



**SERVICE INFORMATION**

**FOR**

**70-2914**

**CTCSS/CDCSS ENCODER**

**FOR SYN-TECH II**

**70-3400AD/BD AND 70-5300AD/BD**

*70-075719  
PCB w/parts*

# **DESCRIPTIONS/FEATURES/SPECIFICATIONS**

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70-2914

## **DESCRIPTION**

The 70-2914 is a CTCSS and CDCSS encoder for the 70-3400AD/BD and 70-5300AD/BD SYN-TECH II models with full duplex kit capability. It affords some of the most commonly requested features of a repeater controller, ie. timeout timer, COR hang timer and courtesy beeper. The 70-2914 also incorporates a high order 300 Hz audio high pass filter to stop retransmission of the input signal's tones or codes. Tone and code selection is done on a per channel basis. Other options are fixed, affecting all channels, and must be set prior to installation.

## **FEATURES**

- All 37 EIA standard tones plus 16 nonstandard tones.
- 105 of the most used DCS codes.
- COR hang timer, settable to 0 (off), 3, 5 and 10 seconds.
- Time Out Timer, settable to 0 (off), 0.5, 1.0, 1.5, 2.0, 3.0, 5.0 and 10.0 minutes.
- Courtesy tone, a beep added to the repeater output when the incoming signal stops. It lets the receiving station(s) know the frequency is available for replies. May be disabled.
- Tone squelch tail elimination. This feature turns off the subaudible tone for 200 milliseconds at the end of transmission, allowing the receiving station's tone squelch to mute before the carrier is dropped. It may be disabled by a dipswitch setting.
- ID timer for external customer supplied ID'er, settable to 0 (off), 9.5, 15.0 and 30.0 minutes. Generates a logic level to initiate an ID (see ID interface specification, Appendix A). Senses repeater usage and starts after first tx and stops after last ID. It is not a continuous cycle. It may be disabled by dipswitch setting. ID generating equipment must be furnished by the user.

## **SPECIFICATIONS**

PCB size is 4.15 by 3.3 inches, constructed of FR-4 fiberglass. Double sided foil pattern with plated through holes. All leaded component construction (no surface mount components).

**POWER CONSUMPTION:** 15 mA from +5 V and 5 mA from switched +13.8 V supplies.

**TONE ENCODE DISTORTION:** Less than 5% (1% typical)

**TONE FREQUENCY ACCURACY:** -0.05 to 0% all tones

**TONE ENCODE RESPONSE TIME:** 10 ms max

**TONE AND DCS DEVIATION:** adjustable from less than 500 to more than 1000 Hz (set by TX exciter)

**WEIGHT:** 2.0 oz.

**OPERATING TEMPERATURE RANGE:** -30 to +60 degrees C.

**RELATIVE HUMIDITY:** 90% at 25° C.

## INSTALLATION

### CHASSIS PREPARATION

1. Turn off the radio and unplug the power cord. Remove the top cover and set aside for later use.
2. Turn the radio so the face plate is on the left, with the left side of the radio facing you and right-side up.
3. The CX-55 logic board is the one closest to you. Remove the three phillips head screws as shown in **Figure 1**, and replace with the 13 mm long standoffs (MPN 70-156132). Save the screws; they'll be used later.
4. Unplug P922 from J922 on the CX-55 logic board. This plug will not be needed.
5. Solder a jumper where shown in **Figure 2**. This connects pin 30 of IC903 to pin 13 of P923.

### ENCODER BOARD PREPARATION

1. Plug one end of the short 8 wire cable (MPN 70-034392) into J922 on the encoder board.
2. Preset all SW1 switches to the positions shown in **Figure 3**.
3. Preset RV-1, 2, 3, 4 and 5 to mid-position as shown in **Figure 4**.

### ASSEMBLY

1. Plug the free end of the short 8 wire cable into the CX-55 logic board's J922.
2. Plug the long 8 wire cable (MPN 70-034909) into the encoder board's J302.
3. Place the encoder board, component side down, over the CX-55 logic board. Position the encoder board so the 16 pin header mates with J923 on the logic board. Route the J302 cable wires so they fit between the encoder PCB and the chassis.
4. Press down on the encoder board to plug them together. Be sure no cable wires are pinched between them. The screw holes in the encoder board should now be centered over the standoff holes. If not, then unplug the encoder and logic boards and try again. Do not continue until the holes are lined up.
5. Get the three screws you removed earlier and screw them into the standoffs.
6. Push the free end of the long J302 cable through the chassis wiring tunnel to the opposite side of the radio chassis. Pull the slack wire through the tunnel. Plug the free end into J302 on the 70-7010 PCB.

