1.4 Active Device List

The following is a complete listing of all the active devices used in the EMCEE Model TTU1000FA UHF Television Transmitter. The devices are grouped together as seen on each specific schematic or interconnection diagram. Given with each device is its schematic designator, EMCEE part number and function.

DEVICE	PART #/DESIGNATOR	FUNCTION
IF/CONVERTER Schematic Diagram 40404021		
Integrated Circuit	AD603AR/U1	Variable Gain Amplifier
Integrated Circuit	SGA-3286/U8, U11, U20	RF Amplifier
PIN Diode	HSMP-3814/CR7-CR10	RF Attenuator
LINEARITY CORRECTOR Schematic Diagram 40404011		
Diode	HSMS-2812/CR1-CR4	RF Switch
Integrated Circuit	MAV-11SM/U1-U8	RF Amplifier
UHF SYNTHESIZER Schematic Diagram 30367094		
Integrated Circuit	3B160/U4	Reference Divider
Integrated Circuit	3B166/U2	Dual Prescaler
Integrated Circuit	3B161/U1	Synthesizer
Integrated Circuit	3B149/U3	Loop Filter
Integrated Circuit	3B141/U6	Feedback Amplifier
Integrated Circuit	3B151/U5	RF Amplifier
VCO	V707S001/G1	Oscillator
REFERENCE OSCILLATOR Schematic Diagram 10368037		
Integrated Circuit	3B130/U1	RF Amplifier
TCXO	RTX0771AD/G1	Oscillator
UHF BANDPASS FILTER Schematic Diagram 20404015		
Integrated Circuit	SGA-4286/U1	RF Amplifier

DEVICE	PART #/DESIGNATOR	FUNCTION
X16 MULTIPLIER (With Vectron Oscillator) Schematic Diagram 30367172		
Hybrid Circuit	SK2/A1, A2, A3	Frequency Doubler
Integrated Circuit	3B153/U1	RF Amplifier
Integrated Circuit	3B141/U2	RF Amplifier
Integrated Circuit	3B151/U3, U6	RF Amplifier
Integrated Circuit	2B131/U4	RF Amplifier
Integrated Circuit	2B130/U5	RF Amplifier
2 WATT UHF AMPLIFIER Schematic Diagram 30404029		
Integrated Circuit	SGA-4186/U1	RF Amplifier
Transistor	AH1/Q1	RF Amplifier
Transistor	PTF10027/Q2	RF Amplifier
300 WATT UHF POWER AMPLIFIER Schematic Diagram 40394135		
Transistor	PTF10027/Q1, Q3	RF Amplifier
Transistor	PTF10007/Q5, Q6	RF Amplifier
Transistor	PTF10159Q7-Q10	RF Amplifier

3.1 PERIODIC MAINTENANCE SCHEDULE:

OPERATION	RECOMMENDATION
ALIGNMENT	Upon installation and at one-year intervals thereafter (Section 3.4).
OUTPUT POWER CALIBRATION	Same as above (Section 3.5).
FANS	Inspect as often as possible (at least monthly) and clean when necessary. No lubrication needed.

3.2 RECOMMENDED TEST EQUIPMENT:

EQUIPMENT	MANUFACTURER	MODEL #
Digital Multimeter	HEWLETT PACKARD	E2378A
Oscilloscope	TEKTRONIX	2232
VHF Sweep Generator	WAVETEK	2001
50 Ohm RF Detector	TELONIC BERKELEY	8553
20dB/30dB Attenuator	NARDA	766-20/30
30dB Directional Coupler	NARDA	3001-30
50 Ohm, 1000W Dummy Load	BIRD	8833
Power Meter	HEWLETT PACKARD	435B
Frequency Counter	HEWLETT PACKARD	5386A
Spectrum Analyzer	HEWLETT PACKARD	8594E
NTSC Video Generator	TEKTRONIX	TSG100

