ALL MODE TRANSCEIVER

TS-790A/E

SERVICE MANUAL

KENWOOD

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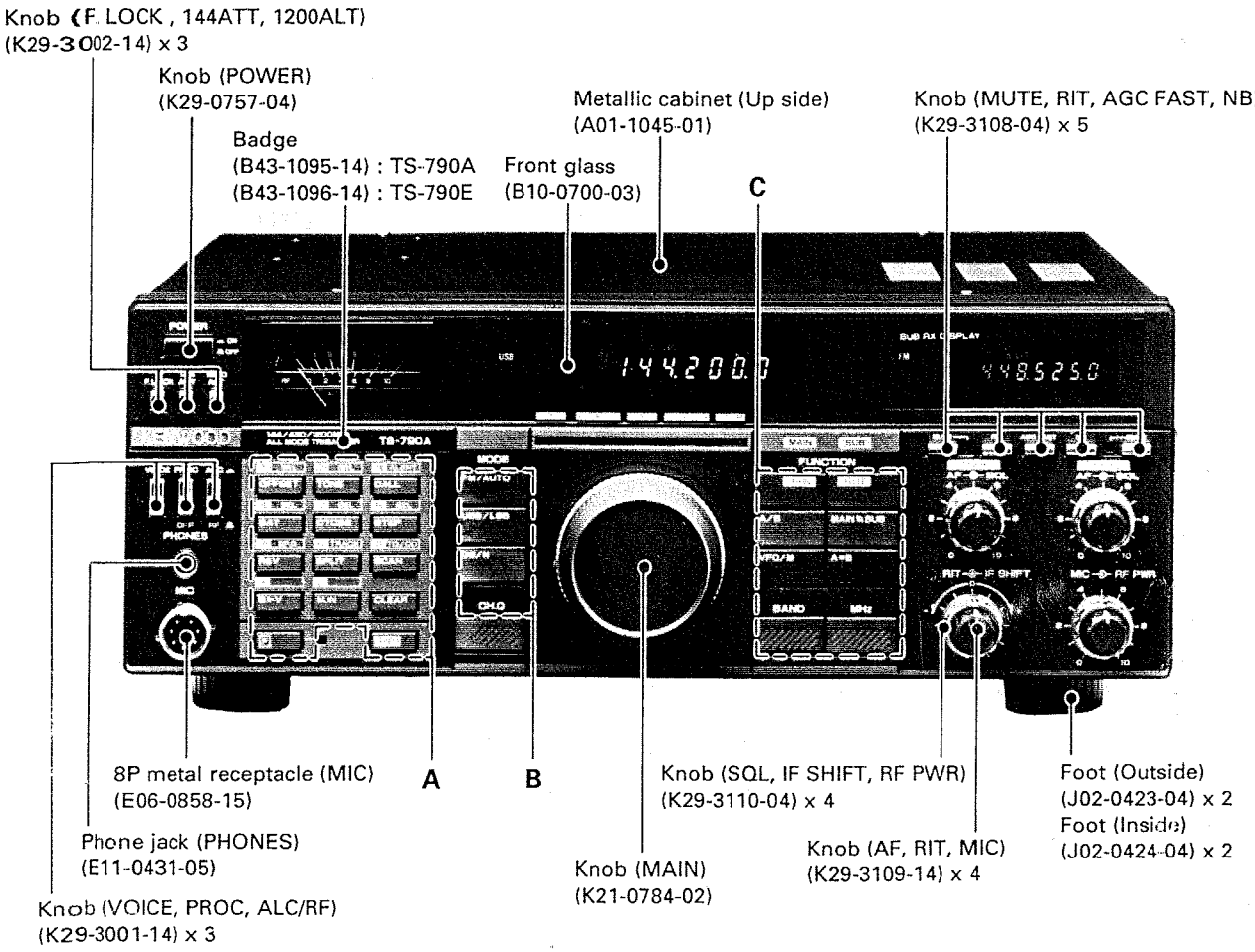

A

Knob (OFFSET) (K27-3002-04)	Knob (TONE) (K27-3005-04)	Knob (CALL) (K27-3004-04)
Knob (SAT) (K27-3006-04)	Knob (CTCSS) (K27-3003-04) : TS-790A Knob (ALERT) (K27-3030-04) : TS-790E	Knob (STEP) (K27-3007-04)
Knob (REV) (K27-3008-04)	Knob (SPLIT) (K27-3009-04)	Knob (SCAN) (K27-3010-04)
Knob (M > V) (K27-3011-04)	Knob (M. IN) (K27-3012-04)	Knob (CLEAR) (K27-3013-04)
Knob (F) (K27-3014-04)		Knob (ENT) (K27-3015-04)

B

Knob (FM/AUTO) (K27-3016-04)
Knob (USB/LSB) (K27-3017-04)
Knob (CW/N) (K27-3018-04)
Knob (CH.Q) (K27-3025-04)

C

Knob (MAIN) (K27-3019-04)	Knob (SUB) (K27-3023-04)
Knob (A/B) (K27-3020-04)	Knob (MAIN≷SUB) (K27-3022-04)
Knob (VFO/M) (K27-3024-04)	Knob (A=B) (K27-3021-04)
Knob (BAND) (K27-3025-04)	Knob (MHz) (K27-3025-04)

Photo is TS-790A.

Caution1. Please connect the dummy load to ANT connector, when adjust a transmit output.
Caution2. In case of repair in the 1.2GHz final unit (option) after repaired a radio conform the receiver sensitivity.

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CIRCUIT DESCRIPTION

Model name / Unit name	TS-790A			TS-790E
	K	M1	M2	T, W
Switch unit	X41-3050-00	X41-3050-00	X41-3050-00	X41-3050-00
RF unit	X44-3060-11	X44-3060-11	X44-3060-00	X44-3060-00
144MHz Final unit	X45-3160-00	X45-3160-00	X45-3160-00	X45-3160-00
430MHz Final unit	X45-3170-00	X45-3170-00	X45-3170-00	X45-3170-00
IF unit	X48-3050-11	X48-3050-11	X48-3050-11	X48-3050-61
PLL unit	X50-3080-00	X50-3080-00	X50-3080-00	X50-3080-00
Control unit	X53-3120-11	X53-3120-21	X53-3120-22	X53-3120-61
UT-10 (Option)	Composite unit (X60-3040-21) 1.2GHz RF unit (X44-3070-00) 1.2GHz Final unit (X45-3150-00) 1.2GHz PLL unit (X50-3090-21)			

Table 1 Differences between TS-790A and TS-790E

Band / Mode	144MHz	430MHz	1200MHz
A1, A3J	Single conversion Superheterodyne	Double conversion Superheterodyne	Triple conversion Superheterodyne
F3	Double conversion Superheterodyne	Triple conversion Superheretodyne	Quadruple-conversion Superhererodyne

Table 2 Type of received frequency conversion by band

● Main IF frequencies

(* Indicates that the frequency is available only in the FM mode.)

Band / IF	144MHz	430MHz	1200MHz
1st	10.695MHz	75.925MHz	287.175MHz
2nd	* 455kHz	10.695MHz	41.415MHz
3rd	—	* 455kHz	10.695MHz
4th	—	—	* 455kHz

● Sub IF frequencies

(* Indicates that the frequency is available only in the FM mode.)

Band / IF	144MHz	430MHz	1200MHz
1st	10.595MHz	75.925MHz	287.075MHz
2nd	* 455kHz	10.595MHz	41.315MHz
3rd	—	* 455KHz	10.595MHz
4th	—	—	* 455kHz

Table 3 Main and sub IF frequencies

Circuit Configuration by Band

The TS-790A/E is a "triple bander". It's design implements the capability to receive on any two of the three bands at the same time.

The TS-790A/E an RF unit, a final unit, and a PLL unit for each band. Input to the IF unit is switched to the main or sub-band circuitry. The main and sub IF frequencies differ by 100kHz to prevent interference. The sub band IF circuit is only capable of reception, while the main IF circuit is capable of both transmission and reception.

• 144MHz-band block

The 144MHz-band uses single conversion techniques (in SSB or CW mode). The 1st HET oscillator converts to the main IF of 10.695MHz. If the sub IF is set to 144MHz, the 1st HET operates at a 100kHz higher frequency and makes conversion to the sub IF of 10.595MHz.

• 430 MHz-band block

The 430MHz-band uses double conversion techniques (in SSB or CW mode). The 1st HET makes conversion to a 1st IF of 75.925MHz. Since the 1st IF is used to generate both the main and sub band IF frequencies the 1st HET oscillator operates at the same frequency, regardless of which IF, main or sub, is to be generated. The 2nd IF is the same as the 1st IF used in the 144MHz-band block. The 2nd HET operates at 65.23MHz for the main IF, or at 65.33MHz for the sub band IF.

CIRCUIT DESCRIPTION

• 1200 MHz-band block

The 1200MHz-band uses triple conversion techniques (in SSBor CW mode). The 1st HET oscillator signal is used to select the main band or sub band IF circuit. The frequency of the HET output, from the PLL unit, differs by 50kHz from the original frequency. It is then doubled by the RF unit to produce a frequency difference of 100kHz. The 2nd HET oscillator signal operates at a local frequency obtained by multiplying 10.24MHz by 24, and the 3rd HET oscillator signal operates at a frequency obtained by multiplying 10.24MHz by three.

• CAR circuit configuration

There are two different CAR frequencies used by the IF unit : one for the main IF and one for the sub IF. These frequencies are generated by the PLL unit. The main and sub IF frequencies differ by 100kHz. For normal IF shift functions, a CAR frequency is supplied to the PLL unit for mixing. In addition to this loop, the TS-790A/E has a different PLL loop to generate the CAR frequency. Therefore, separate PLL circuits are provided for the CAR and the HET signals. (Microcomputer-output data for the CAR and HET PLL is changed at the same time.)

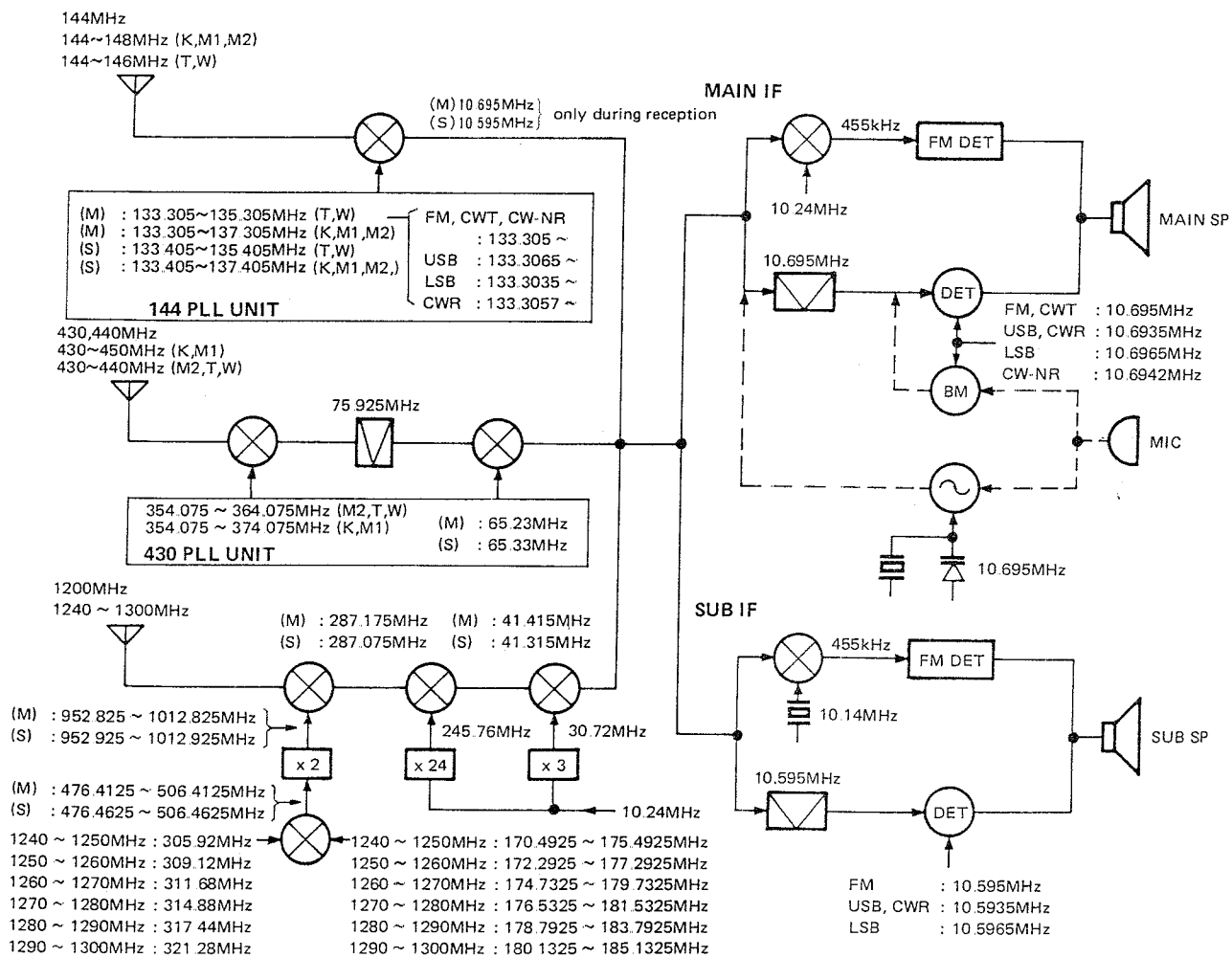


Fig. 1 Circuit configuration by band

CIRCUIT DESCRIPTION

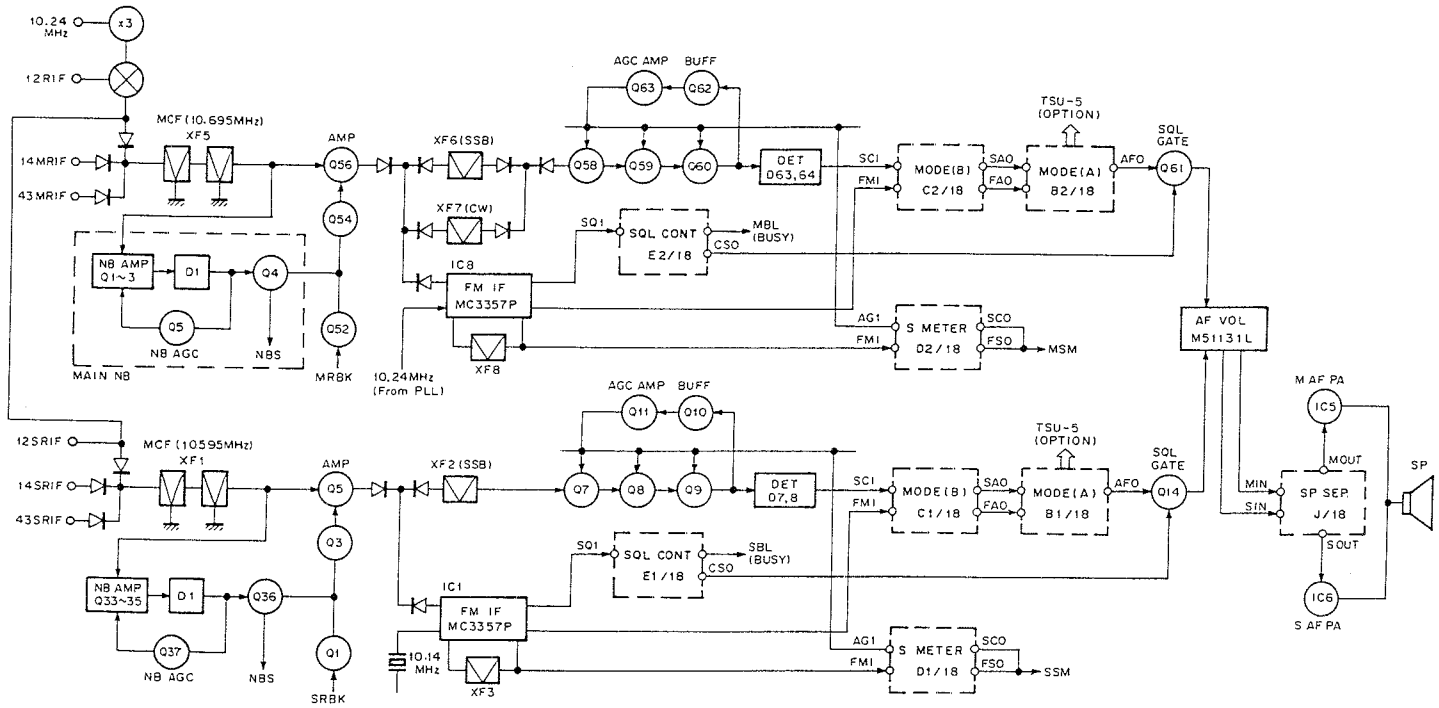


Fig. 2 IF unit block diagram (Main and Sub IF receive circuits)

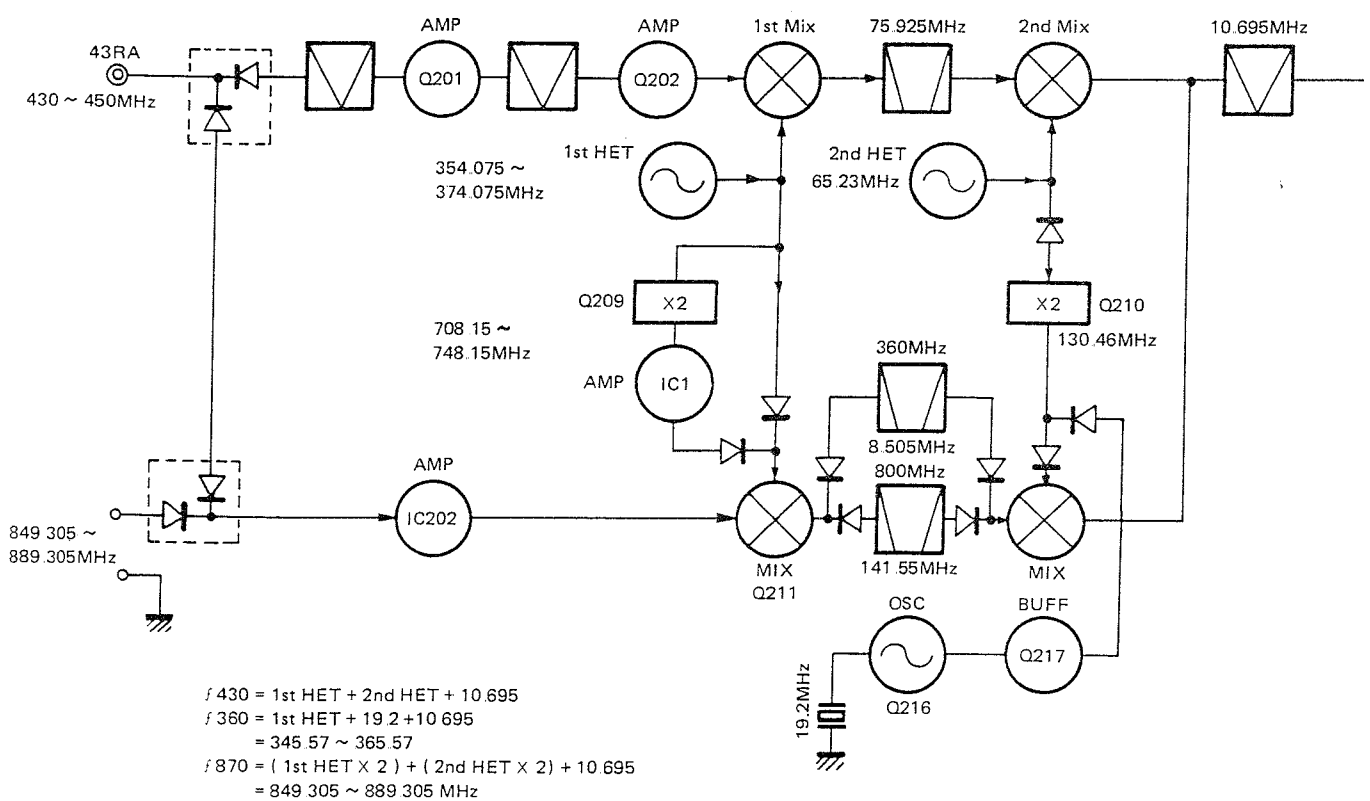


Fig. 3 430MHz RF unit configuration

CIRCUIT DESCRIPTION

Analog Signaling System

The TS-790A/E is an all-mode triple bander. It has a different system configuration from the usual mono-band radio in order to implement the capability of simultaneous reception on any two bands.

There are two displays : main and sub. The main unit acts as a transceiver and the sub unit acts as a receiver. Therefore, the TS-790A/E basically has three front-ends (for 144, 430, and 1200MHz) and two IF circuits (main and sub). The two IF circuits are mounted on a single PC board. The main circuit contains the transmitter circuitry.

Figure 4 shows the receive signal flow. Figure 5 shows the transmitter signal flow. In the 144 or 430MHz-band mode, the appropriate RF unit is connected to the IF unit with an 10.695MHz (main) or 10.595MHz (sub) signal. In the 1200MHz-band mode, the final mixer (used in SSB or CW mode) is contained on the IF unit. Therefore, the RF unit is connected to the IF unit via a 41.415MHz (main) or 41.315MHz (sub) signal.

Figure 6 shows how control signals are generated to select the desired front-ends and select the proper connections to the main or sub IF circuits. This control method may seem redundant, but, if only five control signals (three for band selection and two for main or sub IF selection) were used an additional AND circuit would be needed to produce a signal like 14M. Actually, the six control signals shown in the figure are used directly, or they are combined with other signals such as TXB and RXB.

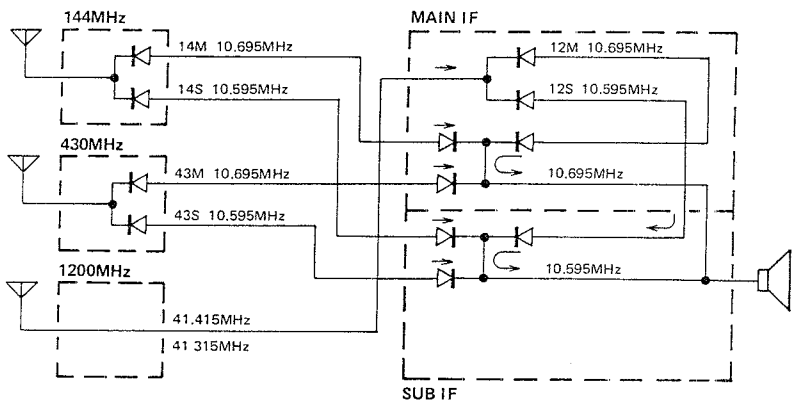


Fig. 4 Received signal flow

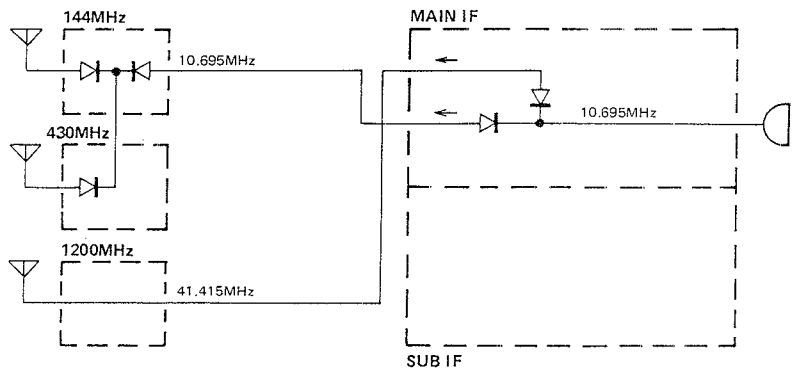


Fig. 5 Transmit signal flow

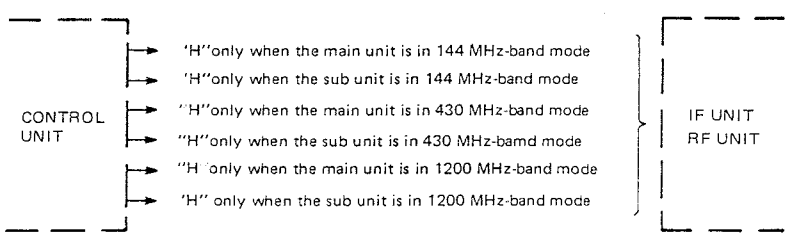


Fig. 6

CIRCUIT DESCRIPTION

• TXB and RXB control circuit for each band

As described above, in order for the appropriate RF unit to be properly connected to the main IF circuit (transceiver) or sub IF circuit (receiver), the TXB and RXB signals, including main or sub band data, are needed in addition to band information. Figure 7 shows the circuit used to generate the information.

Control of 1200MHz-band mode is described below.

1. Control when the main unit is operated in the 1200MHz-band

When the main unit is operated in the 1200MHz-band, the 12M signal is H and the 12S signal is L. During receive, the RXS line becomes H, Q323, Q324, D321, Q325, and Q326 turn on sequentially, causing a logic H to be output from B-RXB. In the 1200MHz-band, this H is used as RXB. That is, the B-RXB is generated from 8V. Although Q321 and Q322 are on, B-TXB is not output because TXB is L.

During transmit, TSB becomes H and B-TXB also becomes H. In the1200MHz-band, this B-TXB is used as TXB. Since RXS is L, Q326 turns off and B-RXB also becomes L.

2. Control when the sub unit is operated in the 1200MHz-band

When the sub unit is operated in the 1200MHz-band, the 12S signal is H. As a result, Q321 and Q322 turn off, and B-TXB is always L. In addition, D321, Q325, and Q326 are on regardless of the state of RXS, so B-RXB is always H.

Similar circuits are also provided for the 144MHz and 430MHz RF units. They operate in the same way as described for the 1200MHz RF unit.

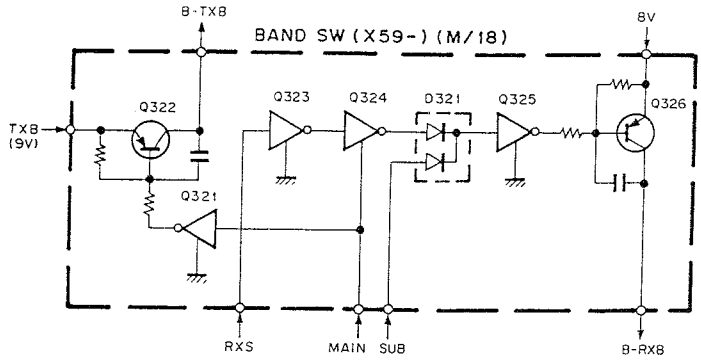


Fig. 7 TXB and RXB control circuit for each band

• Standby circuit

Figure 8 shows the TXB and RXB generation circuit, which is used regardless of the band in which the TS-790A/E operates. When a PTT or packet transmit request is issued, the signal is sent to the CPU in the control unit through the CSS line of the IF unit. The CPU determines whether transmission is disabled. If it is not disabled, the CPU outputs a H signal from CTX line. This H signal is sent to the 144MHz final unit via Q98 and Q123, turning the SW transistor and then TXB (9V) on. The TXB signal is distributed to the final, IF, and RF units.

RXB is the opposite of the TXB logic. Q95 forms a buffer to minimize TXB leakage from the 8V line. The RXS signal has a time constant determined by an electrolytic capacitor connected to the base of Q97. The band switching module uses the signal to generate B-RXB. RXB generated by Q96 cannot be used as a band switching signal due to the time constant, which is determined by many decoupling circuits contained in the circuit following Q96.

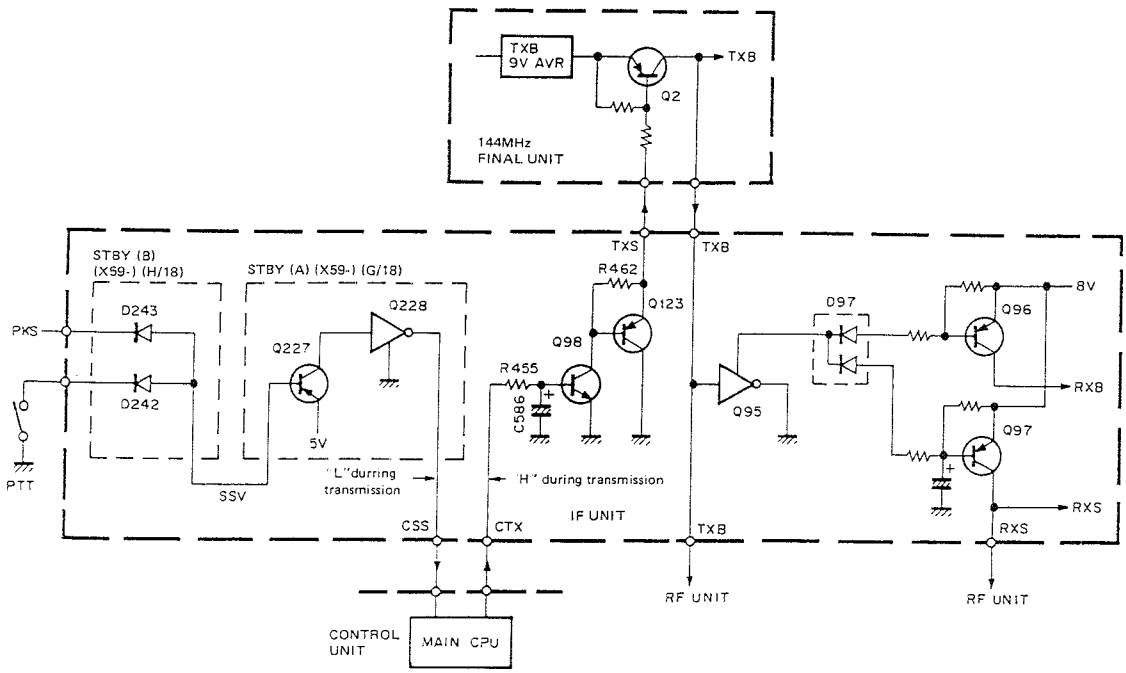


Fig. 8 Standby circuit

CIRCUIT DESCRIPTION

• Keying circuit

The TS-790A/E uses semi break-in CW keying. Traditionally, the time constant was determined by an electrolytic capacitor or timer IC. In the TS-790A/E, the time constant is controlled by an A/D convertor inside the CPU.

For information on STBY(A) (X59-)(G/18), see the description of module operations. Q22 and Q23 form a switch used to disconnect VR11 from the DL2 line when the TS-790A/E operates in a mode other than CW mode.

In the 144 or 430MHz-band, actual keying operations are done by the drain from the final TIF amplifier and the diode switch. In the 1200MHz-band, it is done by a mixer converting the 10.695MHz drain from the final TIF amplifier to 41.415MHz and an input signal to it.

• ALC and power control circuits

The ALC circuit drives its comparator with a voltage obtained by detecting the standing wave, and using it to generate an ALC voltage. The TS-790A/E power is controlled by changing the threshold voltage of the comparator.

If the power decreases, gain will increase by an amount equal to power decrease. To avoid this, gain is decreased by changing the gate bias of the TIF amplifier, thereby minimizing the amount of ALC loop gain fluctuation due to adjustments of the power control.

When FM or CW is selected from the SSB mode, the power needs to be decreased by approx. 20dB. To do this, Q84 and Q85 are used to change the threshold level.

The RF meter is operated from part of the standing wave detection voltage.

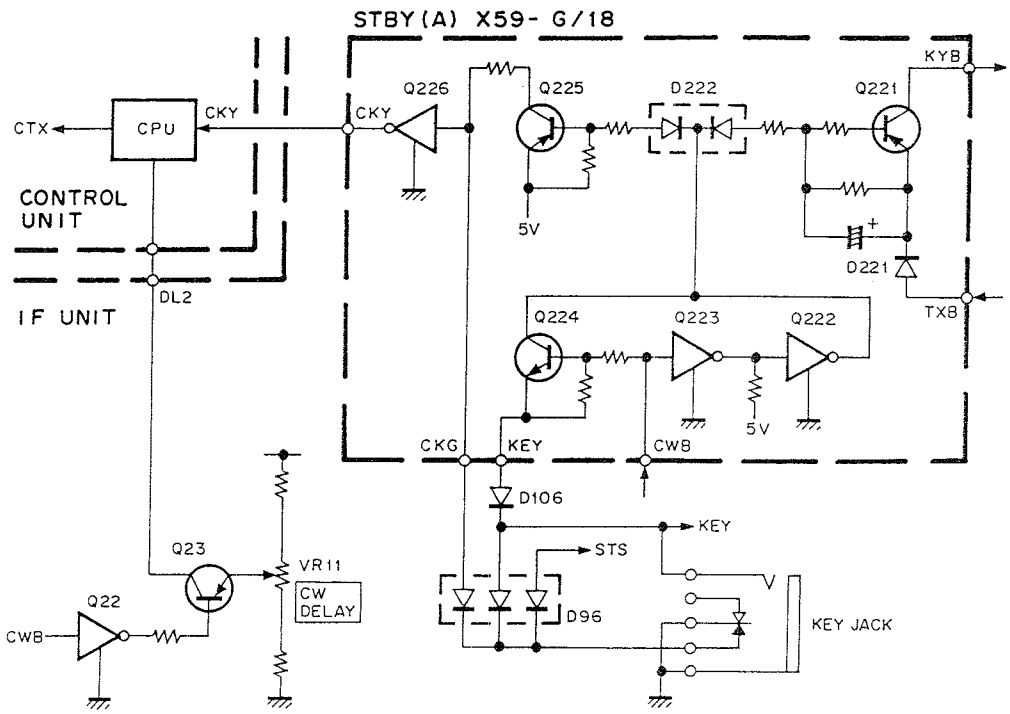


Fig. 9 Keying circuit

CIRCUIT DESCRIPTION

• Squelch circuit

This section will describe how the squelch circuit in the main unit operates.

When the squelch circuit opens, pin 13 of IC8 becomes H. The output voltage from the pin turns on Q181a and Q181b in the SQL control (X59-)(E2/18). Q131b is used to control the packet busy state. It is turned on/off according to a time constant determined by the IC8 squelch circuit, regardless of mode. IC8 operates in any mode including FM mode to allow all-mode squelch. In the FM mode, C546 is not charged because no voltage is supplied to the collector of Q181a. In modes other than FM, the positive (+) side of the capacitor is charged, closing squelch. As a result, a high-impedance state occurs between the collector and emitter of Q181a, and the C546 dischargs thru Q182. This allows the squelch tail to be lengthened.

Q120 is a switching transistor which negates input to Q182 when the TS-790A/E is switched from the FM mode to SSB or CW mode squelch. This prevents malfunction of Q182 due to a pulse produced by differentiating input to C546 at its leading edge. On/off operation of the audio signal switches Q61's squelch gate circuit and also turns the AF switch Q18 on/off. Q18 removes unnecessary noise during transmission, or when no memory channel is available, or when the TS-790A/E is switched to a different mode.

Q118 is used to change the switch timing of the squelch gate in FM, SSB, or CW mode. In SSB or CW mode, internal noise is low, so squelch on/off noise will be easily heard when a headphone set is used. To avoid this, the switching interval is made a little longer, as compared with that in FM mode.

When the optional CTCSS unit (TS-790A only) is used, the squelch circuit operates as described below.

When the CTCSS unit is turned on, the CT line becomes H and Q14 turns on, turning Q61 off regardless of whether the squelch is open or closed. As a result, the TS-790A enters a state in which no sound is output. When a tone is detected in this state, the DET line from the CTCSS unit becomes H and Q141 turns on, turning Q142 on. Thus, the TS-790A enters a state in which sound can be output. Even if the CTCSS is operating, the busy LED is linked with the state of the squelch, open or close, to allow busy state monitoring.

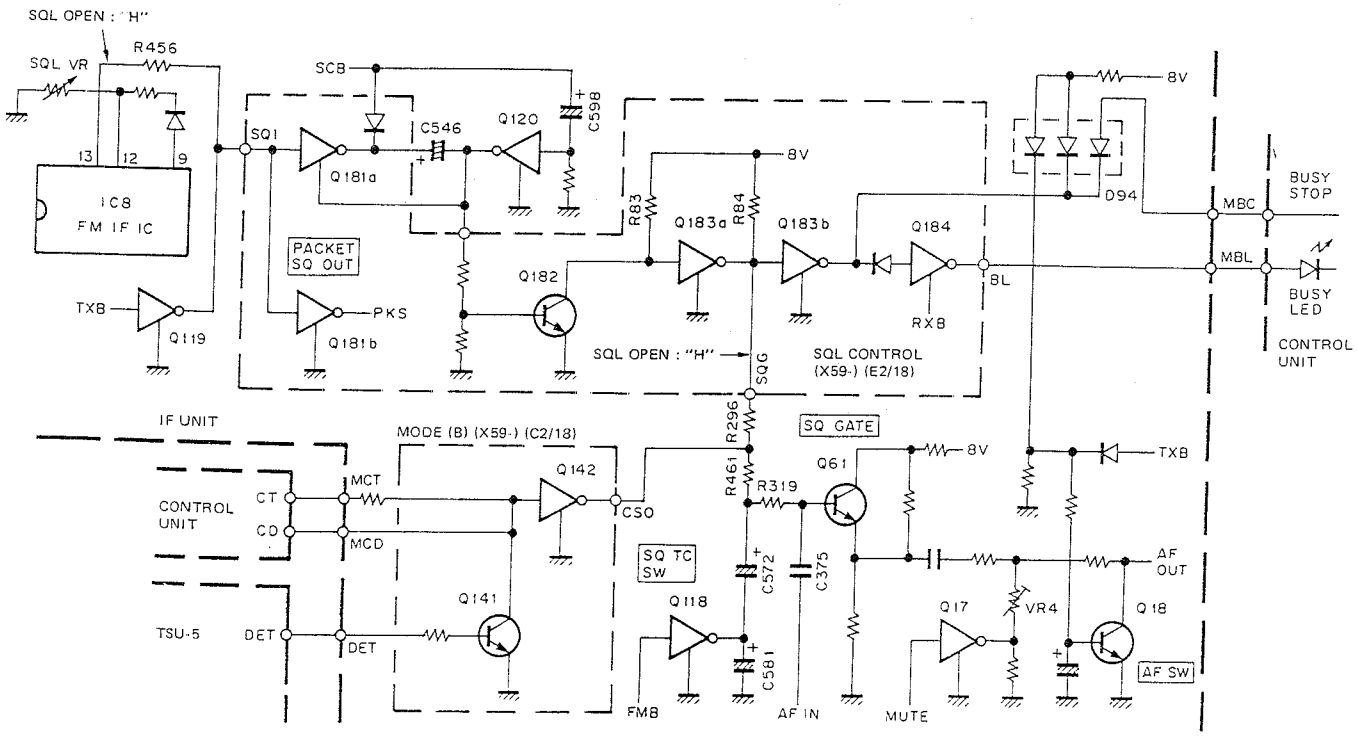


Fig. 10 Squelch circuit

CIRCUIT DESCRIPTION

• Speaker separate circuit

The speaker separate circuit allows effective use of the simultaneous two-band reception capability. That is, it provides a speaker separate switch and two external speaker terminals. Using the switch and connecting external speaker units, the TS-790A/E can be used in various ways.

When SP SEP is off, IC262a turns on and mixes AF from the main and sub units. Also, IC262b or IC262c turn off when only one EXT. SP terminal is used. In all other cases, both are on.

IC261 consists of a logic circuit which controls the above operations. When SP SEP turns on, Q19 and Q20 go on. They are used to prevent fluctuation of the audio level which will occur when the SP SEP line toggles between on and off.

Q261 is a transistor that is used to convert the 5V signal from the control unit to 8V.

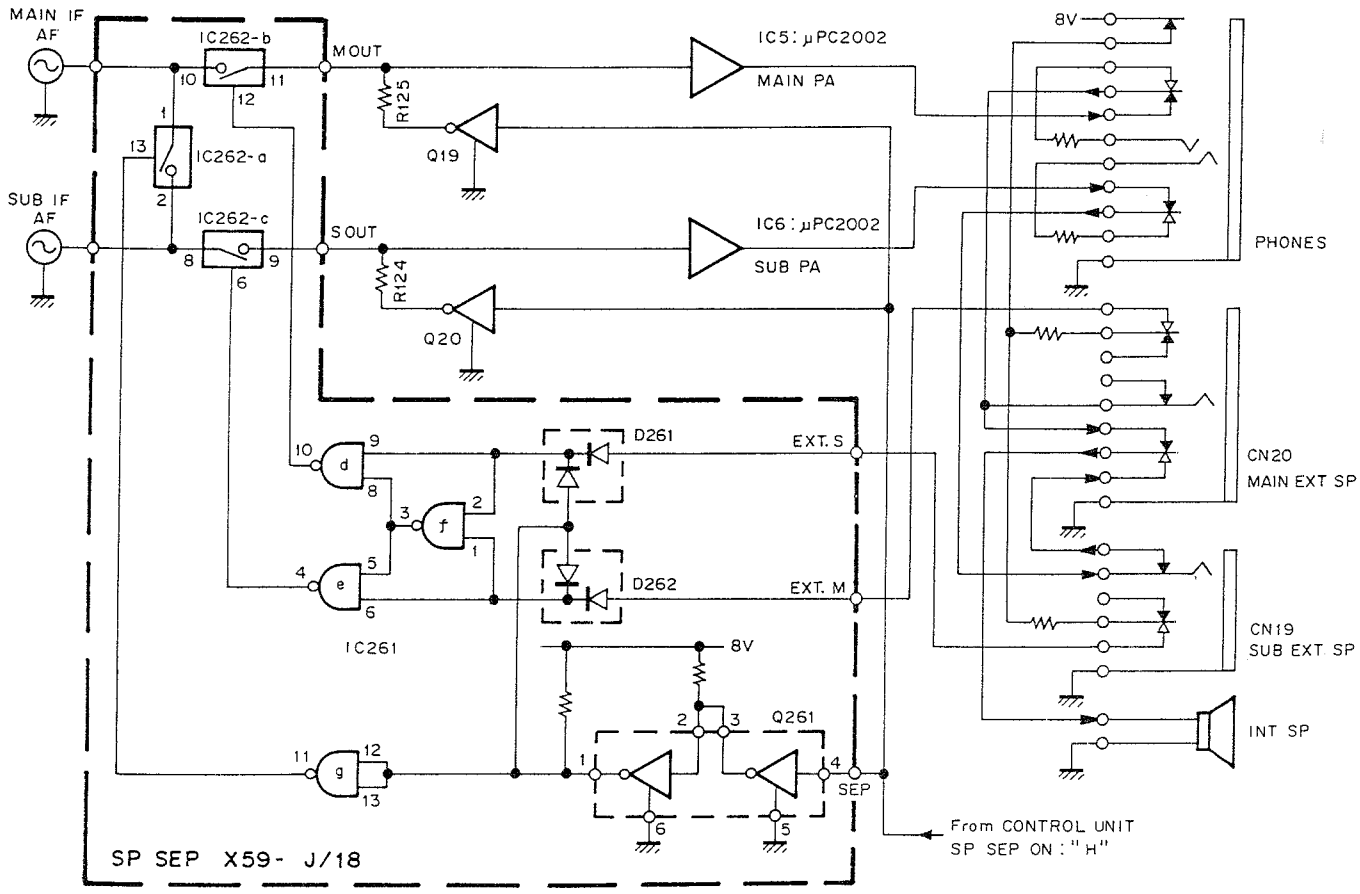


Fig. 11 Speaker separate circuit

CIRCUIT DESCRIPTION

Module Unit in the IF Unit

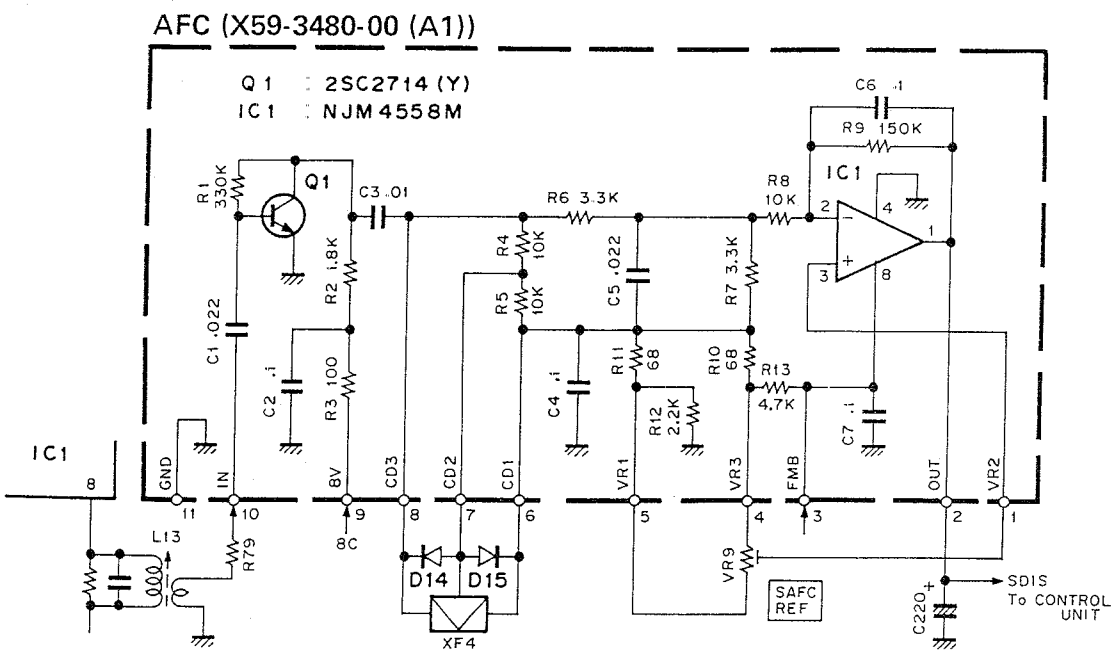
• AFC (ALT) module

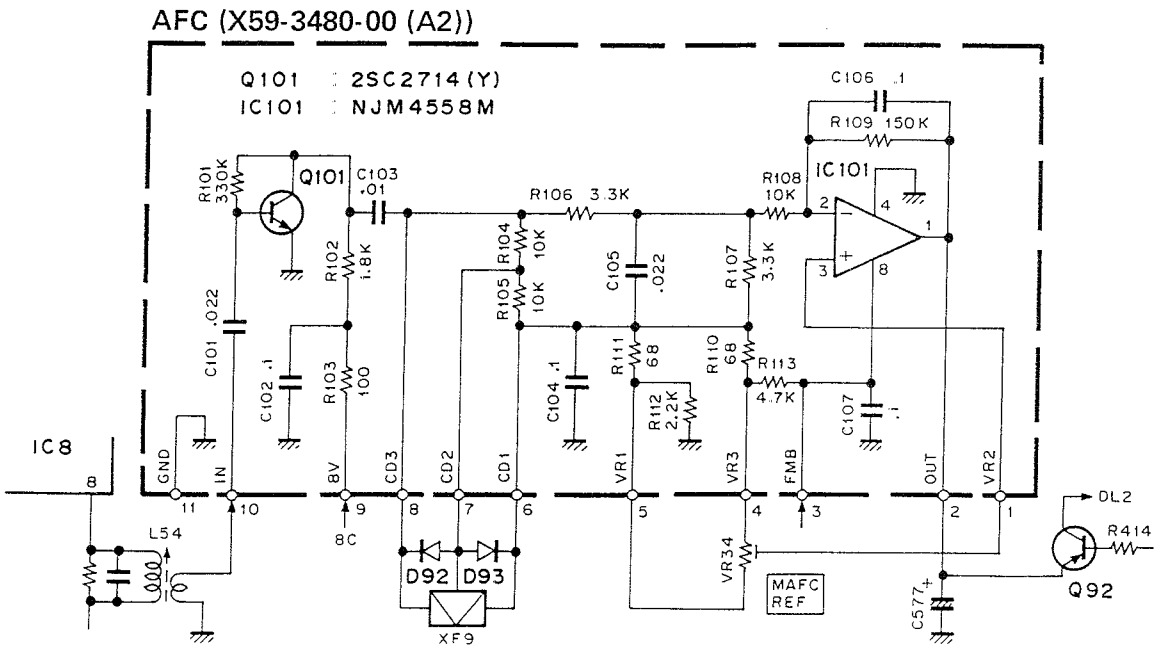
(The same circuit is used in the main and sub unit.)

The 455kHz signal is amplified by Q1 and then converted to a DC voltage by the ceramic discriminator connected to CD1 thru CD3.

The DC voltage is amplified by IC1 and then sent to an A/D convertor in the control unit.

When no signal is present or when the TS-790A/E is tuned, the OUT pin supplies approx. 2.5V. When the TS-790A/E detunes in the range from –3kHz to +3kHz, it outputs a voltage from –3.1V to 1.9V.





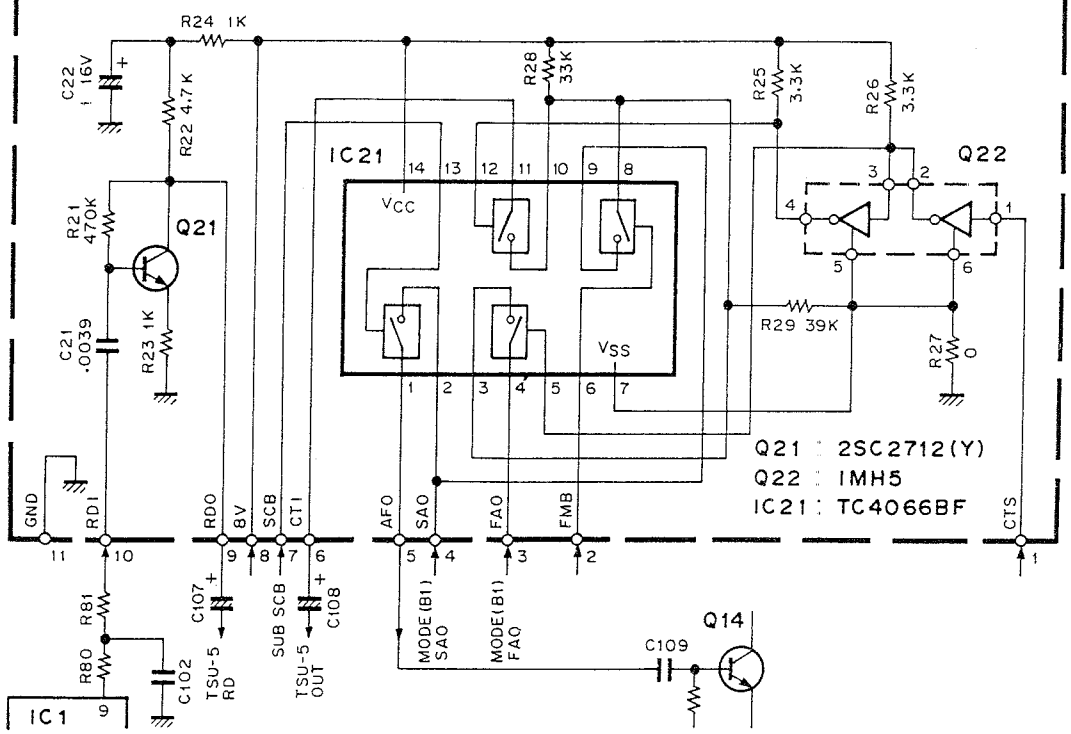
CIRCUIT DESCRIPTION

• MODE (A) module
(The same circuit is used in the main and sub unit.)