# INSTALLATION

70-2914

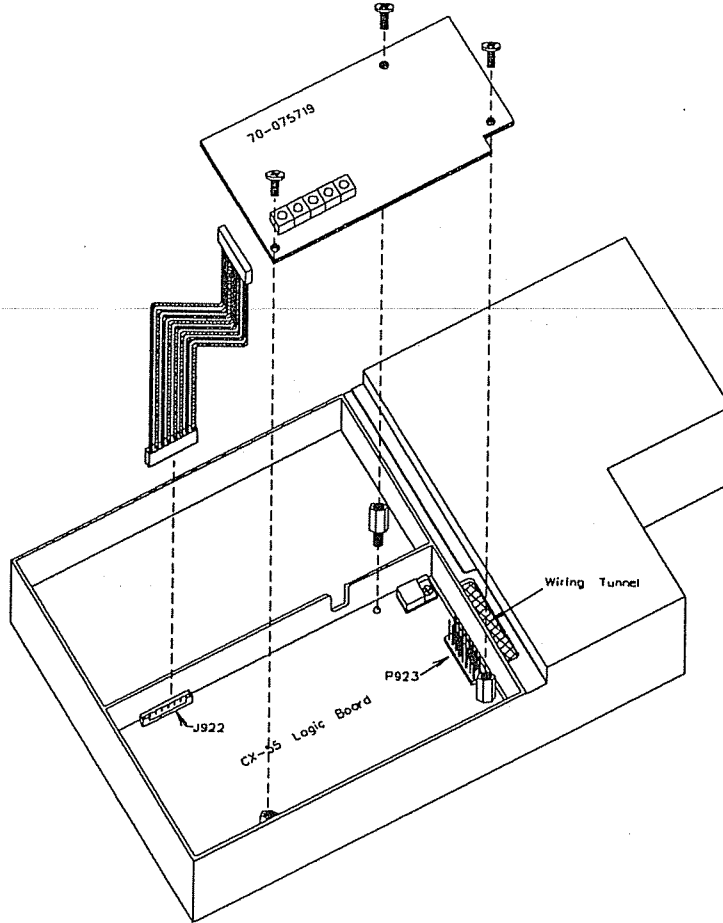


Figure 1

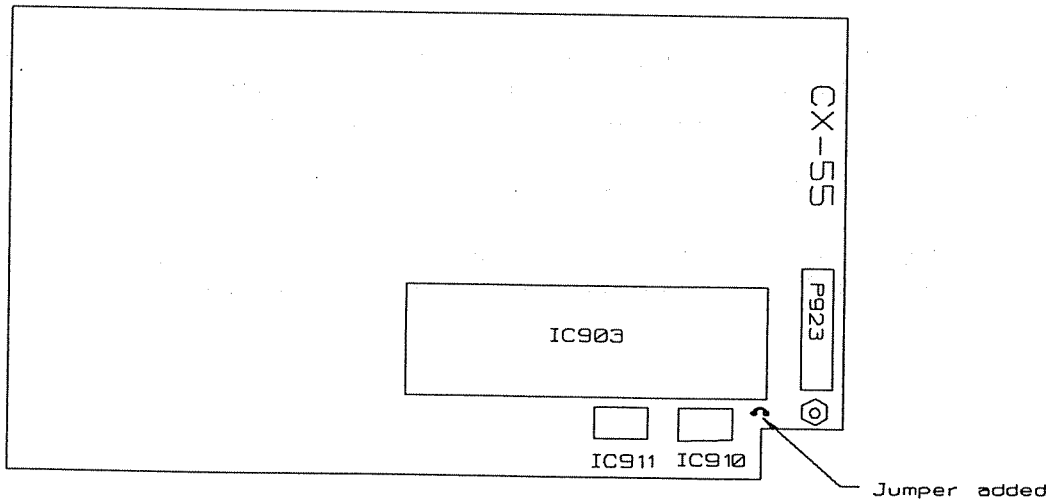


Figure 2

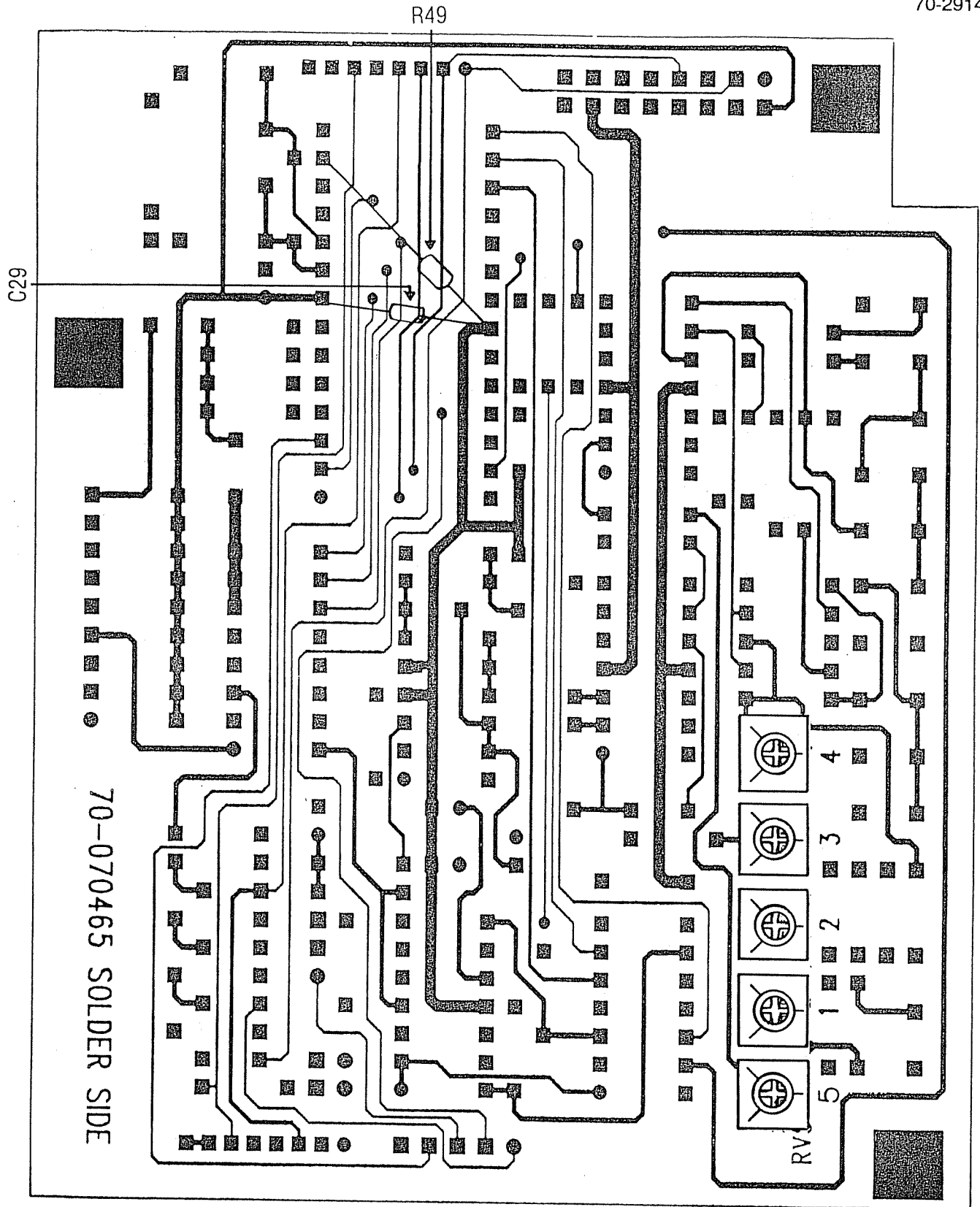


Figure 3

# INSTALLATION

70-2914

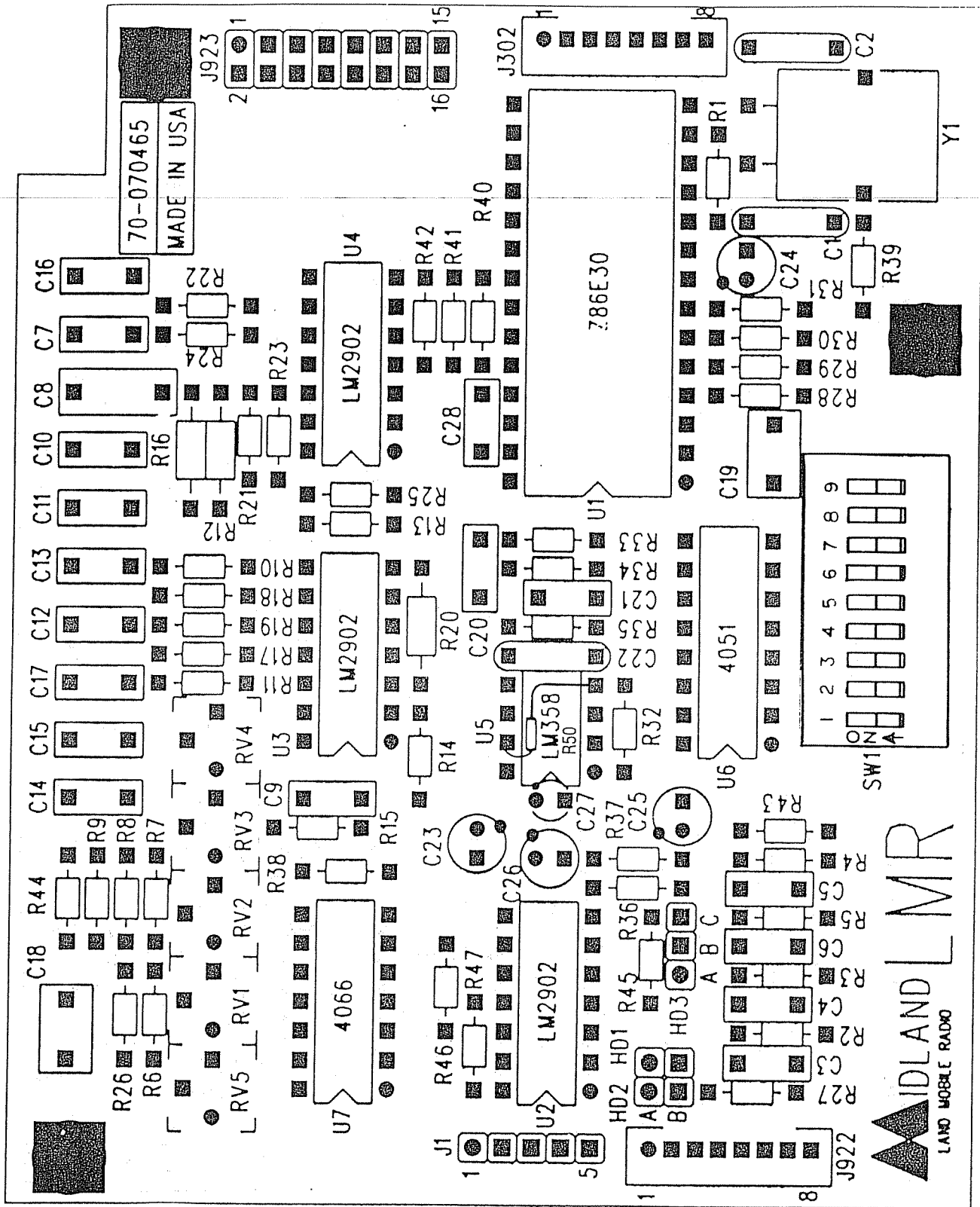


Figure 4

**ALIGNMENT****BALANCE ADJUST**

Adjust RV-5 on the 70-2914 PCB so that a received noise quieting signal with 3 kHz deviation at 1 kHz tone frequency results in a transmitter deviation of 3 kHz. Be sure that you use a channel programmed for no CTCSS/CDCSS encoding.