3.3 TROUBLESHOOTING:

If the visual and/or aural output signals from the transmitter appear distorted, noisy or nonexistent, consider the following procedure as a troubleshooting aid. This procedure assumes the transmitter wiring as well as the cabling and connectors are trouble free. It also assumes the modulator is receiving baseband video and audio signals while providing the required visual and aural IF carriers at appropriate levels of –8dBm peak and –21dBm average, respectively. The general problem area will be indicated by simply checking the front panel diagnostic lights as well as the

transmitter and Exciter RF POWER meters. The diagnostic indicators are located on the front panel of the EMEX1 Exciter and on the Control/Metering panel at the top front of the transmitter cabinet.

3.3a Control/Metering Panel Indicators:

1. Under normal operation the following indicators will be lit green:
   AMPLIFIER 1
   AMPLIFIER 2
   POWER SUPPLY 1
   POWER SUPPLY 2
   RF POWER meter = 100% with FWD green/<10% with REFL green

2. In standby operation the following indicators will be lit green:
   AMPLIFIER 1
   AMPLIFIER 2

3. If either one of the POWER SUPPLY indicators fails to illuminate with the transmitter in OPERATE, it is signaling that one of the 32V power supplies in the 500W Power Amplifier drawer indicated (#1 = A3PS1 or PS2, #2 = A4PS1 or PS2 / see Figure 3–1) has failed and needs to be replaced. Until that time, the IF/Converter's output AGC circuit is deactivated allowing the transmitter to operate at reduced power.

4. If the AMPLIFIER 1 or AMPLIFIER 2 light goes out with the transmitter providing power, it indicates that one of the output transistors in the designated (#1 = A3, #2 = A4 / Figure 3–1) 500W Power Amplifier drawer has failed. If a qualified technician is available, the defective transistor can be replaced; otherwise, replace the affected 300W Power Amplifier assembly (A3A1, A3A2/A4A1, A4A2) or 500W Power Amplifier drawer (A3, A4). In the interim, the fault indication has deactivated the IF/Converter's output AGC control so that the transmitter can operate at lower power.

5. If the AMPLIFIER 1 TEMP or AMPLIFIER 2 TEMP indicator lights yellow, this is a sign that one of the 300W Amplifier Assemblies in the specified 500W Amplifier drawer is operating at a temperature high enough to cause transistor damage. This fault usually occurs due to high ambient temperature at the transmission site, amplifier drawer cooling fan failure or lack of maintenance allowing for fouled fans and blocked front panel air vents.

6. Assuming that the transmitter had previously been operating at its appropriate power and none of the indicators discussed above are showing a fault, if the FWD RF POWER meter is now reading less than 100% with the Exciter RF POWER meter indicating 100% (AGC off) or more (AGC on), a loss of gain has occurred somewhere in the system after the Exciter's output. Check first for faulty cables, failed Hybrid Combiner (A7HY1) or a detuned/ defective output UHF Bandpass Filter (A7FL1). Next, check the gain of each 500W Power Amplifier drawer. Neither the Splitter (A3CP1/A4CP1), Combiner (A3CP2/A4CP2) nor driver amplifier transistors contained in the 500W Power Amplifiers are monitored and, if faulty, will cause loss of gain. Identify the problem component and replace the affected drawer, amplifier assembly, module or component as soon as possible. If it is necessary to operate the transmitter before repairs are effected, be sure to defeat the output AGC by releasing (out) the Exciter's AGC/MANUAL button.

7. If the REFL RF POWER meter registers more than 10% returned power, all the components in the RF system (i.e., transmission line, antenna, jumpers) after the transmitter's output should be checked thoroughly for higher than normal VSWR. The offending component should be repaired or replaced. If the output VSWR seen by the transmitter creates more than 25% returned power, then the VSWR overload protection circuit will place the unit in standby.