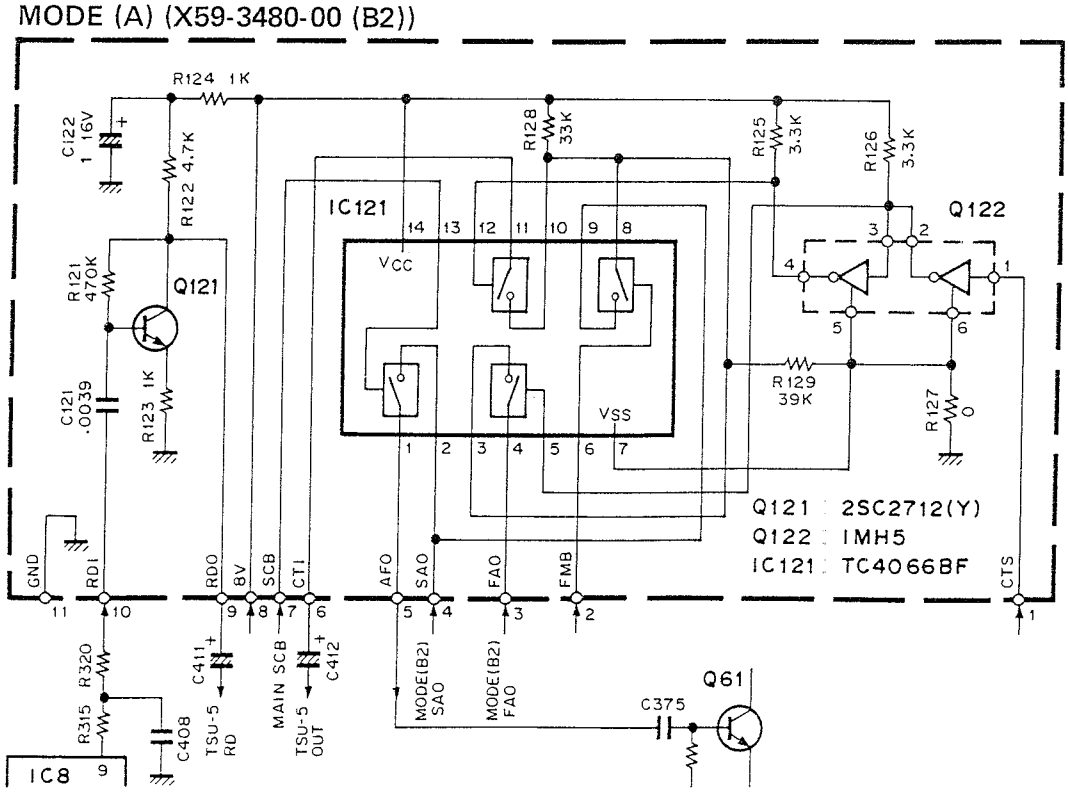
Output from the FM detector is amplified by Q21 and then sent to the tone detect pin in the optional CTCSS unit.

IC21 is used to switch the AF mode when the TS-790A/E is in SSB or FM mode. If the optional CTCSS unit is connected, Q22 can be used to switch the output from a HPF in the CTCSS unit to the FM AF line.

MODE (A) (X59-3480-00 (B1))



MODE (A) (X59-3480-00 (B2))

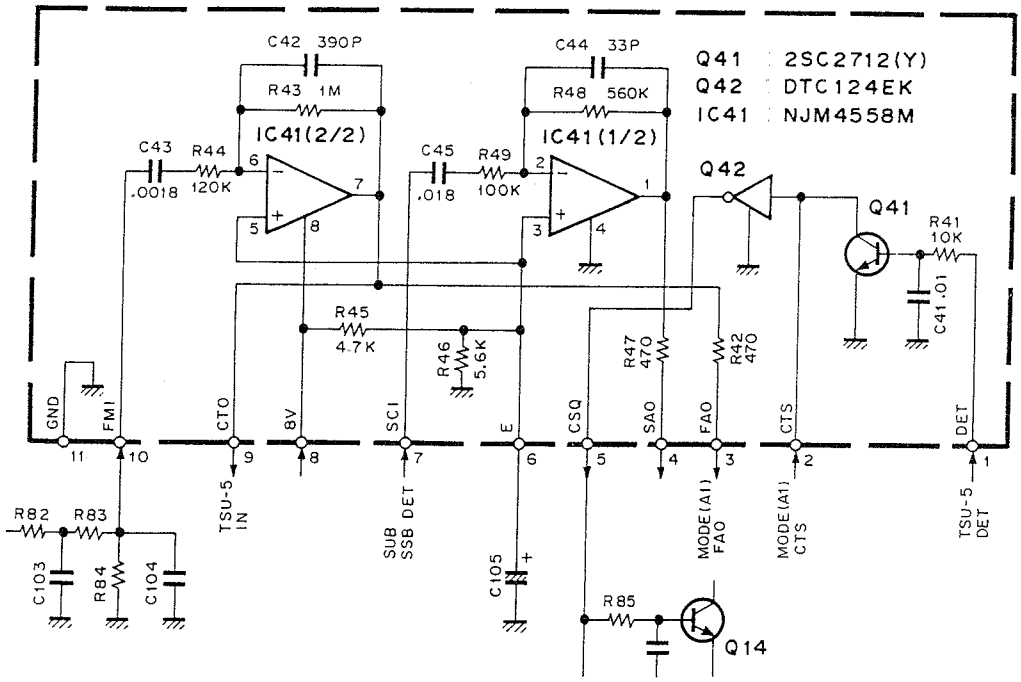


CIRCUIT DESCRIPTION

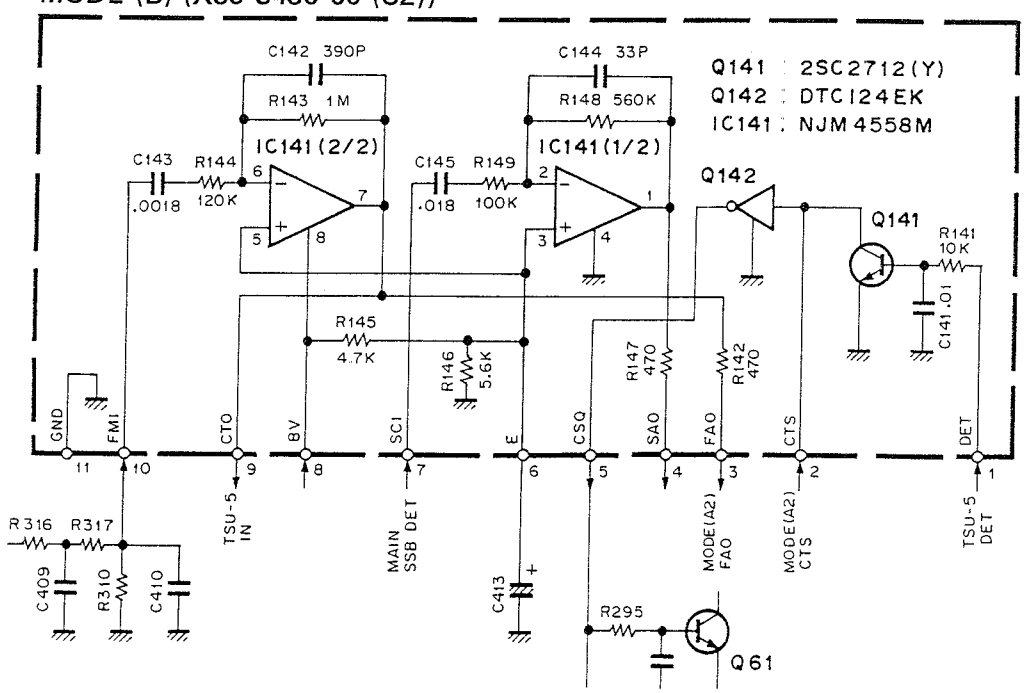
• MODE (B) module
(The same circuit is used in the main and sub unit.)

If the optional CTCSS unit is used, Q41 and Q42 turn the squelch on/off, depending on if the CTCSS unit detected a tone.

MODE (B) (X59-3480-00 (C1))



MODE (B) (X59-3480-00 (C2))



CIRCUIT DESCRIPTION

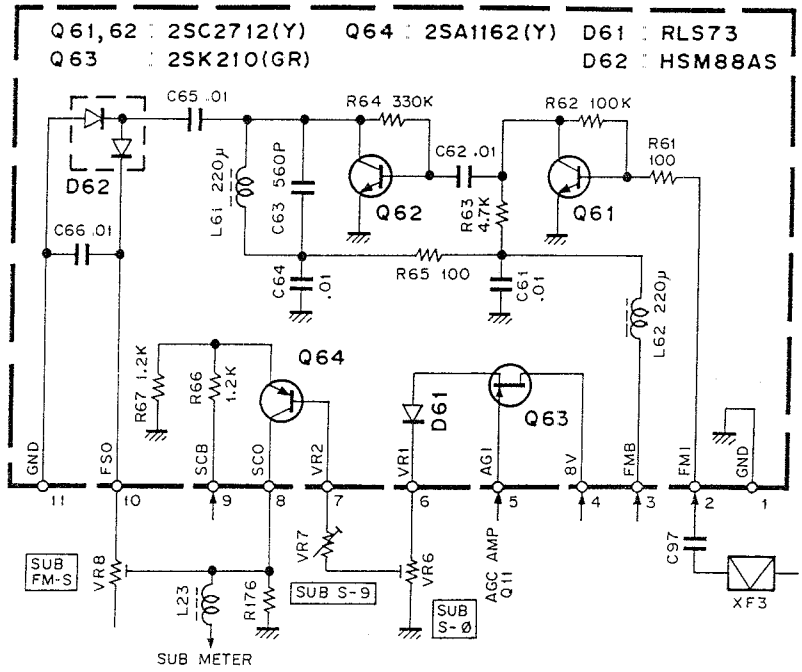
• S-METER module
(The same circuit is used in the main and sub unit.)

Q61, Q62, and D26 form the FM S-meter circuit, which amplifies and detects a signal from the 455kHz filter.

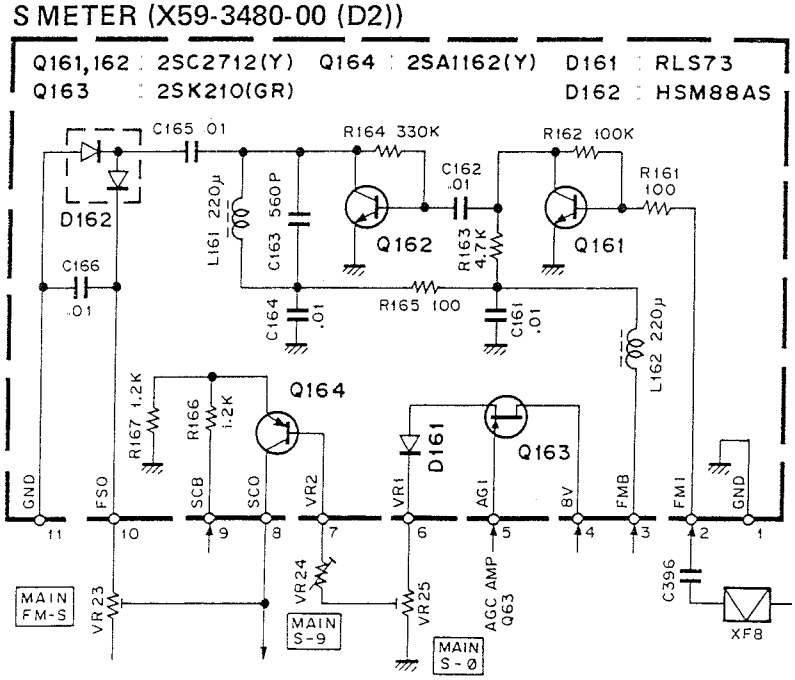
Q43 and Q64 form a SSB S-meter circuit.

The sub unit uses a digital meter, not an analog meter. The SSB S-meter circuit in the sub unit, therefore, is provided with a load of 4.7kΩ resistor. Voltage generated by the resistor is controlled and converted from analog to digital.

S METER (X59-3480-00 (D1))



S METER (X59-3480-00 (D2))



CIRCUIT DESCRIPTION

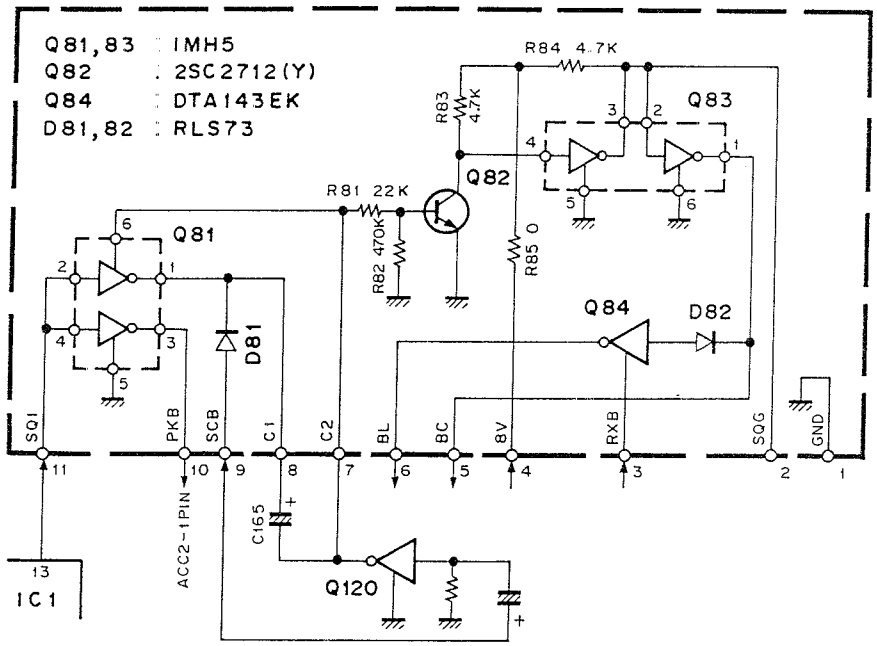
• SQL CONTROL module
(The same circuit is used in the main and sub unit.)

Q81 send the packet busy control signal to the PKS pin.

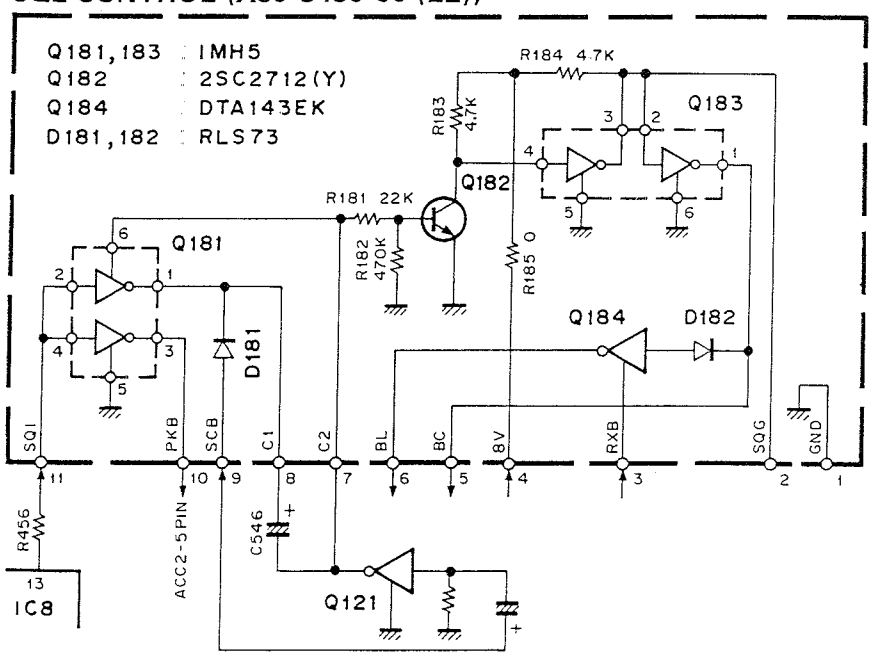
When the squelch is open, the signal is connected to ground.

In SSB or CW mode, the squelch tail is delayed. The BC and BL pins are used to supply the scan stop signal (active L) and the busy LED on signal (active H) to the control unit respectively. The operation of the squelch circuit was described in an earlier section.

SQL CONTROL (X59-3480-00 (E1))



SQL CONTROL (X59-3480-00 (E2))



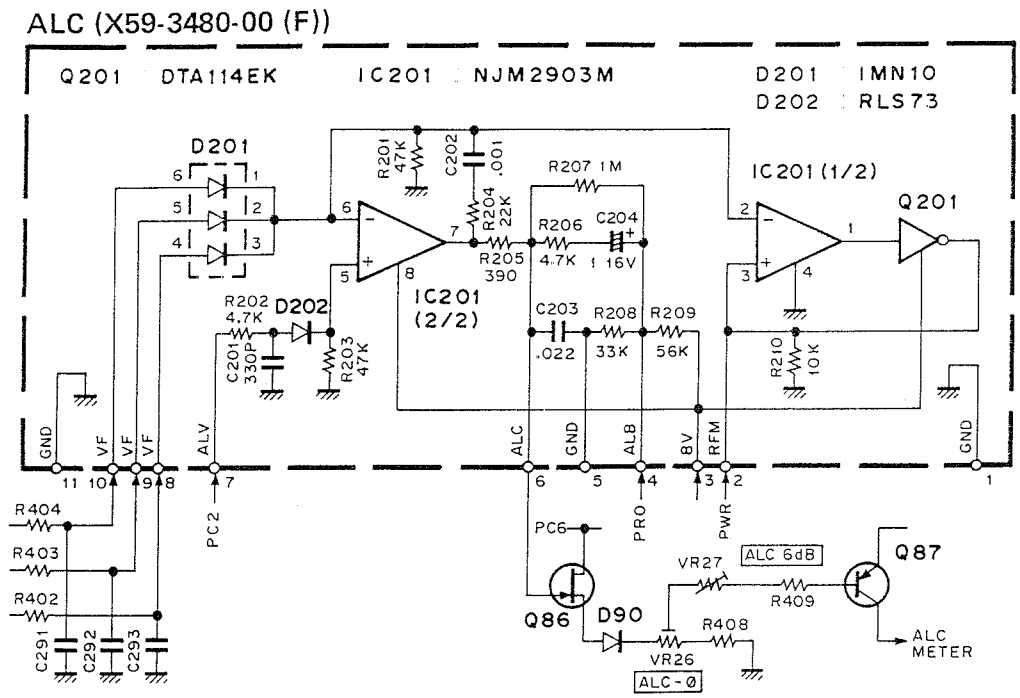
CIRCUIT DESCRIPTION

• ALC module

The ALC module generates ALC voltage, using the standing wave voltage from the final unit.

Output voltage from the ALV pin is changed to change the threshold level of the ALC and control power.

One half of IC201 acts as a voltage buffer to operate the RF meter.

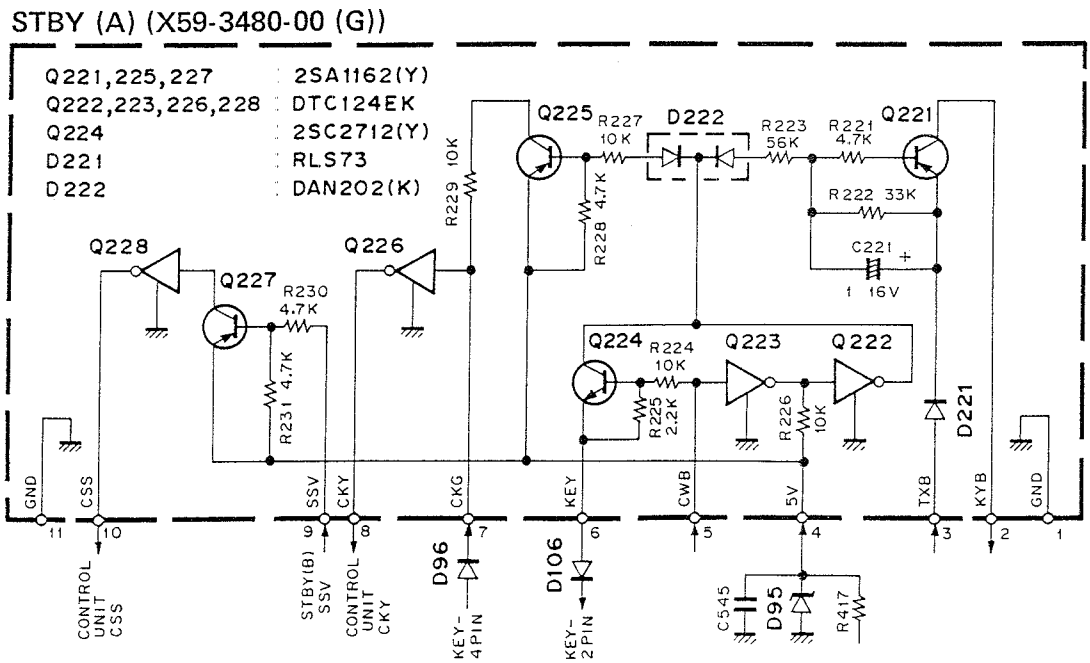


• STBY (A) module

Q227 and Q28 sends the TX GO signal (active L) to the control unit when a semi break-in operation occurs in CW mode or when a transmission request, other than a W or T type tone transmission request, (PTT or SS) is generated.

The CKY pin is used to send the TX GO signal (active L) to the control unit when a semi break-in key down operation occurs.

The KYB pin is used to supply B voltage having a time constant to the TIF amplifier when a semi break-in key down operation occurs.



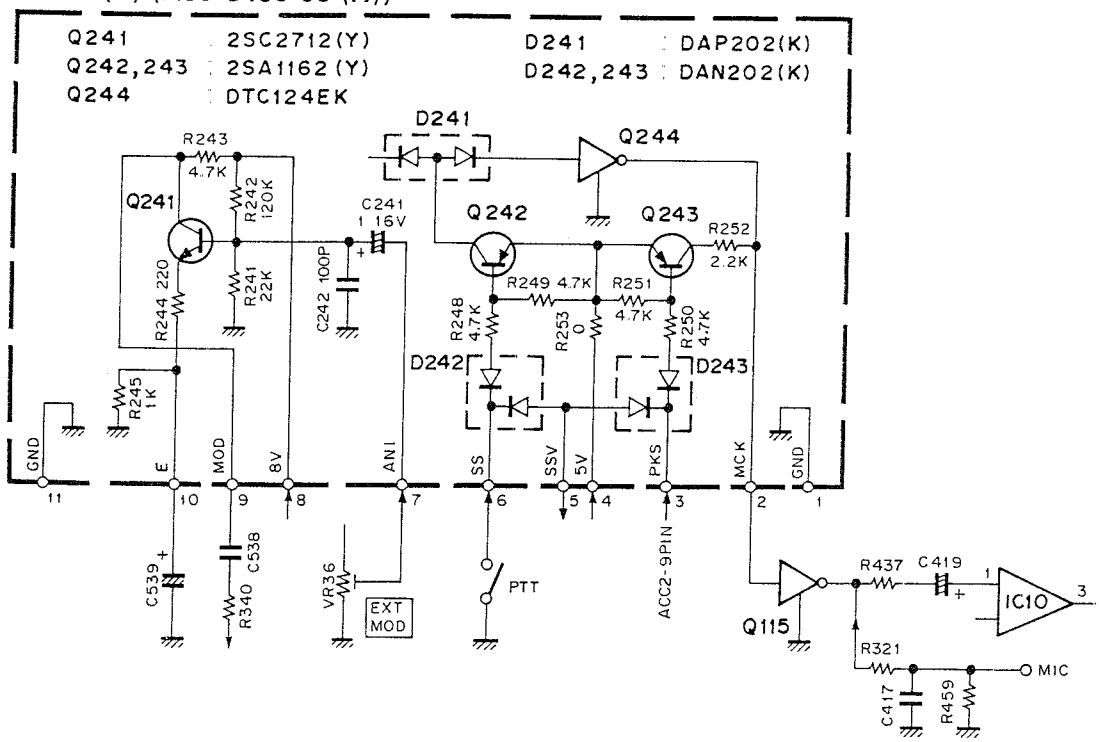
CIRCUIT DESCRIPTION

• STBY (B) module

Q241 receives and amplifies an external analog modulation signal, and sends the signal to the MIC amplifier.

The MCK pin is used to provide a signal which prevents modulation from being caused by input from the MIC when sending the packet standby signal from the PKS pin.

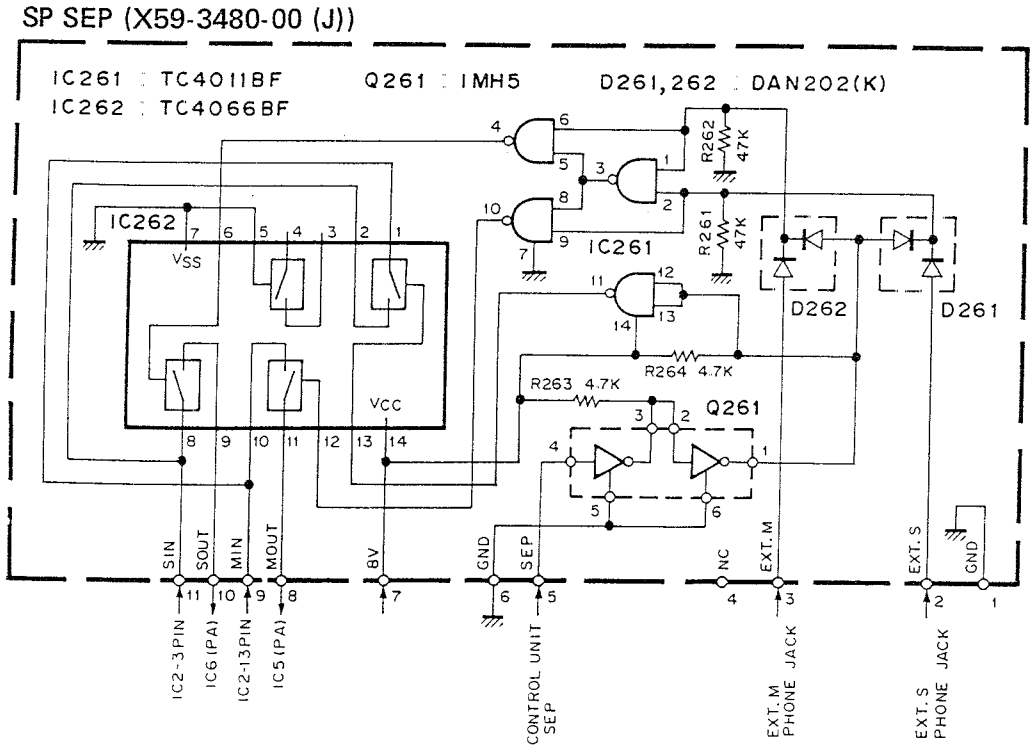
STBY (B) (X59-3480-00 (H))



• SP SEP (Speaker separate) module

The speaker separate module determines which one of the two AF PA IC chips supplies AF from the main or sub IF unit.

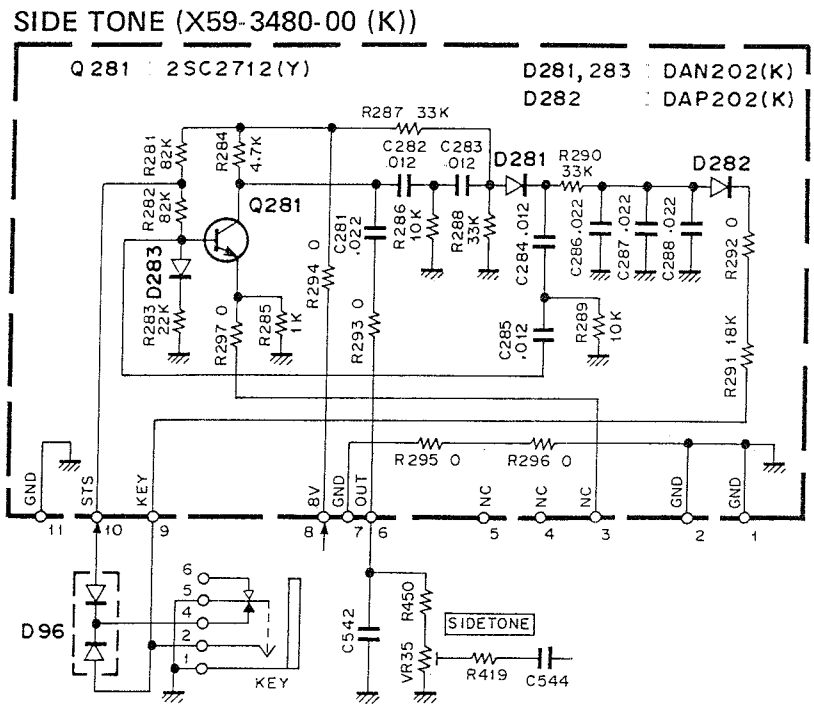
SP SEP (X59-3480-00 (J))



CIRCUIT DESCRIPTION

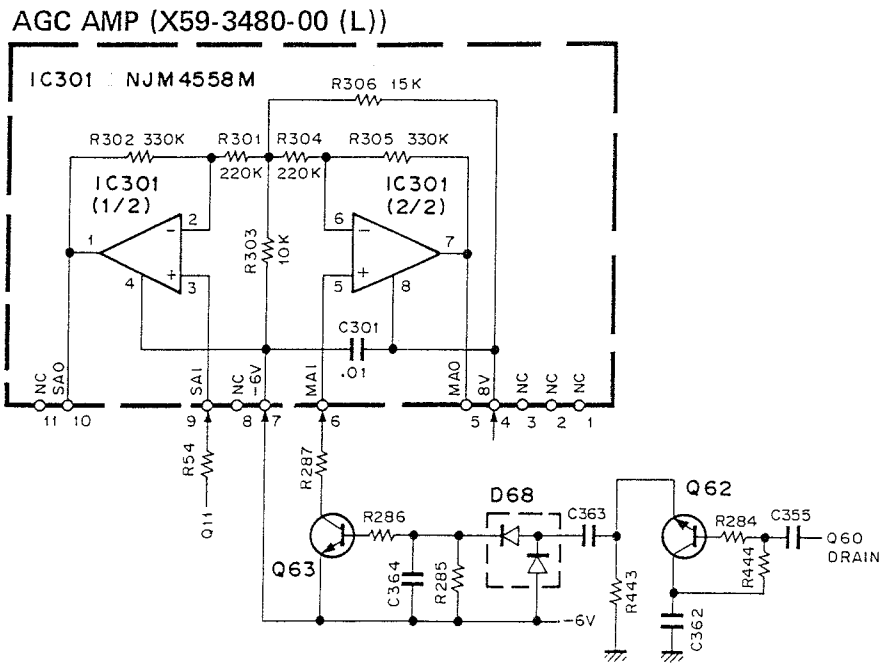
• SIDETONE module

When a CW key is inserted into the KEY jack, the STS pin is disconnected from ground, and Q281 is ready to operate. When the KEY is closed, the OUT pin emits sidetone.



• AGC AMP module

The AGC amplifier module generates negative AGC voltage.

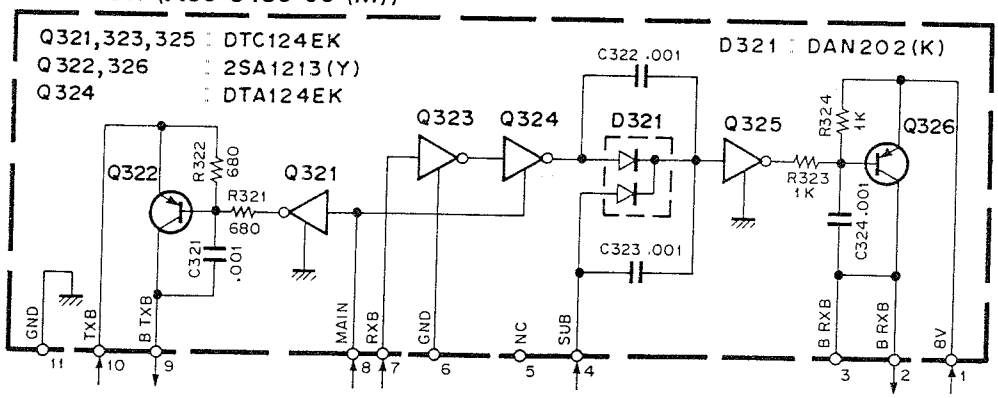


CIRCUIT DESCRIPTION

• BAND SW module

The band switching module generates TXB and RXB for band selection. For example, it generates 14TXB from B-TXB and 43RXB from B-RXB. B-RXB sent to the sub unit does not go off even if the main unit is acting as a transmitter.

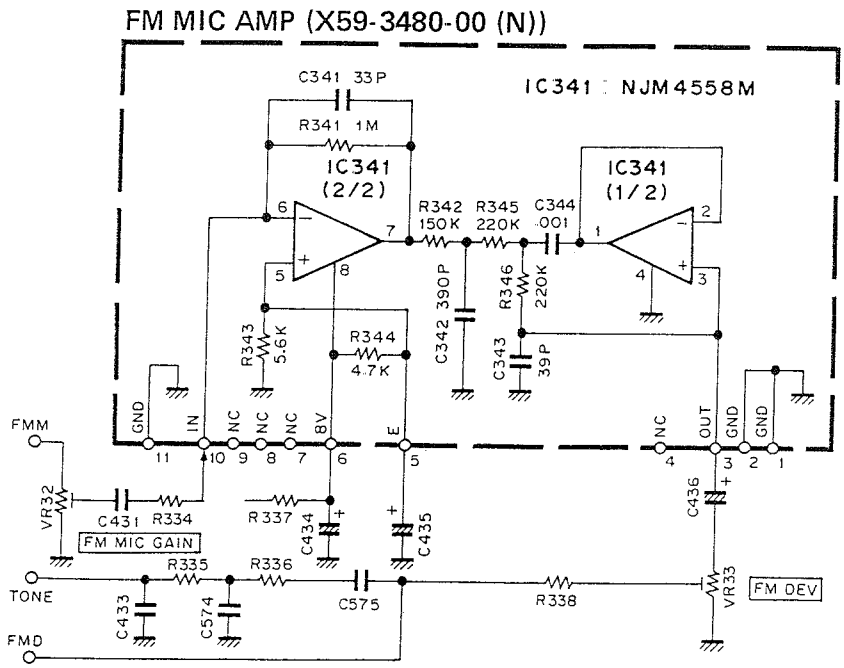
BAND SW (X59-3480-00 (M))



• FM MIC AMP module

IC341 consists of a limiter and a set of LPFs.

FM MIC AMP (X59-3480-00 (N))



CIRCUIT DESCRIPTION

Transmit Frequency Components

In FM mode, signals from the two 10.695MHz crystal oscillators in the IF unit are dorectly modulated. In the SSB or CW mode, the DSB signal is generated, using BM (Balanced Modulation) from IC9 in the iF unit. Then the 10.695MHz signal for SSB is obtained from filter XF6 (10.695MHz).

Band / IF	144MHz	430MHz	1200MHz
A1,A3J,FM	Single conversion	Double conversion	Triple conversion

Table 4 Type of transmit signal conversion by band

Band / IF	144MHz	430MHz	1200MHz
1st	10.695MHz	10.695MHz	10.695MHz
2nd	—	75.925MHz	41.415MHz
3rd	—	—	287.175MHz

Table 5 Transmit IF frequencies

PLL Configuration

The TS-790A/E contains a dual PLL loop for the 144MHz band, a dual PLL loop and a 2nd HET PLL loop for the 430MHz band, a triple PLL loop for the 1200MHz band, and a pair of main and sub PLL loops, totaling 11 PLL loops, and 11 VCOs.

• 144MHz-band block PLL configuration

The 144MHz-band block contains a dual PLL loop using a 20Hz step VFO. 78.5 to 82.5MHz generated from loop B for 2kHz comparison is divided by 100 in IC3 to generate the 20Hz step output. The 20Hz step output is mixed with 10.24MHz by IC1. The upper portion of the mixed signal is extracted by ceramic filters CF1 and CF2. The output from the filter is mixed with 102.4MHz obtained by multiplying 10.24MHz by 10 to generate a 113.425 to 113.465MHz signal. These frequencies are used as local oscillator frequencies for loop A.

Loop A makes a 40kHz comparison. Signals from its VCO are supplied to the 1st HET. L5, L6, D2, D3, and D4 form a variable low-pass filter (LPF), which is used to remove unnecessary components from output of mixer Q6. Bias voltage to D2, D3, and D4 of the LPF is controlled by IC12 logic, using the 14B1 signal from the control unit and the lock detect signal from loop A, to control its cut-off frequency.

14B1	A loop lock detect	Bias voltage to D2 and D3	LPF cut-off frequency
L	Unlocked	≅ 18V	High
H	Unlocked	≅ 18V	High
L	Locked	≅ 18V	High
H	Locked	≅ 1.5V	Low

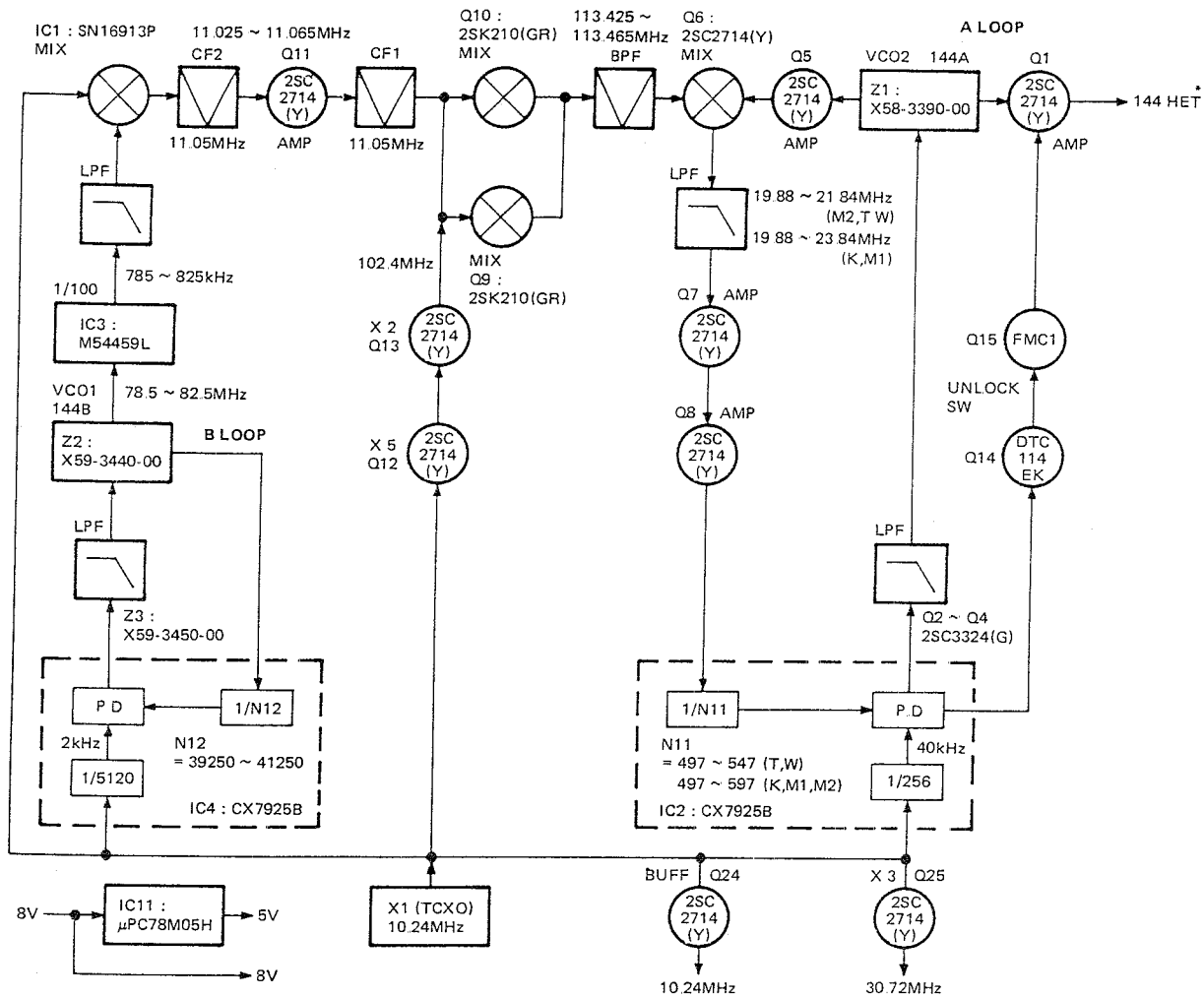
Table 6

The lock detector circuit switches output from pin 5 (AO) of IC2 with Q14 and Q15, and sends unlock information to the Q1 HET amplifier and control unit.

To minimize mutual interference, the 8V power line to each band block is turned off by a switching circuit when it is not used. Each band receives usage information from pin 8 (AO) of the B loop PLL IC chip. The 144MHz PLL uses pin 8 of IC4 to control the switching circuit (Q26 and Q28).

Pin 8 of the PLL IC chip (CX-7925B) can be used to select either lock detect output or general-purpose port. Which to detect is determined by data in the PLL IC when the TS-790A/E power is turned on. The 144MHz PLL sends the IF unit a 10.24MHz local frequency generated by Q24 and a 30.72MHz local frequency generated by Q25 (by multiplying 10.24MHz by three).

CIRCUIT DESCRIPTION



$$N11 = 497 + INT\left(\frac{f - 144}{0.04}\right)$$

$$N12 = 39250 + INT\left(\frac{f\ MOD\ 0.04}{0.002}\right)$$

	MAIN (T, W)	MAIN (K, M1, M2)
FM, CWT, CW-NR	133.3050 ~ 135.3050MHz	133.3050 ~ 137.3050MHz
USB	133.3065 ~ 135.3065MHz	133.3065 ~ 137.3065MHz
LSB	133.3035 ~ 135.3035MHz	133.3035 ~ 137.3035MHz
CWR	133.3057 ~ 135.3057MHz	133.3057 ~ 137.3057MHz

	MAIN	SUB
T, W	133.305 ~ 135.305MHz	133.405 ~ 135.405MHz
K, M1, M2	133.305 ~ 137.305MHz	133.405 ~ 137.405MHz

Fig. 12 144MHz PLL block diagram

CIRCUIT DESCRIPTION

• 430MHz-band block PLL configuration

The 430MHz-band block contains a 20Hz-step triple PLL loop and a 2nd HET PLL loop. 79.5 to 83.5MHz VCO output from the 2kHz loop B is divided by 100 in divider IC53 to generate the 20Hz step output. The 20Hz step signal is mixed with 10.24MHz by IC52. The upper portion of the mixed signal is extracted by ceramic filters CF50 and CF51. The filter output is mixed with 122.88MHz obtained by multiplying 10.24MHz by 12 to generate 133.915 to 133.955MHz. These frequencies are then used as local oscillator frequencies for loop C.

Loop C makes a 40kHz comparison. The frequency of the signal from its VCO varies approx. 2MHz to 3MHz. An output frequency from loop C is used as a local oscillator frequency for loop A. The output frequency is mixed by the DBM (L57, L58, and D51), and then sent to the PLL IC through a BPF. VCO output from loop A is supplied to the 1st HET.

Loop A makes a 460kHz comparison. It is supplied with appropriate data according to the value of N21 which varies by 1MHz as shown in Figure 13. Loop C data, therefore, changes in an irregular manner like the VCO23 frequency shown in the table. The graph in Figure 14 illustrates this.

Loop D is the 10kHz-step 2nd HET PLL loop. When the main unit is set to 430MHz, it is locked at 65.23MHz. When the sub unit is set to 430MHz, it is locked at 65.33MHz. The loop is not locked at any other frequency.

The unlock detect circuit OR's output from IC50 in loop A with that from IC55 in the D loop, and switches the OR output, using Q58 and Q59.

8V power to the 430MHz PLL block is obtained by switching output from IC54 with Q74 and Q75.

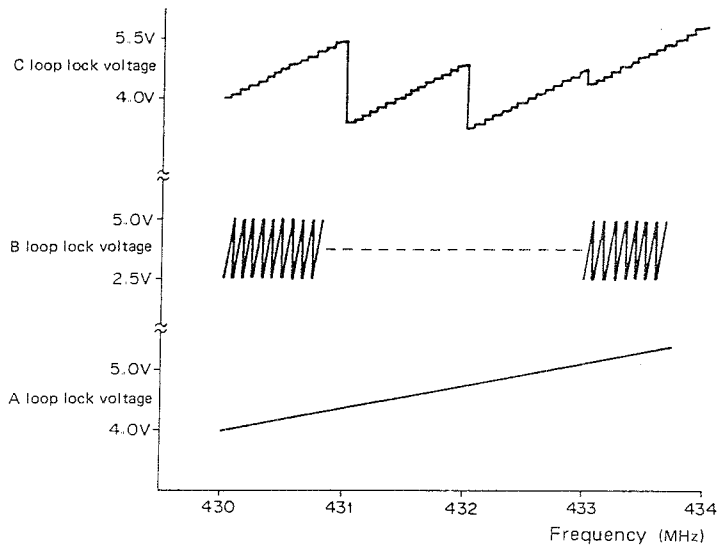
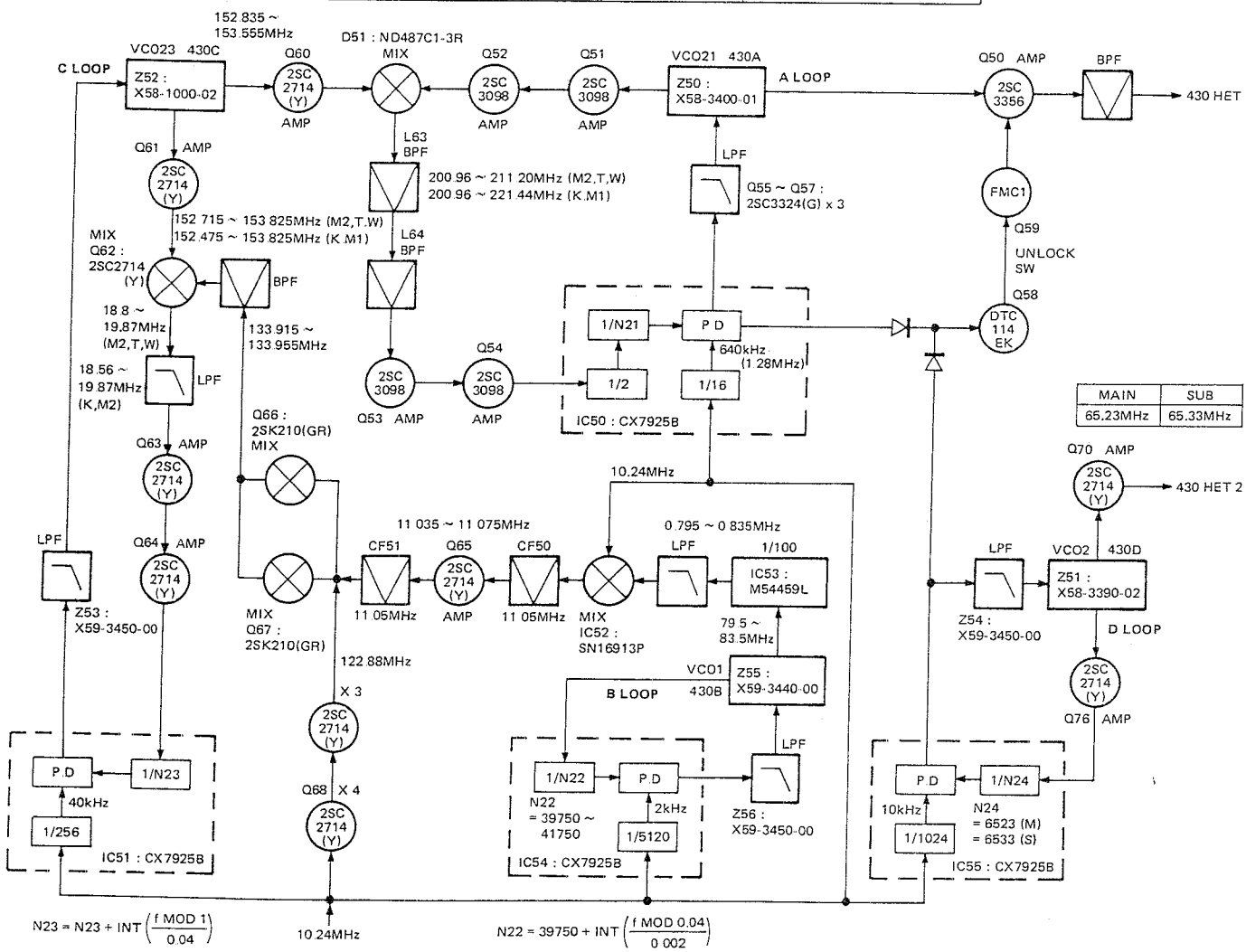


Fig. 14

CIRCUIT DESCRIPTION

	MAIN (M2, T, W)	MAIN (K, M1)
FM, CWT, CW-NR	354.0750 ~ 364.0750MHz	354.0750 ~ 374.0750MHz
USB	354.0765 ~ 364.0765MHz	354.0765 ~ 374.0765MHz
LSB	354.0735 ~ 364.0735MHz	354.0735 ~ 374.0735MHz
CWR	354.0757 ~ 354.0757MHz	354.0757 ~ 374.0757MHz

M2, T, W	354.075 ~ 364.075MHz
K, M1	354.075 ~ 374.075MHz



FREQ'	VCO21	PLL IF21	N21	VCO23	PLL IF23	N23	FREQ'	VCO21	PLL IF21	N21	VCO23	PLL IF23	N23
430	354.075	200.96	314	153.115	19.2	480	441	365.075	212.48	332	152.595	18.68	467
431	355.075	202.24	316	152.835	18.92	473	442	366.075	212.48	332	153.595	19.68	492
432	356.075	202.24	316	153.825	19.92	498	443	367.075	213.76	334	153.315	19.40	485
433	357.075	203.52	318	153.555	19.64	491	444	368.075	215.04	336	153.035	19.12	478
434	358.075	204.8	320	153.275	19.36	484	445	369.075	216.32	338	152.755	19.36	471
435	359.075	206.08	322	152.995	19.08	477	446	370.075	217.60	340	152.475	18.84	464
436	360.075	207.36	324	152.715	18.8	470	447	371.075	217.60	340	153.475	18.56	489
437	361.075	207.36	324	153.715	19.8	495	448	372.075	218.88	342	153.715	19.56	482
438	362.075	208.64	326	153.435	19.52	488	449	373.075	220.16	344	153.195	19.28	475
439	363.075	209.92	328	153.155	19.24	481	450	374.075	221.44	346	152.635	19.00	468
440	364.075	211.2	330	152.875	18.96	474							

Fig. 13 430MHz PLL block diagram

CIRCUIT DESCRIPTION

• 1200MHz-band block PLL configuration

The 1200MHz-band block contains a 10Hz-step triple loop PLL. Since the output frequency from the PLL is doubled by the RF unit, the 20Hz-step VFO is produced in the final stage. 10Hz-step PLL output from loop A is mixed with output from loop C and then passed through a BPF to generate a 500MHz PLL frequency.

Loop B makes a 1kHz comparison. The 1kHz signal is divided by 100 in divider IC2 to generate the 10Hz step output. The other portion of loop B leading to loop A has the same circuit configuration as the 144MHz PLL loop.

Loop C makes a 320kHz comparison. As shown in the table of Figure 15, data supplied to the loop changes each time the frequency varies 10MHz. The frequency of loop C does not vary in regular 5MHz steps (half of the display frequency 10MHz). The sum of C and A loop frequencies varies in 5MHz steps. The loop A lock voltage, therefore, changes like that of loop C in the 430MHz-band block. Mixed A and C loop output is amplified by Q30, Q31, and Q31 for PLL output.

The unlock detect circuit OR's output from IC4 in loop A with that from IC5 in the loop C, and switches the OR output, using Q21, Q21, Q23, and Q24.

Power to the 1200MHz PLL block is obtained by switching output from IC1 with Q74 and Q75.

• CAR PLL configuration

There are two CAR PLL loops : Main and Sub. The PLL section is contained in the same unit as the 144MHz PLL block. Each loop performs 20Hz step operations. These loops have the same configuration, and they only differ in frequencies handled and PLL data supplied. The main loop is described below.