**AUDIO PRIORITY ADJUSTMENT**

There are four audio inputs to the repeater TX modulation path; receiver, local microphone, external ID and AUX/Courtesy tone. During normal operation more than one of these may be enabled at the same time, such as when the ID device becomes active while the repeater is receiving a valid signal, or when the local microphone is used and still receiving a signal. To prevent over deviation or excessive clipping, the audio from these sources are mixed in a way that keeps the peak to peak values the same. This same mixing technique allows controlling the "importance" of each source by adjusting an associated trimmer, RV1 through RV4. A maximum 20dB ratio can be set between any two. The relative level of each can be set so that simultaneous operation of these results in a mixed output that has the desired ratios. As set from the factory all inputs have equal ratios.

Use your own preference to set RV1 through RV4. Setting these will not increase the peak deviation.

**PROGRAMMING****PC PROGRAMMING**

Set the radio for duplex operation by adding a "D" to the end of the model number string. Answer "Y" to the 70-2914 option installed question. Transmitter CTCSS/CDCSS tones/codes are entered directly in the program for each channel.

**70-1080A PROGRAMMING**

Set the radio for duplex operation by initiating the Option Definition Mode. Use the Manual Programming Mode to modify the Data-Packet.

1. Initiate the Manual Programming Mode.
2. Enter this hexadecimal address: 189A, then press **ENT**. A two-digit hexadecimal will appear under "DATA". Note that value.
3. Change the left-hand digit of the data by entering a new value. Duplicate the right-hand digit for second-digit entry.

Original value	Enter
FX	7X
EX	6X

4. Press **ENT** to load the above new data into the Data Packet.
5. Press **RST** to exit the Manual Programming Mode.

Transmitter CTCSS/CDCSS tone/codes are entered as a combination of CTCSS tones and Scrambler/Subsignaling Type choices. A chart with examples is given in Appendix C.

## **PROGRAMMING/CIRCUIT DESCRIPTION**

70-2914

When reading a printout report of channel data for a radio which has the 70-2914 option installed, follow the instructions below to find the transmit signaling. **NOTE:** These steps apply to 70-1080A programming, and 70-1488 PC Programming, Version 3.0 or earlier.

1. Find the CTCSS tone under the TX-ENC field of the printout report. Find the corresponding value in **Table 2** of Appendix C.
2. Locate the column containing the Scrambler and Subsignaling Type in **Table 3**. (This is found in the printout report under the OTHERS field. For example, if the last two entries of the OTHERS field are D/1, then the scrambler is disabled and the subsignaling type is Type 1.)
3. Follow the row of **Table 2** across, and the column of **Table 3** up to find the transmit signaling.

## **CIRCUIT DESCRIPTION**

### **ENCODE GENERATION**

R28, 29, 30 and 31 are part of a sine wave approximation circuit. When a specific pattern of one and zeros is written to the upper four bits of U1's Port 0, a series of dc voltages are summed at the resistors' junction that synthesizes a sine wave in sixteen steps. When generating CTCSS tones this pattern is repeated at a rate equal to the desired tone frequency. Similarly when generating CDCSS codes two half patterns are used to make mark/space transitions. These transitions are done in eight steps, approximating a half sine wave. U5B is used in a simple Sallen-Key low-pass active filter to reduce the residual harmonics to an inaudible level.

### **AUDIO SELECTION AND MIXING**

U7 is an analog electronic switch used to select audio sources. It is controlled by U1 through the upper four pins of Port 3. U2 has four operational amplifiers and is used to provide buffering and Pre-emphasis of the audio sources. Audio mixing is done at pin 5 of U3B.

### **TONE/DCS ELIMINATION FILTER**

U3 and U4 form a high order 300 Hz high pass audio filter. It effectively stops the subaudible tones and DCS codes on the received signal from modulating the transmitter.