3.3b EMEX1 Exciter Drawer Indicators:

1. Under normal "on the air" operating conditions the Exciter's green LED indicators should appear as follows:

SYNTHESIZER LOCK	–	on
IF STATUS	–	on
AMPLIFIER STATUS	–	on
LINEARITY CORRECTOR	–	on
AGC ACTIVE	–	on
SWEEP MODE	–	off
OPERATE/STANDBY	–	on
VSWR RESET	–	off
AGC voltmeter	–	1 segment lit at approximate center
RF POWER meter	–	100%

2. An extinguished SYNTHESIZER LOCK light indicates that the UHF Synthesizer (A2A2) is defective and should be replaced. Under this condition the transmitter is placed in permanent standby until the problem is resolved.

3. The IF STATUS indicator provides verification that an IF signal of appropriate amplitude and frequency is present at the Exciter's input. Loss of IF input from the modulator will cause this LED to shut off.

4. The AMPLIFIER STATUS indicator monitors the operation of the 2 Watt UHF Amplifier module (A2A1) within the Exciter drawer. With the amplifier operating normally, the indicator will be lit green. However, if one of the transistors within the module fails, this LED will extinguish.

5. The LINEARITY CORRECTOR LED, when lit, indicates that the corrector is active. This function is manually controlled by the ENABLE/BYPASS switch (A2PC2S1) mounted on the corrector PC board. This indicator will turn off when the corrector switch is placed in BYPASS.

6. The AGC ACTIVE light will be lit when the front panel AGC/MANUAL switch (A2PC3S2) is pressed in engaging the transmitter's output automatic gain control. With the front panel switch placed in MANUAL (released/out), the AGC is disengaged and the LED will go out.

7. The SWEEP MODE LED will typically be turned off and is only active when the OPERATE/ SWEEP switch (A2PC4S1) on the Control/Interface board is placed in the SWEEP position. This position deactivates both input and output AGC circuits so that low level sweep measurements can be made.

8. The OPERATE/STANDBY indicator will illuminate with the associated front panel switch in the OPERATE (depressed/in) position. The status of this indicator is fully dependent on the position of the OPERATE/STANDBY switch (A2PC3S1) and will stay lit even if the transmitter is forced into standby through some other means.

9. The VSWR RESET light will always be inactive until high reflected power appears at the transmitter's output causing a VSWR overload to occur. This indicator can be extinguished by depressing the front panel momentary VSWR RESET switch, but only after the cause of the high returned power has been cleared.

10. The AGC bar graph meter provides a gross indication of the output AGC voltage activity. Normally, one of the two segments at the center of the meter will be lit suggesting that the AGC system has been properly calibrated and that the transmitter is operating correctly. with the AGC/MANUAL switch (A2PC3S2) in the AGC (in) position and a loss of gain in the transmitter, the AGC circuit will see the reduction in output power and attempt to compensate by increasing its voltage, thereby, adding more gain to the system. This action will move the AGC meter indication toward the + or right side of the meter. If, for some reason, the gain should increase in the transmitter amplifier chain, the AGC circuit will react by decreasing its voltage, reducing system gain while, again, holding the transmitter's output constant. In this situation, the AGC meter bar indication will move toward the – or left side of the display.

11. The RF POWER meter (A2PC3DS9/10/11) provides an indication of the signal level generated at the output of the Exciter. When driving higher power equipment (e.g., TTU1000FA), this meter is calibrated for a 100% reading when the driven equipment is operating at its rated power (100%).

3.3c TTU1000FA Troubleshooting Chart:

The following chart is meant as an aid for uncovering faults that have developed in this transmitter. During normal operation, all indicator LEDs are green, except the AMPLIFIER 1 & 2 VSWR OVLD LEDs which are yellow and red, respectively, but are normally extinguished. This chart lists the LEDs that are indicating a fault by not appearing in their normal state. If a problem develops with the transmitter, note the state of each indicator and compare this to the chart below.