The main loop makes a 2kHz comparison. The output frequency of 45.5MHz ± several-hundred kHz is divided by 100 in IC9 to generate 455kHz ± several kHz. The 455kHz signal is mixed with 10.24MHz by IC8. The upper portion of the mixed frequency is extracted by CF4 to generate 10 695MHz ± several kHz. The frequency is used as CAR.

In modes other than FM mode, power to the mixer (IC5 and IC8) is supplied by the IF unit through the CAR output coaxial cable. In FM mode, CAR components are not included.

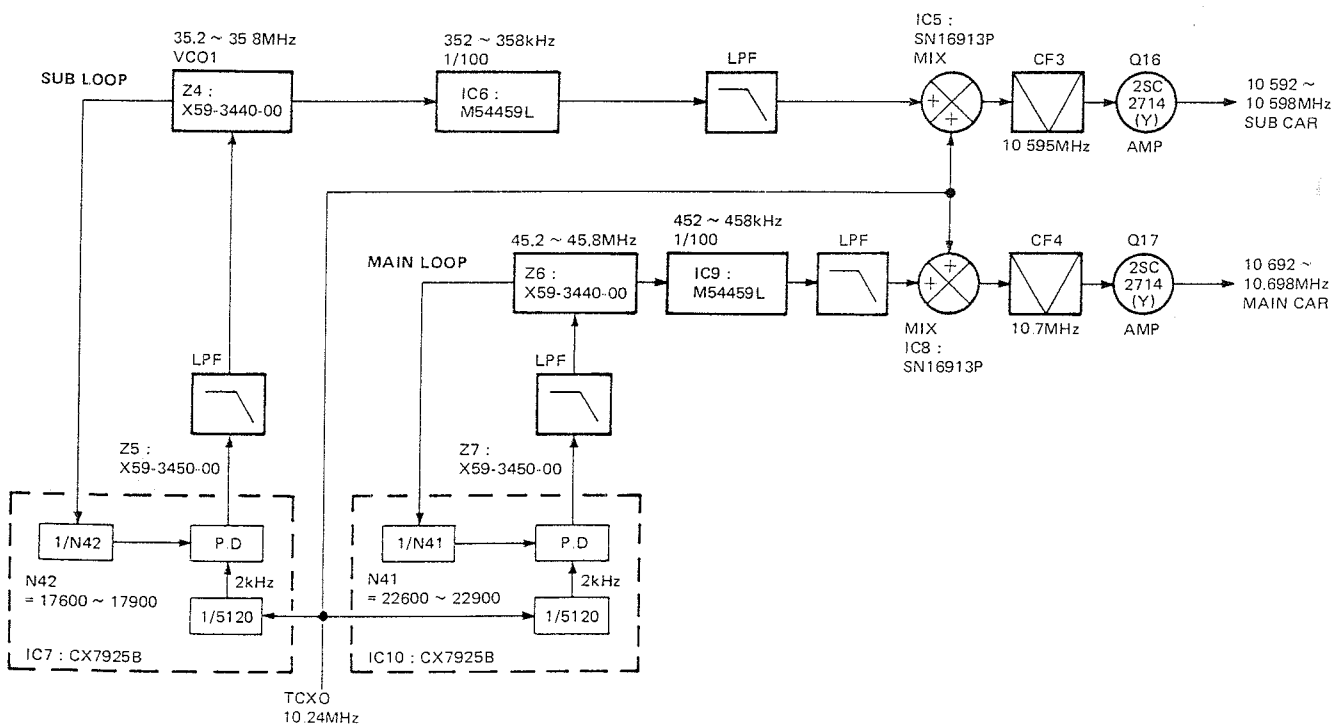


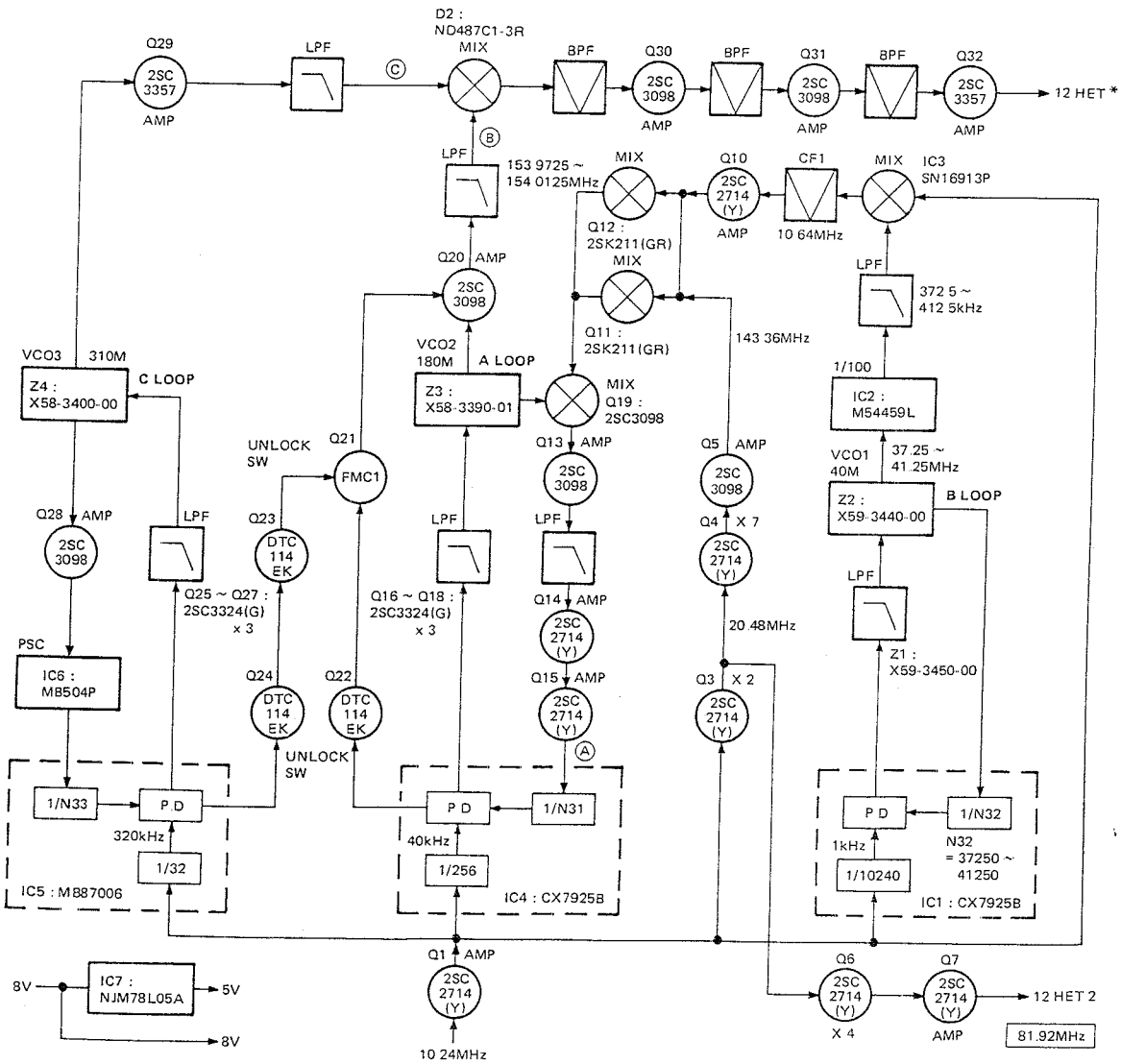
Fig. 16 CAR PLL block diagram

CIRCUIT DESCRIPTION

	Ⓐ	Ⓑ	Ⓒ
1240MHz ~	16.52 ~ 21.52MHz	170.4925 ~ 175.4925MHz	305.92MHz
1250MHz ~	18.32 ~ 23.32MHz	172.2925 ~ 177.2925MHz	309.12MHz
1260MHz ~	20.76 ~ 25.76MHz	174.7325 ~ 179.7325MHz	311.68MHz
1270MHz ~	22.56 ~ 27.56MHz	176.5325 ~ 181.5325MHz	314.68MHz
1280MHz ~	25.00 ~ 30.00MHz	178.7925 ~ 183.7925MHz	317.44MHz
1290MHz ~	26.16 ~ 31.16MHz	180.1325 ~ 185.1325MHz	321.28MHz

	MAIN
FM, CWT, CW-NR	476.41250 ~ 506.41250MHz
USB	476.41325 ~ 506.41325MHz
LSB	476.41175 ~ 506.41175MHz
CWR	476.41285 ~ 506.41285MHz

MAIN	SUB
476.4125 ~ 506.4125MHz	476.4625 ~ 506.4625MHz



FREQ' (MHz)	N33	N31	N32
1260 ~ 1270	974	$519 + \mathrm{INT}\left(\frac{f\ \mathrm{MOD}\ 10}{0.08}\right)$	$37250 + \mathrm{INT}\left(\frac{f\ \mathrm{MOD}\ 0.08}{0.002}\right)$
1270 ~ 1280	984	$564 + \mathrm{INT}\left(\frac{f\ \mathrm{MOD}\ 10}{0.08}\right)$	
1280 ~ 1290	994	$609 + \mathrm{INT}\left(\frac{f\ \mathrm{MOD}\ 10}{0.08}\right)$	
1290 ~ 1300	1004	$654 + \mathrm{INT}\left(\frac{f\ \mathrm{MOD}\ 10}{0.08}\right)$	

FREQ'	HET FREQ'	VCO33	N33	Np	A	VCO31	PLL IF31
1240	476.4125	305.920	956	29	28	170.49250	16.520
1250	481.4125	309.120	966	30	6	172.29250	18.320
1260	486.4125	311.680	974	30	14	174.73250	20.760
1270	491.4125	314.880	984	30	24	176.53250	22.560
1280	496.4125	318.080	994	31	2	178.33250	24.360
1290	501.4125	321.280	1004	31	12	180.13250	26.160

REF = 320kHz, PSC = 1/32, 33

Fig. 15 1200MHz PLL block diagram

CIRCUIT DESCRIPTION

Digital Control Circuit

The TS-790A/E digital block consists of several chips including the main CPU (μPD78C10G-36). It also contains a 32K ROM (27C256A-25), a 8K RAM (TC5564APL-15), and I/O ports (MB89363B and M5M82C55AFP-5), etc., and performs digital control.

The digital control circuit also contains the sub CPU (μPD75206G-531-1B) specially designed for a fluorescent character display. It allows data to be easily output to the display, using serial data commands. The sub CPU also controls LED, and synthesizes subtones and beeps. It is controlled by commands from the main CPU.

The main CPU contains an A/D convertor and a set of serial ports to allow direct input of analog signals. The TS-790A/E can be controlled by an external personal computer via the IF232C (optional level convertor).

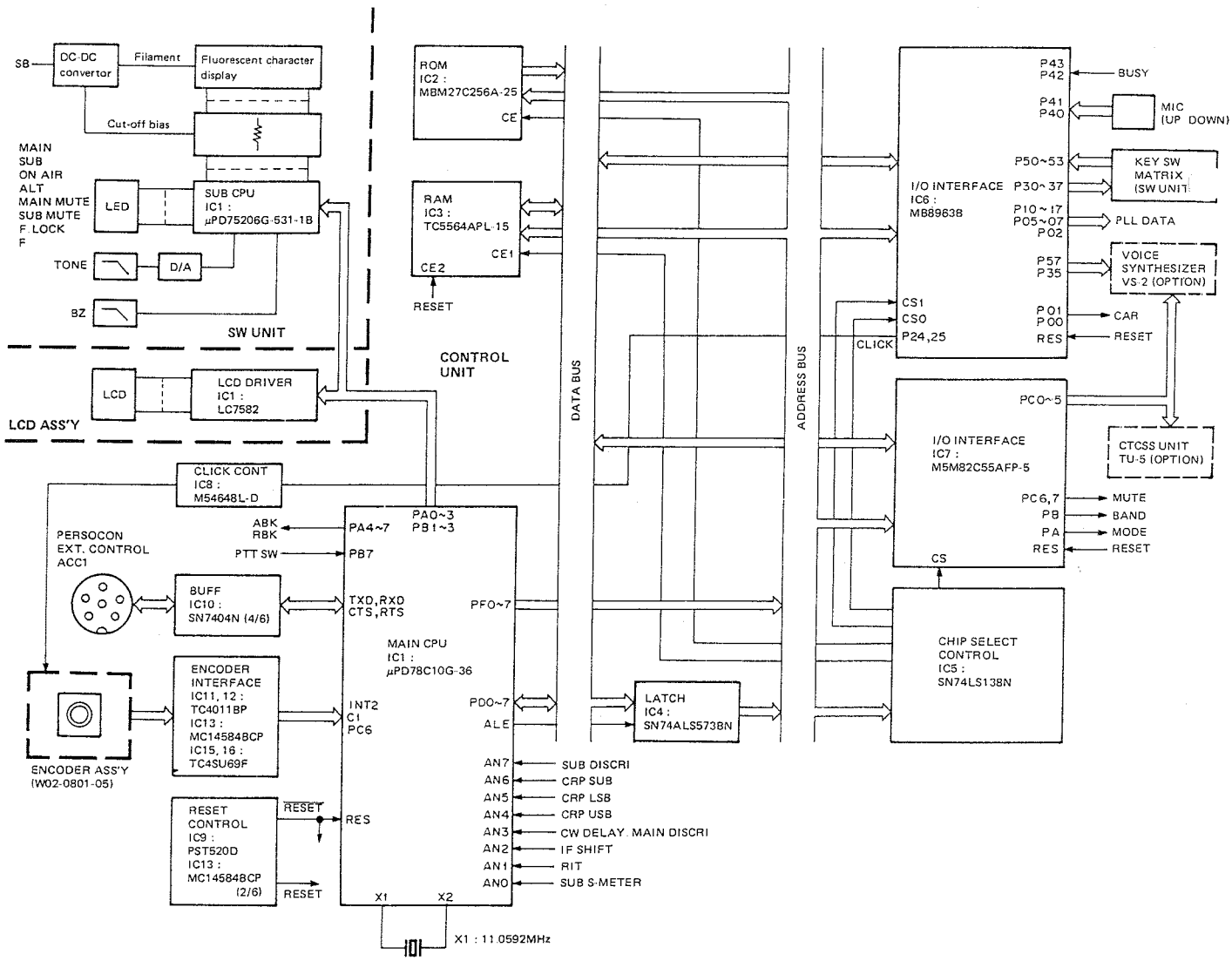


Fig. 17 Digital control block diagram

CIRCUIT DESCRIPTION

• Encoder circuit

The TS-790A/E uses a newly developed optical encoder with detent type tuning (channelized) for easier use. The encoder circuit, therefore, contains an additional encoder waveform shaping circuit and an additional detent drive circuit. The Encoder waveform contains two different signals. One is a two-phase count signal whose phases differs 90 degrees and which contains 250 pulses per rotation. The other is used for the channel lized tuning when detent operation occurs and contains 50 pulses per rotation. The control unit extracts an UP/DOWN direction signal and a count signal (when no detent or detent operation occurs) from the two-phase count signal. It then shapes and sends the signals to the main CPU. The 250-pulse count signal is doubled before extraction to convert it to 500 pulses per rotation.

To perform detent control, a solenoid is used to make the ball contact with the encoder gear. The motor driver IC8 (M54648L-D) is used to control the solenoid. When power is supplied to the solenoid by IC8, and 0V is supplied to the SL1 pin and approx. 10V is supplied to the SL2 pin for approx. 30 seconds, the detent feature turns on. When approx. 10V is supplied to the SL1 pin and 0V is supplied to the SL2 pin for approx. 30 seconds, the detent features turns off.

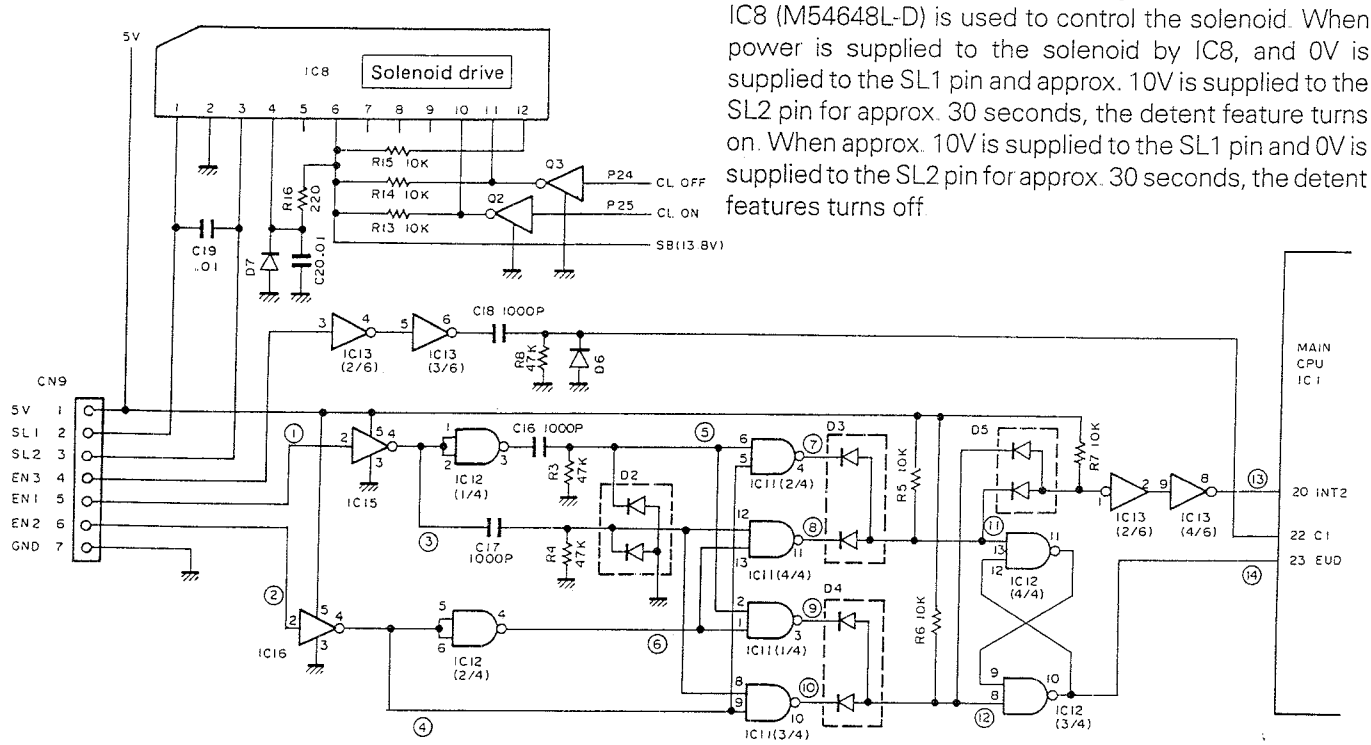


Fig. 18 Encoder waveform shaping, doubling, and solenoid drive circuit

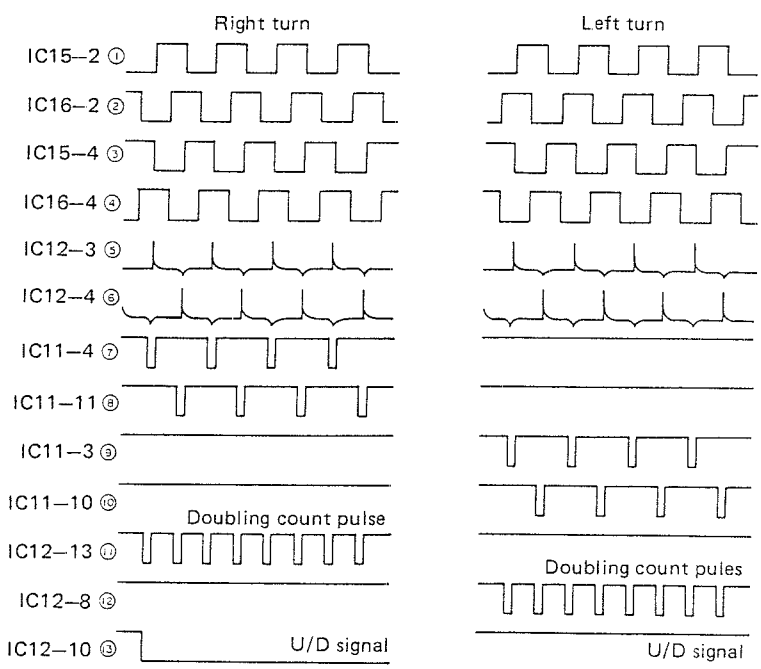


Fig. 19 Timing chart for doubling 250-pulse count signal

CIRCUIT DESCRIPTION

• System reset circuit

IC9 (PST520) forms the system reset circuit. It monitors source voltage to check whether it is approx. 4.2V or less. If source voltage becomes lower than 4.2V, the circuit sends a reset signal to the main CPU and I/O ports, and generates a back-up of RAM. The TS-790A/E stops operation.

When the TS-790A/E power is turned on and the source voltage exceeds approx. 4.2V, the reset signal is cleared. Then, after a time constant determined by R1 and C9 elapses, the main CPU and I/O ports are initialized to start operation.

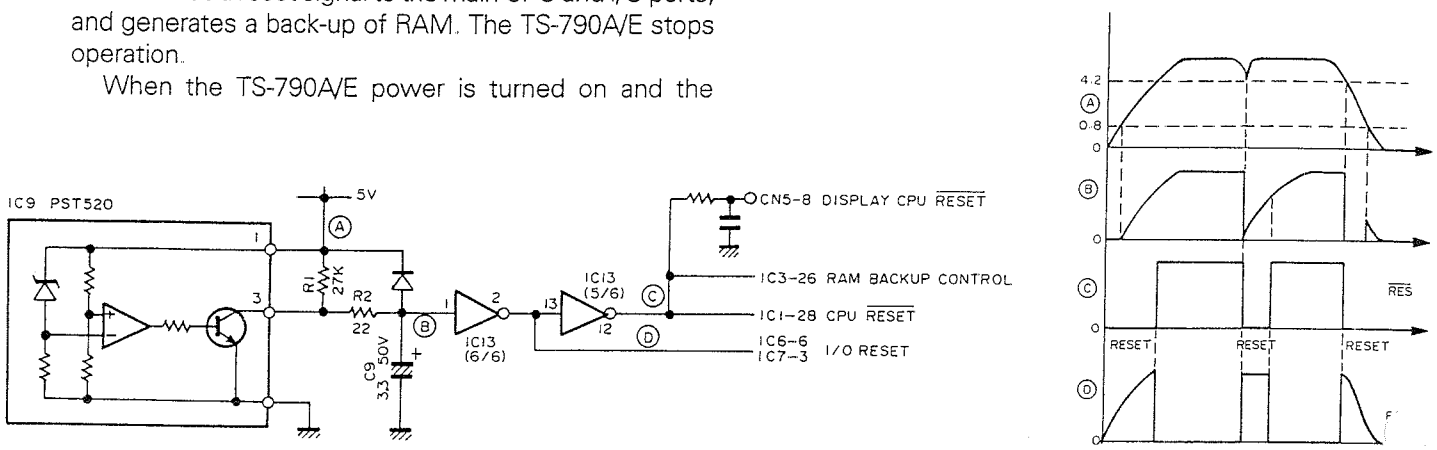


Fig. 20 Reset circuit and timing chart for reset operation

• Addressing control

PD0 to PD7 from the main CPU form an address and data bus multiplex port, and its PF0 to PF7 are A8 to A15 address signals. The signals, therefore, need to be separated into address and data signals. This is done by the D type latch IC4 (SN74ALS573BN). The A13 to A15 address signals are used as chip select signals by the address decoder IC5 (SN74LS138N) and sent to appropriate IC chips.

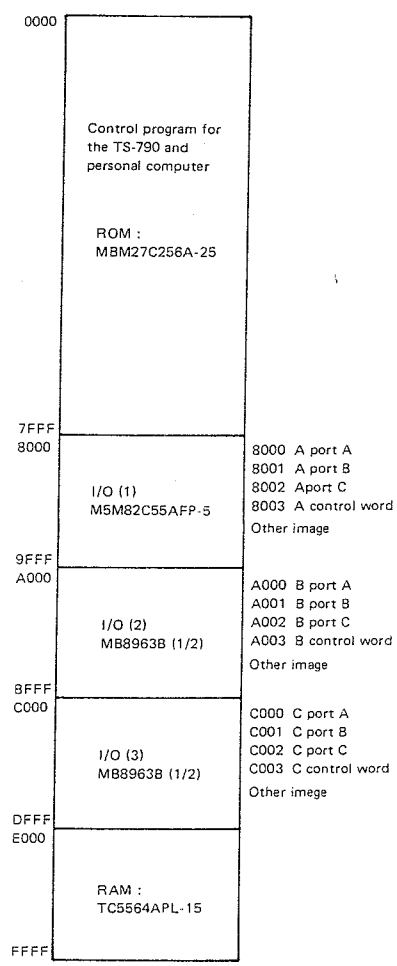


Fig. 22 Memory map

CIRCUIT DESCRIPTION

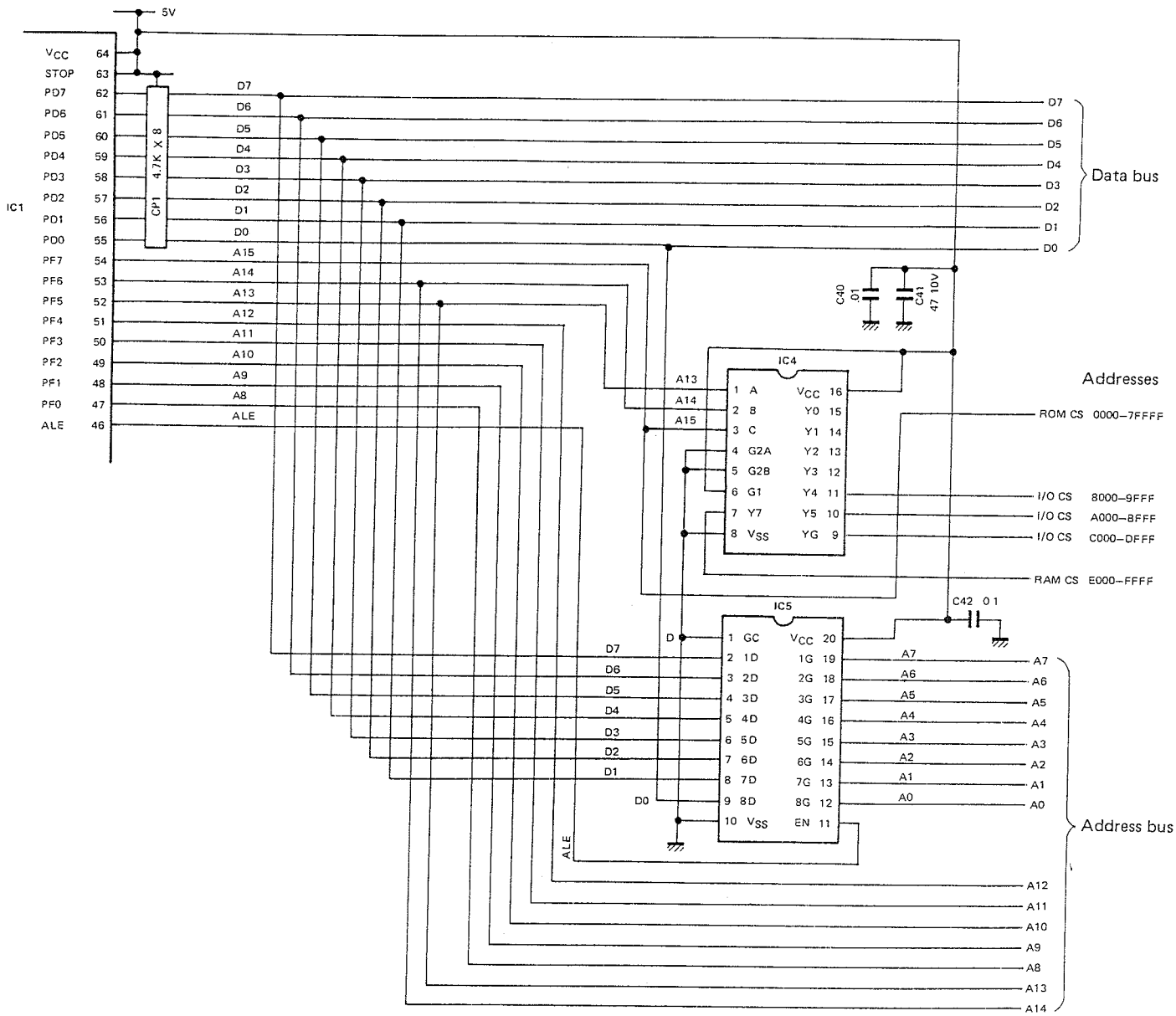


Fig. 21 Address and data separation and address decoder circuits

CIRCUIT DESCRIPTION

• Analog signal input

The main CPU (μPD78C10G-36) contains an A/D convertor to allows direct input of analog signals. Incoming analog signals are internally converted to its corresponding digital values.

Port	Input signal
AN0	Sub S meter voltage
AN1	RIT VR voltage
AN2	IF shift VR voltage
AN3	Main discriminator deviation voltage in FM mode, delay VR voltage inCW or CW-N mode.
AN4	USB VR voltage for CAR adjustment
AN5	LSB VR voltage for CAR adjustment
AN6	Sub VR voltage for CAR adjustment
AN7	Sub discriminator deviation voltage

Table 7

• Display data

The fluorescent character display in the main unit is controlled by the 4-bit sub CPU (μPD75206G-531-1B). The control unit simply needs to send serial data to the display.

The liquid crystal display panel in the sub unit has an LCD driver. The control unit, therefore, can drive the LCD simply by sending serial data.

Display data for the main or sub unit is sent to the switching unit via a flat cable. If the data is for the main unit, it is sent to the sub CPU of the switching unit. If the data is for the sub unit, it is sent to the LCD assembly of the switching unit.

• DC-DC convertor

The DC-DC convertor drives the fluorescent character display. It receives 13.8V at its DC input pin, and outputs 4.9V AC for the display filament and –25V cut-off bias to the display drive circuit.

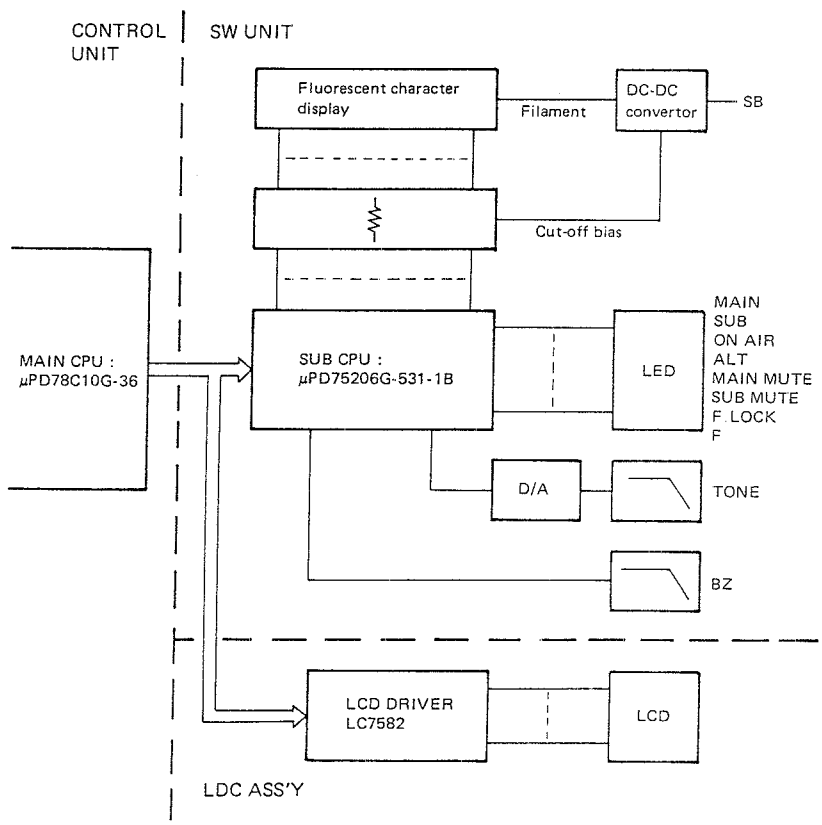


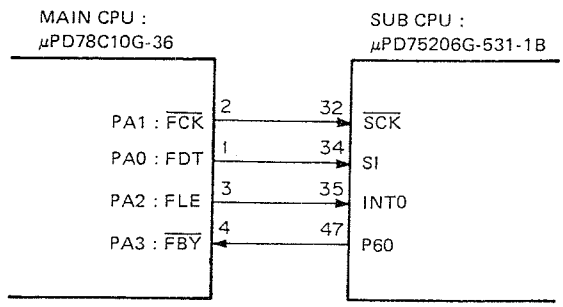
Fig. 23 Display block diagram

CIRCUIT DESCRIPTION

• Sub CPU

The sub CPU is a 4-bit single-chip microcomputer µPD75206G-531-1B specially designed for control of a fluorescent character display. It reduces load on the main CPU. That is, the main CPU can let the sub CPU control turn-on/off and display scan operations of the fluorescent character display, simply by sending appropriate serial display data to the sub CPU in a command form.

The sub CPU also performs subtone synthesization for the repeat and CTCSS, and beep synthesization for the main and sub units. These operations are also controlled by serial data commands from the main CPU.



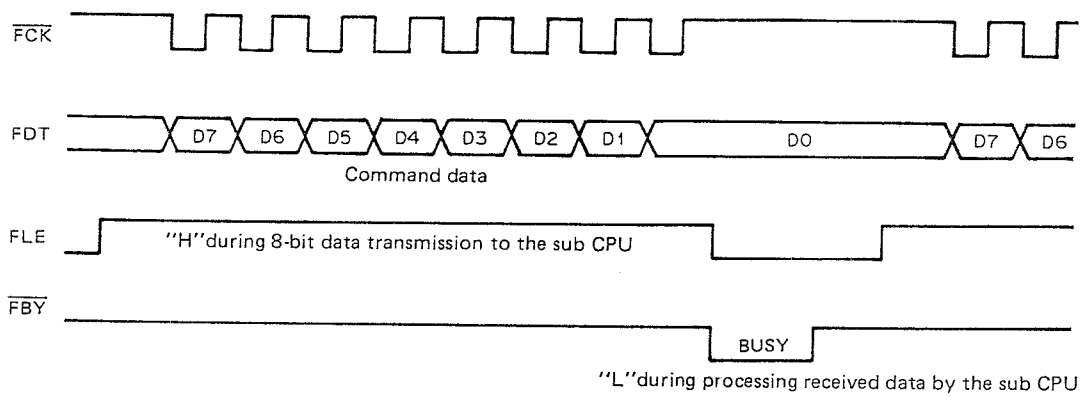


Fig. 24 Timing chart for serial data transmission

• PLL data

The TS-790A/E contains two PLL loops for the 144MHz band, three PLL loops for the 430MHz band, three PLL loops for the 1200MHz band, and two PLL loops for CAR, totaling 11 PLL loops.

Both of the MB87006 and CX7925B need to be supplied with two types of data, one indicating relative divide ratio and the other indicating divide ratios for the variable dividers. The relative frequency division ratio is output when the TS-790A/E power is turned on, since it does not need to be changed. For the division ratio for the variable divider, The VFO frequency or memory frequency is converted to PLL serial data and then sent to each PLL IC chip.

PLL data for the CX7925B contains a difference between a frequency division ratio value and a division ratio data value:

Relative division ratio data value
= relative division ratio value – 2
Relative division ratio data value
= relative division ratio value – 2
(when the AMI input pin is used)
Relative division ratio data value
= relative division ratio value – 8
(when the FMI input pin is used)
Relative division ratio data value
= relative division ratio value – 2
(when the TVI input pin is used)

When the PLL is unlocked, the PLL unit outputs an unlock signal. The control unit detects the unlock signal and reflects the state by switching the display to the dot display mode.

CIRCUIT DESCRIPTION

LOOP		VCO frequency (MHz)	Ref. (kHz) / Ref. division ratio	Division ratio	PLL IC	CX7925B control data: Input pin	PI1	PI2	A	B	T1	T2	Enable port name	Remarks
CAR	MAIN	42.5 ~ 45.8	2 / 5120	22600 ~ 22900 Center 22750	CX7925B	FMI	L	H	L	L	H	H	MCLE	
	SUB	32.5 ~ 35.8	2 / 5120	17600 ~ 17900 Center 17750	CX7925B	FMI	L	H	L	L	H	H	SCLE	
144M	11A	133.305 ~ 137.305 (144 ~ 148)	40 / 256	497 ~ 595	CX7925B	AMI	—	L	Lock detect	Shift register output	H	L	14LE1	IF : 19.88 ~ 23.88MHz
	12B	78.5 ~ 82.5	2 / 5120	31250 ~ 41250	CX7925B	FMI	L	H	144M power information	—	L	L	14LE2	14B1 / ~ 150M : H / 150M ~ : L
430M	21A	354.075 ~ 375.075	640 / 16	155 ~ 170	CX7925B	TVI	H	H	Lock detect	Shift register output	H	L	43LE1	IF : 198.4 ~ 218.6MHz
	22B	79.5 ~ 83.5	2 / 5120	39750 ~ 41750	CX7925B	FMI	L	H	430M power information	—	L	L	43LE2	
	23C	154.995 ~ 157.155	40 / 256	544 ~ 564	CX7925B	AMI	—	L	L	L	H	H	43LE3	IF : 21.76 ~ 23.24MHz
	24D	MAIN : 65.23 SUB : 65.33	10 / 1024	MAIN : 6523 SUB : 6533	CX7925B	FMI	L	H	Lock detect	Shift register output	H	L	43LE4	
1200M	31A	170.4925 ~ 185.1325	40 / 256	413 ~ 778	CX7925B	AMI	—	L	Lock detect	Shift register output	H	L	12LE1	IF : 16.52 ~ 31.16MHz
	32B	37.25 ~ 41.25	1 / 10240	37250 ~ 41250	CX7925B	FMI	L	H	1200M power information	—	L	L	12LE2	
	33C	305.92 ~ 321.28	320 / 32	478 ~ 502	MB87006A + MB504P								12LE3	Prescaler division ratio : 1/32

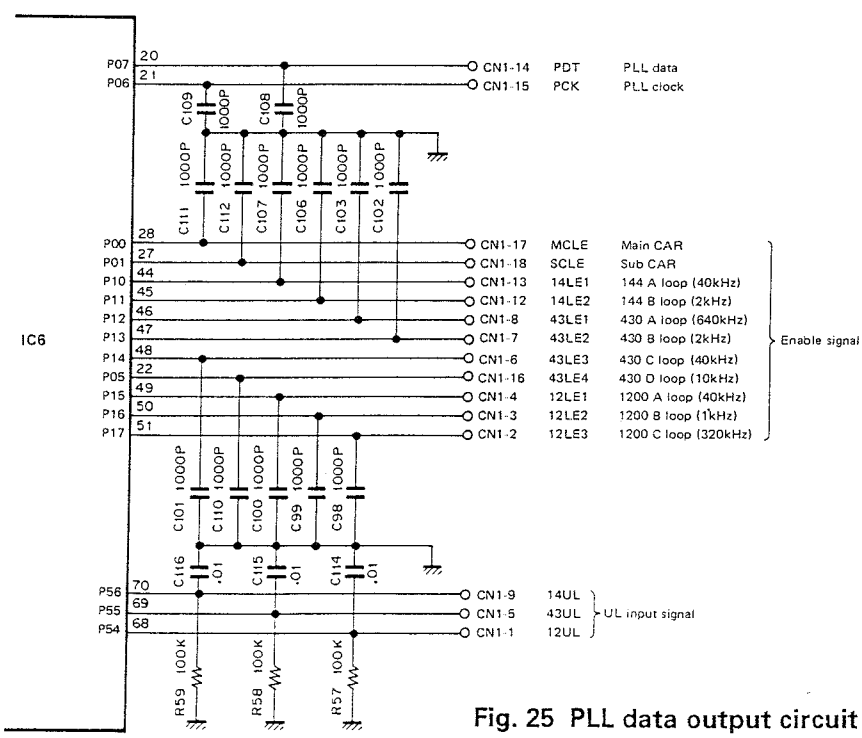


Fig. 25 PLL data output circuit

CIRCUIT DESCRIPTION

• Key scan

Ports P30 and P50 of IC6 form a key scan matrix. The key scan signal is generated, using a negative pulse from P30, to select a corresponding column in the P50 port, and the switch setting of the column is read. When an intersection in the matrix is sensed, its corresponding bit in the P50 port becomes L. This follows the microprocessor to determine which switch is being pressed. Key chatter is absorbed by software.

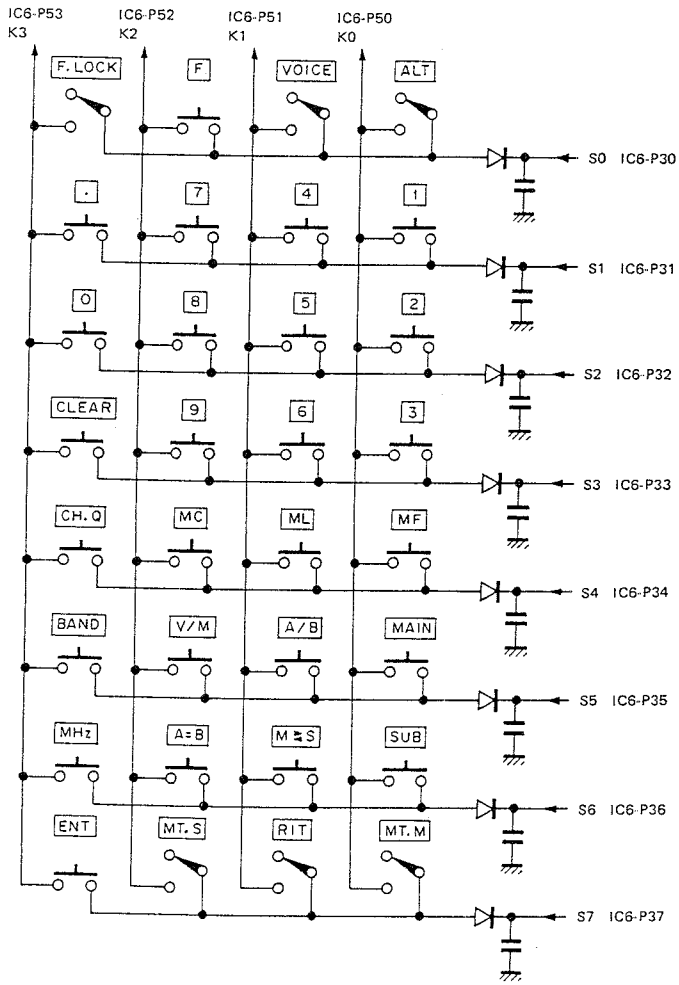


Fig. 26 Key scan matrix

● Output signals

1. Band signals

Signal name	Description
14M 43M 12M	Band signals for the main unit. One of these three band signals is active at any given time to indicate to the other units which band block in the main unit is to be selected When these signal are active, they provide approx 8V.
14S 43S 12S	Band signals for the sub unit. One of these three band signals is active at any given time to indicate to the other units what band block in the sub unit is to be selected. When these signal are active, they provide approx 8V.

2. Mode signals

Signal name	Description
MFMB	Indicates that the main unit is in FM mode.
MSSB	Indicates that the main unit is in LSB or USB mode.
MCWB	Indicates that the main unit is in CW mode.
MCNB	Indicates that the main unit is in CW-N mode.
SFMB	Indicates that the sub unit is in FM mode.
SSCB	Indicates that the sub unit is in LSB, USB or CW mode.

When these signal are active, they provide approx 8V.

3. Other signals

Signal name	Description
CTX	Active during transmission, active "H".
CRX	Active during reception, active "H".
MABK	Main audio stage blanking signal, active "H".
SABK	Sub audio stage blanking signal, active "H".
MRBK	Main IF stage blanking signal, active "L".
SRBK	Sub IF stage blanking signal, active "L".
MCT	Main CTCSS signal, "H" when on.
SCT	Sub CTCSS signal, "H" when on.
MMUT	Main mute signal, active "H".
SMUT	Sub mute signal, active "H".
VCK VDT	Data output pin for CTCSS unit (TSU-5).
MEN	CTCSS unit data enable for main.
SEN	CTCSS unit data enable for sub.
SEP	SP separate signal, "H" when SP separated.

● Input signals

Signal name	Description
CSS	Standby input, "L" indicates TX.
CKY	Keying input, "L" indicates TX.
MBC	Main busy input, "L" indicates busy.
SBC	Sub busy input, "L" indicates busy.
MCD	Main CTCSS detect signal, "L" indicates busy.
SCD	Sub CTCSS detect signal, "L" indicates busy.

