 700C-1 FSK Converter-Blower

ERRATA SHEET TO INSTRUCTION BOOK

FOR

700C-1 FSK CONVERTER-BLOWER

(523-0759199)

Make the following pencil corrections to the 700C-1 instruction book:

Page 1-1 and page 6-1: Change Collins part number 522-3789-001 to read 522-3789-003.

Page 7-1, figure 7-1: Change polarity of diodes CR303, CR304, CR305, and CR306.

15 August 1968
523-0759199-011211

section 4

principles of operation

4.1 General.

The fsk converter circuits, located on TB1 and TB2 in the upper chassis of the 700C-1, include five basic circuits: an audio amplifier, a discriminator, a dc amplifier, a tone generator, and a common, +15-volt power supply. An internal power connector connects the power control circuits in the lower chassis with the fsk converter circuits in the upper chassis. Audio connector P501 connects to the front panel of the RT-671/PRC-47 providing an audio input to the fsk converter circuits and an audio output to modulate the RT-671/PRC-47 along with a remote push-to-talk control line. Refer to the schematic diagram in figure 7-1.

4.2 Power Distribution and External Hookup Functions.

Refer to figure 4-1 for a block diagram of the 700C-1. The power connector adapter supplies all necessary power requirements to the lower chassis section containing the blower and transmit-receive control circuits. An internal connector, between the upper and lower chassis, applies 28.5 volts dc or 26.5 volts ac to the input of the +15-volt power supply in the upper chassis and also connects the output of this +15-volt power supply to a contact on the transmit relay in the lower chassis.

This relay controls the incoming 115 volts ac for blower operation and applies the output of the +15-volt power supply to the primaries of the two audio transformers in the receive mode and to the tone generator section in the transmit mode. The +15-volt output of this power supply is connected to the audio (first stage only) and dc amplifier sections at all times.

An audio connector, which extends from the upper chassis, connects the audio output from the RT-671/PRC-47 to the 700C-1 audio amplifier. It also connects the output of the tone generator (2425 or 1575 Hz) to the microphone input of the RT-671/PRC-47. The REMOTE PTT binding post terminals on the right side of the 700C-1 are connected directly through the audio connector to the push-to-talk control in the RT-671/PRC-47. The TTY LOOP binding post terminals are connected to the last stage of the dc amplifier and also to positive 26.5 volts dc at the power supply. Resistor R501 provides a fine adjustment for the tty loop current.