TTU1000FA TROUBLESHOOTING CHART

PROBLEM	INDICATORS	CAUSE	SOLUTION
NO OUTPUT POWER	ALL EXCITER DRAWER INDICATORS UNLIT	Exciter Power Supply faulty	Check 28V/15V/5V Power Supply. Replace if necessary.
	SYNTH LOCK UNLIT POWER SUPPLY 1 UNLIT POWER SUPPLY 2 UNLIT RF POWER METER 0%	Defective Synthesizer	Check synthesizer for correct output level and frequency. Replace if necessary.
	OPERATE UNLIT POWER SUPPLY 1 UNLIT POWER SUPPLY 2 UNLIT RF POWER METER 0%	Operate/Standby switch in Standby Ground on A8J1-5 of Remote plug No video at input of modulator	Place switch (in) to Operate. Ensure transmitter has not been placed in standby through remote system. Check video program input and VDS tally.
	VSWR RESET RED RF POWER METER 0%	VSWR overload	Clear VSWR problem and press Reset button.
	IF STATUS UNLIT RF POWER METER 0%	No IF input from modulator	Fix cables or replace modulator.
	AMPLIFIER STATUS UNLIT RF POWER METER 0%	2 Watt Amplifier faulty	Replace module.
LOW OUTPUT POWER	AMPLIFIER 1 TEMP YELLOW POWER SUPPLY 1 UNLIT or AMPLIFIER 2 TEMP YELLOW POWER SUPPLY 2 UNLIT RF POWER <100%	High 300W Amplifier temperature	Insure site ambient temperature is controlled. Check fans for proper operation and adequate space to ventilate drawer.

TTU1000FA TROUBLESHOOTING CHART

PROBLEM	INDICATORS	CAUSE	SOLUTION
LOW OUTPUT POWER	AMPLIFIER 1 UNLIT or AMPLIFIER 2 UNLIT RF POWER <100%	Output transistor failure in 300W Amplifier of 500W drawer indicated	Replace failed 500W Amplifier drawer, 300W Amplifier Assembly or transistor.
	POWER SUPPLY 1 UNLIT or POWER SUPPLY 2 UNLIT RF POWER <100%	32V Power Supply failure in 500W drawer indicated	Replace failed 500W Amplifier drawer or 32V power supply.
LOW OUTPUT POWER OR DISTORTED OUTPUT	No Fault indicated	Output Power Calibration is incorrect	See Section 3.5.
		Modulator malfunction	Replace modulator.
		High loss in one of the modules	Test each module for correct gain/loss. See Signal Flow Diagram (Fig 3–2) for gains/ losses.
		Precorrector improperly adjusted or not active	See Section 3.6.
NO VISUAL OUTPUT (AURAL OK)	No Fault indicated	Modulator failure	Replace modulator.
		Bad cable	Check rear panel visual loop-thru cable.
NO AURAL OUTPUT (VISUAL OK)	No Fault indicated	Modulator failure	Replace modulator.
		Bad cable	Check rear panel aural loop-thru cable.

3.4 ALIGNMENT:

3.4a Exciter UHF Bandpass Filter:

1. With the transmitter operating normally, place the OPERATE/STANDBY switch to STANDBY. Carefully pull out the Exciter drawer and remove its top cover. Leave the Power Adjust control as it would be for normal operation and place the Control/Interface board OPERATE/SWEEP switch (A2PC4S1) to the SWEEP position. (The front panel SWEEP MODE light will turn on.)

2. Remove the modulator cable attached to the Exciter's IF INput connector (J1). Also, remove the RF cables attached to both RF OUT connector (J3, J4) and terminate one port with an appropriate 50 ohm load (30dB, 20W attenuator). **(It is very important to remember to reconnect the same cable to the same output connector since each drive signal from the Exciter is 90° out of phase.)** Set up the test equipment as shown in Figure 3–4. Set the VHF generator sweep width from 35 to 55MHz and use 45.75MHz and 41.25MHz markers if available.