CIRCUIT DESCRIPTION

MAIN CPU : μPD78C10G-36 (IC1)

	PA		PB		PC	
0	FDT (FIP data)	O			TXD	O
1	FCK (FIP CK)	O	LCK (LDC CK)	O	RXD	I
2	FLE (FIP LE)	O	LLE (LCD LE)	O	CTS	I
3	FBY IFIP BY)	I	LRDY (LCD Ready)	O	INT2 (250 slit)	I
4	MRBK (M RF BLK)	O	SEP (SP-Sepa)	O	RTS	O
5	SRBK (S RF BLK)	O	CRX (Cont-RX)	O	CI (50 slit)	I
6	MABK (M AF BLK)	O	CTX (Cont-TX)	O	EUD (Encoder up/down)	I
7	SABK (S AF BLK)	O	CSS (Standby)	I	CKY (CW keying)	I

A/D	
AN0	SSRM
AN1	RIT
AN2	IFS
AN3	CW : CLY, FM : MDIS
AN4	CRU
AN5	CRL
AN6	CRS
AN7	SDIS

I/O INTERFACE : MB8963B (IC6)

	BPA (P0X)		BPB (P1X)		BPC (P2X)	
0	MCLE (M CAR LE)	O	14LE1 (PLL LE 144A)	O	S8 (Type key select)	O
1	SCLE (S CAR LE)	O	14LE2 (PLL LE 144B)	O	S9 (Type key select)	O
2	XB1 (144 band 1)	O	43LE1 (PLL LE 430A)	O	SA	O
3	XB2 (144 band 2)	O	43LE2 (PLL LE 430B)	O	SB	O
4			43LE3 (PLL LE 430C)	O	SL1 (Solenoid off)	O
5	43LE4 (430 2nd HET)	O	12LE1 (PLL LE 1.2A)	O	SL2 (Solenoid click)	O
6	PCK1 (Loop PLL CK)	O	12LE2 (PLL LE 1.2B)	O	STR (VS-2 start)	O
7	PDT (PLL data)	O	12LE3 (PLL LE 1.2C)	O		O
	CPA (P3X)		CPB (P4X)		CPC (P5X)	
0	S0 (Key select)	O	MU (Mic up)	I	K0 (Key read)	I
1	S1 (Key select)	O	MD (Mic down)	I	K1 (Key read)	I
2	S2 (Key select)	O	MBC (M-busy)	I	K2 (Key read)	I
3	S3 (Key select)	O	SBC (S-busy)	I	K3 (Key read)	I
4	S4 (Key select)	O	BSY (VS-2 busy)	I	Z UL (1.2 UL)	I
5	S5 (Key select)	O	ATV (ATV)	I	Y UL (430 UL)	I
6	S6 (Key select)	O	MCD (M CTC det)	I	X UL (144 UL)	I
7	S7 (Key select)	O	SCD (S CTC det)	I	12OP (1.2 option)	I

I/O INTERFACE : M5M82C55AFP-5 (IC7)

	APA		APB		APC	
0	MFMB (M FM)	O	14M (M 144 band)	O	VDT (VS-2, CTCSS data)	O
1	MSSB (M SSB)	O	43M (M 430 band)	O	VCK (VS-2, CTCSS CK)	O
2	MCWB (M CW)	O	12M (M 1 2 band)	O	MEN (CTCSS M LE)	O
3	MCNB (M CW-N)	O	14S (S 144 band)	O	SEN (CTCSS S LE)	O
4	SFMB (S FM)	O	43S (S 430 band)	O	MCT (CTCSS M on/off)	O
5	SSCB (S SSB, CW)	O	12S (S 1 2 band)	O	SCT (CTCSS S on/off)	O
6	(PA6)		14W (144 wind)	O	MMUT (Mute M on/off)	O
7	PBK (Power on BLK)	O	43W1 (430 wide 1)	O	SMUT (Mute S on/off)	O

Table 9 I/O maps

CIRCUIT DESCRIPTION

• Control unit I/O port functions

1. CPU : μPD78C10G-36 (IC1)

Port Name		Pin No.	Mane	Functions	I/O	Remarks
Port A	PA0	1	FDT	LCD display data for fluorescent character display.	O	⎍⎍
	PA1	2	FCK	Display data clock for fluorescent character display.	O	⎍⎍
	PA2	3	FLE	Display data enable for fluorescent character display.	O	⎍⎍
	PA3	4	FBY	Display data busy for fluorescent character display.	I	"L": Busy, "H": Sub CPU ready to receive
	PA4	5	MRBK	Main RF blanking.	O	⎍⎍ "L" : Blanking
	PA5	6	SRBK	Sub RF blanking.	O	
	PA6	7	MABK	Main AF blanking.	O	⎍⎍ "H" : Blanking
	PA7	8	SABK	Sub AF blanking.	O	
Port B	PB0	9	—	Not used.	—	
	PB1	10	LCK	Display data clock for LCD display.	O	⎍⎍
	PB2	11	LLE	Display data enable for LCD display.	O	⎍⎍
	PB3	12	LRDY	LCD display on.	O	"H" : Display ON, "L" : Display OFF
	PB4	13	SEP	SP separate signal.	O	"H" : SP separate
	PB5	14	CRX	Transmit/receive control signals.	O	"H" : Receive
	PB6	15	CTX		O	"H" : Transmit
	PB7	16	CSS		I	PTT input, "L" : Transmit
Port C	PC0	17	TXD	Transmit signal for interface to personal computer.	O	TTL level
	PC1	18	RXD	Receive signal for interface to personal computer.	I	
	PC2	19	CTS	Clear-to-send for interface to personal computer.	I	
	PC3	20	INT2	Encoder count data (250 slits).	I	
	PC4	21	RTS	Request-to-send for interface to personal computer.	O	
	PC5	22	CI	Encoder count data (50 slits).	I	
	PC6	23	EUD	Encoder UP/DOWN direction signal.	I	"L" : Right turn, "H" : Left turn
	PC7	24	CKY	CE keying input.	I	"L" : Keying (transmit)
Control signals	PD0 ~ PD7	55 ~ 62	AD0 ~ AD7	CPU address, data multiplex bus.	I/O	
	PF0 ~ PF7	47 ~ 54	A8 ~ A15	CPU high-order address bus.	O	
	ALE	46	ALE	Address/data separate signal.	O	
	RD, WR	44, 45	RD, WR	Read/write signals.	O	
	AVcc	43	AVcc	Power for A/D convertor.	I	
	AVREF	42	AVREF	Reference power for A/D convertor.	I	
	AN7	41	SDIS	A/D channel 7 sub deviation signal.	I	
	AN6	40	CRS	A/D channel 6 sub carrier point adjust.	I	
	AN5	39	CRL	A/D channel 5 main LSB carrier point adjust.	I	
	AN4	38	CRU	A/D channel 4 main USB carrier point adjust.	I	
	AN3	37	DLY	A/D channel 3 CW delay VR input.	I	
	AN2	36	IFS	A/D channel 2 IF shift VR input.	I	
	AN1	35	RIT	A/D channel 1 RIT VR input.	I	
	AN0	34	SSRM	A/D channel 0 sub S meter input.	I	
	AVss	33	AVss	Ground for A/D convertor.	—	
	X1, X2	30, 31	X1, X2	CPU clock crystal oscillator pins.	I	
	RES	28	RES	CPU reset signal.	I	

2. Extended I/O : MB89363B (IC6)

Port Name		Pin No.	Mane	Functions	I/O	Remarks
Port A (P0x)	P00	28	MCLE	Main CAR PLL data enable.	O	
	P01	27	SCLE	Sub CART PLL data enable.	O	
	P02	26	14B1	144 PLL band path indication.	O	
	P03	25	—	Not used.	—	
	P04	23	—	Not used.	—	
	P05	22	43LE4	430PLL D loop enable.	O	
	P06	21	PCK	PLL data clock.	O	
	P07	20	PDT	PLL data.	O	
Port B (P1x)	P10	44	14LE1	144 PLL A loop enable.	O	
	P11	45	14LE2	144 PLL B loop enable.	O	
	P12	46	43LE1	430 PLL A loop enable.	O	
	P13	47	43LE2	430 PLL B loop enable.	O	
	P14	48	43LE3	430 PLL C loop enable.	O	
	P15	49	12LE1	1200 PLL A loop enable.	O	
	P16	50	12LE2	1200 PLL B loop enable.	O	
	P17	51	12LE3	1200 PLL C loop enable.	O	
Port C (P2x)	P20	38	S8	Custom diode, extended diode select.	O	
	P21	39	S9		O	
	P22	40	SA		O	
	P23	43	SB		O	
	P24	37	SL1	Solenoid through pulse.	O	Approx. 20ms
	P25	36	SL2	Solenoid detent pulse.	O	
	P26	35	STR	VS-2 voice start signal.	O	"H" : Start
	P27	34	43W2	430 extended signal.	O	
Port D (P3x)	P30 ~ P33	77 ~ 80	S0 ~ S3	Key matrix select signals.	O	Become "L" sequentially for key matrix input. Active "L".
	P34 ~ P37	1 ~ 4	S4 ~ S7			
Port E (P4x)	P40	61	MU	MIC up switch.	I	"L" : MU SW ON
	P41	60	MD	MIC down switch.	I	"L" : MD SW ON
	P42	59	MBC	Main signal busy.	I	"H" : BUSY, "L" : NO BUSY
	P43	58	SBC	Sub signal busy.	I	
	P44	57	BSY	VS-2 busy.	I	"H" : VS-2 sounding
	P45	56	ATV	ATV switch.	I	"L" : ATV display ON
	P46	55	MCD	Main CTCSS detect.	I	"L" : CTCSS signal detected
	P47	54	SCD	Sub CTCSS detect.	I	
Port F (P5x)	P50 ~ P53	67 ~ 64	K0 ~ K3	Key inputs	I	Input key matrix switches specified by S0 to S8 (S9 to SB).
	P54	68	12UL	1200 unlock input.	I	"L" : UNLOCK, "H" : PLL LOCK
	P55	69	43UL	430 unlock input.	I	
	P56	70	14UL	144 unlock input	I	
	P57	71	120P	1200 option decision.	I	"L" : UT-10 available, "H" : Not available
Control signals	DB0 ~ DB7	12 ~ 19	DB0 ~ DB7	Data bus.	I/O	
	RD, WR	76, 5	RD, WR	Read/write signals.	I	
	RES	6	RES	Reset signal.	I	"H" : Reset
	A0, A1	31, 32	A0, A1	Port select signals.	I	
	CS0	29	CS0	Chip select signal.	I	"L" : P0x to P2x
	CS1	75	CS1	Chip select signal.	I	"L" : P3x to P5x

CIRCUIT DESCRIPTION

3. Extended I/O : M5M82C55AFP-5 (IC7)

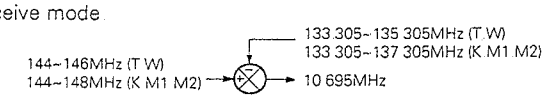
Port Name		Pin No.	Mane	Functions	I/O	Remarks
Port A	PA0	4	MFMB	Main FM mode.	O	"H" : FM mode
	PA1	3	MSSB	Main SSB mode.	O	"H" : LSB or USB mode
	PA2	2	MCWB	Main CW mode.	O	"H" : CW mode
	PA3	1	MCNB	Main CW-N mode.	O	"H" : CW-N mode
	PA4	40	SFMB	Sub FM mode.	O	"H" : FM mode
	PA5	39	SSCB	Sub SSB or CW mode.	O	"H" : LSB, USB, or CW mode
	PA6	38	—	Not used.	—	
	PA7	37	—	Not used.	—	
Port B	PB0	18	14M	Main 144 band.	O	"H" : Main 144
	PB1	19	43M	Main 430 band.	O	"H" : Main 430
	PB2	20	12M	Main 1200 band.	O	"H" : Main 1200
	PB3	21	14S	Sub 144 band.	O	"H" : Sub 144
	PB4	22	43S	Sub 430 band.	O	"H" : Sub 430
	PB5	23	12S	Sub 1200 band.	O	"H" : Sub 1200
	PB6	24	14W	144 extended band.	O	
	PB7	25	43W1	430 extended band.	O	
Port C	PC0	14	VDT	Data for VS-2 and CTCSS (TSU-5).	O	
	PC1	15	VCK	Clock for CS-2 and CTCSS (TSU-5).	O	
	PC2	16	MEN	Enable for main CTCSS.	O	
	PC3	17	SEN	Enable for sub CTCSS.	O	
	PC4	13	MCT	Main CTCSS ON/OFF signal.	O	"H" : CTCSS ON, "L" : OFF
	PC5	12	SCT	Sub CTCSS ON/OFF signal.	O	
	PC6	11	MMUT	Main AF mute signal.	O	"H" : Mute ON, "L" : Normal
	PC7	10	SMUT	Sub AF mute signal.	O	
Control signals	D0 ~ D7	27 ~ 34	D0 ~ D7	Data bus.	I/O	
	RD, WR	5, 36	RD, WR	Read/write signals.	I	
	CS	6	CS	Chip select.	I	
	RES	35	RES	Reset signal.	I	"H" : Reset
	A0, A1	8, 9	S0, S1	Port select signals.	I	

DESCRIPTION OF COMPONENTS

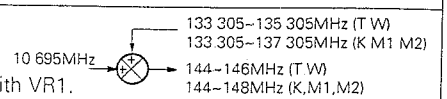
SWITCH UNIT (X41-3050-00)

Component	Use/Function	Operation/Condition/Compatibility
IC1	SUB CPU	CPU of the FL tube (Main display)
Q1	DC-DC convertor for display tube	
Q2	SW	F. LOCK on : on.
Q3	SW	ALT on : on.
Q4	SW	MAIN on : on.
Q5	SW	SUB on : on.
Q6	SW	MAIN MUTE on : on.
Q7	SW	SUB MUTE on : on.
D1		9.1V zener diode.
D2		7.5V zener diode.
D4		43V zener diode.
D5		
D6		30V zener diode.
D7		
D8	S0 key input protection	
D9	S1 key input protection	
D10	S2 key input protection	
D11	S3 key input protection	
D12	S4 key input protection	
D13	S5 key input protection	
D14	S6 key input protection	
D15	S7 key input protection	
D16	SUB BUSY LED	
D17	MAIN BUSY LED	
D18	F (FUNCTION) LED	
D19	ON AIR LED	
D20	F. LOCK LED	
D21	ALT LED	
D22	MAIN LED	
D23	SUB LED	
D24	MAIN MUTE LED	
D25	SUB MUTE LED	

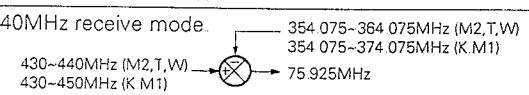
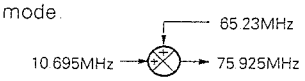
RF UNIT (X44-3060-XX) (A/2) : 144MHz -00 : M2, T, W -11 : K, M1

Component	Use/Function	Operation/Condition/Compatibility
IC1	8V AVR regulator	Input 13.8V, output 8V.
IC2	5V AVR regulator	Input 13.8V, output 5V.
Q1	RF amplifier	Operate in 144MHz receive mode.
Q2	ATT SW	Turn on when a 144ATT SW is on.
Q3	1st mixer	Operate in 144MHz receive mode 
Q4	MAIN receive SW	144MHz sub receive mode : on.
Q5	SUB receive SW	144MHz main receive : on.
Q6	RXB SW	144MHz receive mode : on (except wide band receive mode).
Q7	RXB SW	144MHz wide band receive mode : on.
Q8	Wide band SW	144MHz wide band receive mode : on.

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q9, 10	Transmit mixer	Operate in the 144MHz transmit mode. Adjustable with VR1 The spurious of ±10.695MHz reduced with VR1. 
Q11	Transmit pre-driver	Operate in the transmit mode. Please carefull to ground lead of RF prove when measurement of Q11 and Q12.
Q12	Transmit driver	
D1, 2	Receive filter SW	Switched between 144MHz receive and wide band receive mode.
D3 ~ 6	Vari-cap tuning	144MHz receive vari-cap tuning.
D7	MAIN/SUB receive SW	Switched between 144MHz main receive and sub receive mode.
D8	Wide band SW	Turn on when 144MHz wide band receive mode.
D9	14HET SW	Switched between 144MHz transmit and receive mode.
D10	Transmit IF SW	Switched between 144MHz transmit and 430MHz and 440MHz transmit mode.
D11 ~ 14	Vari-cap tuning	144MHz transmit vari-cap tuning.
D15	Q11 idling	
D16	Q12 idling	
D17, 18	Current reversal prevention	
D19	14RA SW	144MHz transmit mode : on.

RF UNIT (X44-3060-XX) (B/2) : 430MHz -00 : M2, T, W -11 : K, M1

Component	Use/Function	Operation/Condition/Compatibility
IC201, 202	RF amplifier	Operate in the 900MHz wide band receive mode.
Q201, 202	RF amplifier	Operate in the 430MHz and 440MHz receive mode.
Q203	1st mixer	Operate in the 430MHz and 440MHz receive mode. 
Q204	1st IF amplifier	Operate in the 430MHz and 440MHz receive mode.
Q205	1st IF amplifier SW	Operate in the 430MHz and 440MHz receive mode.
Q206	MAIN receive SW	430MHz and 440MHz sub receive mode : on.
Q207	SUB receive SW	430MHz and 440MHz main receive mode : on.
Q208	RF amplifier	43HET2 (65.23MHz).
Q209	2 frequency multiplication	Operate in the 900MHz wide band receive mode (430HET x 2).
Q210	2 frequency multiplication	Operate in the 900MHz wide band receive mode (43HET2 x 2 — 130.46MHz).
Q211	Wide band 1st mixer	Operate in the 360MHz and 900MHz wide band receive mode.
Q212	Wide band 1st IF amplifier	Operate in the 360MHz wide band receive mode (8.505MHz).
Q213	Wide band 1st IF amplifier	Operate in the 900MHz wide band receive mode (141.155MHz).
Q214	Wide band 2nd mixer	Operate in the 360MHz and 900MHz wide band receive mode.
Q215	Wide band 2nd mixer SW	360MHz and 900MHz wide band receive mode : on.
Q216	Wide band reference oscillator	Operate in the 360MHz wide band receive mode (19.2MHz).
Q217	Wide band ref. osc. buffer	Operate in the 360MHz wide band receive mode (19.2MHz).
Q218, 219	Transmit 1st mixer	Operate in the 430MHz and 440MHz transmit mode. 
Q220	RF amplifier	Operate in the 430MHz and 440MHz transmit mode (75.925MHz).
Q221, 222	RF amplifier	Operate in the 430MHz and 440MHz transmit mode.
Q223	Transmit pre-driver	Operate in the 430MHz and 440MHz transmit mode. Please carefull to ground lead of RF prove when measurement of Q223 and Q224.
Q224	Transmit driver	
Q225	Wide band RXB SW	360MHz and 900MHz wide band receive mode : on.
Q226	Wide band SW	360MHz and 900MHz wide band receive mode : on.
Q227	Wide band RXB SW	360MHz and 900MHz wide band receive mode : on.
Q228	Wide band SW	360MHz and 900MHz wide band receive mode : on.
Q229	Wide band RXB SW	360MHz wide band receive mode : on.
Q230	RXB SW	430MHz and 440MHz receive mode : on.

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
D201	430, 440MHz and wide band RX SW	Switched between 430MHz and 440MHz and 360MHz receive mode
D202	MAIN and SUB receive SW	Switched between 430MHz and 440MHz main and sub receive mode
D203	43HET SW	Switched between 430MHz and 440MHz receive and transmit mode
D204	43HET2 SW	Switched between 430MHz and 440MHz receive and transmit mode
D205	43HET SW	Switched between 360MHz and 900MHz wide band receive mode
D206	43HET2 SW	900MHz wide band receive mode : on
D207	IC201 reference voltage	5.1V zener diode
D208	19.2MHz and 43HET2 x 2 SW	Switched between 360MHz and 900MHz wide band receive mode
D209	43HET and 43HET2 x 2 SW	Switched between 360MHz and 900MHz wide band receive mode
D210	Wide band input SW	Switched between 360MHz and 900MHz wide band receive mode
D211	IC202 reference voltage	5.1V zener diode
D212, 213	Wide band 1st IF SW	Switched between 360MHz and 900MHz wide band receive mode
D214	Transmit 2nd mixer	Operate in the transmit mode 354.075~364.075MHz (M2,T,W) 354.075~374.075MHz (K,M1) 75.925MHz → 430~440MHz (M2,T,W) 430~450MHz (K,M1)
D215	Q223 idling	
D216	Q224 idling	
D217 ~ 220	Current reversal prevention	
D221	Wide band RXB SW	Wide band receive mode : on
D222	43RA SW	430MHz and 440MHz transmit mode : on

RF UNIT (X44-3070-00) : Z2 (1.2GHz) OPTION

Component	Use/Function	Operation/Condition/Compatibility
IC1	Amplifier	
Q1	RF amplifier	
Q2	1st mixer	952.825~1012.825MHz (MAIN) 952.925~1012.925MHz (SUB) 1240~1300MHz → 287.175MHz (MAIN) 287.075MHz (SUB)
Q3	Receive IF amplifier	Receive IF 287MHz amplifier.
Q4	1st IF amplifier	1st IF frequency, main : 41.415MHz, sub : 41.315MHz.
Q5	RF SW	Connect DC voltage 5 ~ 12V through RFC to the 12IF terminal : on Connector : "L", normally : 8V.
Q6	RF SW	Switched IF frequency 287.175MHz to 12IF terminal. Normally : "L", Q5 on : "H".
Q7	SW	Receive mode : Q8 off.
Q8	Transmit IF amplifier	Transmit IF 287MHz amplifier.
Q9	Transmit pre-driver	Transmit frequency 1240 ~ 1300MHz amplifier.
Q10	Receive 2 frequency multiplication	476.4125 ~ 506.4125MHz x 2 = 952.825 to ~ 1012.825MHz.
Q11	Receive buffer amplifier	952.825 ~ 1012.825MHz buffer amplifier.
Q12	3 frequency multiplication	12HET2 (81.92MHz) x 3 = 245.76MHz.
Q13	Amplifier	245.76MHz buffer amplifier.
Q14	IC1 SW	12V voltage supply to IC1 when transmit mode.
D1	Q1 base AVR	Voltage limiter circuit of the Q1 (base).
D2	Receive mixer SW	Receive mode become 12RXB : on, signal supplied to RX mixer Q2.
D3	Receive IF SW	Receive mode become 12RXB : on, apply to IF frequency 287MHz.
D4		Receive mode become 12RXB and transmit mode become 12TXB : on, apply to IF frequency 287MHz.
D5	Receive IF SW	Apply to IF 41.415MHz when receive mode.
D6	Transmit IF SW	Apply to IF 41.415MHz when transmit mode.
D7	12IF input/output SW	287.175MHz input/output to J1 jack

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
D8	Transmit IF SW	Transmit mode become 12TXB : on, apply IF frequency 287MHz.
D9, 10	Transmit mixer	Change the 1240 ~ 1300MHz from 287.175MHz in the transmit mode.
D11	Transmit mixer SW	Transmit mode become 12TXB : on, 952 ~ 1012MHz signal supplied to D9 and D10.
D12	Q9 base AVR	Voltage limiter circuit of the Q9 (base).
D13	Q11 base AVR	Voltage limiter circuit of the Q11 (base).
D14, 15	IF common mixer	Change the 41.415MHz from 287.175MHz in the receive mode. Change the 287.175MHz from 41.415MHz in the transmit mode.
D16	Protect the time of delay	Protect the time delay to receive mode from transmit mode

FINAL UNIT (X45-3150-00) : Z3 (1.2GHz) OPTION

Component	Use/Function	Operation/Condition/Compatibility
IC1	Fan starter comparator	DC voltage supplied from No. 8 terminal that the thermister TH1 change a resistor value when getting high temperature.
IC101	Drive power module	
IC102	Final power module	
Q1	Protection SW	Delected DC voltage of D2 with reflect wave : on.
Q2	AVR for Q3	Set the drain voltage of Q3 to 3.0V.
Q3	Receive RF amplifier	GaAs FET.
Q5	Fan starter SW	Detected by thermister, turned on when getting same temperature. Active "L".
D1	Forwarded wave detection	Detected forward wave and make a APC voltage.
D2	Reflected wave detection	Detected reflect wave and make a protection voltage.
D3	Spark prevention	Canceled inverse-electric move force when relay is turned off.
D4	Limitter	Protection in excessive input.
D5		
D6		
D7	IC1 AVR	Voltage supply of IC1 become to constant voltage (7.5V zener diode).
D8, 9	Fan start reversal prevention	

FINAL UNIT (X45-3160-00) : 144MHz

Component	Use/Function	Operation/Condition/Compatibility
IC1	Temperature detection	IC1 (1/2) : Power down, IC1 (2/2) : Fan motor operation.
Q1	Transmit driver	14D terminal : 0.3W, Q1 collector : 1.0W (APC : OFF, RF PWR VR : MIN).
Q2	TXB SW	Adjustable with VR4. Collector voltage is 9.0V in the transmit mode.
Q3	TXB AVR	Approx. 9.3V. If TXB voltage is less than 9.3V, either of the Q3 transistor may be faulty. Please tightend screws.
Q4	Drive + B AVR	Approx. 11.5V. If this voltage is less than 11.0V, either of the Q4 transistor may be faulty. Please tightend screws.
Q5, 6	TXB AVR	
Q7, 8	Drive + B AVR	
Q9	SWR protection control	Adjustable with VR2. Normally, base voltage is 0.2V and collector voltage is 3.0V in the transmit mode. When the antenna is opened, base voltage is 0.6V and collector voltage is 1.7V.
Q10	SW transistor	Operate in transmitter output power is down.
Q11	SW transistor	Operate in cooling fan is working.
Q101	Final PA	
D1	AVR temp. compensation for drive	
D2, 3	Transmit/receive select	Transmit mode : on. If DC source current flows, and no transmitter output is present, either of the diodes may be faulty.
D4	Forwarded wave detection	Adjustable with VR1 in the FM transmit mode. 47W flows when transmitter output is measurement.

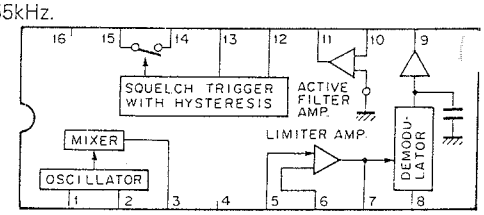
DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
D5	Reflected wave detection	Adjustable with VR2. 5.5A flows when the antenna is opened.
D6, 7	TXB AVR temperature compensation	
D8	TXB AVR reference	5.6V zener diode.
D9	Temp. detection circuit ref. voltage	7.5V zener diode.
D10, 11	Surge voltage absorber	Fan motor.
D12	Q1 idling	Anode voltage is 0.6V in the transmit mode.
D13	Wired OR	Operate in transmitter output is dowwn.
D14	Wired OR	Fan motor.
TH1	Temperature detection	Operate in cooling fan is working : approx. 55°C, fan stopped : approx. 45°C Operate in transmitter output is down : approx. 90°C, transmitter output is present : approx. 80°C.

FINAL UNIT (X45-3170-00) : 430MHz

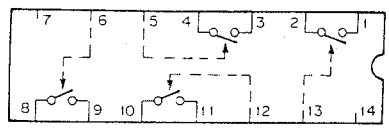
Component	Use/Function	Operation/Condition/Compatibility
IC1	Temperature detection	IC1 (1/2) : Transmitter output is down, IC1 (2/2) : Operate in cooling fan is working
Q1	SWR protection control	Adjustable with VR2. Normally, base voltage is 0.3V and collector voltage is 3.0V in the transmit mode. When the antenna is opened, base voltage is 0.8V and collector voltage is 2.0V.
Q102, 103	Power hybrid IC	
D1	Protection against reverse power connection	A short-circuit occurs when DC power connection is reversed. If power is not turned on when correct DC power connection is made, it may be due to a burned negative DC cable.
D2, 3	Transmit/receive select	Transmit mode : on. If DC source current flows, and no transmitter output is present, either of the diodes may be faulty.
D4	Forwarded wave detection	Adjustable with VR1 in the FM transmit mode. 42W flows when transmitter output is measurement.
D5	Reflected wave detection	Adjustable with VR2. 7A flows when the antenna is opened.
D6	Wired OR	Operate in transmitter output is down.
D7	Wired OR	Fan motor.
D8	Temp. detection circuit ref. voltage	7.5V zener diode.

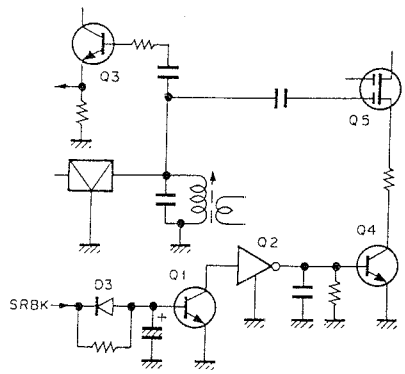
IF UNIT (X48-3050-XX) -11 : K, M1, M2 -61 : T, W

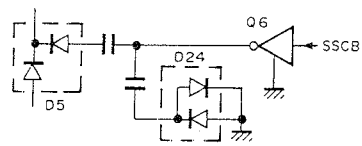
Component	Use/Function	Operation/Condition/Compatibility
IC1	SUB FM MIX, IF, SQL	FM RX, SSB SQ 10.695MHz→455kHz. 
IC2	2ch AF VR	Separately main and sub.
IC3	10V AVR	DC power supply for IC2.
IC4	2ch AF MUTE	Operate in AF mute when POWER SW is turned on and off.
IC5, 6	AF PA	IC5 : main, IC6 : sub.
IC7	8V AVR	DC power supply for sub IF.
IC8	MAIN FM MIX, IF, SQL	FM RX, SSB SQ 10.595MHz→455kHz.
IC9	BM	Balanced modulator.
IC10	MIC amplifier, processor	Operate in the SSB mode (processor).
IC11	8V AVR	DC power supply for main IF.

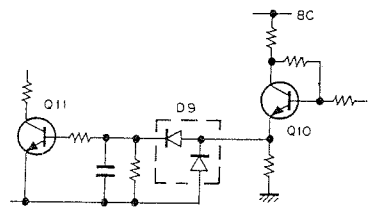
DESCRIPTION OF COMPONENTS

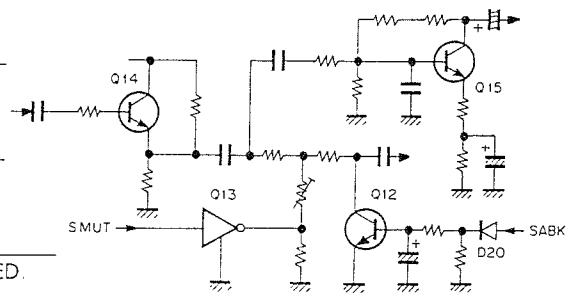
Component	Use/Function	Operation/Condition/Compatibility
IC12, 13	AGC select	IC12 : 144MHz, 1 2GHz IC13 : 430MHz, 440MHz.
IC14	24V AVR	DC power supply for VCO vari-cap diodes in PLL unit.
Q1, 2	DC SW	Sub IF blanking SW
Q3	NB buffer amplifier	
Q4	NB gate SW	Blanking : off
Q5	Receive IF amplifier	Sub SSB, FM common IF 10.595MHz.
Q6	RF SW	SSB, CW receive mode : on, then the FM line is short-circuited
Q7	Receive 1st IF amplifier	SSB, CW 10.595MHz.
Q8	Receive 2nd IF amplifier	SSB, CW 10.595MHz.
Q9	Receive 3rd IF amplifier	SSB, CW 10.595MHz.
Q10	RF buffer amplifier	Pick up to AGC input
Q11	AGC amplifier	
Q12	AF SW	Sub AF killer
Q13	AF SW	Sub AF mute
Q14	SQ gate	
Q15	AF amplifier	Sub ext. output and AF LED.
Q16	AF amplifier	Main ext. output and AF LED.
Q17	AF SW	Main AF mute.
Q18	AF SW	Main AF killer.











DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q19	AF SW	SP SEP : on Approx. 6dB attenuation of the AF input
Q20	AF SW	SP SEP : on. Approx. 6dB attenuation of the AF input.
Q21	AF amplifier	AF output for VOX-4 (AF output = Main + Sub).
Q22, 23	DC SW	CW delay control signal sent to the control unit in the CW mode
Q24	DC SW	ACS SW : on. ACC terminal is turned short circuit.
Q25	AF buffer amplifier	Sub AF LED lighting circuit.
Q26	DC SW	Mute SW of the sub AF LED lighting circuit
Q27, 28	DC SW	Sub AF LED lighting circuit.
Q29	AF buffer amplifier	Main AF LED lighting circuit.
Q30	DC SW	Mute SW of the main AF LED lighting circuit
Q31, 32	DC SW	Main AF LED lighting circuit
Q33 ~ 35	NB IF amplifier	10.595MHz.
Q36	NB gate SW	
Q37	NB AGC amplifier	
Q48	1.2GHZ receive 3rd mixer	Main RX : 41.415MHz→10.695MHz. Sub RX : 41.315MHz→10.595MHz.
Q49	RF SW	Main 1.2GHz mode : on.
Q50	RF SW	Sub 1.2GHz mode : on
Q51	RF amplifier	30.72MHz.
Q52, 53	DC SW	Main IF blanking SW.
Q54	MAIN NB gat4e SW	Blanking : off.
Q55	NB buffer amplifier	
Q56	Receive IF amplifier	Main SSB, FM common IF 10.695MHz.
Q57	RF SW	SSB, CW mode : on.
Q58 ~ 60	Receive IF amplifier	SSB, CW IF amplifier 10.695MHz.
Q61	SQ gate	
Q62	RF buffer amplifier	AGC.
Q63	AGC amplifier	

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q64	DC SW	Main SSB, CW receive mode : "H".
Q65	DC SW	Transmit mode : on, mute to main RX IF.
Q66	DC SW	Processor SW is turn on : on. Increase gain of IC10 to 20dB.
Q67	AF amplifier	Processor control AF amplifier.
Q68	AF buffer amplifier	MIC amplifier output for FM mode.
Q69	MIC amplifier	SSB 2nd MIC amplifier.
Q70	RF SW	Receive mode : on.
Q71	DC SW	FM transmit mode : "H".
Q72	DC SW	Main SSB, CW receive mode : "H".
Q73	10.695MHz OSC	10.695MHz output from the crystal oscillator is modulated.
Q74	OSC buffer amplifier	
Q76	Transmit IF amplifier	All band common ALC (10.695MHz).
Q77	Transmit IF amplifier	144MHz and 430 ~ 450MHz transmitter output control, keying.
Q78	1.2GHz transmit 1st mixer	10.695MHz→41.415MHz, keying.
Q80	1.2GHz transmit IF amplifier	
Q81	DC SW	144MHz and 430 ~ 450MHz transmit mode : "H".
Q82	DC SW	1.2GHz transmit mode : apply to KEY + B voltage.
Q83	DC SW	144MHz and 430 ~ 450MHz transmit mode : apply to KEY + B voltage.
Q84	DC SW	Main 1.2GHz : on.
Q85	DC SW	SSB transmit mode : on. Reduce the transmitter output to approx. 2dB.
Q86	DC buffer amplifier	ALC meter circuit.
Q87	DC amplifier	ALC meter circuit.
Q88	DC SW	SSB transmit mode : TXB voltage is present and DC power supply for the ALC meter circuit.
Q89	DC SW	CONT terminal (ACC4) is "H" : on.
Q90	DC SW	CONT terminal (ACC4) is "H" : off. Stop to TIF output.
Q91	DC SW	SSB, CW transmit mode : "H".
Q92	DC SW	Main CW (main without CW mode) : ALT output is sent to control unit.
Q93	DC SW	Main CW mode : on.
Q94	DC SW	Main CW mode : off.
Q95	DC SW	Receive mode : on.
Q96	DC SW	Make the RXB voltage of IF unit.
Q97	DC SW	Make the RXB voltage of STBY circuit.
Q98	DC SW	TXB (9V) voltage in the 144 final unit : on (transmit mode).
Q99	DC SW	Make the transmit information of ext. interface.
Q100	DC SW	144MHz transmit mode : on.
Q101	DC SW	430MHz and 440MHz transmit mode : on.
Q102	DC SW	1.2GHz transmit mode : on.
Q103	DC SW	144MHz transmit mode : on, open collector.
Q104, 105	DC SW	430MHz and 440MHz transmit mode : on, open collector.
Q106, 107	DC SW	1.2GHz band : on.
Q108	DC SW	SSB and CW receive mode : "H".
Q109	DC SW	FM receive mode : "H".
Q110	1.2GHz KEY SW	1.2GHz keying circuit.
Q111	DC SW	1.2GHz TXG : off.
Q112	RF SW	Transmit mode : mute to main IF.
Q113	DC SW	Transmit with time delay : on, mute to main IF.
Q114	DC SW	Transmit mode : off.
Q115	MIC mute	MIC input : off when transmit to packet communication.
Q116	DC SW	FM mode : processor off.
Q117	SQ TIME CONST SW	FM mode : on, C580 is short-circuit.

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q118	SQ TIME CONST SW	FM mode : on, C581 is short-circuit.
Q119	Transmit SQ OFF	Transmit mode : main SQ output become compulsory off position.
Q120	DC SW	Mode select mode : main SQ output become compulsory off position.
Q121	DC SW	Mode select mode : sub SQ output become compulsory off position.
Q123	DC SW	TXB (9V) voltage in the 144 final unit : on (transmit mode).
Q124	Transmit RD mute	Tone signal to CTCSS unit : off (transmit mode : on).
D1	RF SW	Sub receive 1.2GHz : on.
D2	RF SW	Sub 144MHz and 430 ~ 450MHz receive mode : on.
D3	C36 discharge	
D4	Q5 (gate2) bias temp. compensation	
D5	RF SW	FM IF and SSB IF select.
D6	RF SW	SSB SQ SW is SSB mode : on.
D7, 8	SSB DET	
D9	AGC DET	
D10	C128 charge holding	
D11	DC SW	Main AF output muted.
D12	RF SW	FM IF and SSB SQ select.
D13	Noise RECT.	
D14, 15	Discriminat DET	
D16	SQ DC SW	
D17	5V zener diode	DC power supply (5V) for sub CTCSS unit.
D18	AF RECT.	Sub AF LED.
D19	AF RECT.	Main AF LED.
D20	DC SW	Sub AF output muted.
D21	NB DET	
D22	NB SW	Increase threshold level to Q36 base voltage.
D23	DC OR	Operates in OR : NB and sub RBK.
D24	FM IF limiter	
D25	DC SW	Transmit mode : main AF output muted.
D31	RF SW	1.2GHz receive selected : on.
D32	RF SW	1.2GHz receive select : main or sub.
D33	RF SW	1.2GHz receive mode : on.
D34	RF SW	1.2GHz transmit mode : on.
D35	RF SW	1.2GHz main receive mode : on.
D36	RF SW	1.2GHz sub receive mode : on.
D37	RF SW	144MHz and 430 ~ 450MHz main receive mode : on.
D38 ~ 40	Current reversal prevention	
D41	C313 discharge	
D42	RF SW	Main NB is active : on.
D43	DC SW	Main CWB + SSB.
D44	DC SW	Main CWB + SSB + CNB = SCNB.
D45	DC SW	Main CWB + SSB = SCB.
D46	DC SW	Main CWB + CNB.
D47	DC SW	14S + 43S + 12S = FET Q5 bias voltage (gate2).
D48	DC SW	14M + 43M + 12M = FET Q56 bias voltage (gate2).
D49	Q56(gate2) bias temp. compensation	
D50	DC SW	14M + 34M.
D51	RF SW	Main receive mode : on.
D52	DC SW	Main SCB + CNB.
D53, 54	SSB filter SW	Main SSB and CW mode : on.
D55, 56	CWN filter SW	Main CWN mode : on.

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
D57	RF SW	Main FM mode : on.
D58	RF SW	Main SSB and CW receive mode : on.
D59	RF SW	Main SSB and CW transmit mode : on.
D60	RF SW	Main SSB and CW squelch operate : on.
D61	RF ATT	Set to S1 with main SSB receive mode.
D62	RF SW	Main CAR transmit/receive select SW.
D63, 64	SSB DET	
D65	-6V zener diode	-6V AVR for DC-DC convertor.
D67	Current reversal prevention	
D68	AGC DET	
D69	RF SW	Main FM receive mode : on.
D70	RF SW	Main SSB and CW receive mode : on (SSB SQ).
D71	Current reversal prevention	Main transmit mode : SQ output become compulsory off position.
D72	Noise RECT.	
D73	Processor AF RECT.	
D74	5V zener diode	DC power supply for main CTCSS unit.
D75	DC SW	MIC amplifier is turned off when main CW and FM transmit mode.
D76	Current reversal prevention	CW transmit mode : unbalanced to balanced modulator.
D77	RF SW	Carrier signal input to balanced modulator.
D78	RF SW	Blanced modulator switching.
D79	RF SW	SSB and CW transmit mode : on.
D80	RF SW	Operate in FM transmit mode (10 695MHz). 10 695MHz output from the crystal oscillator is frequency modulated with a vari-cap diode.
D81	Vari-cap diode	FM modulation.
D82	DC SW	12M + 12S.
D83	RF SW	1.2GHz transmit mode : on.
D84	RF SW	144MHz and 430 ~ 450MHz transmit mode : on.
D85	RF SW	1.2GHz transmit mode : on.
D86	RF SW	144MHz and 430 ~ 450MHz transmit mode : on (CW keying switch).
D87, 88	Current reversal prevention	
D89	DC level shift	Transmitter output decrease when DC power supply is lower than normal voltage.
D90	Temperature compensation	ALC meter.
D91	Current reversal prevention	Ext. ALC.
D92, 93	Discriminat DET	Main ALT.
D94	DC SW	Main squelch switching.
D95	5V zener diode	5V AVR.
D96 ~ 98	Current reversal prevention	
D99	Spike-killer	
D100	Current reversal prevention	Ext. ALC.
D101	DC level shift	Ext. ALC.
D102, 103	Current reversal prevention	
D104	FM IF limiter	
D105	5V zener diode	5V AVR.
D106 ~ 108	Current reversal prevention	

DESCRIPTION OF COMPONENTS

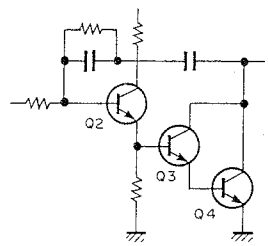
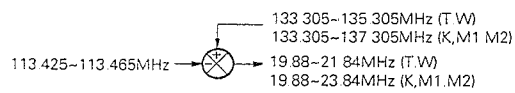
COLLECTION MODULE (X59-3480-00) : This PC board located in the IF unit

Component		Use/Function	Operation/Condition/Compatibility
(A1)	(A2)	**AFC (ALT)**	
IC1	IC101	DC amplifier	Amplifiered to ceramic discriminator output.
Q1	Q101	IF amplifier	Amplifiered to 455kHz signal.
(B1)	(B2)	**MODE (A)**	
IC21	IC121	Mode SW	FM, SSB and CW AF selectable with MODE (B) unit.
Q21	Q121	AF amplifier	Amplifiered FM detection output and sent a receive tone signal to CTCSS unit.
Q22	Q122	DC SW	Connect the HPF of CTCSS unit to FM AF line when CTCSS is turned on.
(C1)	(C2)	**MODE (B)**	
IC41	IC141	AF amplifier	AF output of SSB, CW and FM mode.
Q41	Q141	DC SW	Detected to tone in the CTCSS unit : on.
Q42	Q142	DC SW	CTCSS on : on.
(D1)	(D2)	**S METER**	
Q61	Q161	RF amplifier	455kHz FM S-meter.
Q62	Q162	RF amplifier	455kHz FM S-meter.
Q63	Q163	DC amplifier	SSB and CW S-meter.
Q64	Q164	DC amplifier	SSB and CW S-meter.
(E1)	(E2)	**SQL CONTROL**	
Q81	Q181	SQL DC SW	SQL opened : on. Q81 and Q181 (1/2) : SQL control for packet communication.
Q82	Q182	DC SW and delay	SQL opened : on. Given delay time to closing tail in the CW and SSB mode.
Q83	Q183	DC SW	SQL opened : send a "H" level to SQG terminal. Then, BC terminal is short-circuit.
Q84	Q184	BSY LED SW	SQL opened : "H". Then, LED will lights.
D81	D181	Current reversal prevention	
D82	D192	Current reversal prevention	
(F)		**ALC**	
IC201		ALC amp. and RF meter buffer amp.	Make a ALC and RF meter voltage.
Q201		DC buffer amplifier	RF meter.
D201		Curreent reversal prevention	
D202		D201 temperature compensation	
(G)		**STBY (A)**	
Q221		KYB SW	Supplied to keying voltage woth time constant when CW key is down.
Q222		DC SW	CW mode : off.
Q223		DC SW	CW mode : on.
Q224		KEY SW	CW mode : on, require to transmitter with KEY.
Q225		CKY SW	Detected that CW plug insert to KEY jack.
Q226		CKY SW	KEY down in the CW mode : on, information to CPUs (Semi break-in transmit).
Q227, 228		STBY SW	PTT and SS terminals : short-circuit, transmit information to CPU.
D221, 222		Current reversal prevention	
(H)		**STBY (B)**	
Q241		AF amplifier	Amplifiered to ext. modulation when operates in packet communication.
Q242		PTT, SS SW	PTT and SS transmit mode : on.
Q243		Packet communication SW	Packet communication transmit mode : on.
Q224		DC SW	PTT and packet communication transmit mode : on, canceled to MIC stop circuit.
(J)		**SP SEP**	
IC261		Logic IC	Detected that EXT. M and EXT. S plug insert to EXT. jack.
IC262		Analog SW	Switched AF output between main and sub from signal of IC261.
Q261		DC SW	SEP signal level shift.
D261, 262		Current reversal prevention	
(K)		**SIDE TONE**	
Q281		AF OSC	
D281		OSC SW	
D282		Current reversal prevention	
D283		Temperature compensation	

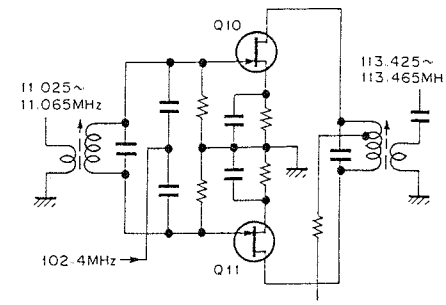
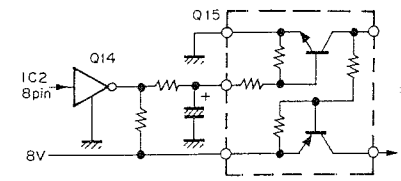
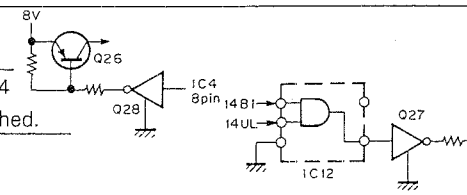
DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
(L)	**AGC AMP**	
IC301	AGC amplifier	Operate in the SSB or CW mode.
(M)	**BAND SW**	
Q321	DC SW	1.2GHz main band : on.
Q322	DC SW	On : apply to TXB voltage.
Q323	DC SW	Receive mode : on.
Q324	DC SW	1.2GHz main receive mode : "H".
Q325	DC SW	Q324 on or 1.2GHz sub band : on,
Q326	DC SW	Q325 on : "H" (band RXB).
D321	Current reversal prevention	
(N)	**FM MIC AMP**	
IC341	Limiter LPF	FM modulation.

PLL UNIT (X50-3080-00) (A/2) : 144MHz

Component	Use/Function	Operation/Condition/Compatibility
IC1	Mixer	2 : input 10.24MHz, 5 : input 785 ~ 825kHz, 1 : output 11.025 ~ 11.065MHz
IC2	A loop PLL IC	7 : VCO input main : 133.305 ~ 135.305MHz (**T, W**), 133.305 ~ 137.305MHz (**K, M1, M2**), sub : 133.405 ~ 135.405MHz (**T, W**), 133.405 ~ 135.405MHz (**K, M1, M2**) 5 : Reference input 10.24MHz
IC3	Frequency 1/100 divider	4 : input 78.5 ~ 82.5MHz, 8 : output 785 ~ 825kHz
IC4	B loop PLL IC	7 : VCO input 78.5 ~ 82.5MHz, 5 : reference input 10.24MHz
IC5	Mixer	2 : input 10.24MHz, 5 : input : 452 ~ 458kHz, 1 : output 10.592 ~ 10.598MHz
IC6	Frequency 1/100 divider	4 : input 35.2 ~ 35.8MHz, 8 : output 352 ~ 358kHz
IC7	PLL IC	7 : VCO input 35.2 ~ 35.8MHz, 5 : reference input 10.24MHz
IC8	Mixer	2 : input 10.24MHz, 5 : input 452 ~ 458kHz, 1 : output 10.692 ~ 10.698MHz
IC9	Frequency 1/100 divider	4 : input 45.2 ~ 45.8MHz, 8 : output 452 ~ 458kHz
IC10	PLL IC	7 : VCO input 45.2 ~ 45.8MHz, 5 : reference input 10.24MHz
IC11	5V AVR	Input 8V, output 5V.
IC12	UNLOCK SW	
Q1	RF amplifier	Main : 133.305 ~ 135.305MHz (**T, W**), 133.305 ~ 137.305MHz (**K, M1, M2**) Sub : 133.405 ~ 135.405MHz (**T, W**), 133.405 ~ 137.405MHz (**K, M1, M2**)
Q2 ~ 4	PLL lowpass filter	
Q5	Amplifier	133.305 ~ 137.305MHz
Q6	Mixer	
Q7, 8	Amplifier	19.88 ~ 23.84MHz

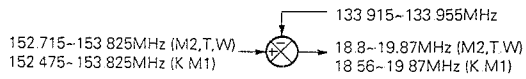
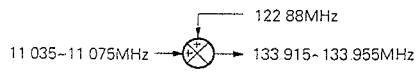
DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q9, 10	Balanced mixer	
Q11	Amplifier	11.05MHz
Q12	5 frequency multiplication	10.24 x 5 = 51.2MHz
Q13	2 frequency multiplication	51.2 x 2 = 102.4MHz
Q14, 15	UNLOCK SW	DC voltage of Q1 stopped When PLL is unlocked. 
Q16	Amplifier	Sub CAR : 10.592 ~ 10.598MHz
Q17	Amplifier	Main CAR : 10.692 ~ 10.698MHz
Q18 ~ 24	Buffer amplifier	10.24MHz buffer amplifier.
Q25	3 frequency multiplication	10.24 x 3 = 30.72MHz
Q26	UNLOCK SW	DC voltage of Q5 ~ 12 stopped when Q28 switched. 
Q27	UNLOCK SW	DC voltage of vari-cap diodes D2 ~ 4 stopped when IC12 and Q27 switched.
Q28	UNLOCK SW	Switched IC4 unlock voltage.
D2 ~ 4	Vari-cap diode	
D5	B loop VCO	
D6	SUB CAR VCO	
D7	MAIN CAR VCO	

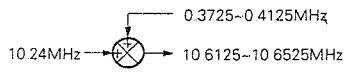
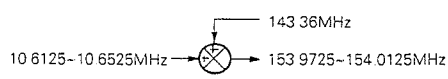
PLL UNIT (X50-3080-00) (B/2) : 430MHz

Component	Use/Function	Operation/Condition/Compatibility
IC50	A loop PLL IC	7 : VCO input 354.075 ~ 364.075MHz (**M2, T, W**), 354.075 ~ 374.075MHz (**K, M1**) 5 : Reference input 10.24MHz
IC51	C loop PLL IC	7 : VCO input 152.715 ~ 153.825MHz (**M2, T, W**), 152.475 ~ 153.825MHz (**K, M1**) 5 : reference input 10.24MHz
IC52	Mixer	2 : input 10.24MHz, 5 : input 795 ~ 835kHz, 1 : output 11.035 ~ 11.075MHz
IC53	Frequency 1/100 divider	4 : input 79.5 ~ 83.5MHz, 8 : output 795 ~ 835kHz
IC54	B loop PLL IC	7 : VCO input 79.5 ~ 83.5MHz, 5 : reference input 10.24MHz
IC55	D loop PLL IC	7 : VCO input (main) 65.23MHz, (sub) 65.33MHz, 5 : reference input 10.24MHz
Q50	RF amplifier	354.075 ~ 364.075MHz (**M2, T, W**), 354.075 ~ 374.075MHz (**K, M1**)
Q51	RF amplifier	
Q52	RF amplifier	
Q53, 54	RF amplifier	200.96 ~ 221.44MHz
Q55 ~ 57	PLL lowpass filter	Converted to DC voltage from PD output (pulse) in the A loop PLL IC.

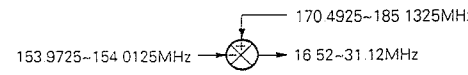
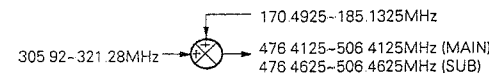
DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q58, 59	PLL UNLOCK SW (A loop)	Q50 voltage stopped when PLL is unlocked.
Q60, 61	RF amplifier	
Q62	Mixer	
Q63, 64	RF amplifier	18.56 ~ 19.7MHz
Q65	RF amplifier	11.035 ~ 11.075MHz
Q66, 67	Mixer	
Q68	4 frequency multiplication	10.24 x 4 = 40.96MHz
Q69	3 frequency multiplication	40.96 x 3 = 122.88MHz
Q70	RF amplifier	HET (main) 65.23MHz, (sub) 65.33MHz
Q71 ~ 73	Buffer amplifier	10.24MHz
Q74, 75	PLL UNLOCK SW (D loop)	Voltage of VCO and etc. stopped when D loop PLL is unlocked.
Q76	Buffer amplifier	Main : 65.23MHz, sub : 65.33MHz
D50		
D51	Mixer	
D52		
D53	B loop VCO	

PLL UNIT : Z1 (X51-3090-21) (1.2GHz)

Component	Use/Function	Operation/Condition/Compatibility
IC1	B loop PLL IC	B loop VCO 37.25 ~ 41.25MHz
IC2	Frequency 1/100 divider	B loop VCO (37.25 ~ 41.25MHz) divided 1/100 : 0.3725 ~ 0.4125MHz
IC3	Mixer	
IC4	A loop PLL IC	A loop VCO 170.4925 ~ 185.1325MHz
IC5	C loop PLL IC	Pulse swallow counter with IC6.
IC6	C loop pre-scalor	Pulse swallow counter with IC5.
IC7	5V AVR	AVR input : 8V, output : 5V.
Q1	10.24MHz buffer amplifier	Amplifiered 10.24MHz TCXO to enough level in the PLL unit.
Q3	10.24MHz 2 frequency multiplication	10.24MHz x 2 = 20.48MHz
Q4	20.48MHz 7 frequency multiplication	20.48MHz x 7 = 143.36MHz
Q5	143.36MHz buffer amplifier	
Q6	20.48MHz 4 frequency multiplication	20.48MHz x 4 = 81.92MHz
Q7	81.92MHz buffer amplifier	Amplifiered Q7 to enough level of 12HET in the PLL unit.
Q8	UNLOCK SW	Switched unlocked output in the B loop PLL IC (IC1).
Q9	10.24MHz buffer amplifier	Amplifiered that enough level to mixer IC (IC3).
Q10	10.6MHz buffer amplifier	Amplifiered that mixed output from IC3.
Q11, 12	Balanced mixer	
Q13 ~ 15	A loop PLL IF amplifier	Amplifiered PLL IF 16.52 ~ 31.12MHz in the A loop.