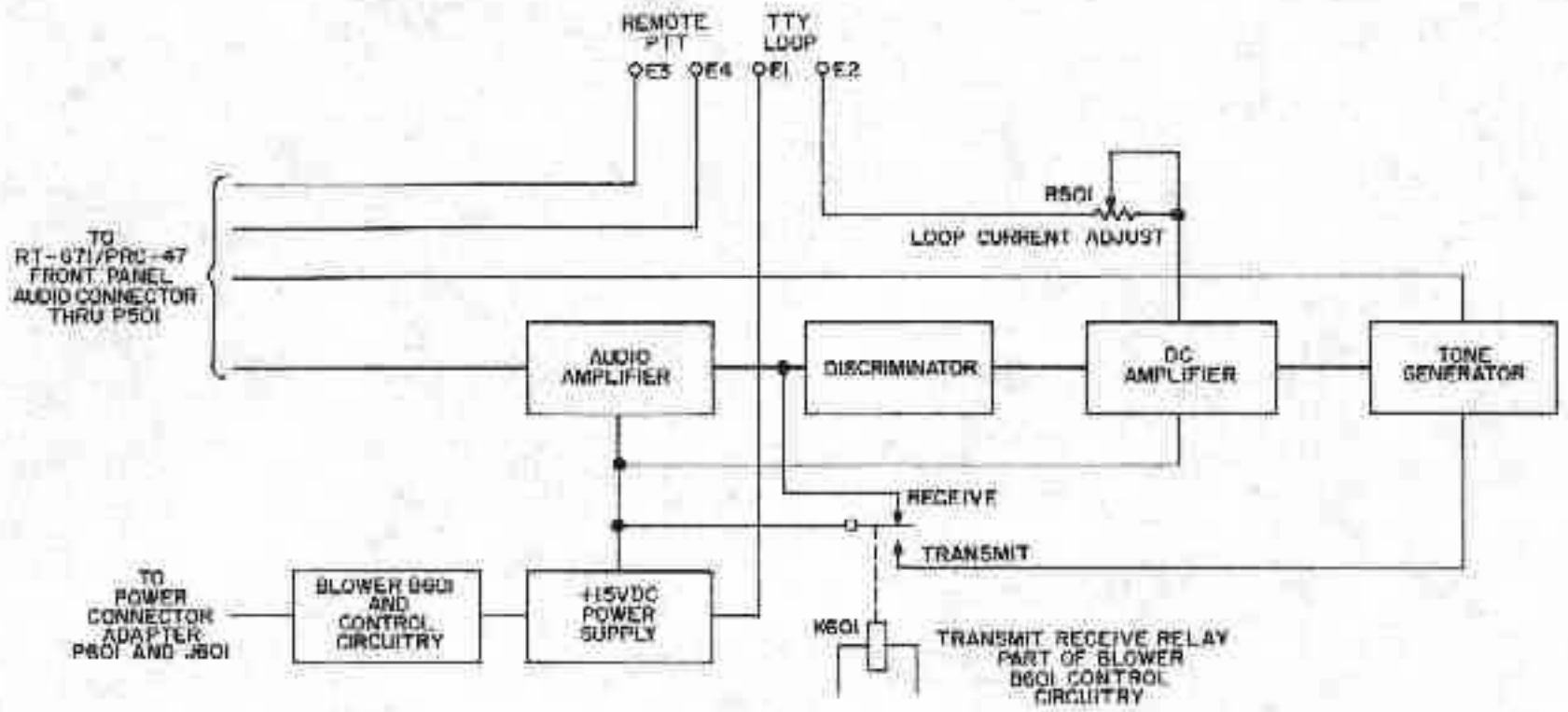


Figure 4-1. 700C-1 FSK Converter-Blower, Block Diagram

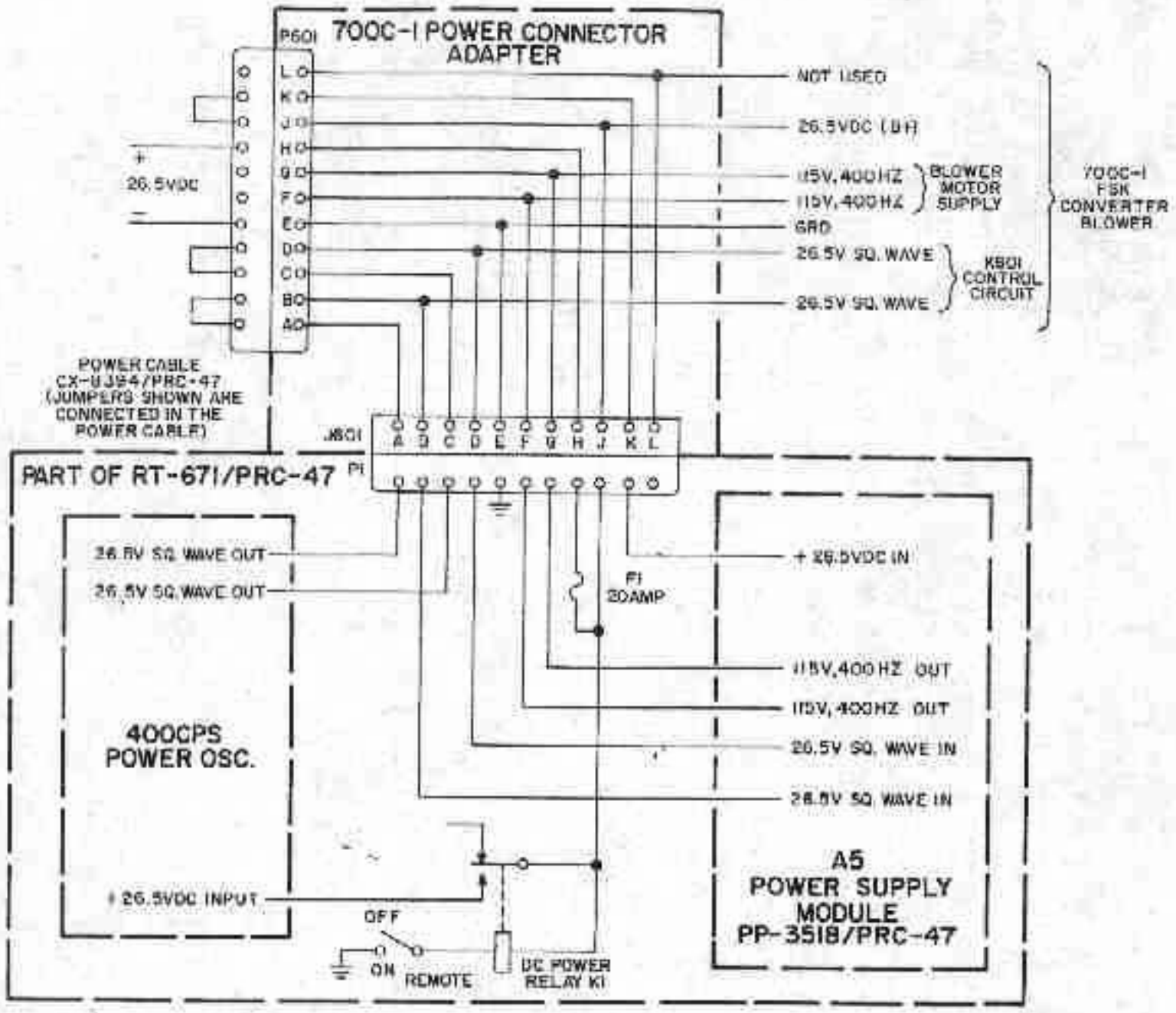


Figure 4-2. 700C-1 Power Connector Adapter, Voltage Distribution Diagram, 26.5-Volt DC Input

4.3 Power Input and Control Circuits.

Refer to figure 4-2 for power connector adapter wiring and for how the input voltages to the 700C-1 are obtained when the 26.5 volt dc external power is applied. Refer to figure 4-3 when 115 volts 400-Hz external power is being applied.

4.4 Power Control Circuit.

Refer to the schematic diagram of the 700C-1, figure 7-1. The power control circuit is located in the lower chassis of the 700C-1. Incoming power is obtained as explained in paragraph 4.3. When the RT-671/PRC-47 high voltage is applied (transmit mode), a control voltage of 26.5 volts ac or a 26.5 square-wave voltage is present across the bridge rectifier, CR801 through CR804. The output of this bridge rectifier energizes the transmit receive control relay K601. A set of normally open contacts on this relay completes the 115 volts 400-Hz path to blower motor B601. Fuse F601 protects incoming 115 volts 400-Hz power from overload conditions. FSK power switch S601 controls the alternate voltages which can be applied to the input of the +15-volt power supply in the upper chassis. Depending on the external input to the RT-671/PRC-47 (ac or dc), switch S601 controls a positive 26.5 volts to the power supply or 115 volts 400 Hz to the primary of transformer T601. The secondary of transformer T601 supplies 26 volts 400 Hz to the power supply through pins C and D of connector J602. Either the positive 26.5 volts or the 115 volts 400 Hz will enable it to produce the required +15-volt output. In the transmit mode, the second set of contacts on relay K601 applies a +15-volt B+ voltage to the tone generator through pin F of J602 and to the discriminator through pin E of J602 in the receive mode.

4.5 Receive Mode Operation.

4.5.1 AUDIO AMPLIFIER.

Transistors Q401 and Q402, operated in common emitter configurations, form a two-stage audio amplifier. Audio signals from the RT-671/PRC-47 enter

