12.7 TW5250 AND TRANSCALL OPTION

12.7.1 GENERAL

This section describes the operation and circuitry of the TW5250 High Speed Selective Calling System and the Transcall Automatic HF Path Evaluation and Selective Calling System.

Section 12.7.3 covers the Installation and Operation of the TW5250 Option. Installation of the Transcall Option is covered in Section 12.7.4 and Operation is detailed in Section 12.7.5. The technical circuit description for both the TW5250 Option and the Transcall Option is described in Section 12.7.6.

12.7.1.1 TW5250 DESCRIPTION

The TW5250 is a high speed selective calling system employing serial data communications capability via a built-in MODEM. The circuitry is contained on printed circuit boards 735152 and 735153 and mounted in a die cast box over M3. Short call bursts are transmitted, followed by listening periods until contact is established. The unit is very reliable because the calling station may interrogate other stations repeatedly until a response is heard.

12.7.1.2 TRANSCALL DESCRIPTION

The Transcall is a path quality evaluation (PQE) system which allows the user to automatically select the best channel for communication with the station being called. Up to ten channels (1 through 10) may be scanned, although the optimum number seems to be five or six. The more channels that are scanned, the longer the system will take to acquire the called station.

The Transcall is contained in a standard die cast box and is located over the M3 module. The 30-wire harness plugs into the module via two 15-pin subminiature "D" connectors. This option is a factory retrofit only. The PC board is identical with that of the TW5250, so that users who already have TW5250 do not have to purchase an additional module.

The system operates by sending short interrogation bursts using a standard Bell 102 modem and 8-bit, 300 Baud serial data. Acknowledge request (ARQ) is used to assure the sending station that the call has been received. This is sometimes called a "handshake." By sending transmit code "000", all stations able to copy the call will sound their alarm tones and indicate "CALL" on their displays. This is the "ALL CALL" function. No handshake is issued in this case.

We have found that the use of high speed data transfers and the examination of a signal strength threshold is a very effective method for PQE. Further, since the modem is a period counting device as opposed to an energy detecting or PLL type, it handles multipath very well. Only when conditions are severe will the system reject the channel with the multipath, even if the signal is strong.

To make its evaluations, the called station transmits 32 characters on each of the available channels. The other station tries to copy these characters, and gives each channel a score based on correct copy. If a character is received correctly, that channel is given one (1) point. If the signal strength on that channel is over the preset threshold (see below) when the character was copied correctly, that channel is given another point. Therefore, the maximum score is 64. The system picks the channel with the highest score. In the case of a tie, the system will pick channels according to the following:

1. If the highest channel number in the scan is one of the ones involved in the tie, it will be selected. I.e., if scanning 6 channels and channel 6 is in the tie, channel 6 will be selected.

2. Otherwise, the lowest channel number will be selected.

12.7.2 SPECIFICATIONS

Table 12.7-1 lists the specifications for the TW5250 Option. Table 12.7-2 lists the specifications for the Transcall Option.

12.7.3 TW5250 INSTALLATION AND OPERATION

12.7.3.1 RECEIVE CODE

Each unit in the system should be assigned a different receive code. Units are preset before shipment and the code is marked on the outside of the transceiver. If it is desired that all transceivers in a system be factory preset, it should be so indicated on the sales order. If it is desired to change the preset receive code, remove the top cover of the transceiver, and remove the option module cover.

TABLE 12.7-1. TW5250 Specifications.

SUPPLY VOLTAGE: 12Vdc nominal

SUPPLY CURRENT: 150mA average

DATA RATE: 300 Baud

DATA FORMAT: 8-bit, 1 stop, no parity

MARK FREQUENCY: 2250Hz

SPACE FREQUENCY: 2050Hz

CALL BURST LENGTH: About 200ms

LISTENING INTERVAL: About 400ms

ACKNOWLEDGE LENGTH: About 2 seconds

TONE FREQUENCY TOLERANCE: ±30Hz

NUMBER OF POSSIBLE CODES: 254

ALL-CALL CODE: ØØØ

CONTROLS: "SEND" button, press once to send, again to stop.

Table 12.7-2. Transcall Specifications.

SUPPLY VOLTAGE: 12Vdc nominal

SUPPLY CURRENT: 150mA average

DATA RATE: 300 Baud

DATA FORMAT: 8-bit, 1 stop, no parity

MARK FREQUENCY: 2250Hz

SPACE FREQUENCY: 2050Hz

TONE FREQUENCY TOLERANCE: ±30Hz

NUMBER OF POSSIBLE CODES: 254

ALL-CALL CODE: 000

ACQUISITION TIME: 300 seconds max.*
180 seconds typ. (not in sync)*
15 seconds typ. (in sync)*

TOTAL ADDITIONAL TIME: 60 seconds max. (after initial acquisition)*
30 seconds typ. (after initial acquisition)*

CONTROLS: "SEND" button, press once to send, again to stop.

"SCAN LIMIT" switch, set positions 1–4 of S1 (TW5250) to BCD representation of selected scan limit. (Switch 1 of S1=MSB, "ON"=1, 10 channels max.)

"MODE" switch functions are as follows:

SELECTION	FUNCTIONS
T.C. ON	TRANSCALL and SELCAL on, SQUELCH off
S.C. ON	SELCAL on only, SQUELCH off
SQUELCH ON	SELCAL and TRANSCALL off, SQUELCH on
SQUELCH OFF	SQUELCH, SELCALL and TRANSCALL off

*Based on 10 channel scan.

Set the code on the eight-position DIP switch, S2, located in the middle of the circuit board. Refer to Table 12.7-3 to match the programmed receive code with its corresponding decimal transmit code.

12.7.3.2 TRANSMIT CODE

The transmitted code is set using the keypad and the method outlined in the transceiver manual. The three-digit decimal number which is entered corresponds to the complement of the receive code.

12.7.3.3 INITIATING CONTACT

Complete operating instructions will be found in Section 4, but it is as simple as pressing the SC button on the transceiver panel, entering the 3-digit decimal code of the station to be called, and pressing the SEND button. If the station receives the call correctly, a transpond signal of about 2 seconds duration will be sent immediately after the calling station's transmitter has stopped. The clarifier must be "OFF" for TW5250 use.