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q16 ~ 18	A loop PLL LPF	Changed to DC voltage from PD output in the A loop PLL IC (IC4).
Q19	A loop PLL IF mixer	
Q20	A loop VCO buffer amplifier	Amplifiered A loop VCO output 170.4925 ~ 185.1325MHz
Q21	UNLOCK SW	Stopped voltage of Q20 when PLL is unlocked.
Q22	A loop PLL UNLOCK SW	Switched unlock output when A loop PLL is unlocked.
Q23, 24	C loop PLL UNLOCK SW	Switched unlock output when C loop PLL is unlocked.
Q25 ~ 27	C loop PLL LPF	Changed to DC voltage from PD output in the C loop PLL IC (IC5).
Q28, 29	C loop VCO buffer amplifier	Amplifiered C loop VCO output 305.92 ~ 321.28MHz
Q30 ~ 32	12HET RF amplifier	Main : 476.4125 ~ 506.4125MHz Sub : 476.4625 ~ 506. 4625MHz
Q33	1.2GHz 8V SW	Stopped 8V DC supply when B loop PLL is unlocked.
D1	B loop VCO vari-cap diode	Oscillated DC voltage to vari-cap diode in the B loop LPF.
D2	Mixer	
D3		

CONTROL UNIT (X53-3120-XX) -11 : K -21 : M1 -22 : M2 -61 : T, W

Component	Use/Function	Operation/Condition/Compatibility
IC1	CPU	
IC2	ROM	
IC3	RAM	
IC4	Address latch	
IC5	Address decode	
IC6, 7	Expande I/O	
IC8	Solenoide drive	
IC9	DC power supply reset	
IC10	Serial buffer	
IC11, 12	Encoder pluse interface	
IC13	Encoder pluse interface	
IC14		
IC15, 16	Encoder pluse interface	
Q1	RAM back-up control	
Q2, 3	Solenoide pluse control	
Q4	900MHz signal switching	
Q5	360MHz signal switching	
Q6	14S band signal switching	
Q7	14M band signal switching	
Q8	43S band signal switching	
Q9	43M band signal switching	
Q10	12S band signal switching	
Q11	12M band signal switching	
Q12	MAIN CWN + B mode signal switching	
Q13	MAIN CW + B mode signal switching	

DESCRIPTION OF COMPONENTS

Component	Use/Function	Operation/Condition/Compatibility
Q14	MAIN SSB + B mode signal switching	
Q15	MAIN FM + B mode signal switching	
Q16	SUB FM + B mode signal switching	
Q17	SUB CW + B mode signal switching	
Q18	ATV input buffer amplifier	
D1	Reset pulse electric capacitor discharge	
D2 ~ 5	Encoder pulse interface	
D6	Encoder pulse interface (50 slit)	
D7	Solenoide upper voltage limiter	
D12. 13	Back-up voltage select	
D14	MU terminal protection	
D15	MD terminal protection	
D21 ~ 24	Distination diode	
D29, 30	Distination diode	

SEMICONDUCTOR DATA

Ceramic filter : L72-0367-05 (144, 430MHzz PLL unit CF1, 2, 50, 51)

• Electrical characteristics

Item	Rating
Center frequency (fo)	Within 11.050MHz ± 50kHz
3dB attenuation bandwidth	Within 150 ± 40kHz
20dB attenuation bandwidth	380kHz or less
Insertion loss	8.0dB or less $20 \log \left(\frac{E1}{2 \quad E2} \right)$
Ripple	1.0dB or less
Spurious attenuation	38dB or more at 9 to 12MHz
Input and output impedance	330Ω

Ceramic filter : L72-0368-05 (144, 430MHzz PLL unit CF3)

• Electrical characteristics

Item	Rating
Center frequency (fo)	Within 10.595MHz ± 50kHz
3dB attenuation bandwidth	Within 150 ± 40kHz
20dB attenuation bandwidth	380kHz or less
Insertion loss	8.0dB or less $20 \log \left(\frac{E1}{2 \quad E2} \right)$
Ripple	1.0dB or less
Spurious attenuation	38dB or more at 9 to 12MHz
Input and output impedance	330Ω

Ceramic filter : L72-0369-05 (144, 430MHzz PLL unit CF4)

• Electrical characteristics

Item	Rating
Center frequency (fo)	Within 10.700MHz ± 50kHz
3dB attenuation bandwidth	Within 150 ± 40kHz
20dB attenuation bandwidth	380kHz or less
Insertion loss	8.0dB or less $20 \log \left(\frac{E1}{2 \quad E2} \right)$
Ripple	1.0dB or less
Spurious attenuation	38dB or more at 9 to 12MHz
Input and output impedance	330Ω

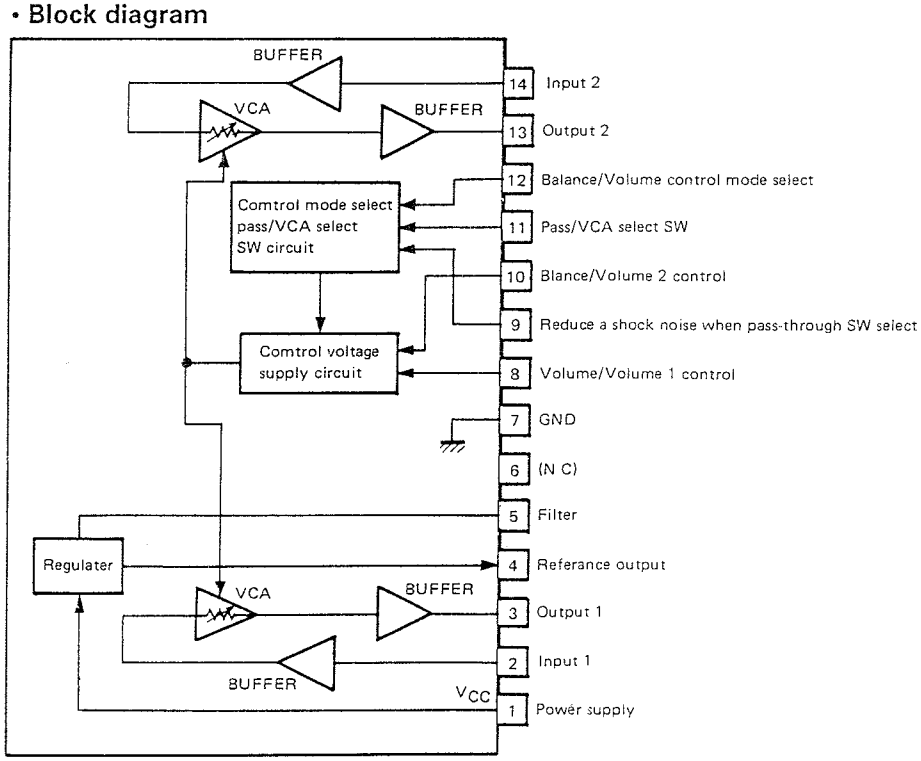
CW crystal filter : L71-0283-15 (IF unit XF7)

• Electrical characteristics

Item	Rating
Nominal center frequency	10.695MHz
Center frequency declination	Within ±80Hz at 6dB and 25°C
6dB pass bandwidth	500Hz or more
Insertion loss	Within 5dB ± 2dB
I/O terminating impedance	1200Ω/6pF
Temperature	−10°C ~ +50°C

2 channel AF volume : M51131L (IF unit IC2)

• Block diagram



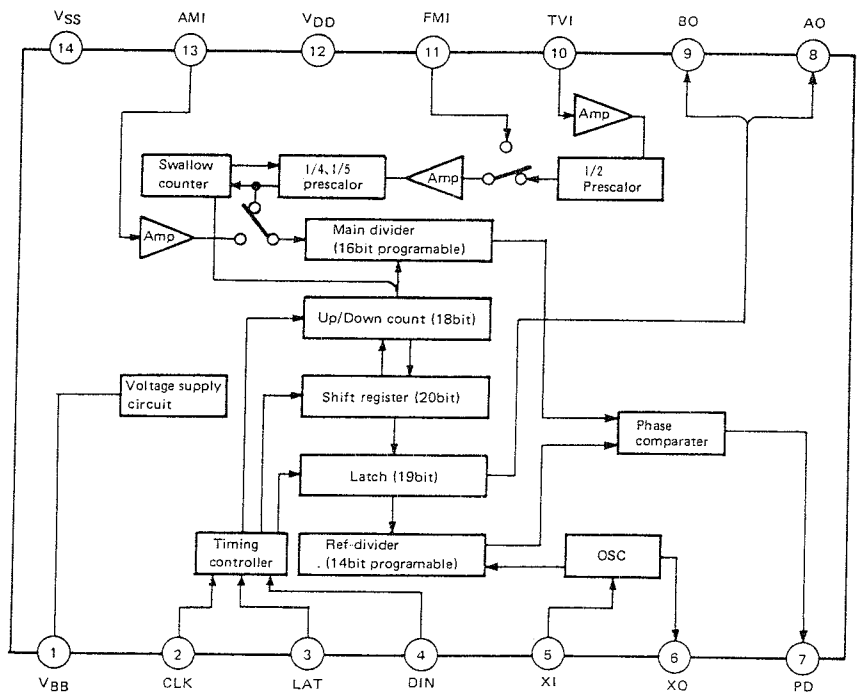
SEMICONDUCTOR DATA

PLL IC : CX-7925B or CX-7925B-1 (144, 430MHz PLL unit IC2,4,7,10,50,51,54,55 / 1.2GHz PLL unit IC1,4)

• Description of terminals

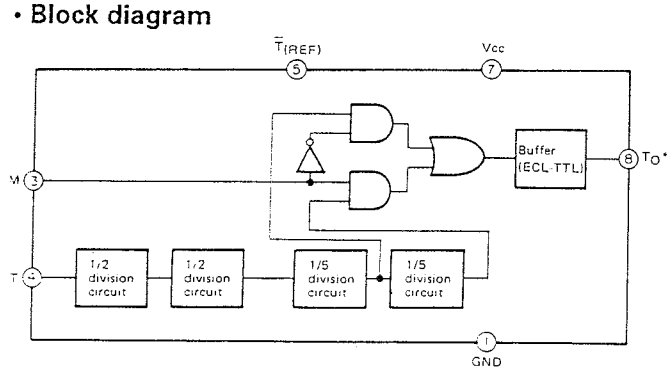
No.	Symbol	Description
1	V_{BB}	PC board terminal (connect the 0.01µF capacitor to shortcircuit (GND)).
2	CLK	Clock input terminal of the 20 bit series input.
3	LAT	Latch signal input terminal of the shift register input and UP/DOWN clock input terminal.
4	DIN	Data input terminal and UP/DOWN mode select terminal ("H" : UP, "L" : DOWN).
5	XI	Reference signal oscillator (X'tal) connection terminals (Max 13MHz, Typ 4MHz).
6	XO	
7	PD	Phase comparator output terminal.
8	AO	External control signal output terminal/UNLOCK output terminal (E/E MOS push-pull).
9	BO	External control signal output terminal/data check terminal (E/E MOS push-pull).
10	TVI	RF signal input terminal (Max. 300MHz or 350MHz), installed 1/2 prescalor.
11	FMI	RF signal input terminal (Max. 150MHz or 180MHz).
12	V_{DD}	Power supply terminal (+5V).
13	AMI	RF signal input terminal (Max. 40MHz or 50MHz).
14	V_{SS}	GND terminal.

• Block diagram



1/100 divider : M54459L (144, 430MHz PLL unit IC3,6,9,53 / 1.2GHz PLL unit IC2)

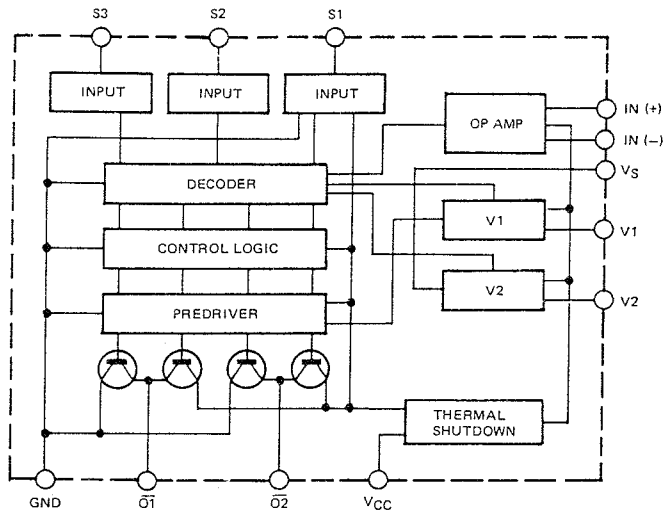
• Block diagram



SEMICONDUCTOR DATA

Solenoid drive : M54648L-D (Control unit IC8)

• Block diagram

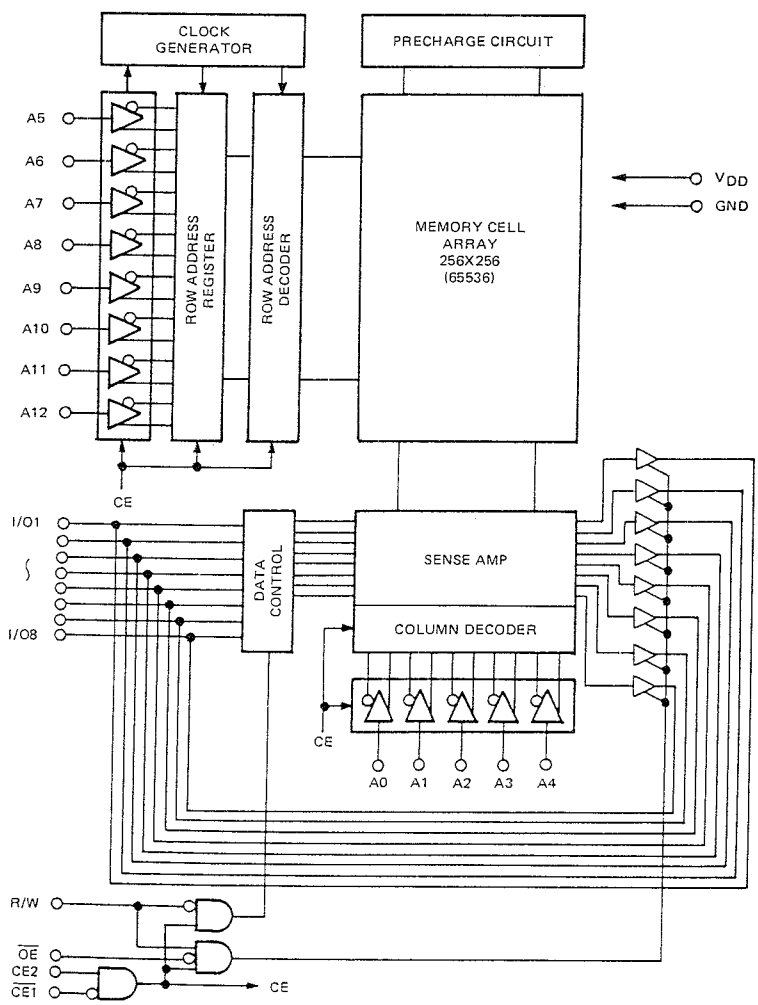


• Truth table

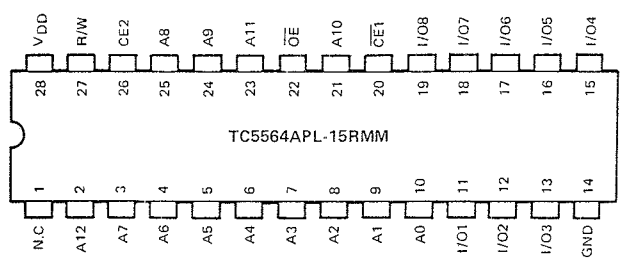
Input			Output		Vcc select circuit	Mode
L	L	L	"OFF" state	"OFF" state	—	STOP
L	L	H	H	L	Ope-amp. output	PLAY (+)
L	H	L	L	H	Ope-amp. output	PLAY(–)
L	H	H	H	L	V2	FF (2)
H	L	L	L	H	V2	REW (2)
H	L	H	H	L	V1	FF (1)
H	H	L	L	H	V1	REW (1)
H	H	H	L	L	VS	BRAKE

RAM : TC5564APL-15 (Control unit IC3)

• Block diagram



• Terminal connection



• Operation mode

Operation mode	CE1	CE2	OE	R/W	I/O1 ~ I/O8	Power
Read	L	H	L	H	D OUT	IDDO
Write	L	H	*	L	D IN	IDDO
Output disable	*	*	H	*	High-Z	IDDO
Standby	H	*	*	*	High-Z	IDDS
	*	L	*	*	High-Z	IDDS

• Description of terminals

Name	Description
A0 ~ A12	Address input
R/W	Read/write control input
OE	Output enable input
CE1, CE2	Chip enable input
I/O1 ~ I/O8	Data input/output
VDD	Power supply terminal (+5V)
GND	Ground
NC	Not used

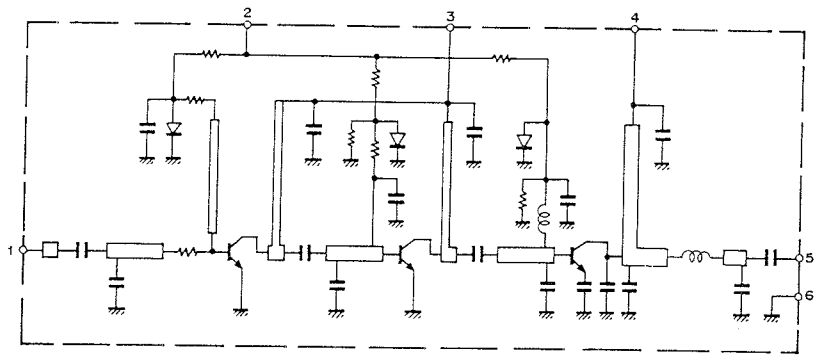
• Access time (MAX)

Item	Time
Access time	150ns
CE1 access time	150ns
CE2 access time	150ns
OE access time	70ns

SEMICONDUCTOR DATA

Power module : M57716 (430MHz final unit Q102)

• Equivalent circuit



1 : Input
2 : Pre-drive +B
3 : Base bias +B
4 : Final +B
5 : Output
6 : Fin (GND)

• Max rating (Tc = 25°C)

Item	Symbol	Rating	Unit
Operating voltage	VCC	17	V
Current consumption	ICC	6	A
Base bias voltage	VBB	10	V
Operating case temperature	Tc (op)	−30 ~ +110	°C
Storage temperature	Tstg	−40 ~ +110	°C

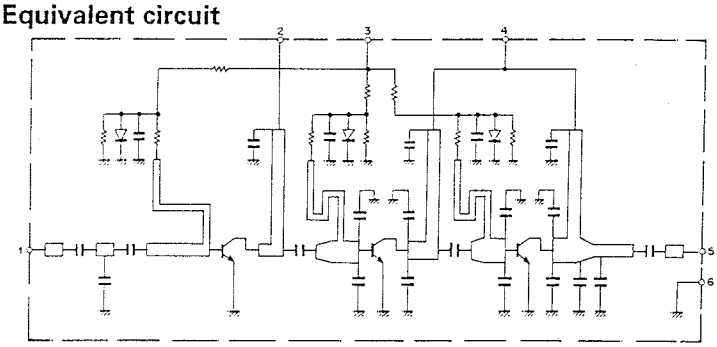
• Electrical characteristics (Tc = 25°C)

Item	Symbol	Condition	Rating			Unit
			MIN.	TYP.	MAX.	
Output power	Po	$V_{CC1} = V_{CC2}$ = 12.5V, V_{BB} = 9V,	18.5	19		W
Total efficiency	η_T	f = 430 ~ 440MHz, pin = 0.2W	40	42		%
Power gain linearity	Gp	$V_{CC1} = V_{CC2}$ = 12.5V, V_{BB} = 9V, f = 430 ~ 440MHz, pin = 10dBm	21			dB

SEMICONDUCTOR DATA

Power module : M57762 (1.2GHz final unit IC102)

• Equivalent circuit



1 : Input
2 : Pre-drive +B
3 : Base bias +B
4 : Final +B
5 : Output
6 : Fin (GND)

• Max rating (Tc = 25°C)

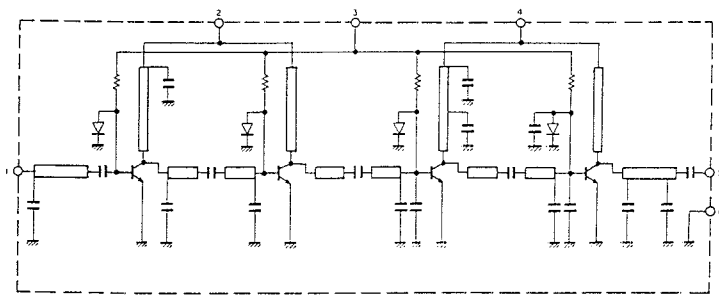
Item	Symbol	Condition	Rating	Unit
Operating voltage	Vcc		17	V
Base bias voltage	VBB		10	V
Current consumption	Icc		8	A
Input power	Pin	ZG = ZL = 50 Ω, Vcc = 12.5V, VBB = 9V	2	W
Output power	Po	ZG = ZL = 50Ω	25	W
Operating case temperature	Tc (op)		–30 ~ +110	°C
Storage temperature	Tstg		–40 ~ +110	°C

• Electrical characteristics (Tc = 25°C)

Item	Symbol	Condition	Rating			Unit
			MIN.	TYP.	MAX.	
Output power	Po	Vcc = 12.5V, VBB = 9V, f = 1.24 ~ 1.3GHz, Pin = 1W, ZG = ZL = 50Ω	18	20		W
Total efficiency	ηT		30	35		%
Base bias current	IBB				500	mA
2nd transmission spurious					–30	dB
Input SWR	pin				2.0	
Output SWR	pout			1.5		
Power gain linearity	Gp	Vcc = 12.5V, VBB = 9V, f = 1.24 ~ 1.3GHz, Pin = 10dBm, ZG = ZL = 50Ω	13			dB
3rd IMD		Vcc = 12.5V, VBB = 9V, f = 1.24 ~ 1.3GHz, Δf = 2kHz, Po ≤14W PEP, ZG = ZL = 50Ω			20	dB
5th IMD					–31	dB

Power module : M67715 (1.2GHz final unit IC101)

• Equivalent circuit



1 : Input
2 : Pre-drive +B
3 : Base bias +B
4 : Final +B
5 : Output
6 : Fin (GND)

• Max rating (Tc = 25°C)

Item	Symbol	Condition	Rating	
Operating voltage	Vcc1		9	
Operating voltage	Vcc2		16	V
Base bias voltage	VBB		9	V
Current consumption	Icc		1.5	A
Input power	Pin	ZG = ZL = 50Ω	10	mW
Output power	Po		4	W
Operating case temperature	Tc (op)		–20 ~ +100	°C
Storage temperature	Tstg		–40 ~ +110	°C

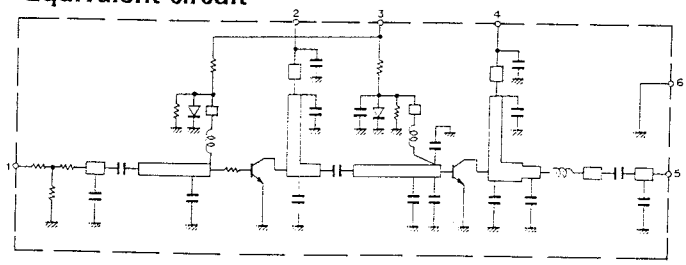
• Electrical characteristics (Tc = 25°C)

Item	Symbol	Condition	Rating			Unit
			MIN.	TYP.	MAX.	
Output power	Po	Vcc = 8V, VBB = 8V, f = 1.24 ~ 1.3GHz, Pin = 10mW, ZG = ZL = 50Ω	1.5	1.7		W
Total efficiency	ηT		23	25		%
2nd transmission spurious					–30	dB
3rd transmission spurious					–35	dB
Input SWR	pin				2.5	—
Output SWR	pout			1.5		—
Power gain linearity	GPT	Vcc = 8V, VBB = 8V, f = 1.24 ~ 1.3GHz, Pin = 0dBm, ZG = ZL = 50Ω	23	25		dB
3rd IMD	IMD3	Vcc = 8V, VBB = 8V, f = 1.24 ~ 1.3GHz, PEP ≤ 1.6W, ZG = ZL = 50Ω, Δf = 20kHz			–23	dB
5th IMD	IMD5				–30	dB

SEMICONDUCTOR DATA

Power module : M67727 (144MHz final unit Q101)

• Equivalent circuit



1 : Input
2 : Pre-drive +B
3 : Base bias +B
4 : Final +B
5 : Output
6 : Fin (GND)

• Max rating (Tc = 25°C)

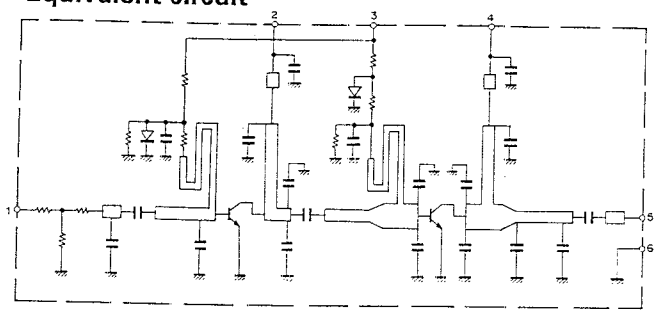
Item	Symbol	Condition	Rating	Unit
Operating voltage	Vcc		16	V
Base bias voltage	VBB		10	V
Current consumption	Icc		24	A
Input power	Pin	Vcc1 ≤ 12.5V, ZG = 50Ω	0.8	W
Output power	Pout	ZL = 50Ω	78	W
Operating case temperature	Tc (op)		−30 ~ +110	°C
Storage temperature	Tstg		−40 ~ +110	°C

• Electrical characteristics (Tc = 25°C)

Item	Symbol	Condition	Rating			Unit
			MIN.	TYP.	MAX.	
Output voltage	Po	Vcc = 12.5V, VBB = 9V, f = 144 ~ 148MHz, Pin = 0.5W, ZG = ZL = 50Ω	60	65		W
Total efficiency	ηT		50	55		%
2nd transmission spurious					−30	dB
3rd transmission spurious					−35	dB
Input SWR	ρin				2.8	
Output SWR	ρout			1.5		
3rd IMD	3rd. IMD	Vcc1 = Vcc2 = 12.5V, VBB = 9V, f = 144 ~ 148MHz		−27	−25	dB
5th IMD	5th. IMD	Po ≤ 45W PEP, Δf = 2kHz, ZG = ZL = 50Ω		−35	−31	dB
Power gain linearity	GPT	Vcc1 = Vcc2 = 12.5V, VBB = 9V, f = 144 ~ 148MHz, Pin = 10mW, ZG = ZL = 50Ω	21	23		dB

Power module : M67728 (430MHz final unit Q103)

• Equivalent circuit



1 : Input
2 : Pre-drive +B
3 : Base bias +B
4 : Final +B
5 : Output
6 : Fin (GND)

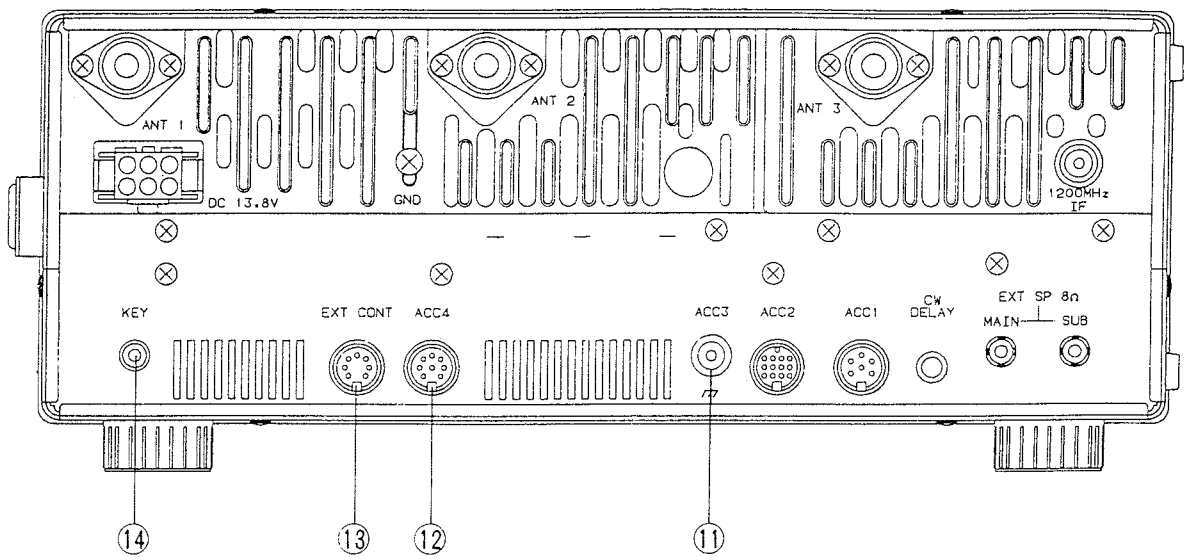
• Max rating (Tc = 25°C)

Item	Symbol	Condition	Rating	Unit
Operating voltage	Vcc		16	V
Base bias voltage	VBB		10	V
Current consumption	Icc		25	A
Input power	Pin	Vcc1 ≤ 12.5V, ZG = 50Ω	14	W
Output power	Pout	ZL = 50Ω	78	W
Operating case temperature	Tc (op)		−30 ~ +110	°C
Storage temperature	Tstg		−40 ~ +110	°C

• Electrical characteristics (Tc = 25°C)

Item	Symbol	Condition	Rating			Unit
			MIN.	TYP.	MAX.	
Output voltage	Po	Vcc = 12.5V, VBB = 9V, f = 430 ~ 450MHz, Pin = 10W, ZG = ZL = 50Ω	60	65		W
Total efficiency	ηT		40	45		%
2nd transmission spurious					−30	dB
3rd transmission spurious					−35	dB
Input SWR	ρin				2.8	
Output SWR	ρout			1.5		
3rd IMD	3rd. IMD	Vcc1 = Vcc2 = 12.5V, VBB = 9V, f = 430~ 450MHz		−27	−25	dB
5th IMD	5th. IMD	Po ≤ 45W PEP, Δf = 2kHz, ZG = ZL = 50Ω		−35	−31	dB
Power gain linearity	GPT	Vcc1 = Vcc2 = 12.5V, VBB = 9V, f = 430 ~ 450MHz, Pin = 100mW, ZG = ZL = 50Ω	7	9		dB

CONTROLS AND FUNCTIONS

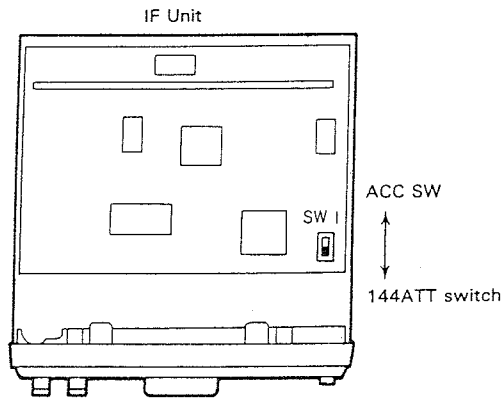


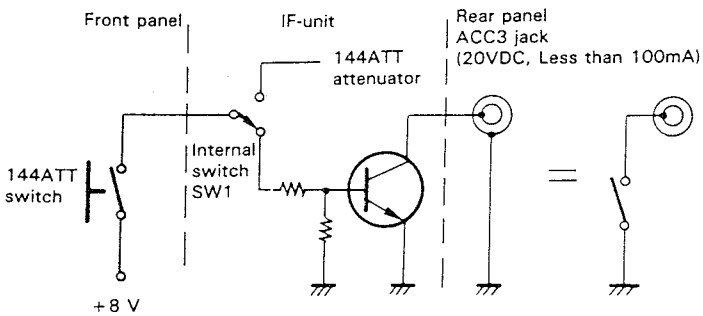
⑪ ACC 3 jack

The front-panel 144ATT switch can be used to control an external pre-amplifier for example when switch SW1 (IF unit X48-3050-XX) is placed to the rear as shown in the accompanying figure.

Cautions:

1. The 144ATT switch cannot be used to control internal receiver gain when the ACC3 jack is used.
2. The outer conductor of the jack is grounded.





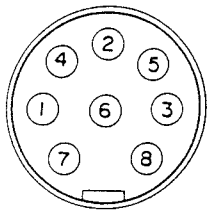
Caution:

Do not try to drive a relay directly.

CONTROLS AND FUNCTIONS

⑫ ACC4 connector

This connector can be used to control an Amateur TV terminal unit.



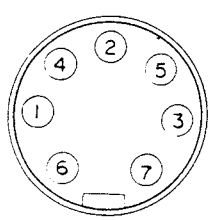
ACC4 View from the rear panel.

ACC4 pin assignments

Pin number	Symbol	Use
1	ALC	Output of internal ALC voltage.
2	GND	Ground.
3	N C	Unused.
4	CNT	When 5 to 12 V is applied to this terminal, the transmitter IF signal to the RF unit will be blocked.
5	N C	Unused.
6	12TXB	Voltage of about 8.8 V is output during transmission at 1200 MHz (maximum permissible output current 50 mA).
7	C B	The DC supply voltage applied to the power terminal will be available at this terminal via a choke coil and the power switch (maximum permissible output current 100 mA).
8	S S	External push to talk terminal transmission starts when grounded (voltage approximately 5 V).

⑬ EXT CONT connector

Used to control external devices like a linear amplifier. Use the 7-pin DIN plug provided.



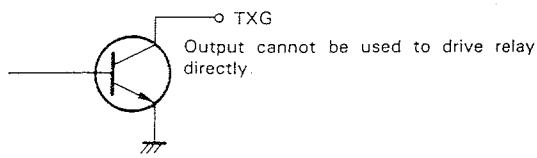
EXT CONT View from the rear panel.

EXT CONT pin assignments

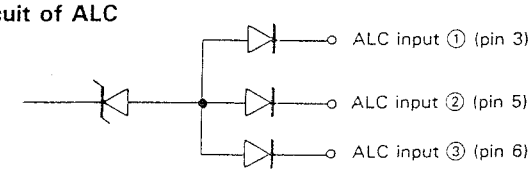
Pin number	Symbol	Use
1	43TXG	Grounded during transmission in 430 MHz band. Normally at high impedance. (Maximum permissible voltage 20 V, maximum permissible current 10 mA).
2	S S	External push to talk terminal transmission starts when grounded.
3	ALC	External ALC input ①. ALC threshold is about −6 V.
4	12TXG	Grounded during transmission in 1200 MHz band. Normally at high impedance. (Maximum permissible voltage 20 V, maximum permissible current 10 mA). (Optional in the TS-790A/790E).
5	ALC	External ALC input ②. ALC threshold is about −6 V.
6	14TXG	Grounded during transmission in 144 MHz band. Normally at high impedance. (Maximum permissible voltage 20 V, maximum permissible current 10 mA).
7	ALC	External ALC input ③. ALC threshold is about −6 V.

Reference information

- **Circuit of each TXG (pin numbers 1,4, and 6).**



- **Circuit of ALC**



⑭ KEY jack

Using shielded line, connect a 1/8″ phone plug to this jack for CW operation. Open-terminal voltage is approximately 5.5 VDC.

DATA COMMUNICATIONS

Packet communications will require the use of a terminal unit (available from your dealer).

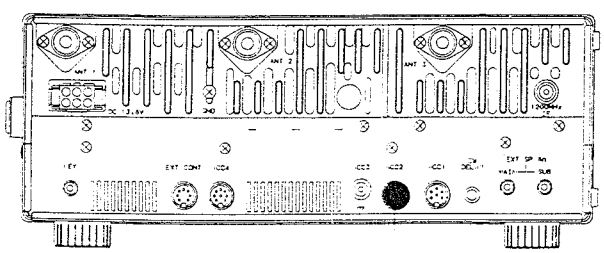
1. The Accessory 2 terminal has been provided for connection of Data communications devices. All necessary connections can be accomplished from the same connector.
2. When using AFSK (Audio Frequency Shift Keying) or modulating the signal with any form of audio tones you should select LSB or USB. If F2 operation is desired select the FM mode.
3. The transceiver will transmit according to the signals received on the STBY pin of the connector. These inputs are generated by the terminal unit in response to inputs from the associated terminal input device.
4. When using LSB, or USB the MIC gain control should be used to adjust the input level for an on scale ALC meter reading.
5. Various forms of data communication like AFSK, RTTY and PACKET are possible.

Cautions:

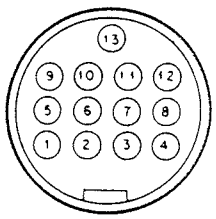
1. Do not transmit key down for a extended periods since damage to the unit might occur.
2. After continued transmission, allow the system to cool before retransmitting.

ACC2 pin assignments

Pin number	Symbol	Use
1	SAF	SUB receiver audio at a fixed level independent of AF control setting. Output voltage: 300 mV/47kΩ or more at high input level
2	ACC	Connected in parallel with ACC 3 pin jack.
3	MAF	MAIN receiver audio at a fixed level independent of AF control setting. Output voltage: 300 mV/47 kΩ or more at high input level.
4	GND	Ground of MAF. (Connect GND of MAIN audio output's shield cable).
5	MSQ	GND when MAIN squelch is open (MAIN BUSY indicator is lit). Open when MAIN squelch is closed (MAIN BUSY indicator is out). When connection is made to this terminal, you cannot send packets while squelch is open. In SSB-CW mode, reception signal will disappear and the squelch will take time to close.
6	MSM	MAIN S-meter output (parallel with device's S-meter). Reading of the internal S-meter will be incorrect if you terminate with an impedance of less than 10 kΩ.
7	SSQ	GND when SUB band squelch is open (SUB BUSY indicator is lit). Open when SUB squelch is closed (SUB BUSY indicator is out). Normally unused since MAIN channel is used for packet communication.
8	GND	Ground of SAF. (Connect GND of SUB audio output's shield cable).
9	PKS	Standby terminal exclusively for terminal units. When this terminal is used, the front panel microphone audio input will be muted automatically.
10	SSM	SUB S-meter output (analog voltage). Reading of the internal S-meter will be incorrect if you terminate with an impedance of less than 50 kΩ. Do not apply external voltage to this terminal.
11	PKD	Transmit audio input terminal (10 mV, 1 kHz) from terminal
12	GND	Ground of PKD. (Connect GND of data signal shield cable)
13	S S	PTT terminal. Transmission begins when grounded. Use Pin 4 or 8 as chassis GND.



ACC2 connector



View from the rear panel.

OPERATION WITH A PERSONAL COMPUTER

Control with a personal computer is possible with the optional IF-232C interface. For more information, refer to the manuals provided with the interface.

■ Function list

- AUTO INFORMATION ON/OFF setting
- BUSY signal readout
- CTCSS number selection and readout
- CTCSS ON/OFF selection and readout
- DESTINATION CODE selection and readout
- Same function as microphone UP/DOWN switch
- VFO A and VFO B frequency selection and readout
- VFO A and VFO B MEMORY CALL setting
- Model No. readout for transceiver recognization
- Display of transceiver current condition
- LOCK ON/OFF setting and display
- AUTO LOCK TUNE ON/OFF selection and readout
- Memory channel setting
- Mode setting
- Memory display
- MUTE ON/OFF selection and readout
- Memory entry
- OFFSET setting
- RIT frequency clearance
- RIT frequency UP/DOWN
- RIT ON/OFF setting
- RX: For receive operation, TX:For transmit operation
- Scan ON/OFF setting
- S-Meter signal output
- SPLIT ON/OFF setting
- STEP ON/OFF setting
- Sub-tone frequency setting
- TONE ON/OFF setting
- Generation of synthesized voice

TS-790A/E

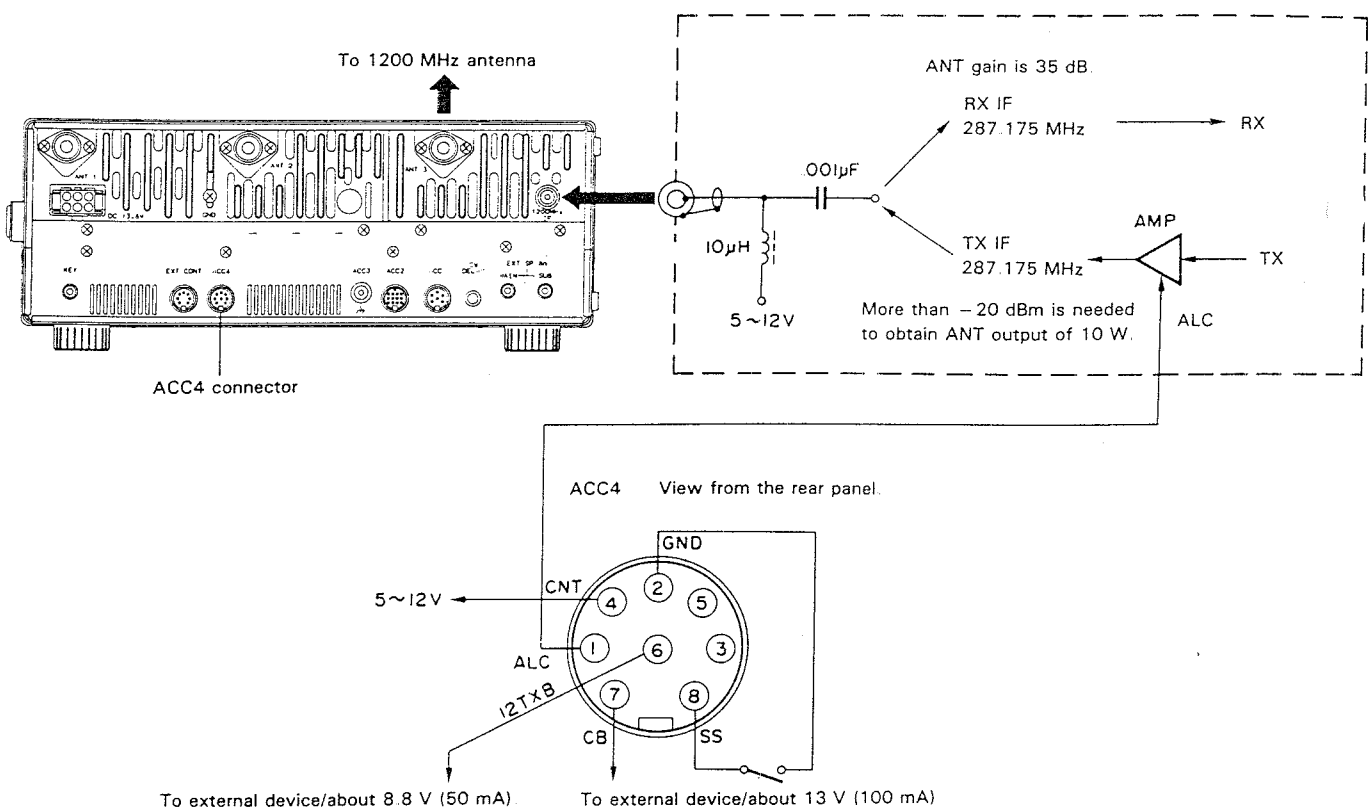
1200MHZ IF CONNECTOR AND ACC4 CONNECTOR

A 5 to 12VDC bias may be applied to the 1200 MHz IF connector, to allow a 1200 MHz IF signal to be used for transmission or reception.

1. Set the MAIN channel to the 1200 MHz band.
2. Apply 5 to 12 V to CNT terminal of the ACC4 connector.

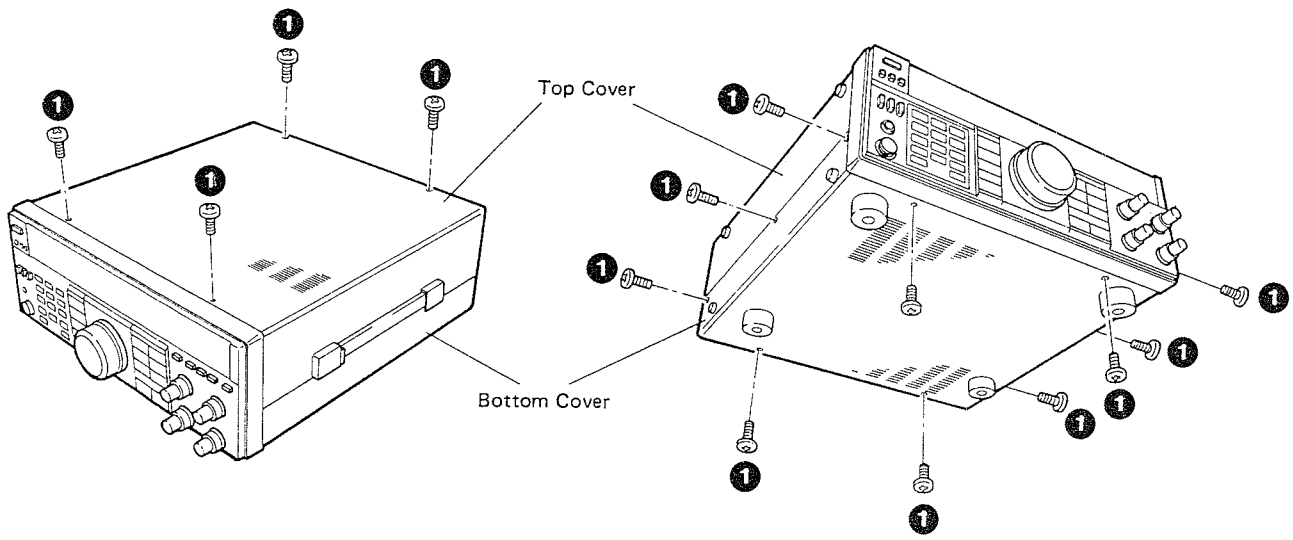
Cautions:

1. When voltage is applied to CNT, you cannot use the front panel microphone jack and internal speaker for transmission and reception.
2. Advanced skills and knowledge will be needed for this type of operation. Be very careful to make connections exactly as shown.

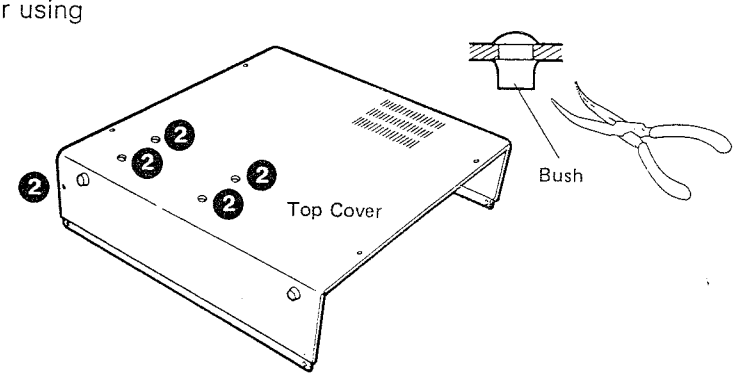


UT-10 (OPTION) INSTALLATION

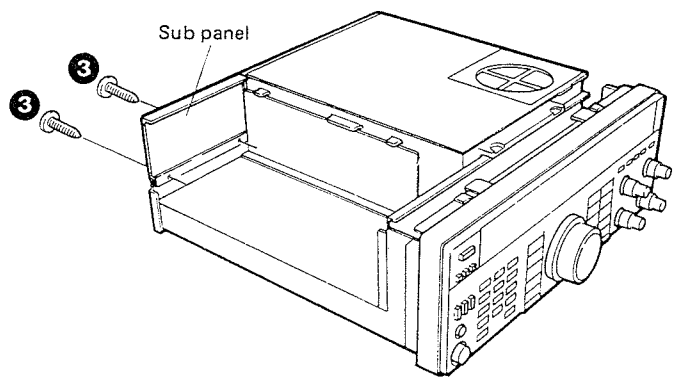
1. Remove the 14 screws holding the top cover and bottom cover (❶).



2. Remove the 5 bushings from the top cover using diagonal cutters (❷).

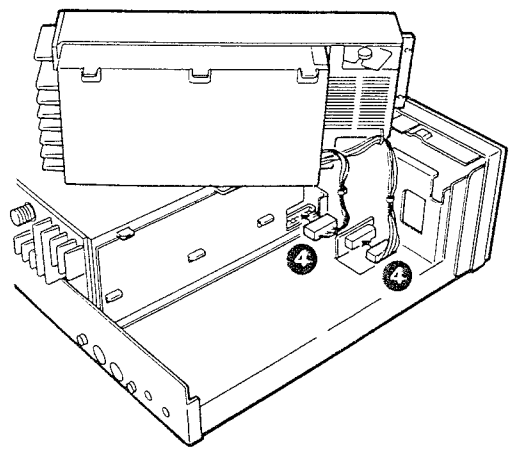


3. Remove the blind plate from the rear of the chassis (❸).
Keep the 2 screws removed for later use. They are not needed now.

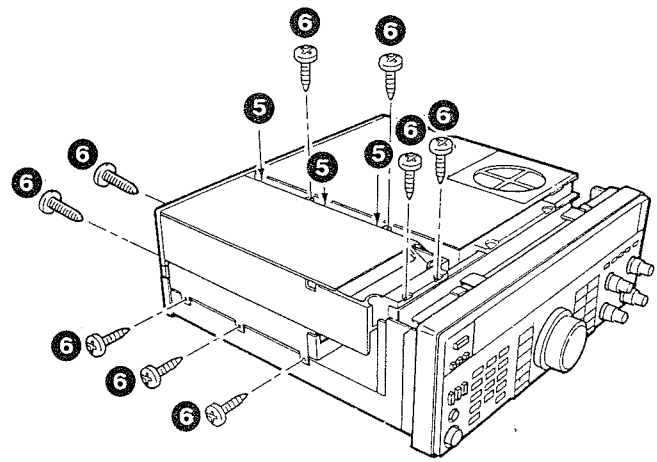


UT-10 (OPTION) INSTALLATION

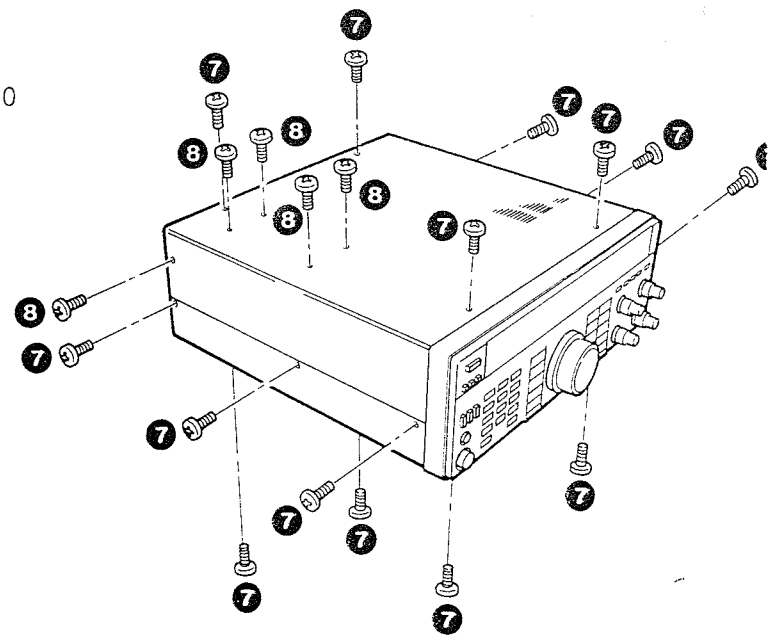
4. Attach the 18-pin connector and the 11-pin connector from the UT-10 (❹).



5. Place the UT-10 as shown in figure. Fasten it to the chassis with 3 screws (❺) and 9 self tapping screws (M3 x 8) (❻).



6. Replace the top and bottom covers (❼).
Use 5 pan head screws provided with the UT-10 (❽).



PARTS LIST

PRECAUTIONS ABOUT PARTS LIST

● On general purpose chip parts

From a part number, the resistance value and capacity value are omitted, and "XXX" is used instead. (Ex.: RD41DB2BXXXJ)
In this case, from the circuit diagram, the reference number and resistance value and capacitance value are read, and they are changed into a part number making use of the following table:

In addition, it should be noted that of those parts represented by serial reference numbers, some numbers may be unused
The unused numbers are listed on the circuit diagram.

● On resistance RD14BB

Of resistance RD14BB, any part number of less than 1/4W is omitted from the parts list.

● On symbols occurring on parts list

* : indicates new parts		⚠ : indicates safty critical components	
E : Europe	**K** : USA	**P** : Canada	**W** : Europe
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Resistor value	Capacitor value
22Ω = 2 2 0 Multiplier 2nd number 1st number	22pF = 2 2 0 Multiplier 2nd number 1st number
0.5Ω = 0R5	0.5pF = 0R5
1Ω = 010	1pF = 010
10Ω = 100	10pF = 100
100Ω = 101	100pF = 101
1000Ω = 1KΩ = 102	1000pF = 0.001μF = 102
10KΩ = 103	0.01μF = 103
100KΩ = 104	
1000KΩ = 1MΩ = 105	

Letter "R" is used for the decimal point. In this case, all become significant figures.