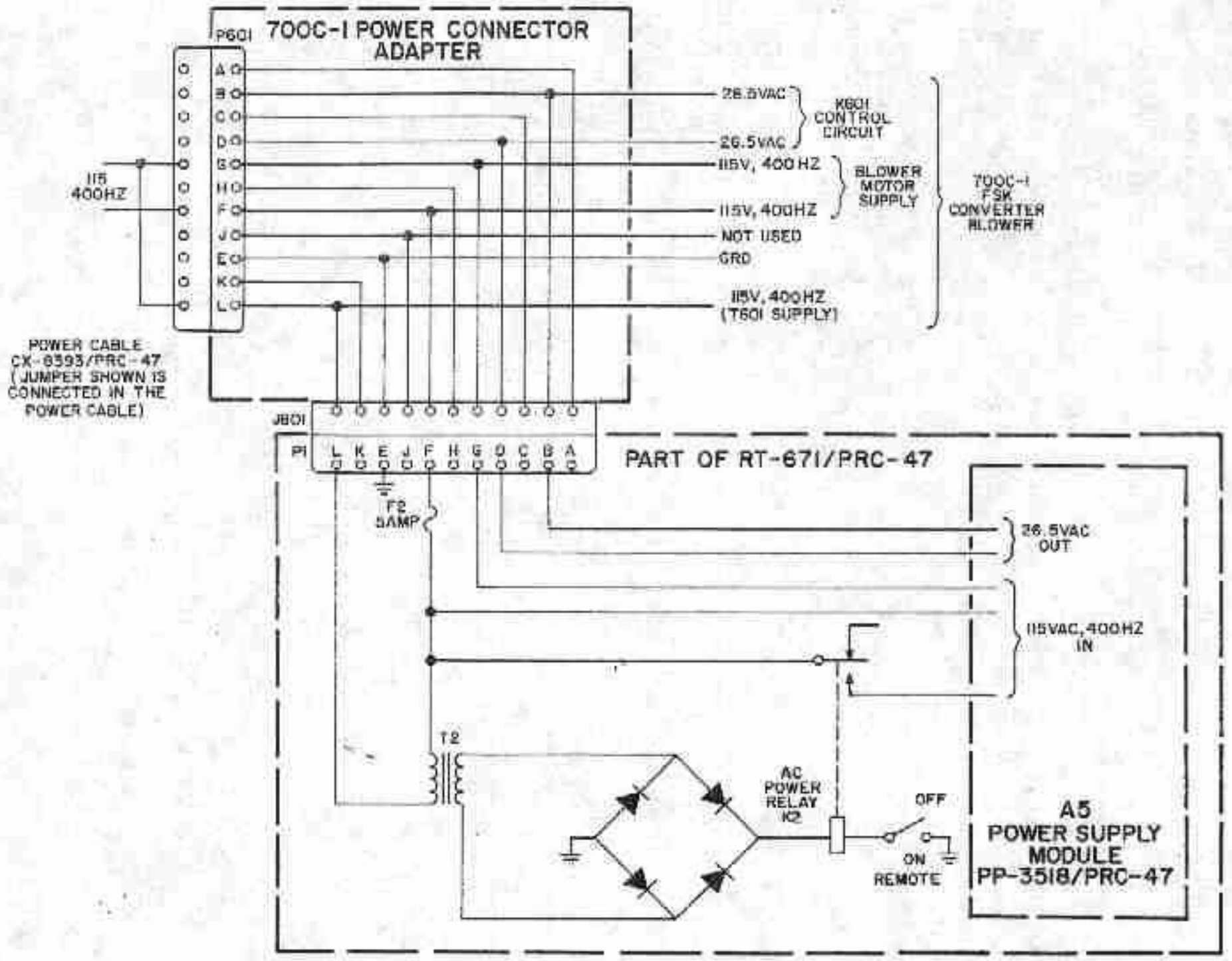


Figure 4-3. 700C-1 Power Connector Adapter, Voltage Distribution Diagram, 115-Volts 400-Hz Input

the 700C-1 fsk circuit at pin L of audio connector P501. The audio input signal, either 1575 Hz or 2425 Hz, enters the audio amplifier at terminal E37 on TB2. Capacitor C401 couples the incoming audio to the base of transistor Q401, and capacitor C402 couples the output of transistor Q401 to the base of transistor Q402. The output of the audio amplifier appears across the secondary windings of series-connected audio transformers T301 and T302 in the collector circuit of Q402. The +15 volts applied to the collector circuit of transistor Q402 is present only in the receive mode and is controlled by the transmit-receive relay K601 in the bottom chassis.

Diodes CR401 and CR402 clip undesirable voltage peaks that can be present on the incoming audio line. The emitter-base junctions of Q401 and Q402 are forward biased by the voltage divider consisting of resistors R403, R404, R407, and R408. Resistor R405 is an emitter-bias resistor for Q401 to provide a small amount of degenerative feedback current, cancelling any audio frequency distortion that might be present. Resistor R409 provides emitter bias for transistor Q402. Capacitor C403 bypasses the audio variations around resistor R409, eliminating any degenerative feedback at R409.

4.5.2 DISCRIMINATOR.

In the receive mode, the double discriminator network in the discriminator section provides a positive output when a 1575-Hz signal is present at the secondaries of transformers T301 and T302 and provides a negative output when a 2425-Hz signal is present at the transformer secondaries. The parallel combination of capacitors C305, C306, C307, and coil L301 in the first discriminator is resonant at 2425-Hz audio frequency. The second discriminator circuit is non-resonant at this same frequency and virtually shorts out the secondary of transformer T302. The audio

voltage across the resonant combination in the first discriminator is coupled to a rectifier network by C301 and C302. The rectifier network consists of diodes CR301, CR302, CR303, CR304, capacitors C315 and C318, and resistors R301 and R302. This network produces both a negative and a positive voltage with respect to ground. In this case, the negative output that appears across resistor R301 is the usable output. This negative voltage is applied through resistor R305 to a switching transistor in the dc amplifier. Capacitors C311 and C312 effectively remove any form of ripple at the dc output point.

The second discriminator circuit functions with a 1575-Hz audio signal in the same manner as the first discriminator. The parallel combination of capacitors C308, C309, C310 and coil L302 is resonant at 1575 Hz. Now, the parallel combination in the first discriminator circuit is nonresonant at this frequency and virtually shorts out the secondary of T301. A negative output does not appear at this first discriminator as it did in the first example. The voltage from the resonant combination in the second discriminator is now coupled to a rectifier circuit by capacitors C303 and C304. The rectifier circuit consists of diodes CR305, CR306, CR307, CR308, capacitors C317 and C318, and resistors R303 and R304. This rectifier arrangement also produces a positive and a negative voltage in respect to ground. The positive voltage appearing across R303 is now the usable output that is applied through resistor R306 to the transistor switch in the dc amplifier. Capacitors C313 and C314 effectively remove any form of ripple at the dc output point.

4.5.3 DC AMPLIFIER.

The dc amplifier consists of transistors Q101 through Q105 and is mounted on terminal board TB1. The output of this amplifier is either a mark (representing a negative input to the dc amplifier from the discriminator) or a space (representing a positive input to the dc amplifier from the discriminator). These two conditions, mark and space, are recognized at the external teletypewriter by a 20-ma or 60-ma loop current flow through Q105 for a mark, and 0-ma loop current for a space. Refer to the schematic diagram in figure 7-1.