### **CONTROL**

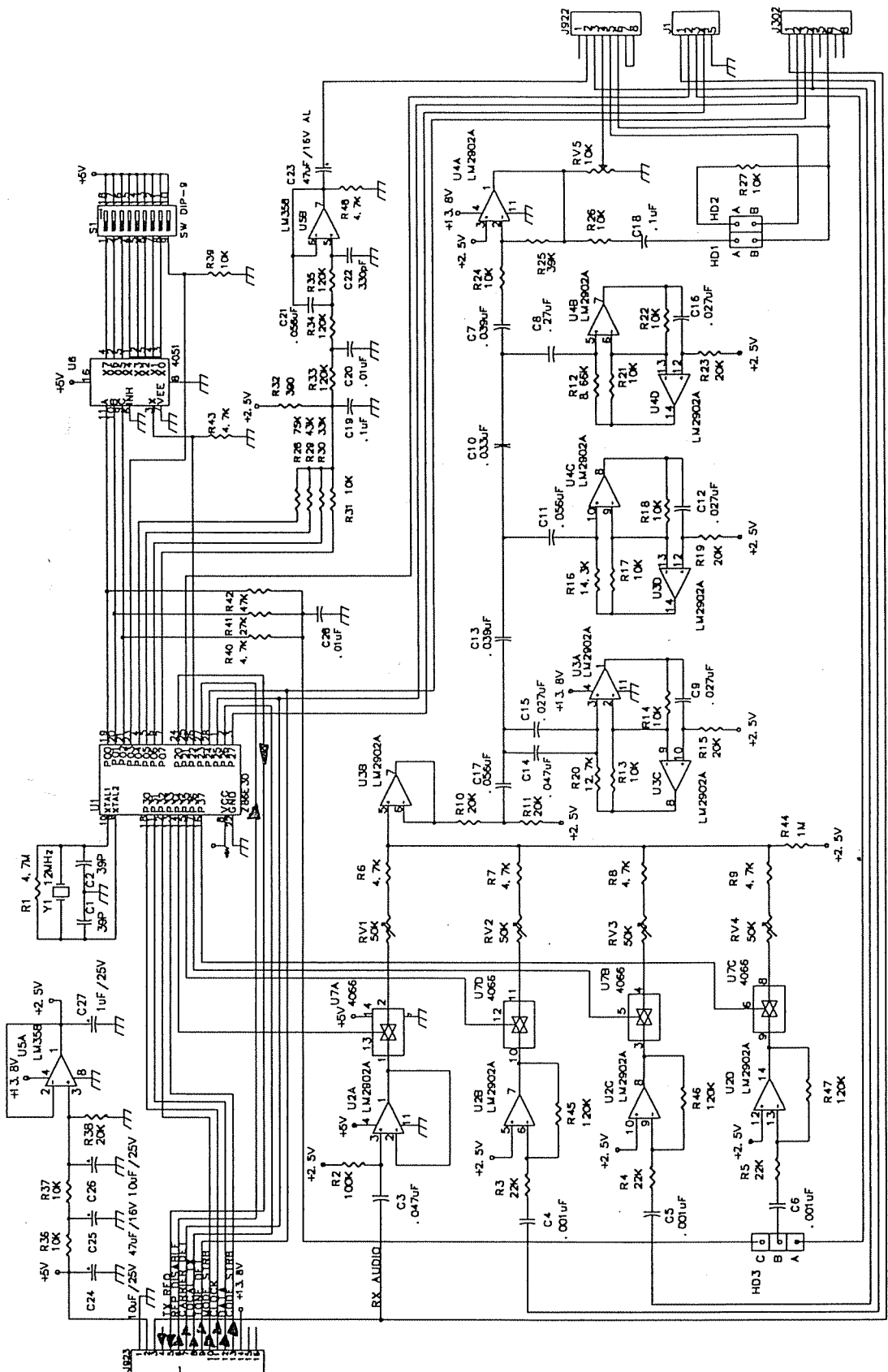
U6 is used to scan SW1. It is an eight position single pole electronic switch that is controlled by U1. A three bit binary number on the A,B and C address pins selects which switch is closed. At radio turn on, U1 sequentially generates address numbers starting at 7 and stopping at 0. This causes pin 3 of U6 to be sequentially connected to pins 4, 2, 5, 1, 12, 15, 14 and 13. R43 pulls pin 3 down when it is switched to an open circuited switch position. U1 inputs the value on pin 26.

U1 receives channel information from the CX-55 logic board through pin 12 of J923. Clock signals on pin 11 of J923 serially transfer the data to U1. Strobe pulses on pins 10 and 13 of J923 are used to complete the data transfer into U1. U1 also controls U7, the audio switch IC, U6, the features switch scanner, generates the encode signals, generates the courtesy tone and maintains several software implemented timers.