12.7.4 TRANSCALL INSTALLATION

12.7.4.1 RECEIVE CODE

Each unit in the system should be assigned a different receive code. Units are preset before shipment and the code is marked on the outside of the transceiver. If it is desired that all transceivers in a system be factory preset, it should be so indicated on the sales order. If it is desired to change the preset receive code, remove the top cover of the transceiver, and remove the option module cover. Set the code on the eight position DIP switch, S2, located in the middle of the circuit board. Refer to Table 12.7-3 to match the programmed receive code with its corresponding decimal transmit code.

12.7.4.2 TRANSMIT CODE

The transmitted code is set using the keypad and the method outlined in Section 4 of this manual.

The three digit decimal number which is entered corresponds to the complement of the receive code.

12.7.4.3 SCAN LIMIT

The scan limit switch allows the user to set the number of channels that are to be scanned. Transcall scans only the first ten channels, starting with the current channel. The scan advances up to the scan limit, then repeats starting on channel 1. Valid scan limit codes range from 2 to 10.

Each unit in the system should be assigned the same scan limit code for proper operation. The operator should set his most preferred channels in the lower channel numbers to ensure that the best channel is selected during the path evaluation sequence. To change the scan limit code, remove the top cover of the transceiver, and remove the option module cover. Set the code on positions 1-4 of the eight position DIP switch, S1, located in the middle of the circuit board. Refer to Table 12.7-4 to set the switch to the desired scan limit.

12.7.4.4 SIGNAL STRENGTH THRESHOLD

The signal strength threshold is preset by the factory, but can be set by the user for more accurate path evaluations. To change the signal strength threshold, remove the top cover of the transceiver, and remove the option module cover. Adjust R30 as indicated by Table 12.7-5.

12.7.5 TRANSCALL OPERATION

12.7.5.1 OPERATION

The Transcall operates and the unit scans under the control of the Transcall when the panel switch is in the "T.C. ON" position. In the "S.C. ON" position, the Transcall will neither send nor receive any Transcall interrogations, but operates as a normal TW5250 Selcal. In this position, the normal scan mode of the transceiver may be used by pressing "SCAN" (see Section 4 of this manual).

When the Transcall is "ON", the panel keypad is disabled and the user may not select channels, frequencies, or change the transmitted S.C. code. To regain panel control, first turn the panel switch AWAY from the "T.C. ON" position. Then press the "F" button on the panel. A couple of seconds later, the display should change from "t.c." to the normal "CH: ". This indicates that panel control is now available. This must be done to change the transmitted code. To restart the Transcall scan, turn the switch back to the "T.C. ON" position.

12.7.5.2 INITIATING TRANSCALL

Operating Transcall is as simple as entering the code of the station to be called (as described previously), setting the MODE switch to "TC ON" and finally pressing the SEND button. Transcall will assume control of the transceiver to find the channel that has the best path conditions between the originating and remote stations.

TABLE 12.7-3. Selective Call Conversion Chart.

TX CODE	RX SWITCHES ON	TX CODE	RX SWITCHES ON
000	12345678	052	12 4 78
001	2345678	053	2 4 78
002	1 345678	054	1 4 78
003	345678	055	4 78
004	12 45678	056	123 78
005	2 45578	057	23 78
006	1 45678	058	1 3 78
007	45678	059	3 78
008	123 4678	060	12 78
009	23 4678	061	2 78
010	1 3 5678	062	1 78
011	3 5678	063	78
012	12 5678	064	123456 8
013	2 5678	065	23456 8
014	1 5678	066	1 3456 8
015	5678	067	3456 8
016	1234 678	068	12 456 8
017	234 678	069	2 456 8
018	1 34 678	070	1 456 8
019	34 678	071	456 8
020	12 4 678	072	123 56 8
021	2 4 678	073	23 56 8
022	1 4 678	074	1 3 56 8
023	4 678	075	3 56 8
024	123 678	076	12 56 8
025	23 678	077	2 56 8
026	1 3 678	078	1 56 8
027	3 678	079	56 8
028	12 678	080	1234 6 8
029	2 678	081	234 6 8
030	1 678	082	1 34 6 8
031	678	083	34 6 8
032	12345 78	084	12 4 6 8
033	2345 78	085	2 4 6 8
034	1 345 78	086	1 4 6 8
035	345 78	087	4 6 8
036	12 45 78	088	123 6 8
037	2 45 78	089	23 6 8
038	1 45 78	090	1 3 6 8
039	45 78	091	3 6 8
040	123 5 78	092	12 6 8
041	23 5 78	093	2 6 8
042	1 3 5 78	094	1 6 8
043	3 5 78	095	6 8
044	12 5 78	096	12345 8
045	2 5 78	097	2345 8
046	1 5 78	098	1 345 8
047	5 78	099	345 8
048	1234 78	100	12 45 8
049	234 78	101	2 45 8
050	1 34 78	102	1 45 8
051	34 78	103	45 8

TABLE 12.7-3. Selective Call Conversion Chart, Continued.

TX CODE	RX SWITCHES ON	TX CODE	RX SWITCHES ON
104	123 5 8	155	3 67
105	23 5 8	156	12 67
106	1 3 5 8	157	2 67
107	3 5 8	158	1 67
108	12 5 8	159	67
109	2 5 8	160	12345 7
110	1 5 8	161	2345 7
111	5 8	162	1 345 7
112	1234 8	163	345 7
113	234 8	164	12 45 7
114	1 34 8	165	2 45 7
115	34 8	166	1 45 7
116	12 4 8	167	45 7
117	2 4 8	168	123 5 7
118	1 4 8	169	23 5 7
119	4 8	170	1 3 5 7
120	123 8	171	3 5 7
121	23 8	172	12 5 7
122	1 3 8	173	2 5 7
123	3 8	174	1 5 7
124	12 8	175	5 7
125	2 8	176	1234 7
126	1 8	177	234 7
127	8	178	1 34 7
128	1234567	179	34 7
129	234567	180	12 4 7
130	1 34567	181	2 4 7
131	34567	182	1 4 7
132	12 4567	183	4 7
133	2 4567	184	123 7
134	1 4567	185	23 7
135	4567	186	1 3 7
136	123 567	187	3 7
137	23 567	188	12 7
138	1 3 567	189	2 7
139	3 567	190	1 7
140	12 567	191	7
141	2 567	192	123456
142	1 567	193	23456
143	567	194	1 3456
144	1234 67	195	3456
145	234 67	196	12 456
146	1 34 67	197	2 456
147	34 67	198	456
148	12 4 67	199	456
149	2 4 67	200	123 56
150	1 4 67	201	23 56
151	4 67	202	1 3 56
152	123 67	203	3 56
153	23 67	204	12 56
154	1 3 67	205	2 56

TABLE 12.7-3. Selective Call Conversion Chart, Continued.