Transistors Q101 and Q102 are operated in a Darlington pair configuration for good stability and high dc gain. The emitter circuit of Q101 is connected through resistor R101 to the base of transistor Q102. The base circuit of transistor Q101 is connected to the discriminator section. The +15 volts from the power supply is applied at all times to the dc amplifier during fsk operation. Transistors Q103 and Q105 are operated in common emitter configurations. Transistor Q104 is operated in a common collector configuration. Transistor Q102 shares a common emitter resistor R111 with transistor Q103. Resistor R111 provides temperature compensation for transistors Q101, Q102, and Q103. Conduction through transistor Q102 is controlled by switching transistor Q101. When the input to the dc amplifier is a negative or zero voltage, transistors Q101 and Q102 are effectively turned off (biased to the point where little or no current flows). In this condition, the forward bias on transistor Q103 emitter-base junction is affected very little. This forward bias is established by the voltage divider consisting of resistors R102, R103, and R104 across the +15 volts line that causes conduction of Q103. The conduction of transistor Q103 establishes a forward bias on the emitter-base junction of transistor Q104, resulting in conduction. The conduction of transistor Q104, in turn, establishes a forward-biased condition on the emitter-base junction of loop current transistor Q105.

The loop current through transistor Q105 can be 20 ma or 60 ma depending on the requirements of the teletypewriter being used. This current is controlled by switch S501 and a series adjusting resistor R501. With switch S501 in the 60-MA position, the emitter resistor of transistor Q105 is R503, and with switch S501 in the 20-MA position, the emitter resistor is R203. When the loop current is 20 ma or 60 ma, the emitter voltage to ground will be approximately the same due to the values of resistors R203 and R503. Diode CR101 isolates the +15 volts and the 26.5 volts which are supplied by the power supply and are present on the loop current line. Resistor R501 provides a fine adjustment for the exact value of loop current required. A loop current filter, consisting of L501, L502, C503, and C504, is provided internally at the TTY LOOP binding post terminals. Test points E5 and E6 are provided to determine the value of the loop current flow by a voltage measurement across resistor R110.

In the preceding discussion, the dc amplifier switching transistor Q101 was receiving either a zero-voltage input or a negative voltage input from the discriminator section. This operation represents the reception of a 2425-Hz signal input resulting in loop current flow through transistor Q105 and causing a mark condition at the teletypewriter unit. The zero-voltage input is actually a rest condition when no signals are being received, and it can be considered a mark condition at the teletypewriter. In the case where a 1575-Hz signal is being received, the output of the discriminator section is a positive voltage. This positive voltage is applied to dc amplifier switching transistor Q101, resulting in a large forward-bias condition on the emitter-base junction of this transistor, and also transistor Q102. Transistor Q102 conducts, causing a reverse-bias condition to exist across the emitter-base junction of transistor Q103. Transistor Q103 is now cut off, which results in a reverse-bias condition on the emitter-base junction of transistor Q104. This, in turn, results in a reverse-bias condition on the emitter-base junction of loop current transistor Q105, halting the loop current output to the teletypewriter. The 1575-Hz signal input is recognized at the teletypewriter as a space.

4.6 Transmit Mode Operation.

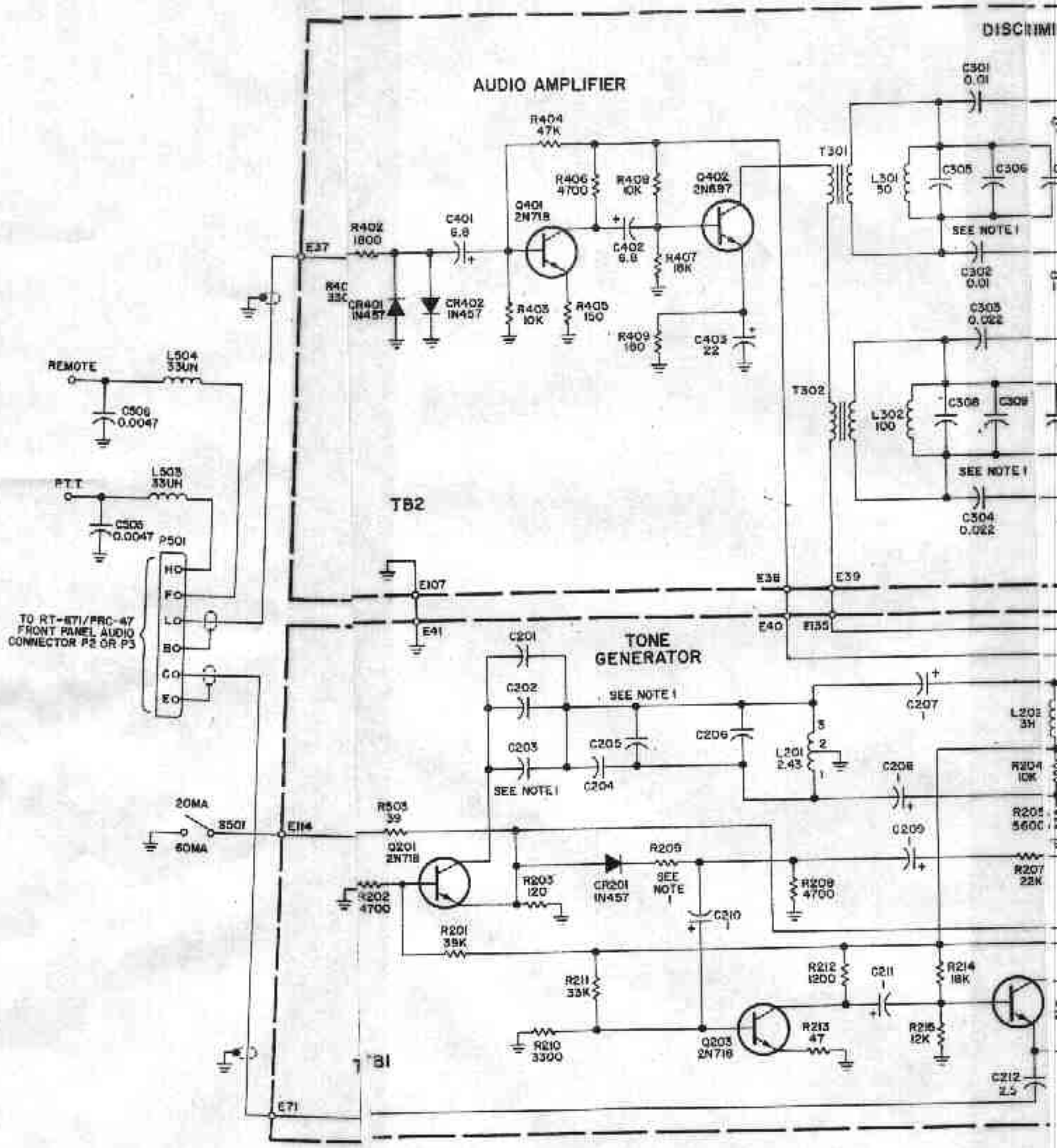
During the 700C-1 transmit mode, the +15 volts from the power supply is removed from the final stage of the audio amplifier, disabling the output of the audio amplifier and discriminator circuits. The input to dc amplifier switching transistor Q101 is now zero voltage, therefore, loop current transistor Q105 will be forward biased and able to conduct whenever the external teletypewriter closes the loop current line. The +15 volts from the power supply is applied to the tone generator section that produces two audio frequency tones for modulation of the RT-671/PRC-47. Refer to the 700C-1 schematic diagram in figure 7-1.