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				TS-790A/E		
1	1A	*	A01-1045-01	METALLIC CABINET(UP SIDE)		
2	3A	*	A01-1046-01	METALLIC CABINET(BOTTOM)		
3	3A	*	A10-1288-11	CHASSIS		
4	1C	*	A20-2636-03	PANEL	KM1M2	
4	1C	*	A20-2637-03	PANEL	TW	
5	3C	*	A22-0754-02	SUB PANEL		
6	2B	*	A23-1503-12	REAR PANEL		
7	2C	*	A33-0410-04	REFLECTOR (METER)		
8	1A,1B	*	A20-2671-02	PANEL ASSY	KM1M2	
8	1A,1B	*	A20-2672-02	PANEL ASSY	TW	
9	1D	*	B01-0663-02	PANEL ESCUTCHEON		
10	1D	*	B10-0700-03	FRONT GLASS		
11	1C		B11-0434-04	FILTER		
12	1D		B11-0436-04	FILTER(ON AIR,BUSY,F.LOCK,ALT)		
13	1D	*	B11-0458-04	FILTER(MAIN)		
14	1D	*	B11-0459-04	FILTER(SUB)		
15	1D	*	B11-0464-04	FILTER (MUTE)		
16	2C	*	B30-0817-15	LAMP (14V 80MA)		
18	2C	*	B31-0660-05	METER		
19	2D	*	B38-0305-15	LCD ASSY		
20	2B	*	B40-3773-14	MODEL NAME PLATE(TS-790A)	KM1M2	
20	2B	*	B40-3774-14	MODEL NAME PLATE(TS-790E)	TW	
21	1D	*	B42-3314-04	LABEL (CASE UP SIDE)		
23	1C	*	B43-1095-14	BADGE (TS-790A)	KM1M2	
23	1C	*	B43-1096-14	BADGE (TS-790E)	TW	
-			B30-0866-08	LAMP (12V 100MA) LCD		
-			B42-2454-04	LABEL (SERIAL NO CARTON BOX)		
-		*	B42-3316-04	LABEL (SUB RX DISPLAY)		
-			B42-3343-04	LABEL (SERIAL NO)		
-			B46-0410-20	WARRANTY CARD	K	
-			B46-0419-00	WARRANTY CARD	W	
-		*	B50-8254-00	INSTRUCTION MANUAL		
-		*	B50-8262-00	INSTRUCTION MANUAL		
			C91-1075-05	CERAMIC 470PF k		
			E07-0751-05	7P DIN PLUG		
			E07-0852-15	8P MEAL PLUG		
			E07-1351-05	13P PLUG		
			E30-2065-25	DC CORD ASSY		
25	2F		E04-0167-05	M TYPE RECEPTACLE(ANT)		
25	2F		E04-0170-05	N TYPE RECEPTACLE(ANT)	TW	
26	1F		E23-0015-04	GND LUG		
27	2F	*	E23-0616-04	GND LUG (ANT)		
-			E31-3303-05	CONNECTING WIRE(430HET)		
-		*	E31-3407-05	CONNECTING WIRE(IF-CONT)		
-		*	E31-3408-05	CONNECTING WIRE(IF-CONT)		
-		*	E31-3409-05	CONNECTING WIRE(CONT-PLL)		
-		*	E31-3410-15	CONNECTING WIRE(CONT-SW)		
-		*	E31-3411-05	CONNECTING WIRE(CONT-SW)		
-		*	E31-3412-05	CONNECTING WIRE(IF-SW)		
-		*	E31-3431-15	CONNECTING WIRE(FAN)		
-		*	E31-3433-05	CONNECTING WIRE(430HET2)		
-		*	E31-3453-05	CONNECTING WIRE(CROSS)	KM1M2	

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-		*	E31-3456-05	CONNECTING WIRE(GND LUG)		
-		*	E31-3487-05	CONNECTING WIRE(144MET)		
			F05-1531-05	FUSE (15A)		
			F05-2036-05	FUSE (20A)		
30	2E	*	F01-0956-11	HEAT SINK		
31	2E	*	F09-0420-05	FAN		
32	1F	*	F11-1079-12	SHIELDING COVER(FINAL)		
33	3F	*	F11-1080-02	SHIELDING COVER(RF)		
34	2B	*	F11-1081-03	SHIELDING COVER(PLL)		
35	1D	*	F15-0659-04	SHADE (FL)		
36	2B	*	F19-0655-03	BLIND PLATE (REAR PANEL)		
37	2F	*	F19-0709-05	HOLE BUSHING		
38	3D		F20-0559-14	INSULATING BOARD(VOLUME)		
39	3D		F20-0551-04	INSULATING BOARD(SUB PANEL)		
		*	G02-0584-04	FLAT SPRING (FINAL)		
			G11-0609-04	CUSHION		
			G13-0855-04	CUSHION (MIC)		
40	3F		G02-0574-04	FLAT SPRING (RF)		
41	2A	*	G02-0575-04	FLAT SPRING (CONT)		
42	1B		G10-0638-14	NON-WOVEN FABRIC(CASE UPSIDE)		
43	1A		G10-0656-04	FELT(SP)		
44	1A,3E	*	G10-0676-04	NON-WOVEN FABRIC(CASE SIDE)		
45	1D	*	G10-0677-04	NON-WOVEN FABRIC(ESCUTCHEON)		
46	3A		G13-0631-04	CUSHION (CASE BOTTOM)		
47	1B		G13-0648-04	CUSHION (VCO COVER)		
48	3A		G13-0840-04	CUSHION (CASE BOTTOM)		
49	1E,3F		G13-0847-04	CUSHION (FINAL,RF SHIELD)		
50	1C	*	G13-0859-04	CUSHION (14KEY)		
51	1D	*	G13-0860-04	CUSHION (MODE)		
52	1D	*	G13-0861-04	CUSHION (FUNCTION)		
53	1F	*	G13-0898-04	CUSHION (SP)		
54	1E,1F	*	G13-0902-04	CUSHION (FINAL SHIELD)		
55	2E	*	G13-0909-04	CUSHION (HEAT SHINK)		
56	3B		G13-0887-04	CUSHION (IF)		
-		*	H01-8142-14	ITEM CARTON BOX(TS-790A)	K,M1,M2	
-		*	H01-8143-14	ITEM CARTON BOX(TS-790E)	TW	
-			H03-2697-04	OUTER PACKING CASE(TS-790A)	K,M1,M2	
-			H03-2698-04	OUTER PACKING CASE(TS-790E)	TW	
-		*	H10-2637-01	POLYSTYRENE FOAMED FIX(FRONT)		
-		*	H10-2638-01	POLYSTYRENE FOAMED FIX(REAR)		
-		*	H13-0820-04	PROTECTION BOARD		
-			H20-1414-03	PROTECTION COVER		
-			H25-0029-04	PROTECTION BAG (FUSE)		
-			H25-0079-04	PROTECTION BAG (MIC)		
-			H25-0112-04	PROTECTION BAG (DC CORD)		
58	3B		J02-0049-14	FOOT (REAR)		
59	3A		J02-0423-04	FOOT (FRONT OUTSIDE)		
60	3A		J02-0424-04	FOOT (FRONT INSIDE)		
61	1A,3A		J02-0441-05	FOOT (SIDE)		
63	3C		J31-0141-04	COLLAR (MIC)		
64	2C		J32-0768-04	BOSS (POWER SW)		
65	3A		J32-0794-04	BOSS (VS-2)		
66	1A	*	J42-0454-05	HOLE BUSHING		

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67	2F		J50-0401-05	HINGE		
-			J13-0404-05	FUSE HOLDER		
-			J61-0307-05	WIRE BAND (RF)		
70	1B		K01-0407-05	HANDLE		
71	2C	*	K21-0784-02	KNOB MAIN		
72	1C	*	K27-3002-04	KNOB(BUTTON) OFFSET		
73	2C	*	K27-3003-04	KNOB(BUTTON) CTCSS	KM1M2	
73	2C	*	K27-3030-04	KNOB(BUTTON) ALERT	TW	
74	1C	*	K27-3004-04	KNOB(BUTTON) CALL		
75	1C	*	K27-3005-04	KNOB(BUTTON) TONE		
76	1C	*	K27-3006-04	KNOB(BUTTON) SAT		
77	2C	*	K27-3007-04	KNOB(BUTTON) STEP		
78	2C	*	K27-3008-04	KNOB(BUTTON) REV		
79	2C	*	K27-3009-04	KNOB(BUTTON) SPLIT		
80	2C	*	K27-3010-04	KNOB(BUTTON) SCAN		
81	2C	*	K27-3011-04	KNOB(BUTTON) M?V		
82	2C	*	K27-3012-04	KNOB(BUTTON) M. IN		
83	2C	*	K27-3013-04	KNOB(BUTTON) CLEAR		
84	2C	*	K27-3014-04	KNOB(BUTTON) F		
85	2C	*	K27-3015-04	KNOB(BUTTON) ENT		
86	2C	*	K27-3016-04	KNOB(BUTTON) FM/AUTO		
87	2C	*	K27-3017-04	KNOB(BUTTON) USB/LSB		
88	2C	*	K27-3018-04	KNOB(BUTTON) CW/N		
89	2C	*	K27-3019-04	KNOB(BUTTON) MAIN		
90	2C	*	K27-3020-04	KNOB(BUTTON) A/B		
91	2C	*	K27-3021-04	KNOB(BUTTON) A=B		
92	2C	*	K27-3022-04	KNOB(BUTTON) MAIN??SUB		
93	2C	*	K27-3023-04	KNOB(BUTTON) SUB		
94	2C	*	K27-3024-04	KNOB(BUTTON) VFO/M		
95	2C	*	K27-3025-04	KNOB(BUTTON) CH.Q,BAND,MHZ		
96	2C		K29-0757-04	KNOB POWER		
97	2C		K29-3001-14	KNOB VOICE,PROC,ALC		
98	2C		K29-3002-14	KNOB ATT,F.LOCK,ALT		
99	3D	*	K29-3108-04	KNOB MUTE,RIT,AGC,NB		
100	2C	*	K29-3109-14	KNOB AF,RIT,MIC		
101	2C	*	K29-3110-04	KNOB SQL,IF SHIFT,RF POW		
102	2F		N15-1040-46	FLAT WASHER (GND)		
103	1C		N19-0637-04	FLAT WASHER (MAIN KNOB)		
A	1E		N09-0626-04	SCREW POWER MODULE		
B	1E,1F		N09-0649-05	SCREW POWER MODULE		
C	3C		N09-0699-05	SCREW PANEL		
D	2F		N30-4014-41	PAN HEAD MACHINE SCREW(GND)		
E	2D		N32-2606-46	FLAT HEAD MACHINE SCR (SW PCB)		
F	2C		N32-3006-46	FLAT HEAD MACHINE SCREW(POWER)		
G	1A,3G		N33-3006-41	OVAL HEAD MACHINE SCREW(CASE)		
I	2E		N35-3008-46	BINDING HEAD MACHINE SCR(FAN)		
J	2A,3E		N87-2606-46	BRAZIER HEAD TAPTITE SCR(PCB)		
K	1F,2B		N87-3006-46	BRAZIER HEAD TAPTITE SCR(SHIEL		
L	2E,2F		N87-3008-46	BRAZIER HEAD TAPTITE SCR(ANT)		
M	3A,3B		N87-4010-46	BRAZIER HEAD TAPTITE SCR(FOOT)		
N	2F,3F		N88-3006-46	FLAT HEAD TAPTITE SCREW(HINGE)		
O	2B		N88-3008-46	FLAT HEAD TAPTITE SCR(REARPANE		
P	2C,3D		N35-3006-41	BINDING HEAD MACHINE SCREW(SUB		

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104	2C		S40-2437-15	PUSH SWITCH (PWER)		
-			S50-1406-05	TACT SWITCH		
105	1F		T07-0252-15	LOUD SPEAKER(FULL RANGE)		
-			T91-0352-15	MICROPHONE		
IC1			LC7582	IC(LCD DRIVER)		
TH001	2E		5TP41L	THERMISTER		
106	2D	*	W02-0801-05	ENCODER		
107	2C,3D	*	X41-3050-00	SWITCH UNIT		
108	3E,3F	*	X44-3060-00	RF UNIT	M2TW	
108	3E,3F	*	X44-3060-11	RF UNIT	KM1	
110	2F	*	X45-3160-00	144MHZ FINAL UNIT		
111	2E	*	X45-3170-00	430MHZ FINAL UNIT		
112	3B	*	X48-3050-11	IF UNIT	KM1M2	
112	3B	*	X48-3050-61	IF UNIT	TW	
113	2A,2B	*	X50-3080-00	PLL UNIT		
114	2A	*	X53-3120-11	CONTROL UNIT	K	
114	2A	*	X53-3120-21	CONTROL UNIT	M1	
114	2A	*	X53-3120-22	CONTROL UNIT	M2	
114	2A	*	X53-3120-61	CONTROL UNIT	TW	
SWITCH UNIT (X41-3050-00)						
D16 -18			B30-0856-05	LED (GREEN SF.BUSY)		
D19			B30-0855-05	LED (RED ON AIR)		
D20			B30-0856-05	LED (GREEN SF.LOCK)		
D21			B30-0857-05	LED (YELLOW ALT)		
D22		*	B30-0862-05	LED (GREEN MAIN)		
D23		*	B30-0863-05	LED (YELLOW SUB)		
D24 ,25		*	B30-0864-05	LED (RED/GREEN MUTE)		
C1 -8			CK73FB1H471K	CHIP C 470PF K		
C9 ,10			CC73FCH1H150J	CHIP C 15PF J		
C11 -14			CK73FB1HXXXK	CHIP C K		
C15 ,16			CK73FB1E103K	CHIP C 0.010UF K		
C17			CE04NW1C100M	ELECTRO 10UF 16WV		
C18			CK45F1H473Z	CERAMIC 0.047UF Z		
C19		*	CE04EW1H470M	ELECTRO 47UF 50WV		
C20			CK45F1H473Z	CERAMIC 0.047UF Z		
C21		*	CE04EW1E221M	ELECTRO 220UF 25WV		
C22 ,23			CK73FB1H102K	CHIP C 1000PF K		
C24 ,25			CK73FB1E103K	CHIP C 0.010UF K		
C26			CK45B1H222K	CERAMIC 2200PF K		
C27 -29			CK73FB1H102K	CHIP C 1000PF K		
CN1		*	E40-0817-05	PIN CONNECTOR (8P LCD ASSY)		
CN3		*	E40-5038-05	FPC CONNECTOR (14P SERIAL)		
CN4			E40-5131-05	FPC CONNECTOR (16P KEY.MIC)		
CN6 ,7			E40-3238-05	PIN CONNECTOR (EH3P MU.MD)		
CN8			E40-3243-05	PIN CONNECTOR (EH8P MIC.PWR)		
CN9		*	E40-3304-05	PIN CONNECTOR (EHS7P AF/SQL)		
CN10		*	E40-3253-05	PIN CONNECTOR (PH9P MIC)		
CN11			E40-3252-05	PIN CONNECTOR (PH8P PHONE)		
CN12		*	E40-5036-05	FPC CONNECTOR (12P SW)		
J1	2C	*	E11-0431-05	PHONE JACK (PHONES)		
J2	2C		E06-0858-15	8P METAL RECEPTACLE(MIC)		

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W6		*	E31-3422-05	CONNECTING WIRE(2P SUB GND)		
W7		*	E31-3423-05	CONNECTING WIRE(4P RIT. IFS)		
A2 ,3			G13-0862-04	CUSHION		
A7		*	G13-0903-04	CUSHION		
A4			J19-1427-03	HOLDER		
A5 ,6		*	J39-0431-04	SPACER		
L1			L40-1011-13	SMALL FIXED INDUCTOR (100UH)		
T1		*	L19-0366-05	BALUN TRANSFORMER (DC/DC)		
X1			L77-1333-05	CRYSTAL RESONATOR(4.194304MHZ)		
CP1			R90-0598-05	MULTI-COMP (10K-20K)		
R1 -7			RK73FB2AXXXJ	CHIP R J 1/10W		
R8			RD14BB2C680J	RD 68 J 1/6W		
R9 -11			RK73FB2AXXXJ	CHIP R J 1/10W		
R12			RD14BB2C680J	RD 68 J 1/6W		
R13 -34			RK73FB2AXXXJ	CHIP R J 1/10W		
R35 ,36			RD14BB2C2R2J	RD 2.2 J 1/6W		
R37			RD14BB2C223J	RD 22K J 1/6W		
R38 ,39		*	RD14CB2E101J	RD 100 J 1/4W		
R40 -64			RK73FB2AXXXJ	CHIP R J 1/10W		
R65		*	RS14DB2H470J	FL-PROOF RS 47 J 1/2W		
R66 -69			RK73FB2AXXXJ	CHIP R J 1/10W		
VR1 ,2	3D	*	R19-9412-05	POTENTIOMETER 50K,10K(AF/SQL)		
VR3	3D	*	R24-9407-05	POTENTIOMETER 10K,50K(MIC/PWR)		
VR4	3D	*	R19-3425-05	POTENTIOMETER (10K,B)		
VR5		*	R12-1085-05	TRIMMING POT.(2.2K) RIT		
VR6		*	R12-1083-05	TRIMMING POT.(1K) IF SHIFT		
S1			S40-2441-15	PUSH SWITCH (F.LOCK)		
S2			S40-2440-15	PUSH SWITCH (144ATT)		
S3 ,4			S40-2441-15	PUSH SWITCH (ALT,VOICE)		
S5 ,6			S40-2440-15	PUSH SWITCH (PROC,ALC/RF)		
S7 -9			S50-1412-05	SENSITIVE SW(OFFSET,TONE.CAL)		
S10 -12			S50-1426-05	SENSITIVE SW(AUTO,MAIN,SUB)		
S13 -15			S50-1412-05	SENSITIVE SW(SAT,CTCSS/ALERT		
S16 -18			S50-1426-05	SENSITIVE SW(LSB/USB,A/B,M??S)		
S19 -22			S50-1412-05	SENSITIVE SW(F,REV,SPLIT,SCAN)		
S23 -25			S50-1426-05	SENSITIVE SW(CW/N,VFO/M,A=B)		
S26 -28			S50-1412-05	SENSITIVE SW(M?V,M.IN,CLEAR)		
S29 -31			S50-1426-05	SENSITIVE SW(CH.Q,BAND,MHZ)		
S32			S50-1412-05	SENSITIVE SW(ENT)		
S33 -35			S40-2441-15	PUSH SW(MAIN/SUB MUTE,RIT)		
S36 ,37			S40-2440-15	PUSH SW(AGC,NB)		
A1		*	FIP14KM7	DISPLAY TUBE		
D1		*	RD9.1M-B2	CHIP ZENER DIODE		
D2		*	RD7.5M-B2	CHIP ZENER DIODE		
D4		*	RD43EB	CHIP ZENER DIODE		
D5		*	1SS81	CHIP DIODE		
D6		*	RD30EB2	CHIP ZENER DIODE		
D7		*	US1090	CHIP DIODE		
D8 -15			RLS73	CHIP DIODE		
IC1		*	75206G-531-1B	IC(MICROPROCESSOR)		
Q1		*	2SC3668(Y)	TRANSISTOR		
Q2 -7			DTA143EK	DIGITAL TRANSISTOR		

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RF UNIT (X44-3060-XX) -00 : TS-790A (M2), TS-790E -11 : TS-790 (K, M1)							
C1			CC73FRH1H120J	CHIP C	12PF J		
C2 -4			CC73FCH1HXXXJ	CHIP C	J		
C5			CC73FRH1H070D	CHIP C	7.0PF D		
C6 ,7			CK73FB1H102K	CHIP C	1000PF K		
C8			CC73FCH1H270J	CHIP C	27PF J		
C9			CC73FCH1H100D	CHIP C	10PF D		
C10			CC73FCH1H270J	CHIP C	27PF J		
C11 -13			CK73FB1H102K	CHIP C	1000PF K		
C14			CC73FCH1H100D	CHIP C	10PF D		
C15			CK73FB1H102K	CHIP C	1000PF K		
C16			CK73EB1E473K	CHIP C	0.047UF K		
C17 -20			CK73FB1H102K	CHIP C	1000PF K		
C21			CK73FB1E103K	CHIP C	0.010UF K		
C22		*	CC73FTH1H120J	CHIP C	12PF J		
C23			CC73FRH1H030C	CHIP C	3.0PF C		
C24 ,25			CK73FB1H102K	CHIP C	1000PF K		
C26 ,27			CC73FCH1HXXXC	CHIP C	C		
C28		*	CC73FTH1H120J	CHIP C	12PF J		
C29 -31			CC73FCH1HXXXC	CHIP C	C		
C32		*	CC73FTH1H120J	CHIP C	12PF J		
C33			CC73FCH1H010C	CHIP C	1.0PF C		
C34			CK73FB1H102K	CHIP C	1000PF K		
C35			CC73FCH1H270J	CHIP C	27PF J		
C36			CC73FCH1H030C	CHIP C	3.0PF C		
C37 ,38			CK73FB1E103K	CHIP C	0.010UF K		
C39		*	CC73FTH1H100D	CHIP C	10PF D		
C40			CC73FCH1H330J	CHIP C	33PF J		
C41 -44			CK73FB1E103K	CHIP C	0.010UF K		
C45 ,46			CK73FB1H102K	CHIP C	1000PF K		
C47 -49			CK73FB1E103K	CHIP C	0.010UF K		
C50 ,51			CC73FRH1H101J	CHIP C	100PF J		
C52 -54			CK73FB1E103K	CHIP C	0.010UF K		
C55		*	CC73FTH1H180J	CHIP C	18PF J		
C56			CK73FB1H102K	CHIP C	1000PF K		
C57			CC73FRH1H220J	CHIP C	22PF J		
C60			CC73FCH1H060D	CHIP C	6.0PF D		
C61			CC73FCH1H1R5C	CHIP C	1.5PF C		
C62		*	CC73FTH1H120J	CHIP C	12PF J		
C63 ,64			CC73FCH1H0R5C	CHIP C	0.5PF C		
C65		*	CC73FTH1H120J	CHIP C	12PF J		
C66 -68			CC73FCH1HXXXC	CHIP C	C		
C69		*	CC73FTH1H120J	CHIP C	12PF J		
C70			CC73FCH1H1R5C	CHIP C	1.5PF C		
C71			CC73FCH1H180J	CHIP C	18PF J		
C72 ,73			CK73FB1H102K	CHIP C	1000PF K		
C74 ,75			CC73FCH1H100D	CHIP C	10PF D		
C77			CK73FB1H102K	CHIP C	1000PF K		
C78			CE04EW1H010M	ELECTRO	1.0UF 50WV		
C79			CK73FB1H102K	CHIP C	1000PF K		
C80			CK73FB1E103K	CHIP C	0.010UF K		
C81 ,82			CK73FB1H102K	CHIP C	1000PF K		
C83			CC73FCH1H150J	CHIP C	15PF J		
C84			CK73FB1H102K	CHIP C	1000PF K		

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C85			CK45F1H473Z	CERAMIC 0.047UF Z		
C86 ,87			CK73FB1H102K	CHIP C 1000PF K		
C88 ,89			C90-0817-05	ELECTRO 1000UF 16WV		
C90			CK73FB1H102K	CHIP C 1000PF K		
C91			CE04EW1A470M	ELECTRO 47UF 10WV		
C92			CE04EW1C221M	ELECTRO 220UF 16WV		
C93			CK73FB1H102K	CHIP C 1000PF K		
C94			CE04EW1A470M	ELECTRO 47UF 10WV		
C95 -99			CK73FB1HXXXK	CHIP C K		
C100-102			CC73FCH1H020C	CHIP C 2.0PF C		
C103-201			CK73FB1EXXXK	CHIP C K		
C202			CC73FCH1H470J	CHIP C 47PF J		
C204			CK73FB1H102K	CHIP C 1000PF K		
C205			CK73EB1E473K	CHIP C 0.047UF K		
C206			CC73FCH1H101J	CHIP C 100PF J		
C207,208			CK73FB1H102K	CHIP C 1000PF K		
C209			CC73FCH1H020C	CHIP C 2.0PF C	KM1	
C209			CC73FCH1H1R5C	CHIP C 1.5PF C	M2TW	
C210			CK73FB1H102K	CHIP C 1000PF K		
C211			CC73FCH1H390J	CHIP C 39PF J		
C212			CK73FB1H102K	CHIP C 1000PF K		
C213			CC73FCH1H030C	CHIP C 3.0PF C		
C214			CK73FB1H102K	CHIP C 1000PF K		
C215			CC73FCH1H010C	CHIP C 1.0PF C	KM1	
C215			CC73FCH1H020C	CHIP C 2.0PF C	M2TW	
C216,217			CC73FCH1HXXXJ	CHIP C J		
C218-220			CK73FB1H102K	CHIP C 1000PF K		
C221			CC73FCH1H180J	CHIP C 18PF J		
C222			CC73FCH1H060D	CHIP C 6.0PF D		
C223			CK73FB1H102K	CHIP C 1000PF K		
C224			CK73FB1E103K	CHIP C 0.010UF K		
C225			CK73FB1H102K	CHIP C 1000PF K		
C226,227			CK73FB1E103K	CHIP C 0.010UF K		
C228			CK73FB1H102K	CHIP C 1000PF K		
C229			CC73FCH1H220J	CHIP C 22PF J		
C230			CK73FB1E103K	CHIP C 0.010UF K		
C231			CC73FCH1H010C	CHIP C 1.0PF C		
C232			CK73FB1E103K	CHIP C 0.010UF K		
C233			CK73FB1H102K	CHIP C 1000PF K		
C234			CC73FCH1H220J	CHIP C 22PF J		
C235			CK73FB1H102K	CHIP C 1000PF K		
C236,237			CC73FCH1H220J	CHIP C 22PF J		
C238			CK73FB1H102K	CHIP C 1000PF K		
C239			CK73FB1E103K	CHIP C 0.010UF K		
C241,242			CK73FB1H102K	CHIP C 1000PF K		
C243			CC73FCH1H220J	CHIP C 22PF J		
C244			CK73FB1H102K	CHIP C 1000PF K		
C245			CC73FCH1H0R5C	CHIP C 0.5PF C		
C246			CC73FCH1H100D	CHIP C 10PF D		
C247			CK73FB1H102K	CHIP C 1000PF K		
C248			CC73FCH1H050C	CHIP C 5.0PF C		
C249			CK73FB1H102K	CHIP C 1000PF K		
C250			CC73FCH1H020C	CHIP C 2.0PF C		
C251			CK73FB1H102K	CHIP C 1000PF K		
C252			CC73FCH1H010C	CHIP C 1.0PF C		

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C253			CK73FB1H102K	CHIP C	1000PF	K		
C254-257			CC73FCH1HXXXJ	CHIP C		J		
C258-261			CC73FCH1H050C	CHIP C	5.0PF	C		
C262			CK73FB1H102K	CHIP C	1000PF	K		
C263			CC73FCH1H101J	CHIP C	100PF	J		
C264			CK73FB1H102K	CHIP C	1000PF	K		
C265			CC73FCH1H120J	CHIP C	12PF	J		
C266			CK73FB1H102K	CHIP C	1000PF	K		
C267			CK73FB1E103K	CHIP C	0.010UF	K		
C268			CC73FCH1H120J	CHIP C	12PF	J		
C269			CC73FCH1H101J	CHIP C	100PF	J		
C270			CK73FB1H102K	CHIP C	1000PF	K		
C271			CK73FB1E103K	CHIP C	0.010UF	K		
C272			CC73FCH1H010C	CHIP C	1.0PF	C		
C273			CC73FCH1H470J	CHIP C	47PF	J		
C274			CK73FB1E103K	CHIP C	0.010UF	K		
C275			CK73FB1H102K	CHIP C	1000PF	K		
C276-278			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C279			CC73FCH1H470J	CHIP C	47PF	J		
C280			CK73FB1E103K	CHIP C	0.010UF	K		
C281			CC73FCH1H101J	CHIP C	100PF	J		
C282			CC73FCH1H100D	CHIP C	10PF	D		
C283			CK73FB1E103K	CHIP C	0.010UF	K		
C284			CK73FB1H102K	CHIP C	1000PF	K		
C285,286			CC73FCH1HXXXJ	CHIP C		J		
C287			CK73FB1H331K	CHIP C	330PF	K		
C288			CK73FB1E103K	CHIP C	0.010UF	K		
C289			CC73FCH1H100D	CHIP C	10PF	D		
C290			CK73FB1E103K	CHIP C	0.010UF	K		
C291			CC73FRH1H120J	CHIP C	12PF	J		
C292,293			CK73FB1E103K	CHIP C	0.010UF	K		
C294			CC73FCH1H470J	CHIP C	47PF	J		
C295,296			CC73FCH1H100D	CHIP C	10PF	D		
C297			CK73FB1H102K	CHIP C	1000PF	K		
C298-301			CK73FB1E103K	CHIP C	0.010UF	K		
C302			CC73FCH1H120J	CHIP C	12PF	J		
C303			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C304			CC73FCH1H101J	CHIP C	100PF	J		
C305			CK73FB1E103K	CHIP C	0.010UF	K		
C306-311			CK73FB1HXXXK	CHIP C		K		
C312			CC73FCH1H101J	CHIP C	100PF	J		
C313,314			CK73FB1H331K	CHIP C	330PF	K		
C315			CC73FCH1H101J	CHIP C	100PF	J		
C316,317			CK73FB1H331K	CHIP C	330PF	K		
C318			CC73FCH1H120J	CHIP C	12PF	J		
C319			CK73FB1H331K	CHIP C	330PF	K		
C320			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C321			CK73FB1H102K	CHIP C	1000PF	K		
C322			CC73FCH1H330J	CHIP C	33PF	J	M2TW	
C323			CK73FB1H331K	CHIP C	330PF	K		
C324			CC73FCH1H090D	CHIP C	9.0PF	D		
C325			CC73FCH1H050C	CHIP C	5.0PF	C		
C326-328			CK73FB1H102K	CHIP C	1000PF	K		
C329			CK73FB1E103K	CHIP C	0.010UF	K		
C330			CK73FB1H102K	CHIP C	1000PF	K		

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TC1			C05-0350-05	TRIMMING CAP 20P		
TC201,202			C05-0354-05	TRIMMING CAP 3P		
TC203			C05-0349-05	TRIMMING CAP 10P		
TC204			C05-0355-05	TRIMMING CAP 30P		
CN1			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN2			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN3			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN4			E40-3237-05	PIN CONNECTOR (EH2P)		
CN5		＊	E40-5163-05	PIN CONNECTOR (TN-5OL3P)		
CN6			E40-3241-05	PIN CONNECTOR (EH6P)		
CN7			E40-3239-05	PIN CONNECTOR (EH4P)		
CN8			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN9			E40-5069-05	PIN CONNECTOR (EH12P)		
CN10			E40-3237-05	PIN CONNECTOR (EH2P)		
CN11			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN201-203			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN204			E40-3237-05	PIN CONNECTOR (EH2P)		
CN205			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN206			E40-3237-05	PIN CONNECTOR (EH2P)		
CN207			E40-5066-05	PIN CONNECTOR (EH9P)		
CN208			E40-3237-05	PIN CONNECTOR (EH2P)		
CN209			E04-0157-05	RF COAXIAL CABLE RECEPTACLE		
CN210-213			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
TP201,202			E23-0512-05	TERMINAL		
W1			E31-3157-05	CONNECTING WIRE		
W5		＊	E31-3448-05	CONNECTING WIRE		
W206		＊	E31-3449-05	CONNECTING WIRE		
W207			E31-0381-05	CONNECTING WIRE		
W208-210			E31-1960-05	CONNECTING WIRE		
W211			E31-0302-05	CONNECTING WIRE	M2TW	
A1			F02-0414-05	HEAT SINK(CAP/ADDITION TYPE)		
A2			F10-1258-04	SHIELDING PLATE		
A3 ,4			F11-0836-05	SHIELDING COVER		
L1		＊	L40-6891-14	SMALL FIXED INDUCTOR(6.8UH)		
L2 ,3			L31-0267-05	COIL(ANT)		
L4		＊	L40-6891-14	SMALL FIXED INDUCTOR(6.8UH)		
L5 ,6			L34-1153-05	COIL		
L7		＊	L40-6891-14	SMALL FIXED INDUCTOR(6.8UH)		
L8			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L9 -11			L31-0267-05	COIL(ANT)		
L12			L34-0956-05	COIL		
L13 ,14			L30-0281-15	IFT		
L15			L31-0313-05	COIL		
L16			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L17			L40-3391-17	SMALL FIXED INDUCTOR(3.3UH)		
L18			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L19			L34-0886-05	TUNING COIL		
L20 -22			L31-0180-05	TUNING COIL		
L23			L34-0452-05	COIL		
L24			L34-1164-05	COIL		
L25			L34-0452-05	COIL		
L26			L40-1092-17	SMALL FIXED INDUCTOR(1UH)		
L27			L34-1157-05	COIL		

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L28 ,29			L15-0016-05	LOW-FREQUENCY CHOKE COIL		
L30			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L31 ,32			L40-2211-48	SMALL FIXED INDUCTOR(220UH)		
L31 ,32			L40-2211-81	SMALL FIXED INDUCTOR(220UH)		
L201			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L202			L34-1051-05	COIL		
L203			L34-1052-05	COIL		
L204,205		*	L79-0836-05	HELICAL BLOCK (5HW)	KM1	
L204,205		*	L79-0837-05	HELICAL BLOCK (5HW)	M2TW	
L206			L34-0895-05	COIL		
L207			L34-1051-05	COIL		
L208,209		*	L34-4097-05	COIL (76MHZ)		
L210			L34-2271-05	TUNING COIL		
L211,212			L30-0281-15	IFT		
L214,215			L34-2271-05	TUNING COIL		
L216			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L217		*	L79-0828-05	HELICAL BLOCK (7HW)		
L218-220			L34-0683-05	TUNING COIL		
L221			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L222			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L223,224			L34-1040-05	COIL		
L225			L40-2201-17	SMALL FIXED INDUCTOR(22UH)		
L226,227			L34-1040-05	COIL		
L228,229			L34-0781-05	TUNING COIL		
L230-232			L34-0683-05	TUNING COIL		
L233			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L234			L34-0749-05	TUNING COIL		
L235			L31-0313-05	COIL		
L236		*	L34-4094-05	COIL (76MHZ)		
L237-239		*	L34-4089-05	COIL (76MHZ)		
L240,241		*	L39-0441-05	COIL		
L242		*	L79-0836-05	HELICAL BLOCK (5HW)	KM1	
L242		*	L79-0837-05	HELICAL BLOCK (5HW)	M2TW	
L243		*	L79-0835-05	HELICAL BLOCK (5HT)		
L244,245			L34-1040-05	COIL		
L247			L34-1079-05	COIL		
L248			L33-0025-05	CHOKE COIL	KM1	
L249,250			L40-2211-48	SMALL FIXED INDUCTOR(220UH)		
L249,250			L40-2211-81	SMALL FIXED INDUCTOR(220UH)		
X201		*	L71-0286-05	CRYSTAL FILTER (MCF 75.925MHZ)		
X202		*	L77-1377-05	CRYSTAL RESONATOR (19.2MHZ)		
R1 -11			RK73FB2AXXXJ	CHIP R J 1/10W		
R12			R92-0670-05	CHIP R 0 OHM		
R13 -44			RK73FB2AXXXJ	CHIP R J 1/10W		
R45			R92-0670-05	CHIP R 0 OHM		
R46 -54			RK73FB2AXXXJ	CHIP R J 1/10W		
R55		*	RS14KB3D4R7J	FL-PROOF RS 4.7 J 2W		
R56 -215			RK73FB2AXXXJ	CHIP R J 1/10W		
R216			R92-0670-05	CHIP R 0 OHM	KM1	
R217-332			RK73FB2AXXXJ	CHIP R J 1/10W		
R333			RD14BB2C470J	RD 47 J 1/6W		
VR1		*	R12-0104-05	TRIMMING POT. 220		
D1 ,2			DAN235(K)	CHIP DIODE		

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D3 -6		*	1SV205	CHIP VARI-CAP DIODE		
D7 -10			DAN235(K)	CHIP DIODE		
D11 -14		*	1SV205	CHIP VARI-CAP DIODE		
D15 -18			RLS73	CHIP DIODE		
D19			RLS135	CHIP DIODE		
D201-206			DAN235(K)	CHIP DIODE		
D207			RD5.1M-B2	CHIP ZENER DIODE		
D208-210			DAN235(K)	CHIP DIODE		
D211			RD5.1M-B2	CHIP ZENER DIODE		
D212,213			DAN235(K)	CHIP DIODE		
D214			ND487C1-3R	DIODE		
D215-220			RLS73	CHIP DIODE		
D221			DAN235(K)	CHIP DIODE		
D222			RLS135	CHIP DIODE		
IC1			UPC7808H	IC(VOLTAGE REGULATOR/ +8V)		
IC2		*	UPC7805H	IC(VOLTAGE REGULATOR/ +5V)		
IC201,202			UPC1651G	IC(OP AMP)		
Q1			3SK184(R)	CHIP FET		
Q2			2SC2714(Y)	CHIP TRANSISTOR		
Q3			3SK179(L)	CHIP FET		
Q4 ,5			DTC124EK	DIGITAL TRANSISTOR		
Q6			2SC2712(Y)	CHIP TRANSISTOR		
Q7			DTA143EK	DIGITAL TRANSISTOR		
Q8			DTC124EK	DIGITAL TRANSISTOR		
Q9 ,10			2SK211(GR)	CHIP FET		
Q11			2SC3357	CHIP TRANSISTOR		
Q12			2SC2538-22-A	TRANSISTOR		
Q201			3SK184(R)	CHIP FET		
Q202			2SK125	FET		
Q203			3SK184(R)	CHIP FET		
Q204		*	2SK508(K53)	CHIP FET		
Q205-207			DTC124EK	DIGITAL TRANSISTOR		
Q208			2SC2714(Y)	CHIP TRANSISTOR		
Q209			2SC3098	CHIP TRANSISTOR		
Q210			2SC2714(Y)	CHIP TRANSISTOR		
Q211			3SK184(R)	CHIP FET		
Q212,213			2SC2714(Y)	CHIP TRANSISTOR		
Q214			3SK179(L)	CHIP FET		
Q215			DTC124EK	DIGITAL TRANSISTOR		
Q216,217			2SC2714(Y)	CHIP TRANSISTOR		
Q218,219			2SK211(GR)	CHIP FET		
Q220			2SC3098	CHIP TRANSISTOR		
Q221			2SC3356	CHIP TRANSISTOR		
Q222,223			2SC3357	CHIP TRANSISTOR		
Q224			2SC2762	TRANSISTOR		
Q225			DTA143EK	DIGITAL TRANSISTOR		
Q226			DTC124EK	DIGITAL TRANSISTOR		
Q227			2SA1213(Y)	CHIP TRANSISTOR		
Q228			DTC124EK	DIGITAL TRANSISTOR		
Q229			DTA143EK	DIGITAL TRANSISTOR		
Q230			2SA1213(Y)	CHIP TRANSISTOR		
Z1		*	X59-3490-00	MODULE UNIT (BAND SW)		
Z201		*	X59-3490-00	MODULE UNIT (BAND SW)		

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144MHz FINAL UNIT (X45-3160-00)						
C1			CQ90-2039-05	ELECTRQ 15UF 16WV		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CE04EW1C101M	ELECTRQ 100UF 16WV		
C4			CK73FB1H102K	CHIP C 1000PF K		
C5			CE04EW1C220M	ELECTRQ 22UF 16WV		
C6 ,7			CK73FB1H102K	CHIP C 1000PF K		
C8			CS15E1VR47M	TANTAL 0.47UF 35WV		
C9 -11			CK73FB1H102K	CHIP C 1000PF K		
C12			CK45F1H473Z	CERAMIC 0.047UF Z		
C13			CE04EW1C221M	ELECTRQ 220UF 16WV		
C14 ,15			CK73FB1H102K	CHIP C 1000PF K		
C16			CC45SL2H080D	CERAMIC 8.0PF D		
C17			CK73FB1H102K	CHIP C 1000PF K		
C18			CC45SL2H220J	CERAMIC 22PF J		
C19			CK45B2H102K	CERAMIC 1000PF K		
C20			CC45SL2H220J	CERAMIC 22PF J		
C21			CC73FCH1H180J	CHIP C 18PF J		
C22 ,23			CC45SL2HXXXJ	CERAMIC J		
C24			CC45SL2H100D	CERAMIC 10PF D		
C25			CC45SL2H150J	CERAMIC 15PF J		
C26 -35			CK73FB1HXXXK	CHIP C K		
C36			CE04EW1C331M	ELECTRQ 330UF 16WV		
C37			CK73FB1H103K	CHIP C 0.010UF K		
C38			CK73FB1E223K	CHIP C 0.022UF K		
C39			CE04EW1C100M	ELECTRQ 10UF 16WV		
C40 -50			CK73FB1HXXXK	CHIP C K		
C51			CE04EW1C100M	ELECTRQ 10UF 16WV		
C52			CK73FB1H102K	CHIP C 1000PF K		
C53			CE04EW1C100M	ELECTRQ 10UF 16WV		
C54 -59			CK73FB1HXXXK	CHIP C K		
C60 -62			CC73FCH1HXXXJ	CHIP C J		
C63 ,64			CK73FB1H102K	CHIP C 1000PF K		
TC1 -4		*	C05-0365-05	TRIMMING CAP 50PF		
A1 -6			E23-0606-04	TERMINAL		
A8			E29-0440-14	TERMINAL (GND)		
CN1			E40-5066-05	PIN CONNECTOR(EH9P)		
CN2		*	E40-0502-05	PIN CONNECTOR(5P)		
CN3 -7			E40-3237-05	PIN CONNECTOR(EH2P)		
TP1			E23-0512-05	TERMINAL		
W1			E31-1959-05	CONNECTING WIRE		
W3 ,4			E31-1959-05	CONNECTING WIRE		
W6			E31-1959-05	CONNECTING WIRE		
W22		*	E31-3396-05	CONNECTING WIRE(14RA)		
W23			E31-2061-05	CONNECTING WIRE(14D)		
A7			F02-0414-05	HEAT SINK(CAP/ADDITION TYPE)		
L1			L34-1019-05	COIL (2.5T)		
L2			L34-0908-05	COIL (9.5T)		
L3			L34-0894-05	COIL (5T)		
L4			L34-0452-05	COIL (6T)		
L5			L34-0908-05	COIL (9.5T)		
L6			L34-0742-05	COIL (5T)		

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L7			L34-0823-05	VHF COIL (3T)		
L8			L40-3391-19	SMALL FIXED INDUCTOR (3.3MH)		
L9		*	L40-1092-19	SMALL FIXED INDUCTOR (1MH)		
L10			L34-0894-05	COIL (5T)		
L11			L34-0895-05	COIL (6T)		
L12			L34-1079-05	COIL (1.5T)		
R1			RD14BB2E151J	RD 150 J 1/4W		
R2 -4			RK73FB2AXXXJ	CHIP R J 1/10W		
R5			RS14DB2H151J	FL-PROOF RS 150 J 1/2W		
R6 -16			RK73FB2AXXXJ	CHIP R J 1/10W		
R17		*	RS14DB2H100J	FL-PROOF RS 10 J 1/2W		
R18 -31			RK73FB2AXXXJ	CHIP R J 1/10W		
R32			RD14CB2E271J	RD 270 J 1/4W		
R33		*	RS14kB2H271J	FL-PROOF RS 270 J 1/2W		
R34			RK73FB2A102J	CHIP R 1.0k J 1/10W		
R35			R92-0670-05	CHIP R 0 OHM		
R36			RK73FB2A272J	CHIP R 2.7k J 1/10W		
VR1 ,2		*	R12-3132-05	TRIMMING POT. 47k		
VR3		*	R12-0091-05	TRIMMING POT. 100		
VR4		*	R12-1083-05	TRIMMING POT. 1K		
W2			R92-0150-05	JUMPER REST 0 OHM		
W5			R92-0150-05	JUMPER REST 0 OHM		
D1			RLS73	CHIP DIODE		
D2			UM9401	DIODE		
D3			MI308	DIODE		
D4 ,5			HSM88AS	CHIP DIODE		
D6 ,7			RLS73	CHIP DIODE		
D8		*	RLZJ5.6B	CHIP ZENER DIODE(5.6V)		
D9			RLZJ7.5	CHIP ZENER DIODE(7.5V)		
D10 -14			RLS73	CHIP DIODE		
IC1			BA718	IC(OP AMP X2)		
Q1			2SC1947	TRANSISTOR		
Q2			2SA1213(Y)	CHIP TRANSISTOR		
Q3 ,4			2SA1307(Y)	TRANSISTOR		
Q5			2SA1162(Y)	CHIP TRANSISTOR		
Q6			2SC2712(Y)	CHIP TRANSISTOR		
Q7			2SC1815(Y)	TRANSISTOR		
Q8			2SA1162(Y)	CHIP TRANSISTOR		
Q9 -11			2SC2712(Y)	CHIP TRANSISTOR		
Q101		*	M67727	IC(POWER MODULE/144-148MHZ)		
TH1			5TP41L	THERMISTER		
430MHz FUNAL UNIT (X45-3170-00)						
C1			C90-2039-05	ELECTRO 15UF 16WV		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CE04EW1C101M	ELECTRO 100UF 16WV		
C4			CK73FB1H102K	CHIP C 1000PF K		
C5			CE04EW1C220M	ELECTRO 22UF 16WV		
C6			CK73FB1H102K	CHIP C 1000PF K		
C7			CK45F1H473Z	CERAMIC 0.047UF Z		
C8			CE04EW1C221M	ELECTRO 220UF 16WV		
C9 -14			CK73FB1H102K	CHIP C 1000PF K		
C15			CM73F2H100D	CHIP C 10PF D		
C16			CC45SL2H020C	CERAMIC 2.0PF C		

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C17			CK73FB1H102K	CHIP C 1000PF K		
C18			CC73FCH1H050C	CHIP C 5.0PF C		
C19			CC45SL2H030C	CERAMIC 3.0PF C		
C20			CM73F2H080D	CHIP C 8.0PF D		
C21			CC45SL2H120J	CERAMIC 12PF J		
C22			CM73F2H120J	CHIP C 12PF J		
C23			CC45SL2H040C	CERAMIC 4.0PF C		
C24			CM73F2H160J	CHIP C 16PF J		
C25			CC45SL2H070D	CERAMIC 7.0PF D		
C26			CM73F2H070D	CHIP C 7.0PF D		
C27 ,28			CK73FB1H102K	CHIP C 1000PF K		
C29			CC73FCH1H0R5C	CHIP C 0.5PF C		
C30 -37			CK73FB1HXXXK	CHIP C K		
C38			CE04EW1C101M	ELECTRO 100UF 16WV		
C39			CK73FB1H102K	CHIP C 1000PF K		
C40			C90-2039-05	ELECTRO 15UF 16WV		
C41			CK73FB1H102K	CHIP C 1000PF K		
C42			CE04EW1C220M	ELECTRO 22UF 16WV		
C43			CK73FB1H102K	CHIP C 1000PF K		
C44			CC45SL2H060D	CERAMIC 6.0PF D		
C45 ,46			CC45SL2H080D	CERAMIC 8.0PF D		
C47			CC45SL2H040C	CERAMIC 4.0PF C		
C48			CK73FB1H102K	CHIP C 1000PF K		
C49			CM73F2H100D	CHIP C 10PF D		
C50 -59			CK73FB1HXXXK	CHIP C K		
C60			CC73FSL1H471J	CHIP C 470PF J		
C61 ,62			CK45B1H471J	CERAMIC 470PF J		
C63 ,64			CC45SL1H101J	CERAMIC 100PF J		
A1			E23-0606-04	TERMINAL		
A2			E29-0440-14	TERMINAL (GND)		
CN1		*	E40-0902-05	PIN CONNECTOR (9P)		
CN2			E40-3238-05	PIN CONNECTOR (EH3P)		
CN3			E40-3750-05	PIN CONNECTOR (EH14P)		
TP1			E23-0512-05	TERMINAL		
W1		*	E31-2032-05	CONNECTING WIRE(43D)		
W2		*	E31-3397-05	CONNECTING WIRE(43RA)		
L1			L34-1040-05	COIL (1T)		
L2			L34-0908-05	COIL (9.5T)		
L3			L34-1019-05	COIL (2.5T)		
L4			L34-1113-05	COIL (1.5T)		
L5			L34-1040-05	COIL (1T)		
L6			L34-1032-05	COIL (3.5T)		
L7			L40-1092-17	SMALL FIXED INDUCTOR (1UH)		
L8 -10			L34-1019-05	COIL (2.5T)		
L11			L40-2282-13	SMALL FIXED INDUCTOR (0.22UH)		
R1			RS14DB2H151J	FL-PROOF RS 150 J 1/2W		
R2 -6			RK73FB2AXXXJ	CHIP R J 1/10W		
R7			R92-0670-05	CHIP R 0 OHM		
R8 -16			RK73FB2AXXXJ	CHIP R J 1/10W		
R17			RS14KB2H271J	FL-PROOF RS 270 J 1/2W		
VR1 ,2		*	R12-3132-05	TRIMMING POT. 47K		
VR3		*	R12-0091-05	TRIMMING POT. 100		
D1			DSA3A1	DIODE		

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D2			UM9401	DIODE		
D3			MI308	DIODE		
D4 ,5			HSM88AS	CHIP DIODE		
D6 ,7			RLS73	CHIP DIODE		
D8			RLZJ7.5	CHIP ZENER DIODE		
IC1			BA718	IC(OP AMP X2)		
Q1			2SC2712(Y)	CHIP TRANSISTOR		
Q102			M57716	IC(POWER MODULE)		
Q103		*	M67728	IC(POWER MODULE/430-450MHZ)		
IF UNIT (X48-3050-XX) -11 : TS-790A -61 : TS-790E						
C1 -12			CK73FB1H102K	CHIP C 1000PF K		
C13 -33			CK73FB1EXXXK	CHIP C K		
C34			CC73FCH1H040C	CHIP C 4.0PF C		
C35			CC73FCH1H470J	CHIP C 47PF J		
C36			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C37 ,38			CK73FB1E103K	CHIP C 0.010UF K		
C39			CK73FB1H102K	CHIP C 1000PF K		
C40			CK73FB1E103K	CHIP C 0.010UF K		
C41			CC73FSL1H101J	CHIP C 100PF J		
C42 -44			CK73FB1E103K	CHIP C 0.010UF K		
C45			CK73FB1H102K	CHIP C 1000PF K		
C46 -51			CK73FB1E103K	CHIP C 0.010UF K		
C52			CK73FB1H102K	CHIP C 1000PF K		
C53 ,54			CK73FB1E103K	CHIP C 0.010UF K		
C55			CC73FCH1H020C	CHIP C 2.0PF C		
C56 -61			CK73FB1E103K	CHIP C 0.010UF K		
C62			CC73FCH1H050C	CHIP C 5.0PF C		
C63 -68			CK73FB1E103K	CHIP C 0.010UF K		
C69			CC73FCH1H100D	CHIP C 10PF D		
C70			CC73FCH1H220J	CHIP C 22PF J		
C71 -73			CK73FB1E103K	CHIP C 0.010UF K		
C74			CC73FSL1H221J	CHIP C 220PF J		
C75			CE04EW1C220M	ELECTRO 22UF 16WV		
C76 -79			CK73FB1E103K	CHIP C 0.010UF K		
C80			CC73FSL1H471J	CHIP C 470PF J		
C81 -83			CK73FB1HXXXK	CHIP C K		
C84			CK73FB1E103K	CHIP C 0.010UF K		
C85			CE04CW1H010M	ELECTRO 1.0UF 50WV		
C86			CE04CW1V2R2M	ELECTRO 2.2UF 35WV		
C87			CK73FB1E223K	CHIP C 0.022UF K		
C88			CC73FCH1H330J	CHIP C 33PF J		
C89 ,90			CK73FB1H821K	CHIP C 820PF K		
C91 -94			CC73FSL1HXXXJ	CHIP C J		
C95			C90-2046-05	ELECTRO 22UF 10WV		
C96			CK73FB1E103K	CHIP C 0.010UF K		
C97			CC73FCH1H060D	CHIP C 6.0PF D		
C98 ,99			CK73FF1E104Z	CHIP C 0.10UF Z		
C100			CC73FCH1H120J	CHIP C 12PF J		
C101			CK73FB1H222K	CHIP C 2200PF K		
C102			CK73FB1E103K	CHIP C 0.010UF K		
C103			CK73FB1H102K	CHIP C 1000PF K		
C104			CK73FB1H682K	CHIP C 6800PF K		
C105,106			CE04EW1C100M	ELECTRO 10UF 16WV		
C107,108			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C109			CK73FB1E103K	CHIP C 0.010UF K		