TX CODE	RX SWITCHES ON	TX CODE	RX SWITCHES ON
206	1 56	231	45
207	56	232	123 5
208	1234 6	233	23 5
209	2345 6	234	1 3 5
210	1 34 6	235	3 5
211	34 6	236	12 5
212	12 4 6	237	2 5
213	2 4 6	238	1 5
214	1 4 6	239	5
215	4 6	240	1234
216	123 6	241	234
217	23 6	242	1 34
218	1 3 6	243	34
219	3 6	244	12 4
220	12 6	245	2 4
221	2 6	246	1 4
222	1 6	247	4
223	6	248	123
224	12345	249	23
225	2345	250	1 3
226	1 345	251	3
227	345	252	12
228	12 45	253	2
229	2 45	254	1
230	1 45		

TABLE 12.7-4. Scan Limits.

No. of Channels Scanned	Set SW1 Segs On
3	2
4	4 2
5	32
6	432
7	1
8	4 1
9	3 1
10	43 1

Table 12.7-5. Signal Strength Threshold Settings.

SINAD	SIGNAL	AGC (VDC)
9.5	-121 (0.2uV)	4.04
25	-98 (2.82uV)	4.02
	-97	3.81
	-96	3.45
	-95	3.16
	-94	2.95
	-93	2.81
	-92	2.69
	-91	2.62
	-90	2.55
	-88	2.45
	-86	2.37
	-84	2.31
	-82	2.24
	-80 (22.4uV)	2.19
	-75	2.05
	-70 (70uV)	1.91
	-65	1.76
	-60	1.60
	-55	1.44
	-50 (700uV)	1.27
	-45 (1.26mV)	1.10
	-35 (4mV)	0.769
	-25 (12.6mV)	0.477

12.7.5.3 TRANSCALL SCAN

When setting the MODE switch to "TC ON", the transceiver switches to Transcall operation and initiates Transcall scanning. This is indicated on the LCD display which shows the characters "tc : XX", where "XX" is the current channel number. The Transcall scan sequence begins on the current channel, advances and continues up to the scan limit. As the scan reaches the limit, it begins again starting on channel 1. Transcall monitors the current channel of the scan sequence for three seconds, listening for any valid selective call or Transcall transmissions.

12.7.5.4 INITIATING CONTACT

After pressing the SEND button, an "arming tone" will sound through the loudspeaker to indicate that the pressing of the key was recognized. Transcall will then call the desired remote station in an attempt to sync its scan sequence to step with the originating station in real time.

The operator may begin calling on the channel of his choice by pressing the SEND button when the channel prior to the desired channel is reached in the scan sequence. Synchronization between stations can also be attained by powering up both transceivers (with the mode switch of both units set to "TC ON") at the same time.

After SEND is pressed and the channel changes to the next channel in the sequence, Transcall will then send an attention burst to the remote station for a period of 200ms. During that period, the push-to-talk (PTT) relay switches on, the proper harmonic filter is set and then the attention burst is sent. Transcall will then switch to receive, (switching the PTT relay off) listening for the acknowledge for a period of 400ms. Transcall calls on each channel initially for three seconds and completes four send-listen cycles during that period. The send-listen cycle can be identified by the clicking of the relays as they switch between the send and receive mode. The calling station continues to call on each channel of the scan sequence until all channels have been tried.

If the path conditions are poor or the scan sequence of the remote is greatly out of step, contact may not be made after the initial acquisition sequence. In that case, the sequence will repeat, this time calling each channel in the sequence for a period equal to (scan limit x 4) + 4 seconds.

This gives the station being called time to scan across the calling channel. If no contact is made after the previous sequence, an audible "no contact" signal is issued.

12.7.5.5 PATH QUALITY EVALUATION

When the remote station responds, a string of 32 packets containing the number AA hexadecimal are sent back to acknowledge contact. Both stations, which are now in sync, step to the next channel and attempt contact until all the channels in the sequence have been tried. The remote station will not attempt contact on channels which exceed the preset signal strength threshold level indicating that the channel is already busy. After all channels have been tried, the remote station continues scanning while the originating station stops its scan to evaluate the path conditions.

The bit error rate (BER) of the answer back packets from each channel are counted and stored in memory. The BER gives an indication of the propagation conditions between the stations. The signal strength level of the received signal is checked and this information is stored for each channel. Transcall then evaluates the BER and signal strength data and selects the channel that represents the best path between the two stations. It then sends the basic selective call bursts on the selected channel, waiting for the remote station to scan to the channel and send its acknowledge. When the acknowledge is received, the "call alarm" tone will sound at both stations and the call message will be displayed to inform the operator that the best channel has been selected. The path evaluation sequence is completed and both stations are now set to the channel which has the best path between them.

During poor signal conditions, the remote station may not respond to the initial selective call that identifies the best channel. In that case, the originating station will keep sending selective call bursts for about 90 seconds to give the remote station a good chance to respond. If no contact is made at all after that period, both stations will then resume (Transcall) scanning.

After the "call alarm" tone is issued, both stations will stay on the selected channel for 60 seconds. Both stations will resume scanning at the same time, thus maintaining the sync of the scan sequences.

12.7.6 TW5250 AND TRANSCALL TECHNICAL CIRCUIT DESCRIPTION

12.7.6.1 CIRCUIT DESCRIPTION

The circuit is based on the 80C39 microprocessor (CPU). The CPU has 27 input/output lines for communication with the rest of the circuit. These take the form of three eight-bit ports, two one-bit I/O lines, and an interrupt line (INT). One of the eight-bit ports is called the bus port and performs a dual function in the system. First it acts as a port for the other devices on the bus; these include the read-only memory (ROM), U3, and the universal asynchronous receiver/transmitter (UART), U4. Second, the data bus is time multiplexed with the lower eight bits of the internal program counter such that the external latch, U2, latches those address bits at the proper time in conjunction with the address latch enable signal (ALE). The data bus port is located at U1 pins 12 through 19, and ALE is pin 11. The crystal at Y3 provides the clock for the CPU. This crystal must be trimmed by C25 to provide proper synchronization between radios.