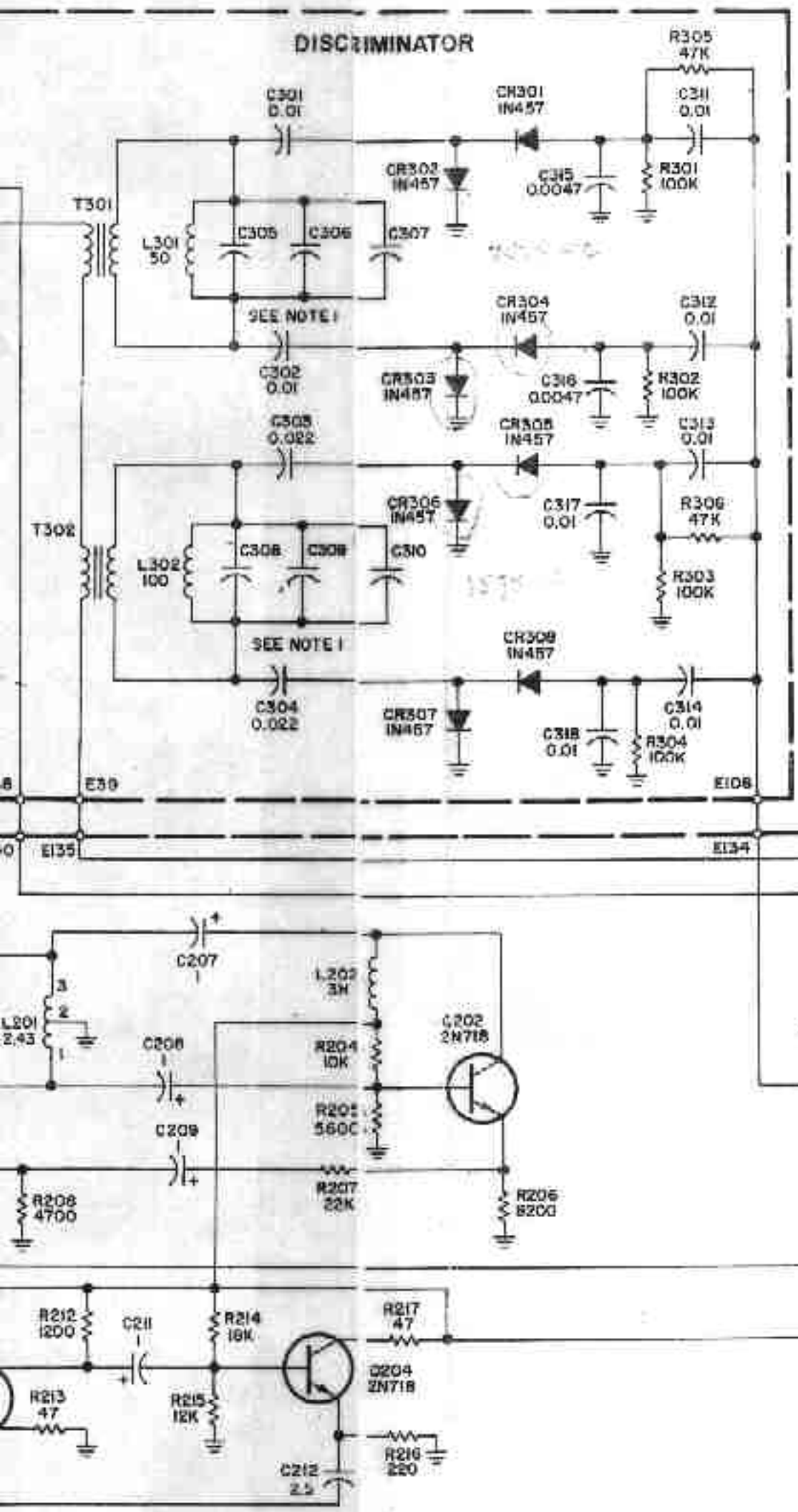
The teletypewriter keyboard controls the two frequency outputs of the tone generator. When the teletypewriter closes the loop current circuit, the tone generator modulates the RT-671/PRC-47 with a 2425-Hz audio tone, and when the loop current circuit is open, the tone generator modulates the RT-671/PRC-47 with a 1575-Hz audio tone.