3. Remove the four screws securing the UHF Bandpass Filter (A2FL1) to the Exciter chassis and place the OPERATE/STANDBY switch to OPERATE. Adjust variable capacitors C1 through C6, accessible through the holes on the front side of filter assembly, to obtain the frequency response shown in Figure 3–5. A small tuning tool is required for this procedure.

4. If the transmitter's channel is being changed to one that is more than 40MHz from the factory preset, connect a spectrum analyzer to the 20dB attenuator in Figure 3–4 and find the transmitter's synthesizer/local oscillator (LO) frequency and the sweep signal appearing on the low side of the LO. Tune the spectrum analyzer to the UHF Synthesizer's new frequency as shown in Table 3–1, UHF Synthesizer Programming Chart. Program the synthesizer for the new channel and look for the LO carrier on the analyzer. Tune the analyzer 44MHz (36MHz for PAL B/G) **below** the LO frequency and tune capacitors C1 through C6 of the Bandpass Filter for maximum amplitude and bandwidth of the sweep generator signal on the spectrum analyzer. Replace the analyzer with the diode detector and oscilloscope, and adjust the Bandpass Filter for the response of Figure 3–5. In order to obtain the appropriate bandwidth and loss characteristics (10dB minimum gain), it may be necessary to open the filter and adjust the position of wire loading probes W1 through W4. If possible, this procedure should be done using a network analyzer (or reasonable substitute) to view input and output return loss, both of which should be less than 18dB.

   IMPORTANT: If the transmitter's output channel has been changed, the UHF Bandpass Filter (A7FL1) at the unit's output must be removed or replaced.

5. Once the filter is appropriately tuned, reattach the filter to the Exciter chassis, move the Control/Interface OPERATE/SWEEP switch to the OPERATE position (SWEEP MODE LED off), replace the cover on the Exciter drawer and remove the test equipment.

6. Recable the Exciter **exactly** as it was cabled when delivered and place the transmitter back in operation according to Section 1.4 of this manual.

3.5 OUTPUT POWER CALIBRATION:

To ensure proper operation, the transmitter's output power level and RF POWER meter calibration should be checked once every year. With the meter switch in the FWD position, the RF POWER meter has been factory calibrated for 100% with the transmitter providing 1000 watts peak visual and 50 watts average aural. The following calibration procedures assume that the composite signal from the transmitter has the aural carrier 13dB down from the peak visual with the visual carrier having 87.5% video modulation and 0% (sync only) average picture level (APL). The power levels stated in the steps below are those expected at the output of the transmitter. Therefore, when measuring these power levels using the equipment shown in Figure 3–6, be sure to take into account the attenuation factor provided by the 20dB directional coupler and the 20dB attenuator. Power levels at 50% APL (5 Step/Ramp/50% Flat Field) are included in brackets following the power level at 0% APL.

3.5a Forward Power:

1. Assuming the transmitter is in operation, place the Exciter's OPERATE/STANDBY switch to STANDBY and set up the test equipment shown in Figure 3–6.

2. Using sync only video, verify that the modulator is providing 87.5% video modulation with the aural carrier 13dB below the visual carrier. Release the Exciter AGC/MANUAL switch to the MANUAL position and the transmitter RF POWER meter switch to FWD. Place the Exciter OPERATE/STANDBY switch to OPERATE.

3. Wait for the transmitter to come up to power and, using a small tuning tool, rotate the OUTPUT LEVEL ADJUST for an external power meter reading of 645W [390W]. Notice that 1000 watts of peak visual power at 0% [50%] APL plus 50 watts of average aural power at 13dB down equals 645W [390W] power on the external average power meter.

4. To check and adjust visual to aural ratio, replace the power meter in Figure 3–6 with a spectrum analyzer. Set the modulator's aural carrier level adjustment for the desired visual/ aural ratio. Remove the spectrum analyzer, return the power meter to the transmitter output and recheck power. Set the OUTPUT LEVEL ADJUST again for an external power meter reading of 645W [390W].