12.7.6.2 PORT LINES

The other port lines are split up among the other communications requirements of the system. Port 1 comprises pins 27 through 34; and port 2 is made up of pins 21 through 24 and pins 35 through 38. The lower three bits of port 2 serve as the three most significant address lines. P24 and P25 provide clock and strobe information to U8, U9, U10, and U15 through level shifter U13. P11, P12, P14 and P16 are configured in software to be inputs. These lines provide control and data to the TW5250. P15, P17, P26, and P27 are programmed in software to be output ports, and provide control and data to other boards in the radio. One bit ports T0 and T1 are used as inputs in the TW5250.

12.7.6.3 UART

The IC U4 is the UART. It provides the serial interface to and from the CPU. Serial information is received from the modem, U5 via the RXD line pin 3. Upon receipt of a valid character, the UART sends an interrupt to the CPU via the RXE line, pin 14. Data is passed to the CPU when the CE line, pin 11, is low and the WRITE line, pin 13, is high.

Data is sent to the UART from the CPU when CE and WRITE are low. Serial data from the UART is passed to the modem on the TXD line, pin 19. During transmission of serial data to the modem;

pin 24 of the UART will be low. This controls the mute line on the modem and turns on the modem tone. U7 provides the baud rate clock for the UART. This clock is derived from a 614.4kHz ceramic resonator.

12.7.6.4 MODEM/FILTER/LEVEL AMP

The modem, filter, and level amplifier are made up of U5, U6, Q4 and Q5 respectively. Receive audio enters U6 on pin 8. This signal is amplified in an internal op amp whose gain is set by the values of resistors R18 and R19. The output of the op amp is fed internally to the filter section whose output appears at pin 3. This filter output is then coupled via the capacitor on pin 3 through R16 to the comparator input on pin 2. R15 provides an adjustment to allow the output of the comparator to be set to a square wave at pin 16. The crystal at Y1 provides the clock required by the filter and the modem. Output of U6 is taken from pin 16 and applied to the RXC input, pin 1 of U5, the modem. The modem takes the frequency shift data and converts it into a TTL level digital signal the UART can use. In transmit the serial data is taken from the UART on pin 19 and enters the modem on U5 pin 11. The high on the mute line, pin 12 enables the output tone on the TXC line, pin 9. As data is shifted in on pin 11 the output tone is shifted between the two FSK frequencies. Output from U5 pin 9 enters the level amplifier through C9 and the level adjust pot R21. The resistors R25 and R24 set the gain of Q4 to approximately 15. Q5 is an emitter follower to provide buffering to Q4.

12.7.6.5 CPU CONTROL CODE INPUT

Control codes for the TW5250 such as scan limits, channel information, transmit code, and receive code are presented to the CPU in a serial data format. U8, U9, U10, and U15 are parallel in serial out shift registers. A high on the strobe input, pin 9 for at least one rising edge of the clock input, pin 10 latches the data on the parallel input lines. Releasing the strobe line and toggling the clock line causes data to be shifted out pin 3 on the rising edge of the clock. The four shift registers are connected in series with U8 being closest to the CPU. Scan limits are set as a binary number on the first four lines of S1.

The receive code is set on S2. The transmit code and the channel information is input to U10 and U15 as parallel information coming from the M9 module.

The CPU directly controls the reading of these shift registers through the use of port 2 lines P24 and P25.

U13 performs the necessary level shifting to interface the TTL levels provided by the CPU to the 8.7V levels needed by the shift registers. P25 becomes the strobe signal for the shift registers and P24 is the clock signal. The CPU can access the data it requires by issuing the proper number of clock "ticks". Shift register data is read by the CPU test pin T1, pin 39.

12.7.7 TRANSCEIVER WIRING FOR TRANSCALL

The following are changes that affect the Mainframe Schematic when the transceiver is retrofitted for Transcall operation. The wiring shown replaces that depicted in Figure 11-4, the Mainframe Schematic.

12.7.7.1 SPEAKER AND HEADPHONE WIRING

For transceivers with the Transcall option installed, refer to Figure 12.7-1 for wiring of the speaker and headphone jack.

12.7.7.2 MODE SWITCH WIRING

For Transcall operation, the mode switch (S2A) commons is connected to ground instead of M9, J9 pin 10 as shown in Figure 12.7-2.

12.7.7.3 TRANSCALL SWITCH, S3

The wiring for Switch S3, the Transcall Switch is shown in Figure 12.7-3.

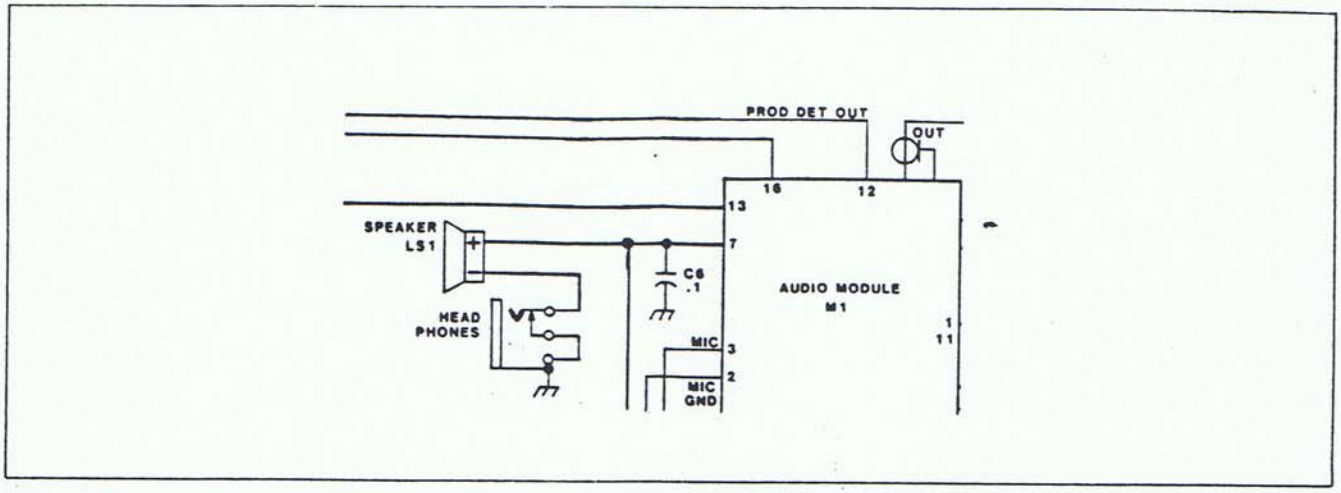

FIGURE 12.7-1. Speaker and Headphone Wiring.