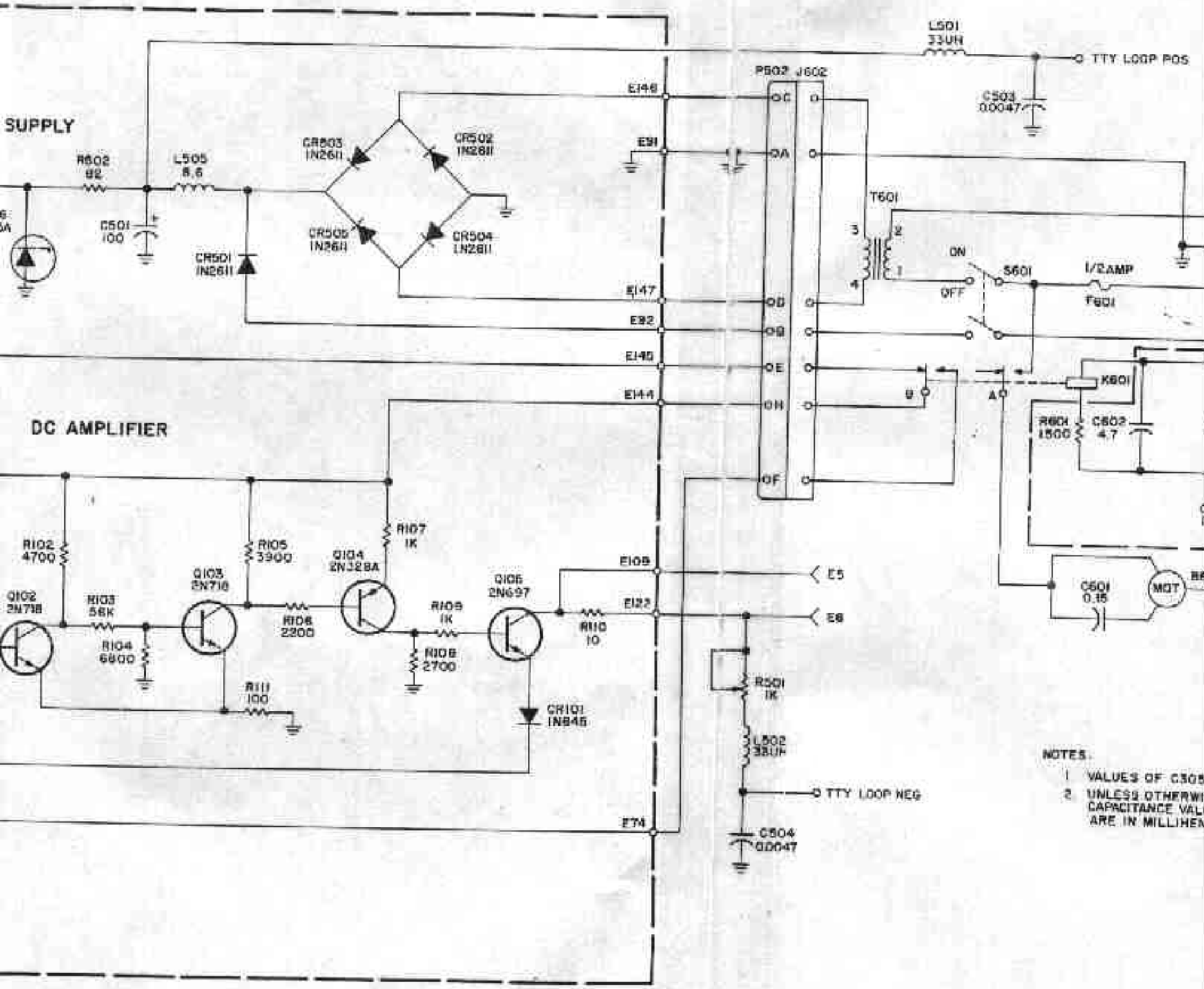
The tone generator consists of a basic audio oscillator circuit and associated audio amplifiers. The basic oscillator circuit includes transistor Q202 and a resonant circuit consisting of inductor L201 and capacitors C204, C205, and C206. The emitter-base bias of Q202 is established by the voltage divider consisting of resistors R204 and R205. The output of the basic oscillator circuit is 2425 Hz. This output is taken from the top of resistor R206 and coupled to the two audio amplifier stages consisting of transistors Q203 and Q204 and their associated circuits. The output of the audio amplifier stages is applied to pin C of audio connector P501. Capacitors C209 and C210 are coupling capacitors between the oscillator and amplifier circuit, and resistors R207, R208, and R210 are oscillator load resistors.

The two conditions that control the tone generator output frequency are current flow in the loop current line (20 or 60 ma) and zero-current flow in the loop current line. Switching transistor Q201 performs the actual frequency change by inserting capacitors C201, C202, and C203 in parallel with the existing capacitors in the basic oscillator. This additional capacitance in the resonant circuit lowers the frequency output of the basic oscillator to 1575 Hz. The emitter-base circuit of transistor Q201 is normally forward biased by the voltage divider consisting of resistors R201 and R202 when no loop current flows. The result is a tone generator frequency output of 1575 Hz for a zero-loop current flow condition.

When loop current flows, the voltage across resistor R503 or resistor R203, depending upon the 20MA/60MA switch position, reverse biases the emitter-base junction of transistor switch Q201. This turns the transistor switch off and removes capacitors C201, C202, and C203 from the basic resonant circuit, causing the oscillator to produce the higher frequency, 2425 Hz. The result is a tone generator frequency output of 2425 Hz for a 20- or 60-ma loop current flow condition. The tone generator output voltage at the higher frequency tends to be slightly greater than at the lower frequency. Diode switch CR201, operating when loop current flows, switches resistor R209 into the oscillator output circuit. Resistor R209 provides a slightly heavier oscillator output load, compensating for the higher voltage output at the higher frequency. This results in an equal voltage output from the tone generator at either frequency.