# SCHEMATIC DIAGRAM

70-2914

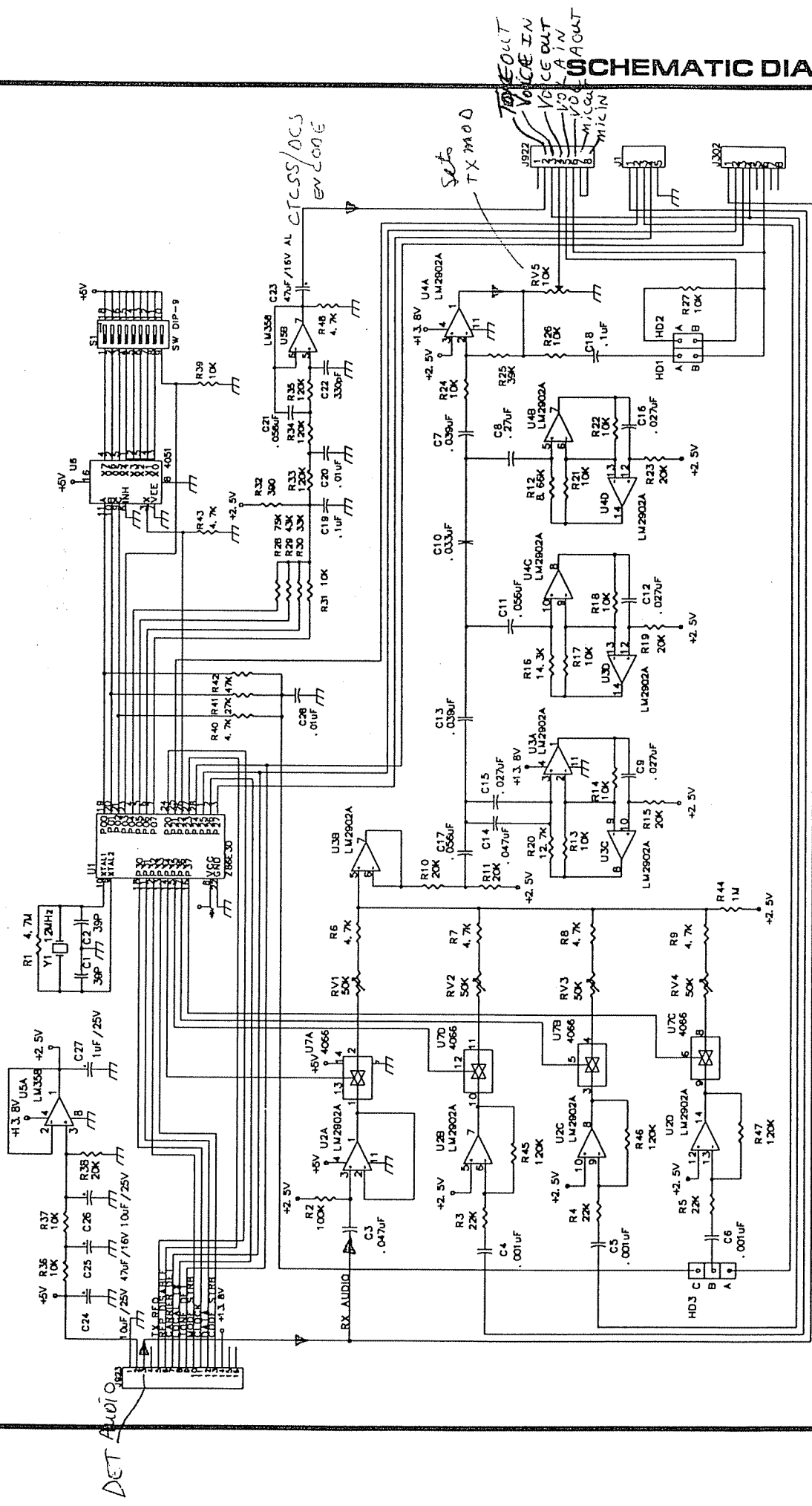


7HX on = hi



## PARTS

REF NO.	DESCRIPTION	PART NO.
<b>CAPACITORS</b>		
C1	39 pF, 5%, CER DISC CAP 100V GP	70-138606
C2	39 pF, 5%, CER DISC CAP 100 V, GP	70-138606
C3	0.047 uF, 5%, 50 V, STACKED METALIZED FILM	70-137135
C4	0.001 uF, 5%, 50 V, STACKED METALIZED FILM	70-137136
C5	0.001 uF, 5%, 50 V, STACKED METALIZED FILM	70-137136
C6	0.001 uF, 5%, 50 V, STACKED METALIZED FILM	70-137136
C7	0.039 uF, 5%, 50 V, STACKED METALIZED FILM	70-137137
C8	0.27 uF, 5%, 50 V, STACKED METALIZED FILM	70-137138
C9	0.027 uF, 5%, 50 V, STACKED METALIZED FILM	70-137144
C10	0.033 uF, 5%, 50 V, STACKED METALIZED FILM	70-137140
C11	0.056 uF, 5%, 50 V, STACKED METALIZED FILM	70-137141
C12	0.027 uF, 5%, 50 V, STACKED METALIZED FILM	70-137144
C13	0.039 uF, 5%, 50 V, STACKED METALIZED FILM	70-137137
C14	0.047 uF, 5%, 50 V, STACKED METALIZED FILM	70-137135
C15	0.027 uF, 5%, 50 V, STACKED METALIZED FILM	70-137144
C16	0.027 uF, 5%, 50 V, STACKED METALIZED FILM	70-137144
C17	0.056 uF, 5%, 50 V, STACKED METALIZED FILM	70-137141
C18	0.1 uF, 5%, 50 V, STACKED METALIZED FILM	70-137142
C19	0.1 uF, 5%, 50 V, STACKED METALIZED FILM	70-137142
C20	0.01 uF, 5%, 50 V, STACKED METALIZED FILM	70-137143
C21	0.056 uF, 5%, 50 V, STACKED METALIZED FILM	70-137141
C22	330 pF, 100 V, CERAMIC DISC CAP	70-136147
C23	47 uF, 20%, 16 V, ALUMINUM ELECTROLYTIC CAP	70-135357
C24	10 uF, 20%, 25 V, ALUMINUM ELECTROLYTIC CAP	70-135358
C25	47 uF, 20%, 16 V, ALUMINUM ELECTROLYTIC CAP	70-135357
C26	10 uF, 20%, 25 V, ALUMINUM ELECTROLYTIC CAP	70-135358
C27	1 uF, 10%, 16 V, TANTALUM ELECTROLYTIC CAP	70-135359
C28	0.01 uF, 5%, 50 V, STACKED METALIZED FILM	70-137143
C29	0.01 uF, 10%, 50 V, AXIAL CERAMIC CAP	70-131083
<b>INTEGRATED CIRCUITS</b>		
U1	Z86E30 MCU, VERSION 2914-1.0 PROGRAM	70-076785
U2	LM2902A QUAD OPAMP, 14 PIN DIP PLASTIC	98-076143
U3	LM2902A QUAD OPAMP, 14 PIN DIP PLASTIC	98-076143
U4	LM2902A QUAD OPAMP, 14 PIN DIP PLASTIC	98-076143
U5	LM358 DUAL OPAMP, 8 PIN DIP PLASTIC	70-076385
U6	CD4051 OCTAL ANALOG MPX, CMOS, 16 PIN DIP	70-076434
U7	CD4066 QUAD ANALOG GATE, CMOS, 14 PIN DIP	70-076395
<b>CONNECTORS</b>		
HD1	2 PIN HEADER .1" PITCH, CONTACTS GOLD PLATE	70-159792
HD2	2 PIN HEADER .1" PITCH, CONTACTS GOLD PLATE	70-159792
HD3	3 PIN HEADER .1" PITCH, CONTACTS GOLD PLATE	70-159793
J302	IL-S-8S-S2T2-EF 8 PIN JACK	70-159253
J922	IL-S-8S-S2T2-EF 8 PIN JACK	70-159253
J923	16 PIN DUAL ROW .1" PITCH HEADER	70-159801
PLUG1	SHORTING HEADER JUMPER	70-159794
PLUG2	SHORTING HEADER JUMPER	70-159794
<b>VARIABLE RESISTORS</b>		
RV1	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV2	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV3	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV4	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV5	10 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164141