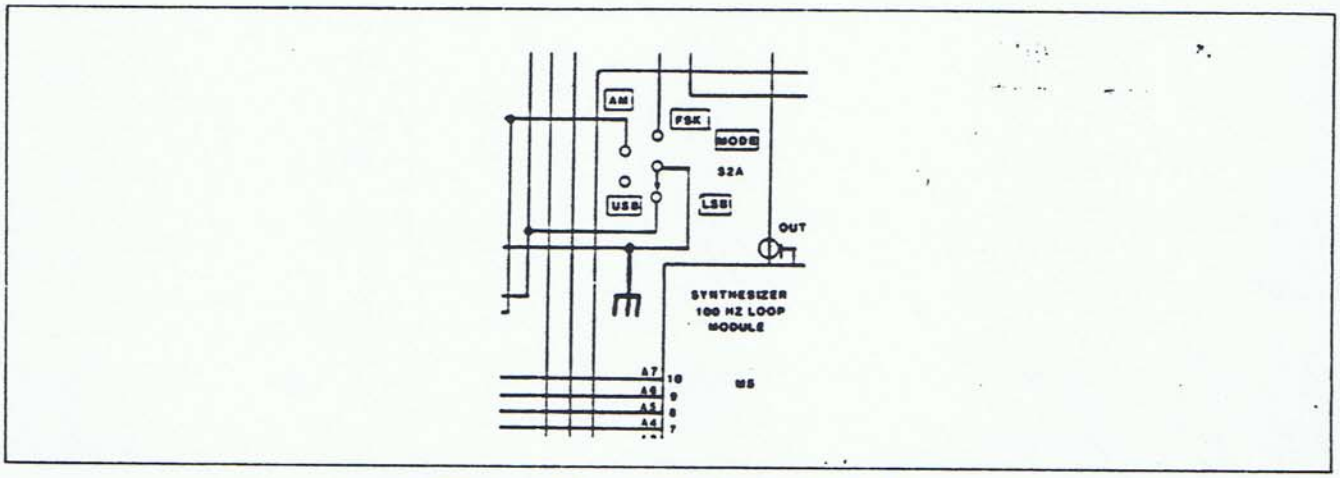

FIGURE 12.7-2. Mode Switch Wiring.

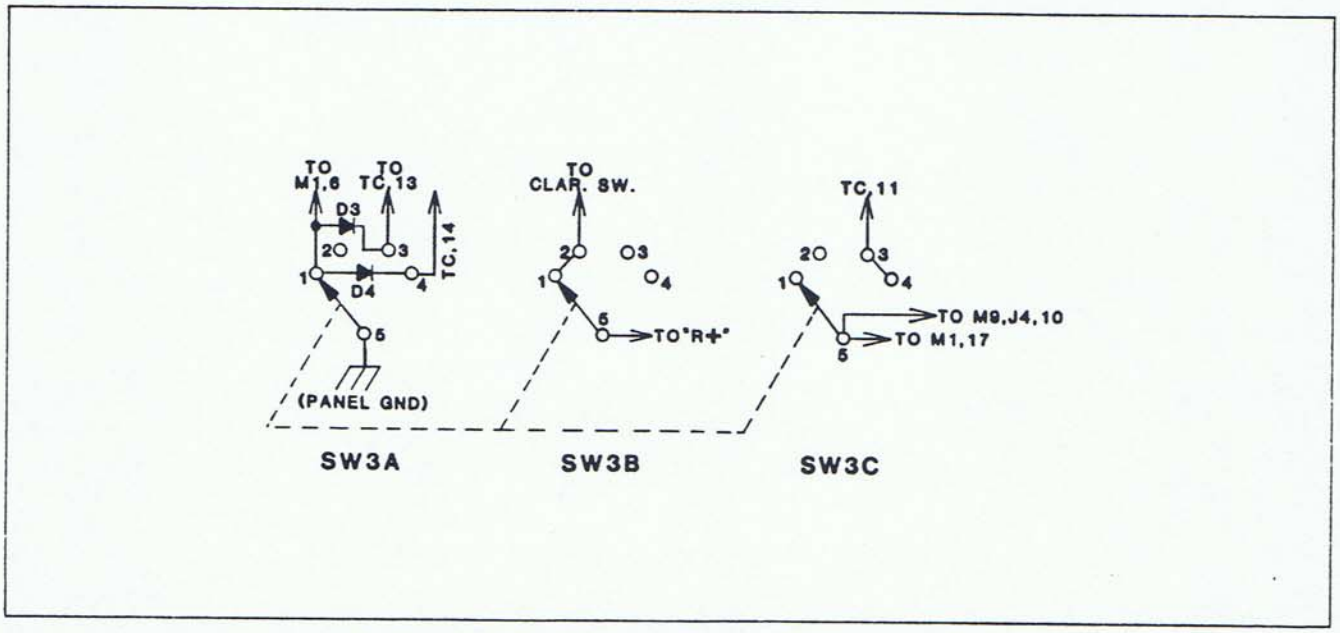

FIGURE 12.7-3. Wiring - Transcall Switch, S3.

TABLE 12.7-6. Test Procedure.

1. Make a visual inspection of the TW5250 or Transcall module for any missing or wrong components, solder bridges, incorrect wiring, etc.

2. Make an ohm check from the +12 line to ground at U14, the +5 line at U14, and the +8.7 line at U12. The readings should show several hundred ohms.