5. With the external power meter reading correctly, place the Control/Metering panel meter switch to FWD and check the transmitter's RF POWER meter for a 100% indication. If this reading is not obtained, adjust FORWARD POWER potentiometer A5PC1R32, located behind the Control/Metering panel (A5) and accessible through the METER ADJUST hole marked FWD, for the correct indication.

6. Activate the transmitter's output gain control by pushing in the Exciter AGC/MANUAL button and recheck the power indication on the external meter for 645 watts [390W]. If the meter reading is not correct, **slowly** turn the AGC LEVEL ADJUST (small tuning tool required) to correct the transmitter output power. The output AGC circuit has a very long time constant which requires the operator to wait for the transmitter power to settle after each small movement of the AGC LEVEL ADJUST.

3.5b Reflected Power:

(OPTIONAL)

7. Carefully pull out the Exciter drawer and remove its top cover. On the Control/Interface board find VSWR OVLD REF potentiometer A2PC4R12 and turn it fully counterclockwise to disable the VSWR overload detection circuit. Place the Control/Metering panel RF POWER meter switch to REFL.

8. Place the Exciter's OPERATE/STANDBY switch to STANDBY and the AGC/MANUAL switch to MANUAL. Switch the INCIDENT (J3) and REFLD (J4) coupling port cables on the Metering Coupler (A7DC1). J2 (REFLD) of the Metering Detector (A5A1) should now be connected to J3 (INCIDENT) of the Metering Coupler. This simulates an open circuit at the transmitter's RF OUTput delivering maximum returned power to the reflected power detector.

9. Place the OPERATE/STANDBY switch to OPERATE and wait until the external power meter reading of 645 watts [390W] is reached. Check the front panel RF POWER meter for a 100% reading. If the meter is incorrect, adjust it using REFLECTED POWER potentiometer A5PC1R32 accessible through the METER ADJUST hole marked REFL on the Control/Metering panel (A5).

10. Using the Exciter's OUTPUT LEVEL ADJUST, decrease the transmitter's power to 25% as seen on the RF POWER meter. This power level is used for setting the trip point of the VSWR overload detection circuit. Return to the Exciter's Control/Interface board and slowly adjust VSWR OVLD REF potentiometer A2PC4R12 clockwise until the Exciter's VSWR RESET indicator illuminates red.

11. Check the VSWR OVLD trip point by pressing the momentary VSWR RESET switch on the Exciter front panel which will reactivate the transmitter. As the transmitter power rises to 25%, the VSWR overload circuit should again trip. If it does not, carefully rotate the VSWR OVLD REF adjust further clockwise and repeat this step to recheck the trip point.

12. Place the OPERATE/STANDBY switch to STANDBY and return the metering cables to their original coupler ports (DC1J3/J4). Remove all test equipment from the transmitter, replace the top cover on the Exciter and push the drawer back into the rack.

13. After properly loading the transmitter, place the unit in operation by pressing the OPERATE/ STANDBY switch in and resetting the OUTPUT LEVEL ADJUST for a 100% indication on the RF POWER bar graph meter. Reactivate the transmitter's output AGC as explained in step #6 above.

3.6 LINEARITY CORRECTOR ADJUSTMENT:

Adjustment of the transmitter linearity is accomplished using eight potentiometers on the Exciter Linearity Corrector board (A2PC1). Since the Linearity Corrector can produce unwanted distortion if adjusted incorrectly, this circuit should not be realigned unless absolutely necessary. The test equipment which should be available for readjustment of the precorrector is a spectrum analyzer which provides demodulated video for measurement of sync and intermodulation and/or a video measurement set with television demodulator for sync, differential gain, differential phase and ICPM measurements. Acquire as much of this test equipment as possible since the precorrection accuracy will depend on equipment versatility. It is assumed that all the transmitter's circuits are

operating properly and its frequency response is correct, allowing the unit to operate with maximum efficiency.

1. Place the transmitter in standby and connect the test equipment available for monitoring intermodulation, sync amplitude and differential gain and phase.