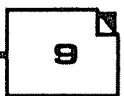


TO MIC OUT  
VOICE IN  
MIC IN  
MIC OUT  
MIC IN

CLASS/D.C.S  
ENV LOOE

Seto  
TX MOD

DET AUDIO



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C26	10 uF, 20%, 25 V, ALUMINUM ELECTROLYTIC CAP	70-135358
C27	1 uF, 10%, 16 V, TANTALUM ELECTROLYTIC CAP	70-135359
C28	0.01 uF, 5%, 50 V, STACKED METALIZED FILM	70-137143
<b>INTEGRATED CIRCUITS</b>		
U1	Z86E30 MCU, VERSION 2914-1.0 PROGRAM	70-076785
U2	LM2902A QUAD OPAMP, 14 PIN DIP PLASTIC	98-076143
U3	LM2902A QUAD OPAMP, 14 PIN DIP PLASTIC	98-076143
U4	LM2902A QUAD OPAMP, 14 PIN DIP PLASTIC	98-076143
U5	LM358 DUAL OPAMP, 8 PIN DIP PLASTIC	70-076385
U6	CD4051 OCTAL ANALOG MPX, CMOS, 16 PIN DIP	70-076434
U7	CD4066 QUAD ANALOG GATE, CMOS, 14 PIN DIP	70-076395
<b>CONNECTORS</b>		
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HD2	2 PIN HEADER .1" PITCH, CONTACTS GOLD PLATE	70-159792
HD3	3 PIN HEADER .1" PITCH, CONTACTS GOLD PLATE	70-159793
J302	IL-S-8S-S2T2-EF 8 PIN JACK	70-159253
J922	IL-S-8S-S2T2-EF 8 PIN JACK	70-159253
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PLUG1	SHORTING HEADER JUMPER	70-159794
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<b>VARIABLE RESISTORS</b>		
RV1	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV2	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV3	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV4	50 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164140
RV5	10 KOHM, 0.25", CERMET TRIMMER RESISTOR	70-164141

REF NO.	DESCRIPTION	PART NO.
<b>RESISTORS</b>		
R1	4.7 MOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147395
R2	100 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147396
R3	22 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147397
R4	22 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147397
R5	22 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147397
R6	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R7	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R8	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R9	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R10	20 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147399
R11	20 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147399
R12	8.66 KOHM, 1%, 1/4W METAL FILM RESISTOR	70-144579
R13	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R14	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R15	20 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147399
R16	14.3 KOHM, 1%, 1/4W METAL FILM RESISTOR	70-144577
R17	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R18	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R19	20 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147399
R20	12.7 KOHM, 1%, 1/4W METAL FILM RESISTOR	70-144578
R21	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R22	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R23	20 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147399
R24	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R25	39 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147400
R26	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R27	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R28	75 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147401
R29	43 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147402
R30	33 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147403
R31	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R32	390 5%, 1/8 W, CARBON FILM RESISTOR	70-147013
R33	120 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147391
R34	120 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147391
R35	120 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147391
R36	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R37	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R38	20 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147399
R39	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R40	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R41	27 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147392
R42	47 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147393
R43	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R44	1 MOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147394
R45	120 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147391
R46	120 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147391
R47	120 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147391
R48	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
R49	10 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147390
R50	4.7 KOHM, 5%, 1/8 W, CARBON FILM RESISTOR	70-147350
<b>MISCELLANEOUS</b>		
S1	9 POSITION DIP SWITCH, SPST, SEALED	70-183139
Y1	12MHz MICROPROCESSOR CRYSTAL, HC49 CASE	70-128132

**APPENDIX A**  
**70-2914 IDENT INTERFACE**

<b>J1</b>	<b>Description</b>
Pin 1 (ID IN)	Identification Audio is input here. Level must be set at the source, about 100 mV p-p needed for 3 kHz deviation. Impedance is more than 50K.
Pin 2 (ID REQ)	70-2914 Requests an ID through this. Active high, 2.4VDC. STD TTL load.
Pin 3 (OPT IN)	External courtesy tone can be input. Requires changing HD3 jumper from B-C to A-B.
Pin 4 (ID Status)	ID source status input. High level (2.4VDC ) indicates ID occurring. 500K load.
Pin 5 (GRND)	PCB ground.

Handshake sequence:

At ID time, ID REQ will go high for no more than 10 ms. If ID STATUS goes high within this 10 ms window, a transmit cycle will begin. The ID IN audio path will be enabled 20 ms after the ID STATUS has gone high. The ID IN audio will be muted and the transmitter turned off if ID STATUS goes low or after 15 seconds.