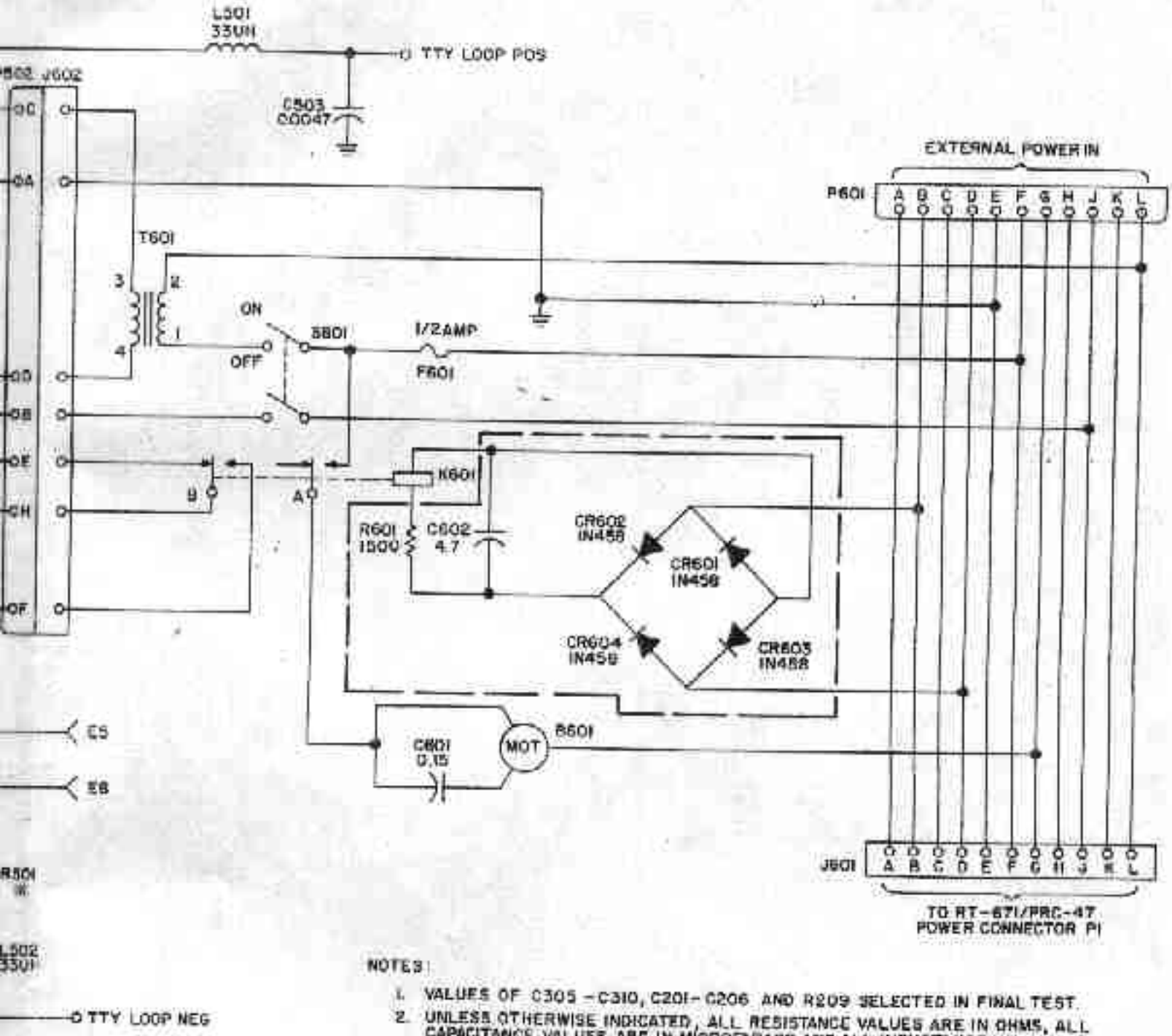

DISCRIMI
AUDIO AMPLIFIER
R404 47K
R406 4700
R408 10K
Q402 2N697
Q401 2N718
C401 6.8
R402 1800
C402 6.8
R407 18K
R405 10K
R405 150
R409 180
C403 22
CR401 IN457
CR402 IN457
E37
T301
L301 50
C305
C306
C301 0.01
SEE NOTE 1
C302 0.01
C303 0.022
T302
L302 100
C308
C309
SEE NOTE 1
C304 0.022
REMOTE
L504 33UH
C508 0.0047
P.T.T
L503 33UH
C505 0.0047
P501
HO
FO
LO
BO
CO
EO
TO RT-671/PRC-47 FRONT PANEL AUDIO CONNECTOR P2 OR P3
TB2
E107
E41
E38
E39
E40
E135
TONE GENERATOR
C201
C202
C203
SEE NOTE 1
C205
C204
C206
L201 2.43
5
2
1
C207
L202 3H
C208
R204 10K
R205 5600
C209
R207 22K
20MA
50MA
S501
E114
R503 39
Q201 2N718
R202 4700
R203 120
CR201 IN457
R209
SEE NOTE 1
C210
R208 4700
R201 35K
R211 33K
R210 3300
Q203 2N718
R212 1200
C211
R214 18K
R213 47
R215 12K
C212 2.5
TB1
E71


DISCRIMINATOR
T301
L301
50
C301
0.01
C305
C306
C307
SEE NOTE 1
C302
0.01
CR301
IN457
CR302
IN457
C315
0.0047
R305
47K
C311
0.01
R301
100K
CR304
IN457
CR303
IN457
C316
0.0047
C312
0.01
R302
100K
T302
L302
100
C305
0.022
C308
C309
C310
SEE NOTE 1
C304
0.022
CR308
IN457
CR306
IN457
C317
0.01
C313
0.01
R306
47K
R303
100K
CR309
IN457
CR307
IN457
C318
0.01
C314
0.01
R304
100K
E39
E135
E108
E134
L201
2.43
C207
L202
3H
C208
C209
R204
10K
R205
560Ω
R207
22K
R208
470Ω
C202
2N718
R206
820Ω
R212
1200
C211
R214
16K
R213
47
R215
12K
C212
2.5
R217
47
Q204
2N718
R216
220
+15VDC POWER SUPPLY
R502
82
L505
8.6
C502
47
CR508
IN1555A
C501
100
CR503
IN2611
CR501
IN2611
CR505
IN2611
DC AMPLIFIER
Q101
2N718A
R101
10K
R102
4700
Q102
2N718
R103
56K
R104
6800
Q103
2N718
R105
3900
R106
2200
Q104
2N3254
R111
100


SUPPLY
R602
82
L505
8.6
C501
100
CR503
IN2611
CR502
IN2611
CR505
IN2611
CR504
IN2611
CR501
IN2611
E148
E91
E147
E82
E145
E144
P502 J602
L501
33UH
TTY LOOP POS
C503
0.0047
T601
ON
OFF
S601
1/2AMP
F601
K601
R604
1500
C502
4.7
DC AMPLIFIER
R102
4700
R103
56K
R104
6800
R105
3900
R106
2200
R107
1K
R108
2700
R109
1K
R110
10
R111
100
Q102
2N718
Q103
2N718
Q104
2N328A
Q105
2N697
CR101
IN645
E109
E122
E74
E5
E8
R501
1K
L502
33UH
TTY LOOP NEG
C504
0.0047
C501
0.15
MOT
NOTES.
1 VALUES OF C505
2 UNLESS OTHERWISE
CAPACITANCE VALU
ARE IN MILLIHENR

section 7

illustrations



NOTES:

1. VALUES OF C305 – C310, C201 – C206 AND R209 SELECTED IN FINAL TEST.
2. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROFARADS AND ALL INDUCTANCE VALUES ARE IN MILLIHENRYS.