2. Remove the top cover of the Exciter drawer and insure that the Linearity Corrector BYPASS/ENABLE switch (A2PC2S1) is in the ENABLE position causing the front panel LINEARITY CORRECTOR light to illuminate.

3. Place the transmitter in operation with the system providing its rated output power. After demodulating video, find the distortion that needs the most correction and slowly adjust the potentiometers shown on the table below dedicated to that type of distortion. Those adjustments designated as CUT IN are used to position the correction on a specific part of the waveform being modified. Those adjustments specified as SLOPE increase and decrease the amount of correction applied. Remember that the corrector was factory calibrated and should need very little readjustment. Also, be aware that, while manipulating the corrector, the transmitter's output must be carefully monitored since changes in linearity can significantly alter the unit's output power.

ADJUSTMENT	CORRECTION	FUNCTION
R21	Diff. Phase	Cut In
R15	Diff. Phase	Slope
R30	Diff. Phase	Cut In
R25	Diff. Phase	Slope
R47	Diff. Gain	Cut In
R41	Diff. Gain	Slope
R55	Sync	Cut In
R57	Sync	Slope

4. After the adjustments in step #3 are completed, modulate the visual signal with a modulated ramp waveform and place the transmitter signal on a spectrum analyzer (100kHz resolution bandwidth) to view in-band intermodulation distortion. Carefully readjust R21 and R15 to null the IM_3 distortion products.

5. Check and, if necessary, readjust the transmitter's output power using the Exciter's front panel OUTPUT LEVEL ADJUST.

6. Repeat steps #3 and #4 to find the appropriate trade-off between differential phase, differential gain, sync amplitude and intermodulation distortion.

7. Place the transmitter in standby, remove the test equipment, reinstall the top cover on the Exciter and slide the drawer back into the cabinet. Properly load the transmitter's output and place it back on the air.

3.7 REMOTE MONITOR SIGNAL LEVELS:

This table lists the signals necessary for control and monitoring of the transmitter provided on the REMOTE connector (A8J1) located on the rear Video/Audio/Remote panel.

NAME	PIN	I/O	TTL	TYPICAL LEVEL
REFL POWER	1	O		<0.25V
AGC VOLTAGE	2	O		+5V
FWD POWER	3	O	X	+3V
OPERATE/STANDBY	5	I	X	Open/Gnd
VSWR RESET	6	I	X	Gnd
AGC ON/OFF	7	I	X	Open/Gnd
GND	8	I/O		Gnd

3.9 SYNTHESIZER PROGRAMMING:

UHF SYNTHESIZER PROGRAMMING CHART (NTSC)

Channel	Visual Frequency (MHz)	LO Freq (MHz)	S4	S3	S2	S1
14	471.25	517	0	A	1	9
15	477.25	523	0	A	3	7
16	483.25	529	0	A	5	5
17	489.25	535	0	A	7	3
18	495.25	541	0	A	9	1
19	501.25	547	0	A	A	F
20	507.25	553	0	A	C	D
21	513.25	559	0	A	E	B
22	519.25	565	0	B	0	9
23	525.25	571	0	B	2	7
24	531.25	577	0	B	4	5
25	537.25	583	0	B	6	3
26	543.25	589	0	B	8	1
27	549.25	595	0	B	9	F
28	555.25	601	0	B	B	D
29	561.25	607	0	B	D	B
30	567.25	613	0	B	F	9
31	573.25	619	0	C	1	7
32	579.25	625	0	C	3	5
33	585.25	631	0	C	5	3
34	591.25	637	0	C	7	1
35	597.25	643	0	C	8	F
36	603.25	649	0	C	A	D
37	609.25	655	0	C	C	B
38	615.25	661	0	C	E	9
39	621.25	667	0	D	0	7
40	627.25	673	0	D	2	5
41	633.25	679	0	D	4	3
42	639.25	685	0	D	6	1

Table 3–1

UHF SYNTHESIZER PROGRAMMING CHART (NTSC)