APPENDIX B

70-2914 FEATURE SETUP

COR Hang-time

SW1 Setting		Hang-time (Seconds)
#1	#2	
* Off	Off	0
On	Off	3
Off	On	5
On	On	10

Identification Timer

SW1 Setting		ID Time (Minutes)
#7	#8	
*Off	Off	Disabled
On	Off	9.5
Off	On	15.0
On	On	30.0

CTCSS Squelch Tail Elimination

SW1 Setting #3	Condition
* Off	Off
On	On

Courtesy Tone

SW1 Setting #9	Condition
* Off	Disabled
On	Enabled

Time Out Timer

SW1 Setting			Time Out Time (Minutes)
#4	#5	#6	
* Off	Off	Off	Disabled
On	Off	Off	0.5
Off	On	Off	1.0
On	On	Off	1.5
Off	Off	On	2.0
On	Off	On	3.0
Off	On	On	5.0
On	On	On	10.0

\* = Default Setting

**APPENDIX C**

70-2914

**APPENDIX C  
70-1080A PROGRAMMING**

CTCSS		Table 1 CDCSS						Table 2 Tone Frequency to Select
STD	NONSTD	Non-Inverted			Inverted			
250.3	254.1	+023	+243	+464	-023	-243	-464	250.3
233.6	229.1	+025	+244	+465	-025	-244	-465	233.6
218.1	206.5	+026	+245	+466	-026	-245	-466	218.1
203.5	159.8	+031	+246	+503	-031	-246	-503	203.5
186.2	165.5	+032	+251	+506	-032	-251	-506	186.2
173.8	171.3	+036	+252	+516	-036	-252	-516	173.8
162.2	177.3	+043	+255	+523	-043	-255	-523	162.2
151.4	183.5	+047	+261	+526	-047	-261	-526	151.4
141.3	189.9	+051	+263	+532	-051	-263	-532	141.3
131.8	196.6	+053	+265	+546	-053	-265	-546	131.8
123.0	199.5	+054	+266	+565	-054	-266	-565	123.0
114.8	69.4	+065	+271	+606	-065	-271	-606	114.8
107.2	198.0	+071	+274	+612	-071	-274	-612	107.2
100.0	202.7	+072	+306	+624	-072	-306	-624	100.0
88.5	150.0	+073	+311	+627	-073	-311	-627	88.5
77.0		+074	+315	+631	-074	-315	-631	77.0
241.8		+114	+325	+632	-114	-325	-632	241.8
225.7		+115	+331	+654	-115	-331	-654	225.7
210.7		+116	+332	+662	-116	-332	-662	210.7
192.8		+122	+343	+664	-122	-343	-664	192.8
179.9		+125	+346	+703	-125	-346	-703	179.9
167.9		+131	+351	+712	-131	-351	-712	167.9
156.7		+132	+356	+723	-132	-356	-723	156.7
146.2		+134	+364	+731	-134	-364	-731	146.2
136.5		+143	+365	+732	-143	-365	-732	136.5
127.3		+145	+371	+734	-145	-371	-734	127.3
118.8		+152	+411	+743	-152	-411	-743	118.8
110.9		+155	+412	+754	-155	-412	-754	110.9
103.5		+156	+413	+777	-156	-413	-777	103.5
94.8		+162	+423		-162	-423		94.8
82.5		+165	+431		-165	-431		82.5
71.9		+172	+432		-172	-432		71.9
97.4		+174	+445		-174	-445		97.4
91.5		+205	+446		-205	-446		91.5
85.4		+212	+452		-212	-452		85.4
79.7		+223	+454		-223	-454		79.7
74.4		+225	+455		-225	-455		74.4
67.0		+226	+462		-226	-462		67.0

Disable	Enable	Disable			Enable			Scrambler
None	None	1	2	3	1	2	3	Subsig Type

Table 3

**Instructions:**

1. Find the desired code in **Table 1**.
2. Follow the row containing the desired code over to **Table 2**. Record this tone frequency.
3. Follow the column containing the desired code down to **Table 3**. Record the Scambler and subsignalling settings.
4. Program the SYNTECH II normally but substitute these settings on TX.



**Example 1: Programming a 100.0 Hz CTCSS Tone**

1. Find 100.0 in **Table 1** under the CTCSS STD column.
2. Follow the row across to **Table 2** to find 100.0.
3. Follow the column down to **Table 3** to find Scrambler "Disable" and Subsig Type "None."

The resulting TX programming would be 100.0 Hz CTCSS tone, Scrambler Disable, and Subsig Type None.

**Example 2: Programming CDCSS code +343**

1. Find +343 in the Non-Inverted column of **Table 1**.
2. Follow the row across to **Table 2** to find 192.8.
3. Follow the column down to **Table 3** find Scrambler "Disable" and Subsig Type "2".

The resulting TX programming would be 192.8 Hz CTCSS tone, Scrambler Disable, and Subsig Type 2.



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## MANUAL ADDITION

MODEL NO(s): \_\_\_\_\_ 70-2914  
SERVICE MANUALS NO(s): \_\_\_\_\_ 70-999936  
MANUAL PRINTING DATE: \_\_\_\_\_ 9/92

MANUAL ADDITION NO.: \_\_\_\_\_ MA-157  
DATE: \_\_\_\_\_ 9/24/92  
SUBJECT: \_\_\_\_\_ Programming

Replace pages 7 and 8 of the manual with the attached page.





## Manual Correction

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MODEL NO(s): \_\_\_\_\_ 70-2914      MANUAL CORRECTION NO: \_\_\_\_\_ MC-211  
SERVICE MANUAL NO: \_\_\_\_\_ 70-999936      DATE: \_\_\_\_\_ 6/9/95  
MANUAL PRINTING DATE: \_\_\_\_\_ 5/95      SUBJECT: \_\_\_\_\_ Part Additions/Corrections

The information for the 70-2914 manual has been corrected as follows:

1. R49 and C29 were added to **Figure 5**.
2. R50 was added to **Figure 6**.
3. Parts list on pages 10 and 11 were modified to include C29, R6, R7, R8, R9, R40, R43, R48, R49 and R50.

Please replace pages 5, 6, 10 and 11 with the attached pages.