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C110			CE04EW1C100M	ELECTRO 10UF 16WV		
C111-113			CK73EB1E104K	CHIP C 0.10UF K		
C114			CC73FSL1H101J	CHIP C 100PF J		
C115			CE04EW1C100M	ELECTRO 10UF 16WV		
C116			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C117			CE04EW1C100M	ELECTRO 10UF 16WV		
C118-120			CK73EB1EXXXK	CHIP C K		
C121			CC73FSL1H101J	CHIP C 100PF J		
C122			CE04EW1C100M	ELECTRO 10UF 16WV		
C123			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C124-126			CK73FB1H102K	CHIP C 1000PF K		
C127			CK73FB1E223K	CHIP C 0.022UF K		
C128			CE04EW1A102M	ELECTRO 1000UF 10WV		
C129			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C130			CE04EW1E220M	ELECTRO 22UF 25WV		
C131			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C132,133			CK73FB1H102K	CHIP C 1000PF K		
C134			CK73FB1E103K	CHIP C 0.010UF K		
C135			C90-2046-05	ELECTRO 22UF 10WV		
C136			CK73FB1E103K	CHIP C 0.010UF K		
C137			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C138			CE04EW1H4R7M	ELECTRO 4.7UF 50WV		
C139,140			CK73FB1E103K	CHIP C 0.010UF K		
C141			CK73FB1H102K	CHIP C 1000PF K		
C142			CK73FB1E103K	CHIP C 0.010UF K		
C143			CE04EW1C100M	ELECTRO 10UF 16WV		
C144,145			CK73FB1H682K	CHIP C 6800PF K		
C146			CE04EW1C100M	ELECTRO 10UF 16WV		
C147			CE04EW0J471M	ELECTRO 470UF 6.3WV		
C148			CK73FB1E103K	CHIP C 0.010UF K		
C149			CE04EW1C221M	ELECTRO 220UF 16WV		
C150			CK73FF1E104Z	CHIP C 0.10UF Z		
C151			CK73FB1E103K	CHIP C 0.010UF K		
C152			CE04EW1C221M	ELECTRO 220UF 16WV		
C153			CE04EW0J471M	ELECTRO 470UF 6.3WV		
C154			CK73FB1E103K	CHIP C 0.010UF K		
C155			CE04EW1C221M	ELECTRO 220UF 16WV		
C156			CK73FF1E104Z	CHIP C 0.10UF Z		
C157			CK73FB1E103K	CHIP C 0.010UF K		
C158			CE04EW1C221M	ELECTRO 220UF 16WV		
C159			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C160,161			CE04EW1C100M	ELECTRO 10UF 16WV		
C162			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C163,164			CK73FB1E103K	CHIP C 0.010UF K		
C165			CS15E1A220M	TANTAL 22UF 10WV		
C166-171			CK73FF1E104Z	CHIP C 0.10UF Z		
C172,173			CE04EW1C100M	ELECTRO 10UF 16WV		
C174-180			CK73FB1E103K	CHIP C 0.010UF K		
C181			CC73FSL1H471J	CHIP C 470PF J		
C182-184			CK73FB1E103K	CHIP C 0.010UF K		
C185			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C186			CK73FB1E103K	CHIP C 0.010UF K		
C187			CE04EW1C100M	ELECTRO 10UF 16WV		
C188			CK73FB1E104K	CHIP C 0.10UF K		
C189			CK73FB1E223K	CHIP C 0.022UF K		

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C190-205			CK73FB1H102K	CHIP C	1000PF	K		
C206,207			CK73FB1E103K	CHIP C	0.010UF	K		
C208			CK73FB1H102K	CHIP C	1000PF	K		
C209			CK73FB1E223K	CHIP C	0.022UF	K		
C210,211			CK73FB1H102K	CHIP C	1000PF	K		
C212			CK73FB1E103K	CHIP C	0.010UF	K		
C213			CC73FCH1H270J	CHIP C	27PF	J		
C214,215			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C216			CE04EW1HR47M	ELECTRO	0.47UF	50WV		
C217			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C218,219			CK73EB1E104K	CHIP C	0.10UF	K		
C220			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C221-223			CK73EB1EXXXK	CHIP C		K		
C224-232			CC73FSL1H471J	CHIP C	470PF	J		
C233			CK73FB1E103K	CHIP C	0.010UF	K		
C251-290			CK73FB1HXXXK	CHIP C		K		
C291-293			CC73FSL1H471J	CHIP C	470PF	J		
C294			CK73FB1H102K	CHIP C	1000PF	K		
C295			CK73FB1E103K	CHIP C	0.010UF	K		
C296			CC73FCH1H020C	CHIP C	2.0PF	C		
C297-300			CK73FB1E103K	CHIP C	0.010UF	K		
C301			CC73FCH1H120J	CHIP C	12PF	J		
C302,303			CK73FB1E103K	CHIP C	0.010UF	K		
C304			CC73FCH1H020C	CHIP C	2.0PF	C		
C305-308			CK73FB1E103K	CHIP C	0.010UF	K		
C309			CC73FCH1H060D	CHIP C	6.0PF	D		
C310			CC73FCH1H470J	CHIP C	47PF	J		
C311,312			CK73FB1E103K	CHIP C	0.010UF	K		
C313			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C314			CK73FB1H102K	CHIP C	1000PF	K		
C315-320			CK73FB1E103K	CHIP C	0.010UF	K		
C321			CC73FCH1H220J	CHIP C	22PF	J		
C322-325			CK73FB1E103K	CHIP C	0.010UF	K		
C326			CC73FCH1H100D	CHIP C	10PF	D		
C327-335			CK73FB1E103K	CHIP C	0.010UF	K		
C337-344			CK73FB1E103K	CHIP C	0.010UF	K		
C345			CC73FCH1H030C	CHIP C	3.0PF	C		
C346-350			CK73FB1E103K	CHIP C	0.010UF	K		
C351			CC73FCH1H050C	CHIP C	5.0PF	C		
C352-354			CK73FB1E103K	CHIP C	0.010UF	K		
C355			CC73FCH1H100D	CHIP C	10PF	D		
C356-363			CK73FB1E103K	CHIP C	0.010UF	K		
C364			CC73FSL1H221J	CHIP C	220PF	J		
C365			CE04EW1C220M	ELECTRO	22UF	16WV		
C367			CE04EW1C100M	ELECTRO	10UF	16WV		
C368			CK73FB1E103K	CHIP C	0.010UF	K		
C369			CC73FSL1H101J	CHIP C	100PF	J		
C370			CC73FCH1H220J	CHIP C	22PF	J		
C371			CC73FSL1H471J	CHIP C	470PF	J		
C372-374			CK73FB1HXXXK	CHIP C		K		
C375			CK73FB1E103K	CHIP C	0.010UF	K		
C376			CE04EW1C100M	ELECTRO	10UF	16WV		
C377			CK73EB1E104K	CHIP C	0.10UF	K		
C378			CE04EW1C470M	ELECTRO	47UF	16WV		
C379			CK73FB1E103K	CHIP C	0.010UF	K		

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C380			CK73FB1H682K	CHIP C	6800PF	K		
C381		*	CE04EW1H470M	ELECTRO	47UF	50WV		
C382			CE04EW1H220M	ELECTRO	22UF	50WV		
C383			CK73FB1H682K	CHIP C	6800PF	K		
C384			CK73FB1E103K	CHIP C	0.010UF	K		
C385			CE04EW1H220M	ELECTRO	22UF	50WV		
C386			CE04EW1C331M	ELECTRO	330UF	16WV		
C387-391			CK73FB1E103K	CHIP C	0.010UF	K		
C392			C90-2046-05	ELECTRO	22UF	10WV		
C393,394			CK73FB1E103K	CHIP C	0.010UF	K		
C395			CK73FF1E104Z	CHIP C	0.10UF	Z		
C396			CC73FCH1H060D	CHIP C	6.0PF	D		
C397			CC73FCH1H120J	CHIP C	12PF	J		
C398			CK73FF1E104Z	CHIP C	0.10UF	Z		
C399			CK73FB1H222K	CHIP C	2200PF	K		
C400			CC73FSL1H121J	CHIP C	120PF	J		
C401,402			CK73FB1H821K	CHIP C	820PF	K		
C403			CC73FCH1H330J	CHIP C	33PF	J		
C404			CK73FB1H102K	CHIP C	1000PF	K		
C405			CK73FB1E223K	CHIP C	0.022UF	K		
C406			CE04CW1H010M	ELECTRO	1.0UF	50WV		
C407			CE04CW1V2R2M	ELECTRO	2.2UF	35WV		
C408			CK73FB1E103K	CHIP C	0.010UF	K		
C409,410			CK73FB1HXXXK	CHIP C		K		
C411,412			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C413			CE04CW1A100M	ELECTRO	10UF	10WV		
C414			CE04EW1C100M	ELECTRO	10UF	16WV		
C415			CK73FB1E103K	CHIP C	0.010UF	K		
C416			C90-2046-05	ELECTRO	22UF	10WV		
C417,418			CC73FSL1H101J	CHIP C	100PF	J		
C419			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C420			CK73FB1H222K	CHIP C	2200PF	K		
C421			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C422			CE04EW1C470M	ELECTRO	47UF	16WV		
C423,424			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C425			CE04EW1C100M	ELECTRO	10UF	16WV		
C426			CE04EW1C470M	ELECTRO	47UF	16WV		
C427			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C428			CK73FB1H102K	CHIP C	1000PF	K		
C429			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C430			CE04EW1C100M	ELECTRO	10UF	16WV		
C431			CK73FB1E103K	CHIP C	0.010UF	K		
C432			CC73FSL1H471J	CHIP C	470PF	J	TW	
C433			CK73FB1H102K	CHIP C	1000PF	K		
C434,435			CE04EW1C100M	ELECTRO	10UF	16WV		
C436			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C437			CK73FB1E103K	CHIP C	0.010UF	K		
C438			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C439			CC73FSL1H101J	CHIP C	100PF	J		
C440			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C441,442			CE04EW1C470M	ELECTRO	47UF	16WV		
C443			CE04EW1H010M	ELECTRO	1.0UF	50WV		
C444-448			CK73FB1EXXXK	CHIP C		K		
C449			CK73FB1H102K	CHIP C	1000PF	K		
C450-453			CK73FB1E103K	CHIP C	0.010UF	K		

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C454			CE04EW1C100M	ELECTRO	10UF	16WV		
C455			CC73FCH1H220J	CHIP C	22PF	J		
C456,457			CK73FB1E103K	CHIP C	0.010UF	K		
C458			CC73FCH1H030C	CHIP C	3.0PF	C		
C459			CK73FB1H102K	CHIP C	1000PF	K		
C460			CC73FCH1H020C	CHIP C	2.0PF	C		
C461			CC73FUJ1H100D	CHIP C	10PF	D		
C462,463			CC73FSL1HXXXJ	CHIP C		J		
C464			CK73FB1E103K	CHIP C	0.010UF	K		
C465			CC73FCH1H030C	CHIP C	3.0PF	C		
C466-470			CK73FB1E103K	CHIP C	0.010UF	K		
C471			CK73FB1H102K	CHIP C	1000PF	K		
C472-477			CK73FB1E103K	CHIP C	0.010UF	K		
C478			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C479,480			CK73FB1E103K	CHIP C	0.010UF	K		
C481,482			CC73FCH1H080D	CHIP C	8.0PF	D		
C483,484			CK73FB1E103K	CHIP C	0.010UF	K		
C485			CC73FTH1H070D	CHIP C	7.0PF	D		
C486			CK73FB1E103K	CHIP C	0.010UF	K		
C487			CC73FCH1H020C	CHIP C	2.0PF	C		
C488			CK73FB1E103K	CHIP C	0.010UF	K		
C489			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C490-493			CK73FB1E103K	CHIP C	0.010UF	K		
C495			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C496			CK73FB1E103K	CHIP C	0.010UF	K		
C497-508			CK73FB1H102K	CHIP C	1000PF	K		
C509			CE04EW1A101M	ELECTRO	100UF	10WV		
C510			CK73FB1E103K	CHIP C	0.010UF	K		
C511			CE04EW1C100M	ELECTRO	10UF	16WV		
C513-520			CK73FB1HXXXK	CHIP C		K		
C521-523			CK73FB1E103K	CHIP C	0.010UF	K		
C524-526			CK73FB1H102K	CHIP C	1000PF	K		
C527			CK73FB1E103K	CHIP C	0.010UF	K		
C528			CK73FF1E104Z	CHIP C	0.10UF	Z	KM1M2	
C529-534			CK73FB1H102K	CHIP C	1000PF	K		
C537			CE04EW1A101M	ELECTRO	100UF	10WV		
C538			CK73EB1E104K	CHIP C	0.10UF	K		
C540-542			CK73FB1H102K	CHIP C	1000PF	K		
C543			CE04EW1C100M	ELECTRO	10UF	16WV		
C544,545			CK73FB1E103K	CHIP C	0.010UF	K		
C546			CS15E1A220M	TANTAL	22UF	10WV		
C547			CK73FB1E223K	CHIP C	0.022UF	K		
C548			CK73EB1E104K	CHIP C	0.10UF	K		
C549-551			CK73FB1E103K	CHIP C	0.010UF	K		
C552			CE04EW1C471M	ELECTRO	470UF	16WV		
C553			CK73FB1E103K	CHIP C	0.010UF	K		
C554-558			CK73FB1H102K	CHIP C	1000PF	K		
C559			CK73FB1H223K	CHIP C	0.022UF	K		
C560			CE04EW1C470M	ELECTRO	47UF	16WV		
C561,562			CK73FB1E103K	CHIP C	0.010UF	K		
C567			CE04EW1HR47M	ELECTRO	0.47UF	50WV		
C568			CE04EW1C100M	ELECTRO	10UF	16WV		
C569			CE04EW1HR47M	ELECTRO	0.47UF	50WV		
C571			CE04EW1A101M	ELECTRO	100UF	10WV		
C572			CE04EW1H010M	ELECTRO	1.0UF	50WV		

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C573			CE04EW1HR47M	ELECTRO 0.47UF 50WV		
C574			CK73FB1E103K	CHIP C 0.010UF K	KM1M2	
C575			CK73FB1H223K	CHIP C 0.022UF K	KM1M2	
C577			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C578			CK73FB1E223K	CHIP C 0.022UF K		
C579			CK73FB1E103K	CHIP C 0.010UF K		
C580-582			CE04EW1H010M	ELECTRO 1.0UF 50WV		
C583			CE04EW1C100M	ELECTRO 10UF 16WV		
C584,585			CK73EB1E104K	CHIP C 0.10UF K		
C586,587			CS15E1VR47M	TANTAL 0.47UF 35WV		
C588,589			CE04EW1H4R7M	ELECTRO 4.7UF 50WV		
C590			CC73FSL1H101J	CHIP C 100PF J		
C591			CK73FF1E104Z	CHIP C 0.10UF Z		
C592-594			C91-0117-05	CERAMIC 0.01UF K		
C595			CK73FB1E473M	CHIP C 0.047UF M		
C596			CK73FB1E223K	CHIP C 0.022UF K		
C597			CK45F1H473Z	CERAMIC 0.047UF Z		
C598			CK73FB1E103K	CHIP C 0.010UF K		
C599			CK73FF1E104Z	CHIP C 0.10UF Z		
TC1			C05-0355-05	TRIMMING CAP 30PF		
TC2			C05-0348-05	TRIMMING CAP 6PF		
TC3			C05-0355-05	TRIMMING CAP 30PF		
CN1			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN2			E40-3239-05	PIN CONNECTOR (4P)		
CN3		*	E40-5036-05	FPC CONNECTOR (12P)		
CN4			E40-3243-05	PIN CONNECTOR (8P)		
CN5			E13-0166-05	PHONO JACK ACC3		
CN6		*	E06-0658-05	DIN RECEPTACLE (6P)ACC1		
CN7		*	E06-1352-05	DIN RECEPTACLE (13P)ACC2		
CN8		*	E31-3452-05	CONNECTING WIRE(7P)	KM1M2	
CN9			E40-5016-05	PIN CONNECTOR (2P)	KM1M2	
CN10,11			E40-3239-05	PIN CONNECTOR (4P)		
CN12,13			E40-3237-05	PIN CONNECTOR (2P)		
CN14			E40-3241-05	PIN CONNECTOR (6P)		
CN16			E40-3241-05	PIN CONNECTOR (6P)		
CN17			E40-3237-05	PIN CONNECTOR (2P)		
CN18			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN19,20		*	E11-0434-05	PHONE JACK EXT.S,EXT.M		
CN21		*	E40-5139-05	FPC CONNECTOR (24P)		
CN22			E40-3237-05	PIN CONNECTOR (2P)		
CN30			E40-3239-05	PIN CONNECTOR (4P)		
CN31			E40-3237-05	PIN CONNECTOR (2P)		
CN32			E40-3242-05	PIN CONNECTOR (7P)		
CN33			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN34			E40-3237-05	PIN CONNECTOR (2P)		
CN35			E40-3238-05	PIN CONNECTOR (3P)		
CN36			E40-3241-05	PIN CONNECTOR (6P)		
CN38			E06-0859-05	DIN RECEPTACLE (8P)ACC4		
CN39			E40-0211-05	PIN CONNECTOR (2P)		
CN40			E40-5016-05	PIN CONNECTOR (2P)	KM1M2	
CN41			E31-3238-05	CONNECTING WIRE(7P)	KM1M2	
CN42		*	E11-0433-05	PHONE JACK KEY		
CN43			F06-0752-05	DIN RECEPTACLE (7P)EXT.CONT		
CN44			E40-3242-05	PIN CONNECTOR (7P)		

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CN45			E40-3240-05	PIN CONNECTOR (5P)		
CN46			E40-3238-05	PIN CONNECTOR (3P)		
CN47			E40-3237-05	PIN CONNECTOR (2P)		
CN48			E40-5066-05	PIN CONNECTOR (9P)		
CN49			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN50		*	E40-3751-05	PIN CONNECTOR (15P)		
CN51-53			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN54			E40-5141-05	FPC CONNECTOR (26P)		
CN55			E40-3237-05	PIN CONNECTOR (2P)		
W3			E31-3451-15	CONNECTING WIRE(2P)		
W4			E31-3450-15	CONNECTING WIRE(4P)		
W5 ,6			E31-3237-05	CONNECTING WIRE	KM1M2	
A1		*	F02-0436-04	HEAT SINK(CAP/ADDITION TYPE)		
			G02-0574-04	FLAT SPRING		
A2 ,3		*	G13-0905-04	CUSHION	KM1M2	
L1		*	L34-4108-05	TUNING COIL (10.7MHZ)		
L2 -7			L30-0281-15	IFT		
L8 ,9			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L10 -12			L40-1021-14	SMALL FIXED INDUCTOR(1MH)		
L13			L30-0531-05	IFT		
L14 ,15			L40-3391-13	SMALL FIXED INDUCTOR(3.3UH)		
L16 ,17			L30-0281-15	IFT		
L18			L40-1021-14	SMALL FIXED INDUCTOR(1MH)		
L19			L40-4701-14	SMALL FIXED INDUCTOR(47UH)		
L20 -29			L40-1001-19	SMALL FIXED INDUCTOR(10UH)		
L30 ,31			L34-2041-05	TUNING COIL		
L32 ,33			L30-0281-15	IFT		
L34 ,35			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L36 ,37			L34-2038-05	TUNING COIL		
L38		*	L34-4093-05	TUNING COIL (30MHZ)		
L39			L40-4701-14	SMALL FIXED INDUCTOR(47UH)		
L40			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L41		*	L34-4108-05	COIL (10.7MHZ)		
L42 ,43			L30-0281-15	IFT		
L44 -46			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L47 -50			L30-0281-15	IFT		
L51 ,52			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L53			L40-1021-14	SMALL FIXED INDUCTOR(1MH)		
L54			L30-0531-05	IFT		
L55 ,56			L40-1021-14	SMALL FIXED INDUCTOR(1MH)		
L57			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L58			L40-4705-25	SMALL FIXED INDUCTOR(47UH)		
L59			L33-0691-05	CHOKE COIL		
L60			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L61 -63			L30-0281-15	IFT		
L64			L34-0858-05	TUNING COIL		
L65 -67			L34-2041-05	TUNING COIL		
L68 ,69			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L70			L15-0306-05	LOW-FREQUENCY CHOKE COIL(700UH		
L71			L40-3391-14	SMALL FIXED INDUCTOR(3.3UH)		
L72			L40-4701-17	SMALL FIXED INDUCTOR(47UH)		
L73			L40-2211-48	SMALL FIXED INDUCTOR(220UH)		
L73			L40-2211-81	SMALL FIXED INDUCTOR(220UH)		

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X1		*	L77-1381-05	CRYSTAL RESONATOR (10.14MHZ)		
X2			L77-1305-05	CRYSTAL RESONATOR (10.695MHZ)		
XF1		*	L71-0281-05	CRYSTAL FILTER (10.595MHZFM)		
XF2		*	L71-0282-05	CRYSTAL FILTER (10.595MHZSSB)		
XF3			L72-0315-05	CERAMIC FILTER (CFW455F FM)		
XF4			L79-0446-05	FILTER (455DISC)		
XF5			L71-0216-05	CRYSTAL FILTER (10.695MHZFM)		
XF6			L71-0249-05	CRYSTAL FILTER (10.695MHZSSB)		
XF7		*	L71-0283-15	CRYSTAL FILTER (10.695MHZCW)		
XF8			L72-0315-05	CERAMIC FILTER (CFW455F FM)		
XF9			L79-0446-05	FILTER (455DISC)		
			N09-0666-05	SCREW		
			N35-3004-46	BINDING HEAD MACHINE SCREW		
R1 -78			RK73FB2AXXXJ	CHIP R J 1/10W		
R79			R92-0670-05	CHIP R 0 OHM		
R80 -176			RK73FB2AXXXJ	CHIP R J 1/10W		
R177			R92-0670-05	CHIP R 0 OHM		
R178-300			RK73FB2AXXXJ	CHIP R J 1/10W		
R301,302			RD14BB2E471J	RD 470 J 1/4W		
R303-408			RK73FB2AXXXJ	CHIP R J 1/10W		
R409			R92-0670-05	CHIP R 0 OHM		
R410-432			RK73FB2AXXXJ	CHIP R J 1/10W		
R433			R92-0670-05	CHIP R 0 OHM		
R434-462			RK73FB2AXXXJ	CHIP R J 1/10W		
R463-467			R92-0670-05	CHIP R 0 OHM		
R468			RD14BB2C103J	RD 10K J 1/6W		
R469,470			R92-0670-05	CHIP R 0 OHM		
R471,472			RK73FB2AXXXJ	CHIP R J 1/10W		
VR1			R12-0432-05	TRIMMING POT. (500)		
VR2 -4			R12-2414-05	TRIMMING POT. (5K)		
VR5 ,6			R12-3447-05	TRIMMING POT. (10K)		
VR7			R12-7407-05	TRIMMING POT. (500K)		
VR8 -10			R12-4414-05	TRIMMING POT. (50K)		
VR11		*	R05-2402-05	POTENTIOMETER(5k)		
VR14-17			R12-2414-05	TRIMMING POT. (5k)		
VR18			R12-4414-05	TRIMMING POT. (50k)		
VR19			R12-3447-05	TRIMMING POT. (10k)		
VR20			R12-0432-05	TRIMMING POT. (500)		
VR21			R12-2414-05	TRIMMING POT. (5k)		
VR22			R12-1090-05	TRIMMING POT. (4.7k)		
VR23			R12-3133-05	TRIMMING POT. (47k)		
VR24			R12-6019-05	TRIMMING POT. (50k)		
VR25,26			R12-3127-05	TRIMMING POT. (10k)		
VR27			R12-6019-05	TRIMMING POT. (50k)		
VR28			R12-7407-05	TRIMMING POT. (500k)		
VR29			R12-2414-05	TRIMMING POT. (5k)		
VR30			R12-3447-05	TRIMMING POT. (10K)		
VR31			R12-0432-05	TRIMMING POT. (500)		
VR32			R12-2414-05	TRIMMING POT. (5k)		
VR33			R12-3447-05	TRIMMING POT. (10k)		
VR34			R12-4414-05	TRIMMING POT. (50k)		
VR35			R12-2414-05	TRIMMING POT. (5k)		
VR36			R12-3447-05	TRIMMING POT. (10k)		

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VR37			R12-4414-05	TRIMMING POT. (50k)		
W1 ,2			R92-1061-05	JUMPER REST 0 OHM		
SW1			S31-1411-05	SLIDE SWITCH (ATT-ACS)		
D1			RLS135	CHIP DIODE		
D2			DAN235(K)	CHIP DIODE		
D3 ,4			RLS73	CHIP DIODE		
D5			DAN235(K)	CHIP DIODE		
D6			RLS135	CHIP DIODE		
D7 -9			HSM88AS	CHIP DIODE		
D10 ,11			RLS73	CHIP DIODE		
D12			DAN235(K)	CHIP DIODE		
D13			HSM88AS	CHIP DIODE		
D14 ,15			1SS101	DIODE		
D16			IMN10	CHIP DIODE		
D17			MTZ3.0JA	CHIP ZENER DIOD		
D18 ,19			HSM88AS	CHIP DIODE		
D20			RLS73	CHIP DIODE		
D21		*	HSM276S	CHIP DIODE		
D22			RLS73	CHIP DIODE		
D23			DAN202(K)	CHIP DIODE		
D24			1SS226	CHIP DIODE		
D25			RLS73	CHIP DIODE		
D31			RLS135	CHIP DIODE		
D32			DAN235(K)	CHIP DIODE		
D33 -36			RLS135	CHIP DIODE		
D37			DAN235(K)	CHIP DIODE		
D38 -41			RLS73	CHIP DIODE		
D42			RLS135	CHIP DIODE		
D43 -46			DAN202(K)	CHIP DIODE		
D47 ,48			IMN10	CHIP DIODE		
D49			RLS73	CHIP DIODE		
D50			DAN202(K)	CHIP DIODE		
D51			RLS135	CHIP DIODE		
D52			DAN202(K)	CHIP DIODE		
D53 ,54			HSM88AS	CHIP DIODE		
D55 -60			RLS135	CHIP DIODE		
D61			1SV128	CHIP DIODE		
D62			DAN235(K)	CHIP DIODE		
D63 ,64			HSM88AS	CHIP DIODE		
D65			MTZ6.2JA	CHIP ZENER DIODE		
D67			RLS73	CHIP DIODE		
D68			HSM88AS	CHIP DIODE		
D69 ,70			RLS135	CHIP DIODE		
D71			RLS73	CHIP DIODE		
D72			HSM88AS	CHIP DIODE		
D73			1N60	DIODE		
D74			MTZ3.0JA	CHIP ZENER DIODE		
D75			DAN202(K)	CHIP DIODE		
D76			RLS73	CHIP DIODE		
D77			RLS135	CHIP DIODE		
D78			HSM88AS	CHIP DIODE		
D79 ,80			RLS135	CHIP DIODE		
D81			1S2208	DIODE		

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D82			DAN202(K)	CHIP DIODE		
D83 -86			RLS135	CHIP DIODE		
D87			DAN202(K)	CHIP DIODE		
D88			RLS73	CHIP DIODE		
D89			MTZ5.1JA	CHIP ZENER DIODE		
D90			RLS73	CHIP DIODE		
D92 ,93			1SS101	DIODE		
D94			IMN10	CHIP DIODE		
D95			MTZ5.1JA	CHIP ZENER DIODE		
D96			IMN10	CHIP DIODE		
D97			DAN202(K)	CHIP DIODE		
D98 -100			IMN10	CHIP DIODE		
D101			MTZ9.1JA	CHIP ZENER DIODE		
D102,103			RLS73	CHIP DIODE		
D104			1SS226	CHIP DIODE		
D105			MTZ5.1JA	CHIP ZENER DIODE (5.1V)		
D106-108			RLS73	CHIP DIODE		
IC1			MC3357P	IC(LOW POWER FM IF)		
IC2		*	M51131L	IC(AF VR)		
IC3		*	LA5010	IC(LOW SATURATION REGULATOR)		
IC4			TA7324P	IC(OP AMP) AF.MUTE		
IC5 ,6			UPC2002V	IC(OP AMP X2)AF PA		
IC7			UPC7808H	IC(VOLTAGE REGULATOR/ +8V)		
IC8			MC3357P	IC(LOW POWER FM IF)		
IC9			AN612	IC(BALANCE MODULATOR)		
IC10			UPC1158H2	IC(ALC AMP) MIC AMP		
IC11			UPC7808H	IC(VOLTAGE REGULATOR/ +8V)		
IC12,13			TC4066BP	IC(ANALOG/ DIGITAL SW)		
IC14		*	AN78L24	IC(VOLTAGE REGULATOR)		
Q1			2SC2712(Y)	CHIP TRANSISTOR		
Q2			DTC124EK	DIGITAL TRANSISTOR		
Q3			2SC2714(Y)	CHIP TRANSISTOR		
Q4			2SC2712(Y)	CHIP TRANSISTOR		
Q5			3SK131(M)	CHIP FET		
Q6			DTC124EK	DIGITAL TRANSISTOR		
Q7 -9			3SK131(M)	CHIP FET		
Q10 -12			2SC2712(Y)	CHIP TRANSISTOR		
Q13			DTC124EK	DIGITAL TRANSISTOR		
Q14 -16			2SC2712(Y)	CHIP TRANSISTOR		
Q17			DTC124EK	DIGITAL TRANSISTOR		
Q18			2SC2712(Y)	CHIP TRANSISTOR		
Q19 ,20			DTC124EK	DIGITAL TRANSISTOR		
Q21			2SC2712(Y)	CHIP TRANSISTOR		
Q22			DTC124EK	DIGITAL TRANSISTOR		
Q23			2SA1162(Y)	CHIP TRANSISTOR		
Q24			2SD1624S	CHIP TRANSISTOR		
Q25			FMU1	DIGITAL TRANSISTOR		
Q26			DTC124EK	DIGITAL TRANSISTOR		
Q27			DTC143TK	DIGITAL TRANSISTOR		
Q28			DTA124EK	DIGITAL TRANSISTOR		
Q29			FMU1	DIGITAL TRANSISTOR		
Q30			DTC124EK	DIGITAL TRANSISTOR		
Q31			DTC143TK	DIGITAL TRANSISTOR		
Q32			DTA124EK	DIGITAL TRANSISTOR		
Q33 -35			2SC2714(Y)	CHIP TRANSISTOR		

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Q36 ,37			2SC2712(Y)	CHIP TRANSISTOR		
Q48			2SK125-5	FET		
Q49 ,50			DTC124EK	DIGITAL TRANSISTOR		
Q51			2SC2026	TRANSISTOR		
Q52			2SC2712(Y)	CHIP TRANSISTOR		
Q53			DTC124EK	DIGITAL TRANSISTOR		
Q54			2SC2712(Y)	CHIP TRANSISTOR		
Q55			2SC2714(Y)	CHIP TRANSISTOR		
Q56			3SK131(M)	CHIP FET		
Q57			DTC124EK	DIGITAL TRANSISTOR		
Q58 -60			3SK131(M)	CHIP FET		
Q61 -63			2SC2712(Y)	CHIP TRANSISTOR		
Q64		*	FMC2	DIGITAL TRANSISTOR		
Q65 ,66			DTC124EK	DIGITAL TRANSISTOR		
Q67			2SC2712(Y)	CHIP TRANSISTOR		
Q68			FMU1	DIGITAL TRANSISTOR		
Q69			2SC2712(Y)	CHIP TRANSISTOR		
Q70			DTC124EK	DIGITAL TRANSISTOR		
Q71 ,72		*	FMC2	DIGITAL TRANSISTOR		
Q73 -75			2SC2714(Y)	CHIP TRANSISTOR		
Q76 ,77			3SK131(M)	CHIP FET		
Q78 ,79			2SK210(GR)	CHIP FET		
Q80			3SK131(M)	CHIP FET		
Q81 -83		*	FMC2	DIGITAL TRANSISTOR		
Q84 ,85			DTC124EK	DIGITAL TRANSISTOR		
Q86			2SK210(GR)	CHIP FET		
Q87			2SA1162(Y)	CHIP TRANSISTOR		
Q88		*	FMC2	DIGITAL TRANSISTOR		
Q89 ,90			DTC124EK	DIGITAL TRANSISTOR		
Q91		*	FMC2	DIDITAL TRANSISTOR		
Q92			2SA1162(Y)	CHIP TRANSISTOR		
Q93 ,94			DTC124EK	DIGITAL TRANSISTOR		
Q95			DTA124EK	DIGITAL TRANSISTOR		
Q96			2SA1213(Y)	CHIP TRANSISTOR		
Q97			2SA1162(Y)	CHIP TRANSISTOR		
Q98 ,99			2SC2712(Y)	CHIP TRANSISTOR		
Q100-102		*	DTA143TK	DIGITAL TRANSISTOR		
Q103-105			DTC143EK	DIGITAL TRANSISTOR		
Q106			DTC124EK	DIGITAL TRANSISTOR		
Q107			2SA1213(Y)	CHIP TRANSISTOR		
Q108,109		*	FMC2	DIGITAL TRANSISTOR		
Q110			DTC124EK	DIGITAL TRANSISTOR		
Q111,112			DTC143TK	DIGITAL TRANSISTOR		
Q113			2SC2712(Y)	CHIP TRANSISTOR		
Q114			DTA124EK	DIGITAL TRANSISTOR		
Q115			DTC124EK	DIGITAL TRANSISTOR		
Q117-119			DTC124EK	DIGITAL TRANSISTOR		
Q120,121			DTC114TK	DIGITAL TRANSISTOR		
Q122		*	FMC2	DIGITAL TRANSISTOR		
Q123			2SA1162(Y)	CHIP TRANSISTOR		
Q124			DTC124EK	DIGITAL TRANSISTOR		
Q125			DTC144WK	DIGITAL TRANSISTOR		
Q126			DTC124EK	DIGITAL TRANSISTOR		
TH1 -4			112-502-2	THERMISTOR (5k)		
TH5			112-501-2	THERMISTOR (500)		

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TH6			112-301-2	THERMISTOR	(300)			
TH7 ,8			112-501-2	THERMISTOR	(500)			
Z1			W02-0808-05	DC-DC MODULE				
		*	X58-3410-00	SUB UNIT	(NB)			
		*	X59-3480-00	MODULE UNIT				
PLL UNIT (X50-3080-00)								
C1 ,2			CC73FCH1HXXXJ	CHIP C		J		
C3 ,4			CK73FB1H102K	CHIP C	1000PF	K		
C5 ,6			CC73FCH1HXXXJ	CHIP C		J		
C7			CK73FB1H102K	CHIP C	1000PF	K		
C8			CE04EW1A221M	ELECTRO	220UF	10WV		
C9		*	C91-1102-05	FILM	0.10UF	J		
C10 ,11			CK73FB1H102K	CHIP C	1000PF	K		
C12			CE04EW1E101M	ELECTRO	100UF	25WV		
C13			CQ92M1H472K	MYLAR	4700PF	K		
C14			C91-1083-05	FILM	0.47UF	63WV		
C15 -17			CK73FB1H102K	CHIP C	1000PF	K		
C18			CE04EW1E101M	ELECTRO	100UF	25WV		
C19			CC73FCH1H220J	CHIP C	22PF	J		
C20			CC73FSL1H101J	CHIP C	100PF	J		
C21 -23			CK73FB1HXXXK	CHIP C		K		
C24 ,25			CC73FCH1H050C	CHIP C	5.0PF	C		
C26 -34			CK73FB1HXXXK	CHIP C		K		
C35			CC73FSL1H101J	CHIP C	100PF	J		
C36 ,37			CK73FB1H102K	CHIP C	1000PF	K		
C38			CK73FB1E223K	CHIP C	0.022UF	K		
C39			CK73FB1H102K	CHIP C	1000PF	K		
C40			CK73FB1E223K	CHIP C	0.022UF	K		
C41			CK73FF1E104Z	CHIP C	0.10UF	Z		
C42			CK73FB1H102K	CHIP C	1000PF	K		
C43			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C44			CC73FCH1H070D	CHIP C	7.0PF	D		
C45 -47			CK73FB1H103K	CHIP C	0.010UF	K		
C48 ,49			CC73FCH1H220J	CHIP C	22PF	J		
C50			CK73FB1E223K	CHIP C	0.022UF	K		
C51			CC73FCH1H470J	CHIP C	47PF	J		
C52 -55			CK73FB1H103K	CHIP C	0.010UF	K		
C56			CK73FB1E223K	CHIP C	0.022UF	K		
C57			CK73FB1H103K	CHIP C	0.010UF	K		
C58			CC73FCH1H080D	CHIP C	8.0PF	D		
C59			CK73FB1H103K	CHIP C	0.010UF	K		
C60			CC73FCH1H220J	CHIP C	22PF	J		
C61			CK73FB1H103K	CHIP C	0.010UF	K		
C62			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C63			CC73FCH1H220J	CHIP C	22PF	J		
C64 ,65			CK73FB1HXXXK	CHIP C		K		
C66			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C67			CK73FB1H102K	CHIP C	1000PF	K		
C68			CK73FF1E104Z	CHIP C	0.10UF	Z		
C69			CK73FB1E223K	CHIP C	0.022UF	K		
C70			CE04EW1A470M	ELECTRO	47UF	10WV		
C71			CK73FB1H102K	CHIP C	1000PF	K		
C72			CQ92M1H333K	MYLAR	0.033UF	K		

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C73			CE04EW1A470M	ELECTRO	47UF	10WV		
C74			CQ92M1H562K	MYLAR	5600PF	K		
C75			CK73FB1H102K	CHIP C	1000PF	K		
C76			CC73FCH1H220J	CHIP C	22PF	J		
C77		＊	CC73FUJ1H180J	CHIP C	18PF	J		
C78			CE04EW1A101M	ELECTRO	100UF	10WV		
C79 -81			CK73FB1H103K	CHIP C	0.010UF	K		
C82			CK73FB1E223K	CHIP C	0.022UF	K		
C83 -86			CK73FB1HXXXK	CHIP C		K		
C87			CE04EW1HR47M	ELECTRO	0.47UF	50WV		
C88 ,89			CK73FB1H102K	CHIP C	1000PF	K		
C90 ,91			CK73FB1E223K	CHIP C	0.022UF	K		
C92			CK73FB1H103K	CHIP C	0.010UF	K		
C93			CC73FCH1H220J	CHIP C	22PF	J		
C94 -97			CK73FB1H103K	CHIP C	0.010UF	K		
C98			CK73FB1E223K	CHIP C	0.022UF	K		
C99			CK73FB1H103K	CHIP C	0.010UF	K		
C100			CC73FCH1H050C	CHIP C	5.0PF	C		
C101			CK73FB1H681K	CHIP C	680PF	K		
C102			CK73FB1H102K	CHIP C	1000PF	K		
C103			CK73FB1H681K	CHIP C	680PF	K		
C104			CK73FB1E223K	CHIP C	0.022UF	K		
C105			CK73FB1H103K	CHIP C	0.010UF	K		
C106			CK73FB1H102K	CHIP C	1000PF	K		
C107			CK73FB1E223K	CHIP C	0.022UF	K		
C108			CE04EW1A101M	ELECTRO	100UF	10WV		
C109		＊	CC73FUJ1H220J	CHIP C	22PF	J		
C110			CC73FCH1H220J	CHIP C	22PF	J		
C111			CK73FB1H102K	CHIP C	1000PF	K		
C112			CE04EW1A470M	ELECTRO	47UF	10WV		
C113			CQ92M1H333K	MYLAR	0.033UF	K		
C114			CQ92M1H562K	MYLAR	5600PF	K		
C115			CK73FF1E104Z	CHIP C	0.10UF	Z		
C116			CK73FB1E223K	CHIP C	0.022UF	K		
C117			CK73FB1H102K	CHIP C	1000PF	K		
C118			CK73FB1E223K	CHIP C	0.022UF	K		
C119			CK73FB1H103K	CHIP C	0.010UF	K		
C120			CK73FB1E223K	CHIP C	0.022UF	K		
C121			CC73FCH1H220J	CHIP C	22PF	J		
C122-125			CK73FB1HXXXK	CHIP C		K		
C126			CK73FB1E223K	CHIP C	0.022UF	K		
C127			CK73FB1H103K	CHIP C	0.010UF	K		
C128			CC73FCH1H050C	CHIP C	5.0PF	C		
C129-131			CK73FB1HXXXK	CHIP C		K		
C132			CK73FB1E223K	CHIP C	0.022UF	K		
C133,134			CK73FB1HXXXK	CHIP C		K		
C135			CK73FB1E223K	CHIP C	0.022UF	K		
C136			CE04EW1A101M	ELECTRO	100UF	10WV		
C137		＊	CC73FUJ1H220J	CHIP C	22PF	J		
C138			CC73FCH1H180J	CHIP C	18PF	J		
C139			CK73FB1H102K	CHIP C	1000PF	K		
C140			CQ92M1H333K	MYLAR	0.033UF	K		
C141			CQ92M1H562K	MYLAR	5600PF	K		
C142			CE04EW1A470M	ELECTRO	47UF	10WV		
C143			CK73FB1H103K	CHIP C	0.010UF	K		

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C144			CK73FF1E104Z	CHIP C	0.10UF Z		
C145			CK73FB1E223K	CHIP C	0.022UF K		
C146-148			CK73FB1H102K	CHIP C	1000PF K		
C149,150			CK73FB1E223K	CHIP C	0.022UF K		
C151,152			CC73FCH1H180J	CHIP C	18PF J		
C153			CK73FB1H102K	CHIP C	1000PF K		
C154,155			CK73FB1E223K	CHIP C	0.022UF K		
C156			CC73FCH1H070D	CHIP C	7.0PF D		
C157			CE04EW1A470M	ELECTRO	47UF 10WV		
C158			CK73FB1E223K	CHIP C	0.022UF K		
C159			CC73FCH1H100D	CHIP C	10PF D		
C160			CK73FB1E223K	CHIP C	0.022UF K		
C161			CK73FB1H102K	CHIP C	1000PF K		
C162			CC73FSL1H101J	CHIP C	100PF J		
C163			CK73FB1E223K	CHIP C	0.022UF K		
C164			CC73FSL1H101J	CHIP C	100PF J		
C165			CK73FB1E223K	CHIP C	0.022UF K		
C166			CK73FB1H103K	CHIP C	0.010UF K		
C167			CC73FCH1H050C	CHIP C	5.0PF C		
C168			CK73FB1E223K	CHIP C	0.022UF K		
C169			CC73FCH1H0R5C	CHIP C	0.5PF C		
C170			CK73FB1E223K	CHIP C	0.022UF K		
C171			CK73FB1H103K	CHIP C	0.010UF K		
C172			CC73FCH1H220J	CHIP C	22PF J		
C173			CK73FB1E223K	CHIP C	0.022UF K		
C174			CC73FCH1H0R5C	CHIP C	0.5PF C		
C175			CK73FB1H103K	CHIP C	0.010UF K		
C176			CK73FB1E223K	CHIP C	0.022UF K		
C177			CC73FSL1H560J	CHIP C	56PF J		
C178-188			CK73FB1HXXXK	CHIP C	K		
C189			CC73FCH1H470J	CHIP C	47PF J		
C190-207			CK73FB1HXXXK	CHIP C	K		
C208,209			CE04EW1A101M	ELECTRO	100UF 10WV		
C210-213			CK73FB1HXXXK	CHIP C	K		
C214			CE04EW1A101M	ELECTRO	100UF 10WV		
C215-217			CE04EW1A470M	ELECTRO	47UF 10WV		
C216			CK73FB1E223K	CHIP C	0.022UF K		
C218			CK73FB1H103K	CHIP C	0.010UF K		
C219			CC73FCH1H390J	CHIP C	39PF J		
C220			CK73FB1H103K	CHIP C	0.010UF K		
C221-222			CC73FCH1HXXXJ	CHIP C	J		
C250			CC73FCH1H070D	CHIP C	7.0PF D		
C251			CC73FCH1H010C	CHIP C	1.0PF C		
C252			CC73FCH1H100D	CHIP C	10PF D		
C253			CC73FCH1H020C	CHIP C	2.0PF C		
C254-256			CC73FCH1H070D	CHIP C	7.0PF D		
C257			CK73FB1H471K	CHIP C	470PF K		
C258			CC73FSL1H101J	CHIP C	100PF J		
C259,260			CK73FB1H102K	CHIP C	1000PF K		
C261			CC73FSL1H101J	CHIP C	100PF J		
C262			CC73FCH1H050C	CHIP C	5.0PF C		
C263-265			CK73FB1HXXXK	CHIP C	K		
C266			CC73FCH1H470J	CHIP C	47PF J		
C267			CK73FB1H102K	CHIP C	1000PF K		
C269			CC73FSL1H101J	CHIP C	100PF J		

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C270			CK73FB1H103K	CHIP C	0.010UF K		
C271,272			CC73FCH1HXXXJ	CHIP C	J		
C273,274			CK73FB1H102K	CHIP C	1000PF K		
C275			CC73FCH1H030C	CHIP C	3.0PF C		
C276-278			CK73FB1H102K	CHIP C	1000PF K		
C279			CK73FB1E223K	CHIP C	0.022UF K		
C280			CK73FF1E104Z	CHIP C	0.10UF Z		
C281			CK73FB1H102K	CHIP C	1000PF K		
C282			CQ92M1H102K	MYLAR	1000PF K		
C283			C91-1083-05	FILM	0.47UF 63WV		
C284,285			CK73FB1H102K	CHIP C	1000PF K		
C286			CE04EW1A221M	ELECTRO	220UF 10WV		
C287			CK73FB1H102K	CHIP C	1000PF K		
C288		*	C91-1102-05	FILM	0.10UF J		
C289			CE04EW1HR47M	ELECTRO	0.47UF 50WV		
C290,291			CK73FB1HXXXK	CHIP C	K		
C292			CE04EW1E101M	ELECTRO	100UF 25WV		
C293			CC73FCH1H390J	CHIP C	39PF J		
C294,295			CK73FB1H102K	CHIP C	1000PF K		
C296			CC73FCH1H030C	CHIP C	3.0PF C		
C297,298			CK73FB1HXXXK	CHIP C	K		
C299			CE04EW1A221M	ELECTRO	220UF 10WV		
C300			CK73FB1H102K	CHIP C	1000PF K		
C301			CQ92M1H332K	MYLAR	3300PF K		
C302			C91-1074-05	FILM	0.33UF 63WV		
C303			CE04EW1A470M	ELECTRO	47UF 10WV		
C304,305			CK73FB1H103K	CHIP C	0.010UF K		
C306			CC73FCH1H030C	CHIP C	3.0PF C		
C307,308			CK73FB1H102K	CHIP C	1000PF K		
C309			CC73FCH1H020C	CHIP C	2.0PF C		
C310			CK73FB1H102K	CHIP C	1000PF K		
C311,312			CK73FB1E223K	CHIP C	0.022UF K		
C313			CK73FB1H102K	CHIP C	1000PF K		
C314-316			CC73FCH1HXXXJ	CHIP C	J		
C317			CK73FB1E223K	CHIP C	0.022UF K		
C318,319			CK73FB1HXXXK	CHIP C	K		
C320			CK73FB1E223K	CHIP C	0.022UF K		
C321			CK73FB1H102K	CHIP C	1000PF K		
C322			CK73FB1E223K	CHIP C	0.022UF K		
C323			CE04EW1A470M	ELECTRO	47UF 10WV		
C324			CK73FB1H102K	CHIP C	1000PF K		
C325			CK73FF1E104Z	CHIP C	0.10UF Z		
C326			CK73FB1H103K	CHIP C	0.010UF K		
C327			CK73FB1E223K	CHIP C	0.022UF K		
C328-331			CK73FB1H103K	CHIP C	0.010UF K		
C332			CC73FCH1H080D	CHIP C	8.0PF D		
C333			CC73FCH1H470J	CHIP C	47PF J		
C334			CK73FB1H103K	CHIP C	0.010UF K		
C335,336			CC73FCH1H100D	CHIP C	10PF D		
C337-339			CK73FB1HXXXK	CHIP C	K		
C340			CC73FCH1H070D	CHIP C	7.0PF D		
C341,342			CC73FCH1HXXXD	CHIP C	D		
C343			CC73FCH1H150J	CHIP C	15PF J		
C344			CK73FB1E223K	CHIP C	0.022UF K		
C345,346			CC73FCH1HXXXC	CHIP C	C		

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C347,348			CK73FB1H103K	CHIP C	0.010UF	K		
C349			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C350			CC73FCH1H470J	CHIP C	47PF	J		
C351,352			CK73FB1H102K	CHIP C	1000PF	K		
C353			CK73FB1E223K	CHIP C	0.022UF	K		
C354			CE04EW1A470M	ELECTRO	47UF	10WV		
C355			CK73FF1E104Z	CHIP C	0.10UF	Z		
C356			CQ92M1H333K	MYLAR	0.033UF	K		
C357			CQ92M1H562K	MYLAR	5600PF	K		
C358			CE04EW1A470M	ELECTRO	47UF	10WV		
C359,360			CK73FB1HXXXK	CHIP C		K		
C361			CC73FCH1H220J	CHIP C	22PF	J		
C362		*	CC73FUJ1H180J	CHIP C	18PF	J		
C363			CE04EW1A101M	ELECTRO	100UF	10WV		
C364-366			CK73FB1HXXXK	CHIP C		K		
C367			CK73FB1E223K	CHIP C	0.022UF	K		
C368-371			CK73FB1HXXXK	CHIP C		K		
C372			CE04EW1A470M	ELECTRO	47UF	10WV		
C373			CK73FB1E223K	CHIP C	0.022UF	K		
C374			CK73FF1E104Z	CHIP C	0.10UF	Z		
C375			CK73FB1H102K	CHIP C	1000PF	K		
C376			C91-1083-05	FILM	0.47UF	63WV		
C377			CQ92M1H472K	MYLAR	4700PF	K		
C378			CE04EW1A470M	ELECTRO	47UF	10WV		
C379,380			CK73FB1H103K	CHIP C	0.010UF	K		
C381			CC73FCH1H030C	CHIP C	3.0PF	C		
C382			CK73FB1H102K	CHIP C	1000PF	K		
C383		*	C91-1102-05	FILM	0.10UF	J		
C384			CK73FB1H102K	CHIP C	1000PF	K		
C385			CE04EW1A221M	ELECTRO	220UF	10WV		
C386			CK73FB1H102K	CHIP C	1000PF	K		
C387			CC73FCH1H020C	CHIP C	2.0PF	C		
C388-391			CK73FB1HXXXK	CHIP C		K		
C392			CC73FSL1H101J	CHIP C	100PF	J		
C393			CC73FCH1H100D	CHIP C	10PF	D		
C394			CK73FB1E223K	CHIP C	0.022UF	K		
C395			CK73FB1H103K	CHIP C	0.010UF	K		
C396			CE04EW1A101M	ELECTRO	100UF	10WV		
C397-407			CK73FB1HXXXK	CHIP C		K		
C408			CC73FCH1H100D	CHIP C	10PF	D		
C409			CC73FCH1H120J	CHIP C	12PF	J		
C410			CC73FCH1H030C	CHIP C	3.0PF	C		
C411,412			CC73FCH1H100D	CHIP C	10PF	D		
C413-416			CC73FCH1HXXXD	CHIP C		D		
C417			CE04EW1A470M	ELECTRO	47UF	10WV		
C418			CC73FCH1H120J	CHIP C	12PF	J		
C419,420			CC73FCH1H100D	CHIP C	10PF	D		
C421			CC73FCH1H050C	CHIP C	5.0PF	C		
C422			CC73FCH1H100D	CHIP C	10PF	D		
TC1			C05-0350-05	TRIMMING CAP (20P)				
TC50			C05-0349-05	TRIMMING CAP (10P)				
ALL			E29-0440-14	TERMINAL (GND)				
CN1		*	E40-5137-05	PIN CONNECTOR (22P)				
CN2		*	E40-3308-05	PIN CONNECTOR (11P)				