Channel	Visual Frequency (MHz)	LO Freq (MHz)	S4	S3	S2	S1
43	645.25	691	0	D	7	F
44	651.25	697	0	D	9	D
45	657.25	703	0	D	B	B
46	663.25	709	0	D	D	9
47	669.25	715	0	D	F	7
48	675.25	721	0	E	1	5
49	681.25	727	0	E	3	3
50	687.25	733	0	E	5	1
51	693.25	739	0	E	6	F
52	699.25	745	0	E	8	D
53	705.25	751	0	E	A	B
54	711.25	757	0	E	C	9
55	717.25	763	0	E	E	7
56	723.25	769	0	F	0	5
57	729.25	775	0	F	2	3
58	735.25	781	0	F	4	1
59	741.25	787	0	F	5	F
60	747.25	793	0	F	7	D
61	753.25	799	0	F	9	B
62	759.25	805	0	F	B	9
63	765.25	811	0	F	D	7
64	771.25	817	0	F	F	5
65	777.25	823	1	0	1	3
66	783.25	829	1	0	3	1
67	789.25	835	1	0	4	F
68	795.25	841	1	0	6	D
69	801.25	847	1	0	8	B

Table 3–1

UHF SYNTHESIZER PROGRAMMING CHART (PAL)

Channel	Visual Frequency (MHz)	LO Freq (MHz)	S4	S3	S2	S1
21	471.25	510.15	0	9	F	6
22	479.25	518.15	0	A	1	E
23	487.25	526.15	0	A	4	6
24	495.25	534.15	0	A	6	E
25	503.25	542.15	0	A	9	6
26	511.25	550.15	0	A	B	E
27	519.25	558.15	0	A	E	6
28	527.25	566.15	0	B	0	E
29	535.25	574.15	0	B	3	6
30	543.25	582.15	0	B	5	E
31	551.25	590.15	0	B	8	6
32	559.25	598.15	0	B	A	E
33	567.25	606.15	0	B	D	6
34	575.25	614.15	0	B	F	E
35	583.25	622.15	0	C	2	6
36	591.25	630.15	0	C	4	E
37	599.25	638.15	0	C	7	6
38	607.25	646.15	0	C	9	E
39	615.25	654.15	0	C	C	6
40	623.25	662.15	0	C	E	E
41	631.25	670.15	0	D	1	6
42	639.25	678.15	0	D	3	E
43	647.25	686.15	0	D	6	6
44	655.25	694.15	0	D	8	E
45	663.25	702.15	0	D	B	6
46	671.25	710.15	0	D	D	E
47	679.25	718.15	0	E	0	6
48	687.25	726.15	0	E	2	E
49	695.25	734.15	0	E	5	6

For PAL operation the grounds to Pins 21 and 23 of U1 (MC145152) must be removed.

Table 3–1

UHF SYNTHESIZER PROGRAMMING CHART (PAL)

Channel	Visual Frequency (MHz)	LO Freq (MHz)	S4	S3	S2	S1
50	703.25	742.15	0	E	7	E
51	711.25	750.15	0	E	A	6
52	719.25	758.15	0	E	C	E
53	727.25	766.15	0	E	F	6
54	735.25	774.15	0	F	1	E
55	743.25	782.15	0	F	4	6
56	751.25	790.15	0	F	6	E
57	759.25	798.15	0	F	9	6
58	767.25	806.15	0	F	B	E
59	775.25	814.15	0	F	E	6
60	783.25	822.15	1	0	0	E
61	791.25	830.15	1	0	3	6
62	799.25	838.15	1	0	5	E
63	807.25	846.15	1	0	8	6
64	815.25	854.15	1	0	A	E
65	823.25	862.15	1	0	D	6
66	831.25	870.15	1	0	F	E
67	839.25	878.15	1	1	2	6
68	847.25	886.15	1	1	4	E

For PAL operation the grounds to Pins 21 and 23 of U1 (MC145152) must be removed.

Table 3–1