Figure 7-1. 700C-1 FSK Converter-Blower, Schematic Diagram

INSTALLATION INSTRUCTIONS

FOR

CV-2455/PRC-47 CONVERTER-BLOWER

COLLINS PART NUMBER 777-1418-001

SUPPLIED UNDER CONTRACT N00027-67-C-0165

1. INSTALLATION KIT CONTENTS

Screw, panhead, 8-32 x 3/8, qty - 4

2. INSTALLATION INSTRUCTIONS (Refer to Figures 1 and 2.)

a. Remove four flathead screws securing the cover plate (including the tune and load chart) and gasket to the RT-671/PRC-47.
b. Set aside the cover plate, gasket, and four screws for future use.
c. Remove four flathead screws securing the heat-sink cover (including the chart plate), heat-sink gasket, and heat sink to the RT-671/PRC-47.
d. Set aside the heat-sink cover, heat-sink gasket, and four screws for future use.
e. Insert and tighten the four 8-32 x 3/8 panhead screws supplied in the installation kit into the heat sink, securing the heat sink to the RT-671/PRC-47.
f. Place the CV-2455/PRC-47 Converter-Blower over the front panel openings left by removal of the cover plate and heat-sink cover, and tighten the four captive screws in the lower chassis of the CV-2455/PRC-47 securing the CV-2455/PRC-47 to the RT-671/PRC-47.
g. Connect CV-2455/PRC-47, connector P2, to either AUDIO connector P2 or P3 on the RT-671/PRC-47.
h. Connect CV-2455/PRC-47, connector P1, to POWER connector P1 on the RT-671/PRC-47.
i. Connect two wires from the teletypewriter AN/TGC-14A(V) TTY LOOP terminals to TTY LOOP terminals J4 and J5 on the CV-2455/PRC-47 (observe polarity). If remote teletypewriter lines are used, they may be up to 1 mile in length (2-mile loop) of #20 AWG wire (not to exceed 110 ohms).
j. For remote push-to-talk operation, connect two wires from a remote switch to REMOTE PTT terminals J2 and J3 on the CV-2455/PRC-47. These remote lines may be up to 1 mile in length (2-mile loop) of #20 AWG wire (not to exceed 110 ohms).

3. PRELIMINARY ADJUSTMENTS

a. Connect equipment as shown in figure 3.
b. Set the CV-2455/PRC-47, RT-671/PRC-47, and AN/TGC-14A(V) POWER switches to ON.

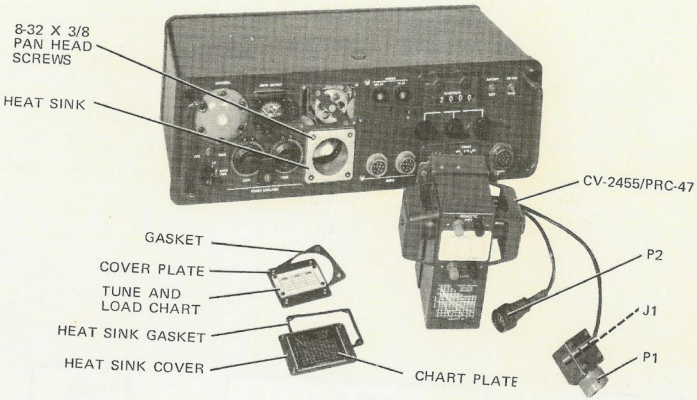
c. On the RT-671/PRC-47, set the CW-FSK/VOICE switch to CW-FSK for transmit mode, and to VOICE for receive mode. Rotate the VOLUME control fully cw. If the AN/TGC-14A(V) chatters in receive mode due to excessive noise, rotate the VOLUME control not more than 1/3 turn ccw until the chatter stops. Refer to the AN/PRC-47 manual for all other RT-671/PRC-47 control settings.

d. Note if the CV-2455/PRC-47 blower is in operation by checking air flow at the bottom of the CV-2455/PRC-47 when in transmit mode.

e. With a screwdriver or coin, unscrew the cap on the right side of the CV-2455/PRC-47. With the cap removed, the following controls are accessible: switch S2, potentiometer R45, and test jacks J6 and J7.

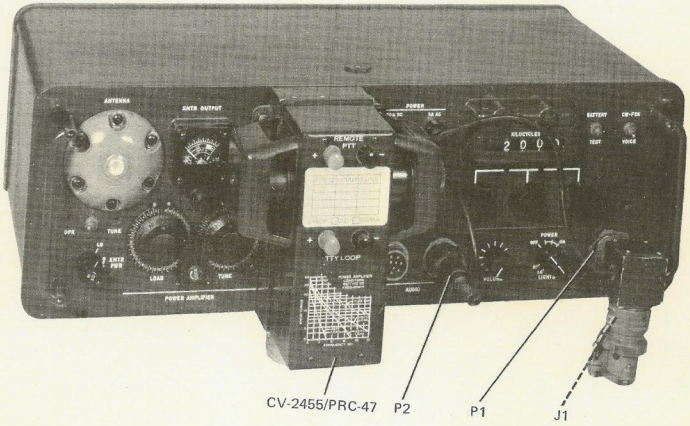
f. Set switch S2 to 20 MA. (If another teletypewriter is used, set to the proper position for the teletypewriter requirements: either 20 MA or 60 MA.)

g. Connect a voltmeter to J6 and J7, and adjust R45 for 20 +10 to -0 ma current. A current of 20 ma will result in a voltage of 0.2 volt dc (if adjusting for 60 ma, the resultant voltage will be 0.6 volt dc).



TPI-3120-017

Figure 1. CV-2455/PRC-47 Converter-Blower Prior to Installation on RT-671/PRC-47.



TPI-3119-017

Figure 2. CV-2455/PRC-47 Converter-Blower Installed on RT-671/PRC-47.

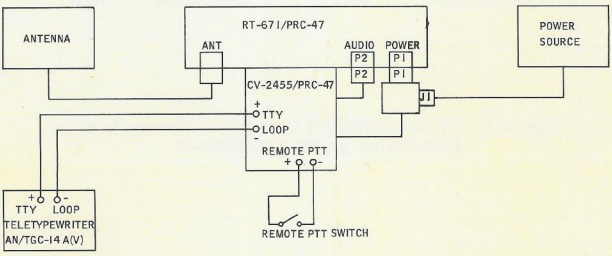


Figure 3. Interconnecting Wiring Diagram.