3. Connect the module to the harness on top of M3 of the TW100 transceiver. Connect the transceiver to its power supply and power up.

4. Adjust C26 so that the frequency at pin 11 of the CPU (ALE) is close to 341.333kHz as possible.

5. Remove U11. Adjust R21 (tone level) so that the voltage at the emitter of Q5 is approximately 0.5Vac p-p. Replace U11.

6. Adjust R15 so that the waveform at pin 16 of U6 is clipping at 0V and 5V (hitting the rails). No RF receiver input should be applied.

7. Set R30 so that the wiper of R30 reads 2.1V. Use FET input meter or oscilloscope.

8. Verify that each input bit of U8 and U9 toggles when the corresponding switch of U8, U9 is toggled. (Refer to schematic).

9. Check that the signals $\overline{INT}$, $\overline{WR}$, $\overline{PSEN}$, and ALE are at correct TTL levels.

10. Measure the risetime of the clock signal at pin 10 of U10. Verify that it is no greater than 15 microseconds from 0V to 8V.

11. Verify that the frequency at U7, pin 5 reads 19.2kHz.

12. Verify the operation of the TW5250 SELCAL/TRANSCALL module.

    Receiving a call.

    A. Connect a load (12V lamp or etc.) to the collector of Q3 (refer to schematic). Install the TW5250 module with SELCAL software (-32) in U3.

    B. Using a transceiver with a working SELCAL installed, operate it sending to the unit under test. Make sure that the receive code of the UUT is set to the same code of the sending transceiver.

    C. When a proper call is received, the "CALL: ___ " prompt should be displayed and the "ring" tone should be heard. Verify that the load (of step A) is switched on also.

    Initiating a call.

    A. Send using the transceiver with the UUT and verify that it functions correctly.

13. Verify that the RF output power is 100W when the SELCAL is sending.

TABLE 12.7-7. Transcall Final Test Procedure.

1. Make sure that each transceiver and TW5250 module has been tested and aligned properly.
2. Set the scan limit switch (refer to Table 12.7-4) of both transceivers to scan 6 channels.
3. Set one transceiver's receive code to 170 and its transmit code to 85. Set the other transceiver's receive code to 85 and its transmit code to 170 (refer to Table 12.7-3).
4. Connect both transceivers as illustrated in Figure 12.7-4.
5. Set the mode switch of both units to "SQUELCH ON" and power up both units.
6. While enabling the PTT, speak into the microphone and adjust the attenuator so that the signal strength barely moves off of zero. Check this in the other direction also.
7. Check the Transcall scan. Switch the mode of one unit to "T.C. ON" and check that the transceiver is scanning (as indicated on the LCD display). Make sure that it scans to channel 6 and then repeats on channel 1. Verify this also on the other transceiver.
8. Check the Transcall PQE operation. Press the SEND button of one transceiver (which is now the originating station). Verify that the transceiver sends on each channel until it receives the acknowledge from the other unit.
9. After the transceiver receives the answer back, verify that the other unit (remote station) syncs its scan with the originating station. Verify that the remote station sends the PQE burst on each channel, until all channels have been tried.
10. The originating station will decide which channel has the best path quality and then will send selcal bursts on that channel. Verify that the remote station scans around to the selected channel and that the "ring" signal sounds at both stations.
11. Verify that the "CALL: xx" message is also displayed at the called station. Check that both stations stay on the selected channel for 60 seconds before they resume scanning.
12. Repeat steps 8 through 11 in the other direction.

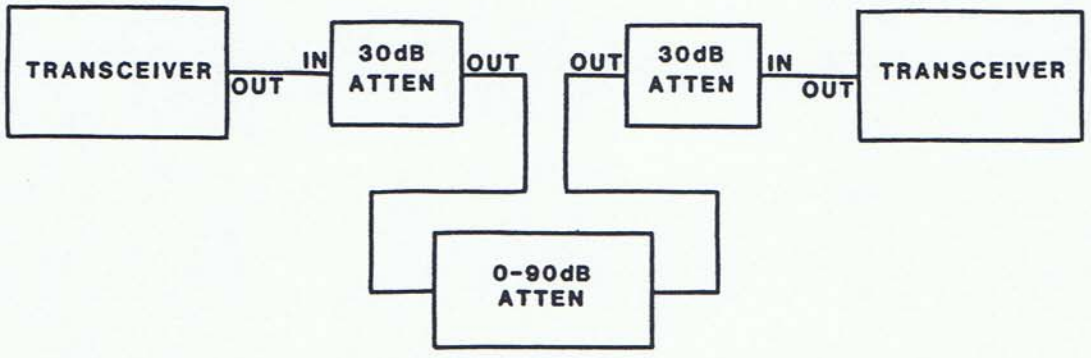

FIGURE 12.7-4. Transceiver Connections.

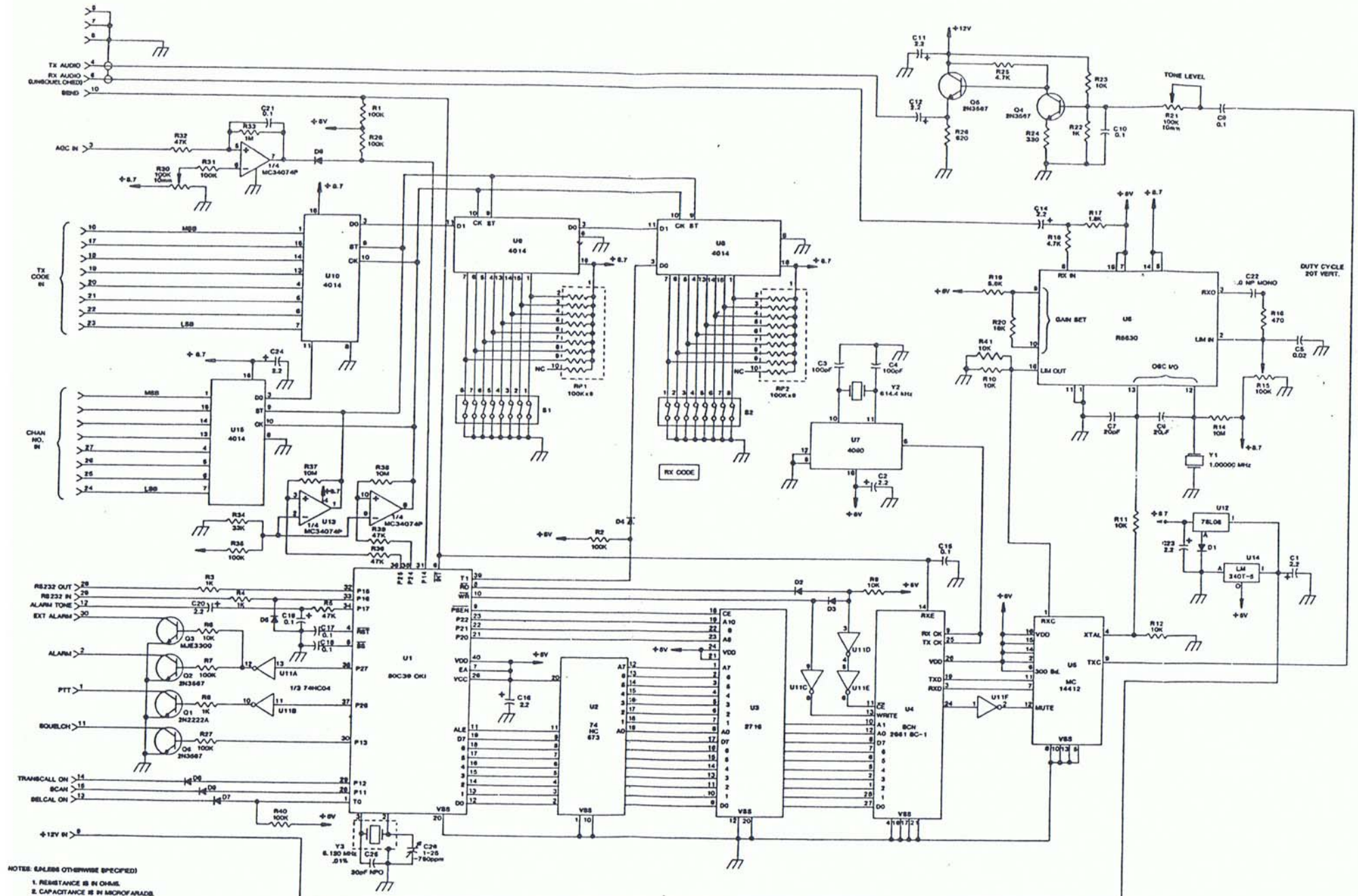

FIGURE 12.7-6. Schematic Diagram, TW5250 and Transcall Option.

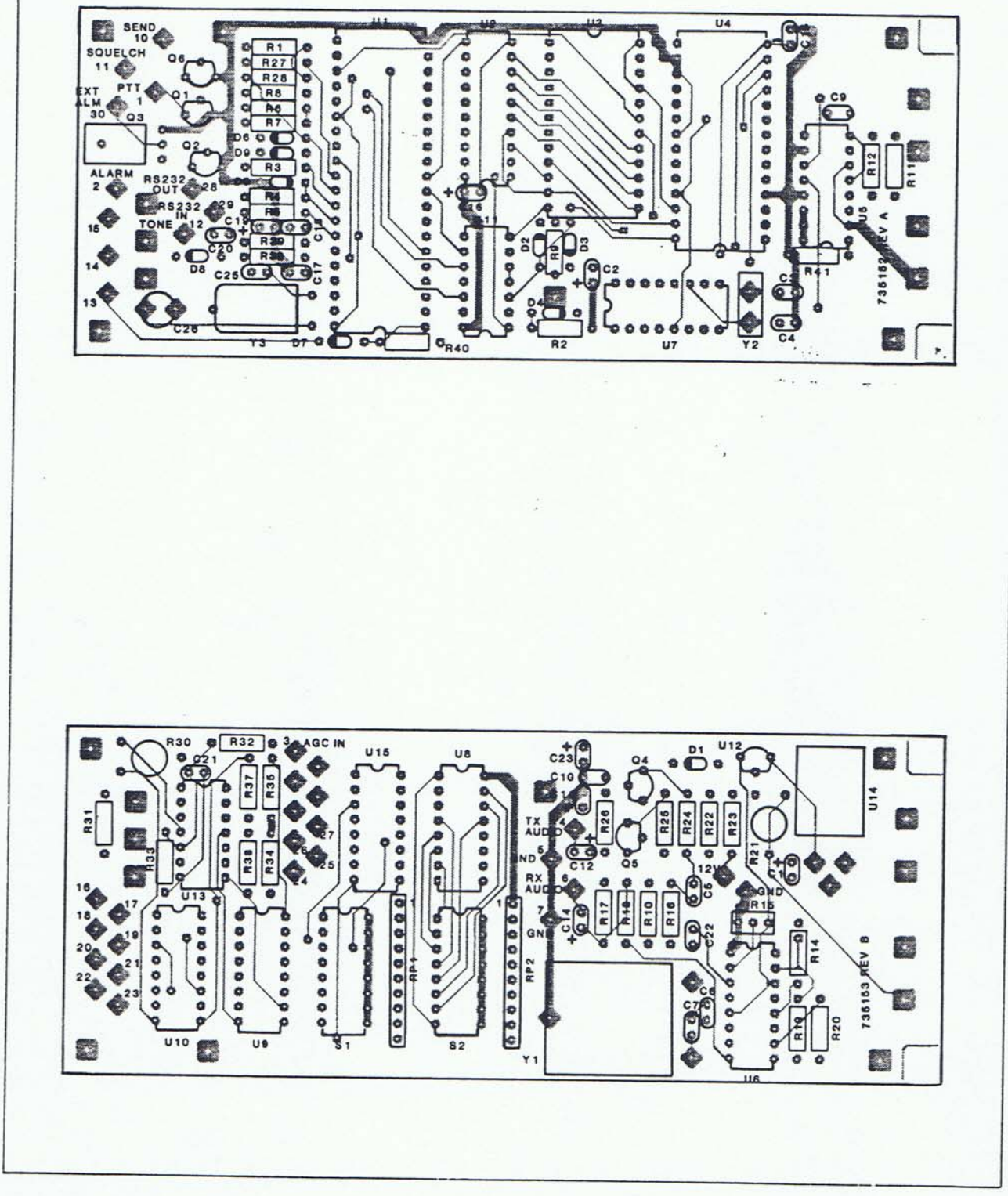

FIGURE 12.7-5. Component Locations, TW5250 and Transcall Option.

TABLE 12.7-8. Parts List, TW5250 and Transcall Option.

C1	241020	Capacitor, Tantalum 2.2
C2	241020	Capacitor, Tantalum 2.2
C3	210101	Capacitor, Disc NPO 100pF
C4	210101	Capacitor, Disc NPO 100pF
C5	254203	Capacitor, Mylar .02
C6	210200	Capacitor, Disc NPO 20pF
C7	210200	Capacitor, Disc NPO 20pF
C8		Not Used.
C9	275104	Capacitor, Monolithic 50V .1
C10	275104	Capacitor, Monolithic 50V .1
C11	241020	Capacitor, Tantalum 2.2
C12	241020	Capacitor, Tantalum 2.2
C13		Not Used.
C14	241020	Capacitor, Tantalum 2.2
C15	275104	Capacitor, Monolithic 50V .1
C16	241020	Capacitor, Tantalum 2.2
C17	275104	Capacitor, Monolithic 50V .1
C18	275104	Capacitor, Monolithic 50V .1
C19	275104	Capacitor, Monolithic 50V .1
C20	241020	Capacitor, Tantalum 2.2
C21	275104	Capacitor, Monolithic 50V .1
C22	275105	Capacitor, Monolithic 100V 1
C23	241020	Capacitor, Tantalum 2.2
C24	241020	Capacitor, Tantalum 2.2
C25	210330	Capacitor, Disc NPO 33pF
C26	261250	Capacitor, Trimmer 1-25pF
C27	254203	Capacitor, Mylar .02
D1	320002	Diode 1N4148
D2	320002	Diode 1N4148
D3	320002	Diode 1N4148
D4	320002	Diode 1N4148
D5	320002	Diode 1N4148
D6	320002	Diode 1N4148
D7	320002	Diode 1N4148
D8	320002	Diode 1N4148
D9	320002	Diode 1N4148
Q1	310057	Transistor, NPN PN2222A
Q2	310003	Transistor, NPN 2N3567
Q3	310091	Transistor, MJE3300
Q4	310057	Transistor, NPN PN2222A
Q5	310057	Transistor, NPN PN2222A
Q6	310057	Transistor, NPN PN2222A
R1	113104	Resistor, Film 1/8W 5% 100K
R2	113103	Resistor, Film 1/8W 5% 10K
R3	113102	Resistor, Film 1/8W 5% 1K
R4	113102	Resistor, Film 1/8W 5% 1K
R5	113473	Resistor, Film 1/8W 5% 4.7K
R6	113103	Resistor, Film 1/8W 5% 10K
R7	113104	Resistor, Film 1/8W 5% 100K
R8	113102	Resistor, Film 1/8W 5% 1K

TABLE 12.7-8. Parts List, TW5250 and Transcall Option, Continued.

R9	113103	Resistor, Film 1/8W 5% 10K
R10	113103	Resistor, Film 1/8W 5% 10K
R11	113103	Resistor, Film 1/8W 5% 10K
R12	113103	Resistor, Film 1/8W 5% 10K
R13		Not Used.
R14	113106	Resistor, Film 1/8W 5% 10M
R15	170210	Resistor, Trimmer 25T 100K
R16	113471	Resistor, Film 1/8W 5% 470
R17	113182	Resistor, Film 1/8W 5% 1.8K
R18	113472	Resistor, Film 1/8W 5% 4.7K
R19	113562	Resistor, Film 1/8W 5% 5.6K
R20	113183	Resistor, Film 1/8W 5% 18K
R21	170115	Resistor, Trimmer 100K
R22	113102	Resistor, Film 1/8W 5% 1K
R23	113103	Resistor, Film 1/8W 5% 10K
R24	113331	Resistor, Film 1/8W 5% 330
R25	113472	Resistor, Film 1/8W 5% 4.7K
R26	113621	Resistor, Film 1/8W 5% 620
R27	113104	Resistor, Film 1/8W 5% 100K
R28	113104	Resistor, Film 1/8W 5% 100K
R29		Not Used.
R30	170115	Resistor, Trimmer 100K
R31	113104	Resistor, Film 1/8W 5% 100K
R32	113473	Resistor, Film 1/8W 5% 47K
R33	113106	Resistor, Film 1/8W 5% 10M
R34	113333	Resistor, Film 1/8W 5% 33K
R35	113104	Resistor, Film 1/8W 5% 100K
R36	113473	Resistor, Film 1/8W 5% 47K
R37	113106	Resistor, Film 1/8W 5% 10M
R38	113106	Resistor, Film 1/8W 5% 10M
R39	113473	Resistor, Film 1/8W 5% 47K
R40	113104	Resistor, Film 1/8W 5% 100K
R41	113103	Resistor, Film 1/8W 5% 10K
RP1	182002	Resistor Pak 100K
RP2	182002	Resistor Pak 100K
S1	530010	Switch, Scan Limit/Options
S2	530010	Switch, RX Code
U1	330142	IC, 80C39
U2	330141	IC, 74HCT573
U3	330102	IC, UPD2716-6
U4	330167	IC, SCN2661BC1N28
U5	330180	IC, MC 14412VP
U6	330215	IC, RM5630AP
U7	330037	IC, CD 4060 AE
U8	330181	IC, MC 14014BCP
U9	330181	IC, MC 14014BCP
U10	330181	IC, MC 14014BCP
U11	330196	IC, 74HC04
U12	330018	IC, 78L08
U13	330220	IC, MC34074P

TABLE 12.7-8. Parts list, TW5250 and Transcall Option, Continued.

U14	330076	IC, LM340
U15	330181	IC, MC14014BCP
Y1	360028	Crystal, 1.000MHz Microprocessor
Y2	363001	Resonator, Ceramic 614.4kHz
Y3	360018	Crystal, 5,120.000kHz

NOTE: Unless otherwise specified, capacitance is in microfarads and resistance is in ohms.