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CN3			E40-3237-05	PIN CONNECTOR (2P)		
CN4 -6			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN7			E40-3237-05	PIN CONNECTOR (2P)		
CN8			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN9			E40-5069-05	PIN CONNECTOR (12P)		
CN50,51			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
TP1 -12			E23-0465-05	TERMINAL		
TP50,51			E23-0465-05	TERMINAL		
TP53-61			E23-0465-05	TERMINAL		
W1		*	E31-3392-05	CONNECTING WIRE		
A1 -4			F11-0817-04	SHIELDING COVER		
A5 -8			F11-0818-24	SHIELDING COVER		
A9			F10-1258-04	SHIELDING PLATE		
A10		*	F11-1120-04	SHIELDING COVER		
CF1 ,2		*	L72-0367-05	CERAMIC FILTER (SFE 11.050MJ)		
CF3		*	L72-0368-05	CERAMIC FILTER (SFE 10.595MJ)		
CF4		*	L72-0369-05	CERAMIC FILTER (SFE 10.7MJ-27)		
CF50,51		*	L72-0367-05	CERAMIC FILTER (SFE 11.050MJ)		
L1			L34-1025-05	COIL (5.5T)		
L2			L34-1026-05	COIL (7.5T)		
L3 ,4		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L5 ,6		*	L40-1892-19	SMALL FIXED INDUCTOR (1.8U)		
L7 ,8			L34-2044-05	TUNING COIL		
L9			L34-2043-05	TUNING COIL		
L10			L31-0313-05	COIL		
L11			L30-0281-15	IFT		
L12		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L13 ,14			L34-2232-05	TUNING COIL		
L15 ,16			L34-2042-05	TUNING COIL		
L17			L32-0676-05	OSCILLATING COIL		
L18		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L19 ,20			L40-1011-14	SMALL FIXED INDUCTOR (100U)		
L21			L40-2211-14	SMALL FIXED INDUCTOR (220U)		
L22			L30-0281-15	IFT		
L23 ,24			L40-2211-14	SMALL FIXED INDUCTOR (220U)		
L25			L32-0197-05	OSCILLATING COIL		
L26			L40-2211-14	SMALL FIXED INDUCTOR (220U)		
L27			L30-0281-15	IFT		
L28 ,29		*	L40-1811-14	SMALL FIXED INDUCTOR (180U)		
L30		*	L32-0633-05	OSCILLATING COIL		
L31 ,32		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L33		*	L40-6891-19	SMALL FIXED INDUCTOR (6.8U)		
L34		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L35 ,36			L34-2038-05	TUNING COIL		
L37 ,38			L30-0289-05	IFT		
L39			L40-1092-19	SMALL FIXED INDUCTOR (1U)		
L50 -53			L34-1058-05	COIL (2.5T)		
L54 ,55		*	L40-1582-19	SMALL FIXED INDUCTOR (0.15U)		
L56		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L57 ,58		*	L39-0441-05	COIL		
L59 ,60		*	L40-1582-19	SMALL FIXED INDUCTOR (0.15U)		
L61		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L62			L34-0683-05	TUNING COIL		
L63 ,64		*	L79-0831-05	FILTER MODULE		

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L65 ,66		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L67		*	L40-1582-19	SMALL FIXED INDUCTOR (0.15U)		
L68 ,69		*	L40-4791-19	SMALL FIXED INDUCTOR (4.7U)		
L70		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L71			L30-0281-15	IFT		
L72			L31-0313-05	COIL		
L73		*	L34-4091-05	TUNING COIL		
L74 ,75		*	L34-4092-05	TUNING COIL		
L76 ,77			L34-2041-05	TUNING COIL		
L78 ,79			L34-2044-05	TUNING COIL		
L80		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L81			L32-0676-05	OSCILLATING COIL		
L83		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L84			L34-2271-05	TUNING COIL		
L85		*	L40-1001-19	SMALL FIXED INDUCTOR (10U)		
L86 ,87			L40-1011-14	SMALL FIXED INDUCTOR (100U)		
L88			L34-1032-05	COIL (3.5T)		
L89			L34-1177-05	COIL (4.5T)		
L90			L34-1032-05	COIL (3.5T)		
L91 ,92			L40-2272-80	SMALL FIXED INDUCTOR (0.022U)		
X1		*	L77-1392-05	TCXO (10.24MHZ)		
R1 -362			RK73FB2AXXXJ	CHIP R J 1/10W		
D2			1SV164	CHIP VARI-CAP DIODE		
D3			1SV166	CHIP VARI-CAP DIODE		
D4			1SV164	CHIP VARI-CAP DIODE		
D5 -7			1SV166	CHIP VARI-CAP DIODE		
D50			1SS184	CHIP DIODE		
D51			ND487C1-3R	DIODE		
D52			1SS184	CHIP DIODE		
D53			1SV166	CHIP VARI-CAP DIODE		
IC1			SN16913P	IC(DUBLE BALANCED MIXERS)		
IC2		*	CX-7925B	IC(DIGITAL SELECT PLL)		
IC2			CX-7925B-1	IC(DIGITAL SELECT PLL)ER PLL)		
IC3			M54459L	IC(PRE SCALER)		
IC4		*	CX-7925B	IC(DIGITAL SELECT PLL)		
IC4		*	CX-7925B-1	IC(DIGITAL SELECT PLL)ER PLL)		
IC5			SN16913P	IC(DUBLE BALANCED MIXERS)		
IC6			M54459L	IC(PRE SCALER)		
IC7		*	CX-7925B	IC(DIGITAL SELECT PLL)		
IC7		*	CX-7925B-1	IC(DIGITAL SELECT PLL)ER PLL)		
IC8			SN16913P	IC(DUBLE BALANCED MIXERS)		
IC9			M54459L	IC(PRE SCALER)		
IC10		*	CX-7925B	IC(DIGITAL SELECT PLL)		
IC10		*	CX-7925B-1	IC(DIGITAL SELECT PLL)ER PLL)		
IC11			UPC78M05H	IC(VOLTAGE REGULATOR/ +5V)		
IC12		*	TC4S81F	IC(AND GATE)		
IC50,51		*	CX-7925B	IC(DIGITAL SELECT PLL)		
IC50,51		*	CX-7925B-1	IC(DIGITAL SELECT PLL)ER PLL)		
IC52			SN16913P	IC(DUBLE BALANCED MIXERS)		
IC53			M54459L	IC(PRE SCALER)		
IC54,55		*	CX-7925B	IC(DIGITAL SELECT PLL)		
IC54,55		*	CX-7925B-1	IC(DIGITAL SELECT PLL)ER PLL)		
Q1			2SC2714(Y)	CHIP TRANSISTOR		

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Q2 -4		*	2SC3324(G)	CHIP TRANSISTOR		
Q5 -8			2SC2714(Y)	CHIP TRANSISTOR		
Q9 ,10			2SK210(GR)	CHIP FET		
Q11 -13			2SC2714(Y)	CHIP TRANSISTOR		
Q14			DTC114EK	DIGITAL TRANSISTOR		
Q15		*	FMC1	DIGITAL TRANSISTOR		
Q16 ,17			2SC2714(Y)	CHIP TRANSISTOR		
Q18 -23		*	FMU1	DIGITAL TRANSISTOR		
Q24 ,25			2SC2714(Y)	CHIP TRANSISTOR		
Q26			2SA1213(Y)	CHIP TRANSISTOR		
Q27 ,28			DTC114EK	DIGITAL TRANSISTOR		
Q50			2SC3356	CHIP TRANSISTOR		
Q51 -54			2SC3098	CHIP TRANSISTOR		
Q55 -57		*	2SC3324(G)	CHIP TRANSISTOR		
Q58			DTC114EK	DIGITAL TRANSISTOR		
Q59		*	FMC1	DIGITAL TRANSISTOR		
Q60 -65			2SC2714(Y)	CHIP TRANSISTOR		
Q66 ,67			2SK210(GR)	CHIP FET		
Q68 -70			2SC2714(Y)	CHIP TRANSISTOR		
Q71 -73		*	FMU1	DIGITAL TRANSISTOR		
Q74			DTC114EK	DIGITAL TRANSISTOR		
Q75			2SA1213(Y)	CHIP TRANSISTOR		
Q76			2SC2714(Y)	CHIP TRANSISTOR		
Z1		*	X58-3390-00	SUB UNIT (VCO2 144A)		
Z2		*	X59-3440-00	MODULE UNIT (VCO1)		
Z3		*	X59-3450-00	MODULE UNIT (LPF)		
Z4		*	X59-3440-00	MODULE UNIT (VCO1)		
Z5		*	X59-3450-00	MODULE UNIT (LPF)		
Z6		*	X59-3440-00	MODULE UNIT (VCO1)		
Z7		*	X59-3450-00	MODULE UNIT (LPF)		
Z50			X58-3400-01	SUB UNIT (VCO3 430A)		
Z51			X58-3390-02	SUB UNIT (VCO2 430D)		
Z52			X58-1000-02	SUB UNIT (VCO 430C)		
Z53 ,54		*	X59-3450-00	MODULE UNIT (LPF)		
Z55		*	X59-3440-00	MODULE UNIT (VCO1)		
Z56		*	X59-3450-00	MODULE UNIT (LPF)		
CONTROL UNIT (X53-3120-XX) -11 : K -21 : M1 -22 : M2 -61 : T, W						
C1			CE04EW1A470M	ELECTRO 47UF 10WV		
C2			C91-0119-05	CERAMIC 0.047UF K		
C3			CE04EW1A470M	ELECTRO 47UF 10WV		
C4			C91-0119-05	CERAMIC 0.047UF K		
C5			CE04EW1E221M	ELECTRO 220UF 25WV		
C6			C91-0119-05	CERAMIC 0.047UF K		
C7			CE04EW1A470M	ELECTRO 47UF 10WV		
C8			CK73FB1E103K	CHIP C 0.010UF K		
C9			CE04EW1H3R3M	ELECTRO 3.3UF 50WV		
C10 ,11			CC73FCH1H100D	CHIP C 10PF D		
C12 -14			CK73FB1E103K	CHIP C 0.010UF K		
C16 -18			CK73FB1H102K	CHIP C 1000PF K		
C19			CK45F1H103Z	CERAMIC 0.010UF Z		
C20			CK73FB1E103K	CHIP C 0.010UF K		
C21			CE04EW1A470M	ELECTRO 47UF 10WV		
C22 -28			CK73FB1E103K	CHIP C 0.010UF K		
C29			CP90-2058-05	ELECTRO 47UF 10WV		

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C30			CK73FF1E104Z	CHIP C 0.10UF Z		
C31 -38			CK73FB1H102K	CHIP C 1000PF K		
C39			CK73FB1E103K	CHIP C 0.010UF K		
C40			CK73FF1E104Z	CHIP C 0.10UF Z		
C41			CE04EW1A470M	ELECTRO 47UF 10WV		
C42 ,43			CK73FF1E104Z	CHIP C 0.10UF Z		
C44			C90-2041-05	ELECTRO 10UF 10WV		
C45			CK73FF1E104Z	CHIP C 0.10UF Z		
C46			CE04EW1A470M	ELECTRO 47UF 10WV		
C47			CK73FF1E104Z	CHIP C 0.10UF Z		
C48 -56			CK73FB1E103K	CHIP C 0.010UF K		
C57 -60			CK73FB1H102K	CHIP C 1000PF K		
C61			CK73FB1E103K	CHIP C 0.010UF K		
C62 -65			CK73FB1H102K	CHIP C 1000PF K		
C66 -71			CK73FB1E103K	CHIP C 0.010UF K		
C74 -76			CK73FB1H102K	CHIP C 1000PF K		
C77			CK73FB1E103K	CHIP C 0.010UF K		
C78 ,79			CK73FB1H102K	CHIP C 1000PF K		
C80 -82			CK73FB1E103K	CHIP C 0.010UF K		
C83 -86			CK73FB1H102K	CHIP C 1000PF K		
C87 -89			CK73FB1E103K	CHIP C 0.010UF K		
C90 -95			CK73FB1H102K	CHIP C 1000PF K		
C96			CK73FB1E103K	CHIP C 0.010UF K		
C97			CK73FF1E104Z	CHIP C 0.10UF Z		
C98 -103			CK73FB1H102K	CHIP C 1000PF K		
C105			CK73FB1E103K	CHIP C 0.010UF K		
C106-112			CK73FB1H102K	CHIP C 1000PF K		
C113-116			CK73FB1E103K	CHIP C 0.010UF K		
C117-120			CK73FB1H471K	CHIP C 470PF K		
C121			CK73FB1E103K	CHIP C 0.010UF K		
C122-129			CK73FF1E104Z	CHIP C 0.10UF Z		
C130-161			CK73FB1HXXXK	CHIP C K		
C162-165			CK73FF1E104Z	CHIP C 0.10UF Z		
C166-185			CK73FB1HXXXK	CHIP C K		
CN1		*	E40-5137-05	FPC CONNECTOR (22P)		
CN2			E40-3239-05	PIN CONNECTOR (4P)		
CN3			E40-3240-05	PIN CONNECTOR (5P)		
CN4			E40-3303-05	PIN CONNECTOR (6P)		
CN5		*	E40-5038-05	FPC CONNECTOR (14P)		
CN6			E40-5141-05	PIN CONNECTOR (26P)		
CN7			E40-5131-05	FPC CONNECTOR (16P)		
CN8		*	E40-5139-05	FPC CONNECTOR (24P)		
CN9			E40-3242-05	PIN CONNECTOR (7P)		
CN10			E40-3237-05	PIN CONNECTOR (2P)		
CN11			E40-3240-05	PIN CONNECTOR (5P)		
CN12			E40-3237-05	PIN CONNECTOR (2P)		
CN13		*	E02-2015-05	IC SOCKET (28P)		
L1			L40-1011-17	SMALL FIXED INDUCTOR (100U)		
L2 ,3			L40-4701-17	SMALL FIXED INDUCTOR (47U)		
X1		*	L77-1380-05	CRYSTAL RESONATOR(11.0592MHZ)		
CP1			R90-0455-05	MULTI-COMP 4.7kX8 J 1/4W		
R1 -78			RK73FB2AXXXJ	CHIP R J 1/10W		
R79 ,80			R92-0670-05	CHIP R 0 OHM		
R81 -83			R92-0679-05	CHIP R 0 OHM		

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VR1 -3		*	R12-1090-05	TRIMMING POT. (4.7k)		
D1			RLS73	CHIP DIODE		
D2 -5			DAP202(K)	CHIP DIODE		
D6			RLS73	CHIP DIODE		
D7		*	RLZ12JB	CHIP ZENER DIODE		
D12 -15			RLS73	CHIP DIODE		
D21			RLS73	CHIP DIODE	TW	
D22			1SS133	CHIP DIODE	KM1M2	
D23			1SS133	CHIP DIODE	M1TW	
D24			1SS133	CHIP DIODE	M1M2TW	
D29 ,30			1SS133	CHIP DIODE		
D32			1SS133	CHIP DIODE		
IC1		*	UPD78C10G-36	IC(MICROPROCESSOR)		
IC2		*	27C256A-25JAN5	IC(ROM)		
IC2		*	27C256AD-20JAN5	IC(ROM)		
IC3		*	TC5564APL-15	IC(8KX8 RAM)		
IC4		*	SN74ALS573BN	IC(TRIPRE UNBUFFERED INVERTER)		
IC5			SN74LS138N	IC(DECODERS)		
IC6		*	MB89363B	IC(MICROPROCESSOR)		
IC7			M5M82C55AFP-5	IC(MICROPROCESSOR)		
IC8		*	M54648L-D	IC(BI-DIRECTIONAL MOTOR DR)		
IC9			PST520D	IC(LOW POWER RESET)		
IC10			SN7404N	IC(6-CIRCUIT INVERTER)		
IC11,12			TC4011BP	IC(NAND X4)		
IC13			MC14584BCP	IC(ENCODER IC)		
IC15,16		*	TC4SU69F	IC(INVERTER GATE)		
Q2 -5			DTC124EK	DIGITAL TRANSISTOR		
Q6 -17		*	FMC1	DIGITAL TRANSISTOR		
Q18			DTC124EK	DIGITAL TRANSISTOR		
BA1		*	W09-0514-05	LITHIUM BATTERY		
VCO (X58-1000-02)						
C1			CQ92M1H473K	MYLAR 0.047UF K		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CC73FCH1H130J	CHIP C 13PF J		
C4 ,5			CC73FCH1HXXXD	CHIP C D		
C6			CK73FB1H102K	CHIP C 1000PF K		
C7			CC73FCH1H180J	CHIP C 18PF J		
C8			CC73FCH1H050C	CHIP C 5.0PF C		
C9			CK73FB1H102K	CHIP C 1000PF K		
TC1			C05-0031-15	TRIMMING CAP 10PF		
			E23-0464-05	TERMINAL		
			F11-1018-04	SHIELDING COVER		
			F11-1056-04	SHIELDING COVER		
L1			L32-0682-05	OSCILLATING COIL (3.3U)		
L2			L33-0690-05	CHOKE COIL (3.5T)		
R1 -5			RK73FB2AXXXJ	CHIP R J 1/10W		
D1			1SV50	VARI-CAP DIODE		
Q1			2SK125	FET		
Q2			2SC3714(Y)	CHIP TRANSISTOR		

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VCO (X58-3390-XX) -00 : 144A -02 : 430D						
A7			B42-2437-04	LABEL		
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			CC73FSL1H101J	CHIP C 100PF J		
C3			CC73FCH1H180J	CHIP C 18PF J	430D	
C3			CC73FCH1H220J	CHIP C 22PF J	144A	
C4			CC73FCH1H100D	CHIP C 10PF D	144A	
C4			CC73FCH1H220J	CHIP C 22PF J	430D	
C5			CC73FCH1H070D	CHIP C 7.0PF D		
C6			CC73FCH1H120J	CHIP C 12PF J	144A	
C6			CC73FCH1H180J	CHIP C 18PF J	430D	
C7			CC73FCH1H030C	CHIP C 3.0PF C		
C7			CC73FCH1H120J	CHIP C 12PF J		
C8 ,9			CK73FB1H102K	CHIP C 1000PF K		
C10			CC73FCH1H020D	CHIP C 2.0PF D	430D	
C10			CC73FCH1H030C	CHIP C 3.0PF C	144A	
C11			CK73FB1H102K	CHIP C 1000PF K		
TC1			C05-0349-05	TRIMMING CAP (10PF)		
TP1 -3			E23-0486-05	TERMINAL		
A1		*	F11-1085-04	SHIELDING COVER		
A2		*	F11-1086-04	SHIELDING COVER		
A6		*	G13-0904-04	CUSHION		
L1			L33-0690-05	CHOKE COIL (3.3U)		
L2		*	L34-2313-05	COIL	430D	
L2		*	L34-2315-05	COIL	144A	
A3 -5			N30-2604-41	PAN HEAD MACHINE SCREW		
R1 -7			RK73FB2AXXXJ	CHIP R J 1/10W		
D1			1SV166	CHIP VARI-CAP DIODE		
Q1		*	2SK508NV(K52)	CHIP FET		
Q2			2SC2714(Y)	CHIP TRANSISTOR		
VCO (X58-3400-01)						
A7			B42-2437-04	LABEL		
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			CC73FSL1H101J	CHIP C 100PF J		
C3			CC73FCH1H120J	CHIP C 12PF J		
C4			CC73FCH1H100D	CHIP C 10PF D		
C5			CC73FCH1H030C	CHIP C 3.0PF C		
C6 ,7			CC73FCH1HXXXD	CHIP C D		
C8			CK73FB1H102K	CHIP C 1000PF K		
C9			CC73FCH1HR75C	CHIP C 0.75PF C		
C10			CK73FB1H102K	CHIP C 1000PF K		
C11			CC73FSL1H101J	CHIP C 100PF J		
C12			CK73FB1H102K	CHIP C 1000PF K		
TC1			C05-0348-05	TRIMMING CAP 6PF		
TP1 -3			E23-0486-05	TERMINAL		
A1			F11-1085-04	SHIELDING COVER		
A2			F11-1086-04	SHIELDING COVER		

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A6			G13-0904-04	CUSHION		
L1		＊	L34-2316-05	COIL		
L2			L33-0663-05	CHOKE COIL		
L3 ,4		＊	L40-1092-19	SMALL FIXED INDUCTOR (1U)		
A3 -5			N30-2604-41	PAN HEAD MACHINE SCREW		
R1 -6			RK73FB2AXXXJ	CHIP R J 1/10W		
D1			1SV166	CHIP VARI-CAP DIODE		
Q1			2SK508NV(K52)	CHIP FET		
Q2			2SC3356	CHIP TRANSISTOR		
NB (X58-3410-00)						
C1 -7			CK73FB1E103K	CHIP C 0.010UF K		
C8			CE04CW1C100M	ELECTRO 10UF 16WV		
C9			CK73FB1E103K	CHIP C 0.010UF K		
C10			CK73FB1H331K	CHIP C 330PF K		
C11			CK73FB1E103K	CHIP C 0.010UF K		
C12			CK73FB1H102K	CHIP C 1000PF K		
C13			CE04CW1H010M	ELECTRO 1.0UF 50WV		
C14 ,15			CK73FB1E103K	CHIP C 0.010UF K		
W1		＊	E40-0411-05	PIN CONNECTOR (4P)		
W2			E40-0311-05	PIN CONNECTOR (3P)		
L1			L40-4701-14	SMALL FIXED INDUCTOR (47U)		
L2 ,3			L30-0281-15	IFT		
L4			L40-1021-14	SMALL FIXED INDUCTOR (1M)		
R1 -14			RK73FB2AXXXJ	CHIP R J 1/10W		
D1			HSM276S	CHIP DIODE		
D2			RLS73	CHIP DIODE		
Q1 -3			2SC2714(Y)	CHIP TRANSISTOR		
Q4 ,5			2SC2712(Y)	CHIP TRANSISTOR		
VCO (X59-3440-00)						
C1			CC73FCH1H080D	CHIP C 8.0PF D		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CC73FCH1H030C	CHIP C 3.0PF C		
C4			CK73FB1H103K	CHIP C 0.010UF K		
			E23-0471-05	TERMINAL		
L1			L40-1011-48	SMALL FIXED INDUCTOR (100U)		
R1 -7			RK73FB2AXXXJ	CHIP R J 1/10W		
Q1			2SK210(GR)	CHIP FET		
Q2			2SC2714(Y)	CHIP TRANSISTOR		
LPF (X59-3450-00)						
C1			CK73FB1H103K	CHIP C 0.010UF K		
			E23-0471-05	TERMINAL		
R1 -4			RK73FB2AXXXJ	CHIP R J 1/10W		
Q1 -3			2SC3324(G)	CHIP TRANSISTOR		
MODULE UNIT (X59-3480-00)						
C1			CK73FB1E223K	CHIP C 0.022UF K		

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C2			CK73EB1E104K	CHIP C 0.10UF K		
C3			CK73FB1E103K	CHIP C 0.010UF K		
C4			CK73EB1E104K	CHIP C 0.10UF K		
C5			CK73FB1E223K	CHIP C 0.022UF K		
C6 ,7			CK73EB1E104K	CHIP C 0.10UF K		
C21			CK73FB1H392K	CHIP C 3900PF K		
C22			C92-0004-05	CHIP TAN 1UF 16WV		
C41			CK73FB1E103K	CHIP C 0.010UF K		
C42			CC73FSL1H391J	CHIP C 390PF J		
C43			CK73FB1H182K	CHIP C 1800PF K		
C44			CC73FCH1H330J	CHIP C 33PF J		
C45			CK73FB1H183K	CHIP C 0.018UF K		
C61 ,62			CK73FB1E103K	CHIP C 0.010UF K		
C63			CC73FSL1H561J	CHIP C 560PF J		
C64 -101			CK73FB1EXXXK	CHIP C K		
C102			CK73EB1E104K	CHIP C 0.10UF K		
C103			CK73FB1E103K	CHIP C 0.010UF K		
C104			CK73EB1E104K	CHIP C 0.10UF K		
C105			CK73FB1E223K	CHIP C 0.022UF K		
C106,107			CK73EB1E104K	CHIP C 0.10UF K		
C121			CK73FB1H392K	CHIP C 3900PF K		
C122			C92-0004-05	CHIP TAN 1UF 16WV		
C141			CK73FB1E103K	CHIP C 0.010UF K		
C142			CC73FSL1H391J	CHIP C 390PF J		
C143			CK73FB1H182K	CHIP C 1800PF K		
C144			CC73FCH1H330J	CHIP C 33PF J		
C145			CK73FB1H183K	CHIP C 0.018UF K		
C161,162			CK73FB1E103K	CHIP C 0.010UF K		
C163			CC73FSL1H561J	CHIP C 560PF J		
C164-166			CK73FB1E103K	CHIP C 0.010UF K		
C201			CC73FCH1H331J	CHIP C 330PF J		
C202			CK73FB1H102K	CHIP C 1000PF K		
C203			CK73FB1E223K	CHIP C 0.022UF K		
C204			C92-0004-05	CHIP TAN 1UF 16WV		
C221			C92-0004-05	CHIP TAN 1UF 16WV		
C241			C92-0004-05	CHIP TAN 1UF 16WV		
C242			CC73FCH1H101J	CHIP C 100PF J		
C281			CK73FB1E223K	CHIP C 0.022UF K		
C282-285			CK73FB1H123K	CHIP C 0.012UF K		
C286-301			CK73FB1EXXXK	CHIP C K		
C321-324			CK73FB1H102K	CHIP C 1000PF K		
C341			CC73FCH1H330J	CHIP C 33PF J		
C342			CC73FSL1H391J	CHIP C 390PF J		
C343			CC73FCH1H390J	CHIP C 39PF J		
C344			CK73FB1H102K	CHIP C 1000PF K		
			E23-0471-05	TERMINAL		
L61 ,62		*	L40-2211-48	SMALL FIXED INDUCTOR (220UH)		
L161,162		*	L40-2211-48	SMALL FIXED INDUCTOR (220UH)		
R1 -26			RK73FB2AXXXJ	CHIP R J 1/10W		
R27			R92-0670-05	CHIP R 0 OHM		
R28 -84			RK73FB2AXXXJ	CHIP R J 1/10W		
R85			R92-0670-05	CHIP R 0 OHM		
R101-126			RK73FB2AXXXJ	CHIP R J 1/10W		

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R127			R92-0670-05	CHIP R 0 OHM		
R128-166			RK73FB2AXXXJ	CHIP R J 1/10W		
R167			RK73EB2B122J	CHIP R 1.2K J 1/8W		
R181-184			RK73FB2AXXXJ	CHIP R J 1/10W		
R185			R92-0670-05	CHIP R 0 OHM		
R201-252			RK73FB2AXXXJ	CHIP R J 1/10W		
R253			R92-0670-05	CHIP R 0 OHM		
R261-291			RK73FB2AXXXJ	CHIP R J 1/10W		
R292-297			R92-0670-05	CHIP R 0 OHM		
R301-346			RK73FB2AXXXJ	CHIP R J 1/10W		
D61			RLS73	CHIP DIODE		
D62			HSM88AS	CHIP DIODE		
D81 ,82			RLS73	CHIP DIODE		
D161			RLS73	CHIP DIODE		
D162			HSM88AS	CHIP DIODE		
D181,182			RLS73	CHIP DIODE		
D201		*	IMN10	CHIP DIODE		
D202			RLS73	CHIP DIODE		
D221			RLS73	CHIP DIODE		
D222			DAN202(K)	CHIP DIODE		
D241			DAP202(K)	CHIP DIODE		
D242,243			DAN202(K)	CHIP DIODE		
D261,262			DAN202(K)	CHIP DIODE		
D281			DAN202(K)	CHIP DIODE		
D282			DAP202(K)	CHIP DIODE		
D283			DAN202(K)	CHIP DIODE		
D321			DAN202(K)	CHIP DIODE		
IC1			NJM4558M	IC(OP AMP X2)		
IC21			TC4066BF	IC(BILATERAL SWITCH X4)		
IC41			NJM4558M	IC(OP AMP X2)		
IC101			NJM4558M	IC(OP AMP X2)		
IC121			TC4066BF	IC(BILATERAL SWITCH X4)		
IC141			NJM4558M	IC(OP AMP X2)		
IC201		*	NJM2903M	IC(COMPARATOR X2)		
IC261			TC4011BF	IC(NAND X4)		
IC262			TC4066BF	IC(BILATERAL SWITCH X4)		
IC301			NJM4558M	IC(OP AMP X2)		
IC341			NJM4558M	IC(OP AMP X2)		
Q1			2SC2714(Y)	CHIP TRANSISTOR		
Q21			2SC2712(Y)	CHIP TRANSISTOR		
Q22		*	IMH5	DIGITAL TRANSISTOR		
Q41			2SC2712(Y)	CHIP TRANSISTOR		
Q42			DTC124EK	DIGITAL TRANSISTOR		
Q61 ,62			2SC2712(Y)	CHIP TRANSISTOR		
Q63			2SK210(GR)	FET		
Q64			2SA1162(Y)	CHIP TRANSISTOR		
Q81		*	IMH5	DIGITAL TRANSISTOR		
Q82			2SC2712(Y)	CHIP TRANSISTOR		
Q83		*	IMH5	DIGITAL TRANSISTOR		
Q84			DTA143EK	DIGITAL TRANSISTOR		
Q101			2SC2714(Y)	CHIP TRANSISTOR		
Q121			2SC2712(Y)	CHIP TRANSISTOR		
Q122		*	IMH5	DIGITAL TRANSISTOR		
Q141			2SC2712(Y)	CHIP TRANSISTOR		
Q142			DTC124EK	DIGITAL TRANSISTOR		

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Q161,162			2SC2712(Y)	CHIP TRANSISTOR		
Q163			2SK210(GR)	CHIP FET		
Q164			2SA1162(Y)	CHIP TRANSISTOR		
Q181		*	IMH5	DIGITAL TRANSISTOR		
Q182			2SC2712(Y)	CHIP TRANSISTOR		
Q183		*	IMH5	DIGITAL TRANSISTOR		
Q184			DTA143EK	DIGITAL TRANSISTOR		
Q201			DTA114EK	DIGITAL TRANSISTOR		
Q221			2SA1162(Y)	CHIP TRANSISTOR		
Q222,223			DTC124EK	DIGITAL TRANSISTOR		
Q224			2SC2712(Y)	CHIP TRANSISTOR		
Q225			2SA1162(Y)	CHIP TRANSISTOR		
Q226			DTC124EK	DIGITAL TRANSISTOR		
Q227			2SA1162(Y)	CHIP TRANSISTOR		
Q228			DTC124EK	DIGITAL TRANSISTOR		
Q241			2SC2712(Y)	CHIP TRANSISTOR		
Q242,243			2SA1162(Y)	CHIP TRANSISTOR		
Q244			DTC124EK	DIGITAL TRANSISTOR		
Q261		*	IMH5	DIGITAL TRANSISTOR		
Q281			2SC2712(Y)	CHIP TRANSISTOR		
Q321			DTC124EK	DIGITAL TRANSISTOR		
Q322			2SA1213(Y)	CHIP TRANSISTOR		
Q323			DTC124EK	DIGITAL TRANSISTOR		
Q324			DTA124EK	DIGITAL TRANSISTOR		
Q325			DTC124EK	DIGITAL TRANSISTOR		
Q326			2SA1213(Y)	CHIP TRANSISTOR		
BAND SW (X59-3490-00)						
C1 -4			CK73FB1H102K	CHIP C 1000PF K		
			E23-0471-05	TERMINAL (11P)		
R1 -4			RK73FB2AXXXJ	CHIP R J 1/10W		
D1			DAN202(K)	CHIP DIODE		
Q1			2SA1213(Y)	CHIP TRANSISTOR		
Q2			DTC124EK	DIGITAL TRANSISTOR		
Q3			2SA1213(Y)	CHIP TRANSISTOR		
Q4			DTC124EK	DIGITAL TRANSISTOR		
Q5			DTA124EK	DIGITAL TRANSISTOR		
Q6			DTC124EK	DIGITAL TRANSISTOR		

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UT-10 (OPTION)								
			B42-2454-04	LABEL				
-			B50-8250-10	INSTRUCTION MANUAL				
-			H01-8207-04	ITEM CARTON BOX				
-			H03-2743-04	OUTER PACKING CASE				
-			H12-1412-03	CARTON BOARD				
-			H25-0029-04	PROTECTION BAG				
-			H25-0723-04	PROTECTION BAG				
			N33-3006-41	OVAL HEAD MACHINE SCREW				
			N87-3008-46	BRAZIER HEAD TAPTITE SCREW				
			X60-3040-21	COMPOSITE UNIT				
RF UNIT (X44-3070-00)								
C1 ,2			CC73FCH1HXXXC	CHIP C		C		
C3			CC73FCH1H330J	CHIP C	33PF	J		
C4			CK73FB1H103K	CHIP C	0.010UF	K		
C5 ,6			CC73FCH1H100D	CHIP C	10PF	D		
C7			CE04EW1H100M	ELECTRO	10UF	50WV		
C8			CC73FCH1H100D	CHIP C	10PF	D		
C9 -14			CC73FCH1HXXXC	CHIP C		C		
C15			CC73FCH1H150J	CHIP C	15PF	J		
C16			CC73FCH1H030C	CHIP C	3.0PF	C		
C17 ,18			CC73FCH1HXXXJ	CHIP C		J		
C19			CC73FCH1H100D	CHIP C	10PF	D		
C20			CK73FB1H221K	CHIP C	220PF	K		
C21			CC73FCH1H150J	CHIP C	15PF	J		
C22			CK73FB1H221K	CHIP C	220PF	K		
C23			CC73FCH1H100D	CHIP C	10PF	D		
C24 ,25			CC73FCH1HXXXC	CHIP C		C		
C26			CK73FB1H221K	CHIP C	220PF	K		
C27			CK73EB1E473K	CHIP C	0.047UF	K		
C28 ,29			CK73FB1H221K	CHIP C	220PF	K		
C30			CC73FCH1H120J	CHIP C	12PF	J		
C31			CC73FCH1H080D	CHIP C	8.0PF	D		
C32 ,33			CK73FB1H221K	CHIP C	220PF	K		
C34			CC73FCH1H270J	CHIP C	27PF	J		
C35			CK73FB1H222K	CHIP C	2200PF	K		
C36 -38			CC73FCH1HXXXJ	CHIP C		J		
C39			CC73FCH1H100D	CHIP C	10PF	D		
C40 ,41			CK73FB1H103K	CHIP C	0.010UF	K		
C42			CC73FCH1H100D	CHIP C	10PF	D		
C43 ,44			CC73FCH1H330J	CHIP C	33PF	J		
C45			CK73FB1H221K	CHIP C	220PF	K		
C46			CC73FRH1H060D	CHIP C	6.0PF	D		
C47			CC73FCH1H390J	CHIP C	39PF	J		
C48			CC73FRH1H060D	CHIP C	6.0PF	D		
C49			CC73FCH1H100D	CHIP C	10PF	D		
C50 ,51			CK73FB1HXXXK	CHIP C		K		
C52			CC73FCH1H100D	CHIP C	10PF	D		
C53			CK73FB1H103K	CHIP C	0.010UF	K		
C54			CC73FCH1H680J	CHIP C	68PF	J		
C55 -57			CK73FB1H221K	CHIP C	220PF	K		
C58			CC73FCH1H100D	CHIP C	10PF	D		

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C59 ,60			CK73FB1H221K	CHIP C	220PF	K		
C61			CC73FCH1H150J	CHIP C	15PF	J		
C62			CC73FCH1H040C	CHIP C	4.0PF	C		
C63 ,64			CC73FCH1H120J	CHIP C	12PF	J		
C65			CC73FCH1H030C	CHIP C	3.0PF	C		
C66			CC73FCH1H100D	CHIP C	10PF	D		
C67 -69			CK73FB1H221K	CHIP C	220PF	K		
C70 ,71			CC73FCH1HXXXC	CHIP C		C		
C72			CC73FCH1H330J	CHIP C	33PF	J		
C73			CK73FB1H103K	CHIP C	0.010UF	K		
C74 ,75			CC73FCH1H100D	CHIP C	10PF	D		
C76			CE04EW1A101M	ELECTRO	100UF	10WV		
C77			CC73FCH1H100D	CHIP C	10PF	D		
C78 ,79			CC73FCH1HXXXC	CHIP C		C		
C80			CC73FCH1H070D	CHIP C	7.0PF	D		
C81			CC73FCH1H180J	CHIP C	18PF	J		
C82			CC73FCH1HR75C	CHIP C	0.75PF	C		
C83 -85			CC73FCH1HXXXJ	CHIP C		J		
C86			CC73FCH1H010C	CHIP C	1.0PF	C		
C87 ,88			CC73FCH1HXXXJ	CHIP C		J		
C89 ,90			CC73FCH1HXXXC	CHIP C		C		
C91 ,92			CC73FCH1HXXXJ	CHIP C		J		
C94			CK73FB1H103K	CHIP C	0.010UF	K		
C95			CC73FCH1H100D	CHIP C	10PF	D		
C96			CC73FCH1H150J	CHIP C	15PF	J		
C97			CE04EW1H100M	ELECTRO	10UF	50WV		
C98			CC73FCH1H180J	CHIP C	18PF	J		
C100			CC73FCH1H050C	CHIP C	5.0PF	C		
C101			CC73FCH1H150J	CHIP C	15PF	J		
C102			CK73FB1H221K	CHIP C	220PF	K		
C103,104			CC73FRH1H470J	CHIP C	47PF	J		
C106			CK73FB1H221K	CHIP C	220PF	K		
C107			CC73FCH1H100D	CHIP C	10PF	D		
C108			CK73FB1H222K	CHIP C	2200PF	K		
C109			CC73FRH1H070D	CHIP C	7.0PF	D		
C110			CC73FCH1H101J	CHIP C	100PF	J		
C111			CC73FRH1H080D	CHIP C	8.0PF	D		
C112			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C113			CC73FRH1H080D	CHIP C	8.0PF	D		
C114			CC73FCH1H101J	CHIP C	100PF	J		
C115			CC73FRH1H070D	CHIP C	7.0PF	D		
C116			CC73FCH1H030C	CHIP C	3.0PF	C		
C117-119			CK73FB1H221K	CHIP C	220PF	K		
C120,121			CC73FCH1HXXXJ	CHIP C		J		
C122-125			CC73FCH1H100D	CHIP C	10PF	D		
C126			CK73FB1H221K	CHIP C	220PF	K		
C127			CC73FCH1H100D	CHIP C	10PF	D		
C128			CK73FB1H221K	CHIP C	220PF	K		
C129			CC73FCH1H100D	CHIP C	10PF	D		
C130			CK73FB1H221K	CHIP C	220PF	K		
C131			CC73FCH1H100D	CHIP C	10PF	D		
C132			CK73FB1H221K	CHIP C	220PF	K		
C133			CC73FCH1H100D	CHIP C	10PF	D		
C134			CK73FB1H221K	CHIP C	220PF	K		
C135			CC73FCH1H100D	CHIP C	10PF	D		

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C136,137			CK73FB1HXXXK	CHIP C K		
C138-141			CC73FCH1H100D	CHIP C 10PF D		
A12 -16			E29-0455-04	TERMINAL (GND)		
CN1			E04-0159-05	MINI PIN JACK A (12RA)		
CN2			E40-3238-05	PIN CONNECTOR EH3P		
CN3			E04-0159-05	MINI PIN JACK A (12HET)		
CN4			E40-3242-05	PIN CONNECTOR EH7P		
CN5			E04-0159-05	MINI PIN JACK A (12D)		
CN6			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
CN7			E40-3240-05	PIN CONNECTOR EH5P		
J1			E13-0166-05	PIN JACK		
TP1			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
TP2			E40-0211-05	PIN CONNECTOR 2P		
TP3 -6			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
A1		*	F10-1384-04	SHIELDING PLATE		
A2		*	F10-1385-04	SHIELDING PLATE		
A3		*	F10-1386-04	SHIELDING PLATE		
A4		*	F10-1387-04	SHIELDING PLATE		
A5		*	F10-1388-04	SHIELDING PLATE		
A6 -8			F11-0836-05	SHIELDING COVER		
A9 -11			F11-1040-05	SHIELDING COVER		
L1 ,2			L79-0827-05	HELICAL BLOCK 1.27GHZ		
L3			L34-1083-05	COIL 1T		
L4			L34-1079-05	COIL 1.5T		
L5			L34-1124-05	COIL 6.5T		
L6		*	L79-0650-15	HELICAL RESONATOR 287MHZ		
L7			L34-1035-05	COIL 11.5T		
L8			L34-1120-05	COIL 2.5T		
L9		*	L79-0650-15	HELICAL RESONATOR 287MHZ		
L10		*	L34-1084-05	COIL 4.5T		
L11			L34-1027-05	COIL 5.5T		
L12			L34-2041-05	TUNING COIL 41MHZ		
L13			L34-1027-05	COIL 5.5T		
L14 ,15			L34-4050-05	COIL		
L16			L34-1207-05	COIL 3.5T		
L17		*	L79-0650-15	HELICAL RESONATOR 287MHZ		
L18			L34-1083-05	COIL 1T		
L19		*	L39-0446-05	TROIDAL COIL		
L20 ,21			L79-0827-05	HELICAL BLOCK 1.27GHZ		
L22			L34-1058-05	COIL 2.5T		
L23			L34-1083-05	COIL 1T		
L25			L34-1083-05	COIL 1T		
L26		*	L79-0839-05	HELICAL BLOCK 983MHZ		
L27			L34-0956-05	COIL 82MHZ		
L28 -31			L34-4050-05	COIL		
L32			L34-1079-05	COIL 1.5T		
L33			L39-0441-05	TROIDAL COIL		
L34 -42			L33-0666-05	CHOKE COIL		
R1 -104			RK73FB2AXXXJ	CHIP R J 1/10W		
D1		*	RLZJ5.6	CHIP ZENER DIODE (5.6V)		
D2			1SV128	CHIP DIODE		
D3 -8			RLS135	CHIP DIODE		

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D9 ,10		*	HSM276S	CHIP DIODE				
D11			1SV128	CHIP DIODE				
D12 ,13		*	RLZJ5.6	CHIP ZENER DIODE (5.6V)				
D14 ,15		*	HSM276S	CHIP DIODE				
D16			RLS135	CHIP DIODE				
IC1		*	UPC1659G	IC(DRIVE IC)				
Q1			2SC4093	CHIP TRANSISTOR				
Q2 ,3			3SK184(R)	CHIP FET				
Q4			2SK125	FET				
Q5 -7			2SC2712(Y)	CHIP TRANSISTOR				
Q8 ,9			2SC4093	CHIP TRANSISTOR				
Q10			2SC3356	CHIP TRANSISTOR				
Q11			2SC3357	CHIP TRANSISTOR				
Q12			2SC3098	CHIP TRANSISTOR				
Q13			2SC3357	CHIP TRANSISTOR				
Q14			FMC3	DIGITAL TRANSISTOR				
FINAL UNIT (X45-3150-00)								
C1			CC73FCH1H1R5C	CHIP C	1.5PF	C		
C2 ,3			CK73FB1H102K	CHIP C	1000PF	K		
C4			CE04EW1E470M	ELECTRO	47UF	25WV		
C5			CC73FCH1H100D	CHIP C	10PF	D		
C6			CE04EW1E470M	ELECTRO	47UF	25WV		
C7			CK73FB1H102K	CHIP C	1000PF	K		
C8			CC73FCH1H100D	CHIP C	10PF	D		
C9			CE04EW1E470M	ELECTRO	47UF	25WV		
C10 -12			CC73FCH1HXXXC	CHIP C		C		
C13			CK73FB1H102K	CHIP C	1000PF	K		
C14			CC73FCH1H100D	CHIP C	10PF	D		
C15			CE04EW1E470M	ELECTRO	47UF	25WV		
C16			CK73FB1H102K	CHIP C	1000PF	K		
C17			CC73FCH1H100D	CHIP C	10PF	D		
C18			CE04EW1E470M	ELECTRO	47UF	25WV		
C19			CK73FB1H102K	CHIP C	1000PF	K		
C20			CC73FCH1H100D	CHIP C	10PF	D		
C21 ,22			CE04EW1E470M	ELECTRO	47UF	25WV		
C27 -30			CM73F2AXXXC	CHIP C		C		
C31			CM73F2A330J	CHIP C	33PF	J		
C32			CC73FCH1H010C	CHIP C	1.0PF	C		
C33 -35			CC73FCH1H100D	CHIP C	10PF	D		
C36			CC73FCH1H010C	CHIP C	1.0PF	C		
C37 -41			CC73FCH1HXXXD	CHIP C		D		
C42			CK73FB1H103K	CHIP C	0.010UF	K		
C43			CC73FCH1H100D	CHIP C	10PF	D		
C44			CC73FCH1H130J	CHIP C	13PF	J		
C45			CC73FCH1H050C	CHIP C	5.0PF	C		
C46			CC73FCH1H060D	CHIP C	6.0PF	D		
C47 ,48			CC73FCH1HXXXC	CHIP C		C		
C49			CC73FCH1H090D	CHIP C	9.0PF	D		
C50			CK73FB1H103K	CHIP C	0.010UF	K		
C51			CC73FCH1H100D	CHIP C	10PF	D		
C52			CC73FCH1H330J	CHIP C	33PF	J		
C53 ,54			CC73FCH1HXXXC	CHIP C		C		
C55			CC73FCH1H100D	CHIP C	10PF	D		
C56			CK73FB1H103K	CHIP C	0.010UF	K		

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C57			CC73FCH1H100D	CHIP C 10PF D		
C58			CK73FB1H103K	CHIP C 0.010UF K		
C59			CE04EW1E470M	ELECTRO 47UF 25WV		
C60 -70			CC73FCH1HXXXD	CHIP C D		
C71			CK73FB1H103K	CHIP C 0.010UF K		
C72 ,73			CC73FCH1H100D	CHIP C 10PF D		
C74			CK73FB1H221K	CHIP C 220PF K		
C75			CC73FCH1H100D	CHIP C 10PF D		
C76			CK73FB1H221K	CHIP C 220PF K		
C77			CC73FCH1H100D	CHIP C 10PF D		
C78			CK73FB1H221K	CHIP C 220PF K		
C79 ,80			CC73FCH1H100D	CHIP C 10PF D		
C81			CK73FB1H221K	CHIP C 220PF K		
C82			CC73FCH1H100D	CHIP C 10PF D		
C83			CK73FB1H221K	CHIP C 220PF K		
C84 -89			CC73FCH1H100D	CHIP C 10PF D		
C90			CK73FB1H221K	CHIP C 220PF K		
C91 -93			CC73FCH1H100D	CHIP C 10PF D		
C94			CK73FB1H221K	CHIP C 220PF K		
C95 -97			CC73FCH1H100D	CHIP C 10PF D		
C98			CK73FB1H221K	CHIP C 220PF K		
C100-104			CC73FCH1H100D	CHIP C 10PF D		
C105			CK73FB1H221K	CHIP C 220PF K		
C106-110			CC73FCH1H100D	CHIP C 10PF D		
TC1 ,2		*	C05-0368-05	TRIMMING CAP 10PF		
CN1			E40-3237-05	PIN CONNECTOR EH2P		
CN2			E40-3242-05	PIN CONNECTOR EH7P		
CN3			E40-3239-05	PIN CONNECTOR EH4P		
W1 ,2			E31-2067-05	CONNECTING WIRE		
A1		*	F10-1383-04	SHIELDING PLATE(POWER MODULE)		
-			J61-0307-05	WIRE BAND		
L1			L92-0121-05	BALLOON COIL		
L2 -6			L33-0666-05	CHOKE COIL		
L9			L33-0666-05	CHOKE COIL		
L10 ,11			L34-1166-05	COIL		
L12			L39-0421-04	COIL		
L13 -20			L33-0666-05	CHOKE COIL		
R1 -34			RK73FB2AXXXJ	CHIP R J 1/10W		
R35			RD14CB2E271J	RD 270 J 1/4W		
VR1			R12-3132-05	TRIMMING POT. 47K		
K1			S51-1434-05	RELAY		
D1 ,2		*	HSM88ASR	CHIP DIODE		
D3			RLS73	CHIP DIODE		
D4		*	HSM88ASR	CHIP DIODE		
D5			RLZJ4.3	ZENER DIODE (4.3V)		
D6			RLS73	CHIP DIODE		
D7			RLZJ7.5	ZENER DIODE (7.5V)		
D8 ,9			RLS73	CHIP DIODE		
IC1			BA718	IC(OP AMP X2)		
Q1			2SC2712(Y)	CHIP TRANSISTOR		
Q2			2SA1162(Y)	CHIP TRANSISTOR		

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Q3			MGF1502	FET				
Q5			2SC2712(Y)	CHIP TRANSISTOR				
Q101		*	M67715	IC(POWER MODULE/ 450-470MHZ)				
Q102		*	M57762	IC(POWER MODULE/ 1.24-1.3GHZ)				
TH1			5TP41L	THERMISTOR (10K)				
PLL UNIT (X50-3090-21)								
C1 ,2			CK73FB1HXXXK	CHIP C		K		
C3			CC73FCH1H020C	CHIP C	2.0PF	C		
C4			CK73FB1H223K	CHIP C	0.022UF	K		
C5			CC73FCH1H060D	CHIP C	6.0PF	D		
C6 ,7			CK73FB1HXXXK	CHIP C		K		
C8			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C9			CC73FCH1H180J	CHIP C	18PF	J		
C10 ,11			CK73FB1H103K	CHIP C	0.010UF	K		
C12			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C13			CC73FCH1H100D	CHIP C	10PF	D		
C14 ,15			CK73FB1H102K	CHIP C	1000PF	K		
C16			CC73FCH1H120J	CHIP C	12PF	J		
C17 ,18			CK73FB1H103K	CHIP C	0.010UF	K		
C19			CC73FCH1H0R5C	CHIP C	0.5PF	C		
C20			CC73FCH1H120J	CHIP C	12PF	J		
C21 ,22			CK73FB1H103K	CHIP C	0.010UF	K		
C23 ,24			CC73FCH1H270J	CHIP C	27PF	J		
C25 -27			CK73FB1HXXXK	CHIP C		K		
C28			CE04EW1E470M	ELECTRO	47UF	25WV		
C29			CQ92M1H473K	MYLAR	0.047UF	K		
C30			CQ92M1H103K	MYLAR	0.010UF	K		
C31			CE04EW1E470M	ELECTRO	47UF	25WV		
C32			CK73FB1H222K	CHIP C	2200PF	K		
C33 ,34		*	CC73FUJ1HXXXJ	CHIP C		J		
C35			CC73FCH1H470J	CHIP C	47PF	J		
C36			CK73FB1H102K	CHIP C	1000PF	K		
C37			CE04EW1E470M	ELECTRO	47UF	25WV		
C38 ,39			CK73FB1HXXXK	CHIP C		K		
C40			CC73FCH1H330J	CHIP C	33PF	J		
C41 -44			CK73FB1HXXXK	CHIP C		K		
C45			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C46 ,47			CK73FB1HXXXK	CHIP C		K		
C48			CC73FCH1H181J	CHIP C	180PF	J		
C49			CK73FB1H561K	CHIP C	560PF	K		
C50			CC73FCH1H820J	CHIP C	82PF	J		
C51			CK73FB1H331K	CHIP C	330PF	K		
C52 ,53			CC73FCH1HXXXD	CHIP C		D		
C54			CK73FB1H223K	CHIP C	0.022UF	K		
C55			CC73FCH1H120J	CHIP C	12PF	J		
C56 -60			CK73FB1HXXXK	CHIP C		K		
C61			CC73FCH1H470J	CHIP C	47PF	J		
C62 -64			CK73FB1HXXXK	CHIP C		K		
C65 ,66			CC73FCH1H100D	CHIP C	10PF	D		
C67 -70			CK73FB1HXXXK	CHIP C		K		
C71			CC73FCH1H070D	CHIP C	7.0PF	D		
C72			CC73FCH1H030C	CHIP C	3.0PF	C		
C73 ,74			CK73FB1HXXXK	CHIP C		K		
C75			CC73FCH1H150J	CHIP C	15PF	J		
C76			CK73FB1H102K	CHIP C	1000PF	K		

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C77 ,78			CC73FCH1HXXXJ	CHIP C		J		
C79 -88			CK73FB1HXXXK	CHIP C		K		
C89			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C90			C91-1083-05	FILM	0.47UF	63WV		
C91			CQ92M1H222K	MYLAR	2200PF	K		
C92			CK73FB1H103K	CHIP C	0.010UF	K		
C93			CE04EW1E470M	ELECTRO	47UF	25WV		
C94		*	C91-1102-05	FILM	0.10UF	J		
C95 ,96			CK73FB1H471K	CHIP C	470PF	K		
C97 ,98			CE04EW1A101M	ELECTRO	100UF	10WV		
C99			CC73FCH1H070D	CHIP C	7.0PF	D		
C100,101			CK73FB1H471K	CHIP C	470PF	K		
C102			CC73FCH1H050C	CHIP C	5.0PF	C		
C103			CK73FB1H103K	CHIP C	0.010UF	K		
C104			CC73FCH1H680J	CHIP C	68PF	J		
C105,106			CK73FB1H471K	CHIP C	470PF	K		
C107-110			CC73FCH1HXXXJ	CHIP C		J		
C111			CK73FB1H103K	CHIP C	0.010UF	K		
C112			CE04EW1HR47M	ELECTRO	0.47UF	50WV		
C113			CC73FCH1H101J	CHIP C	100PF	J		
C114			CK73FB1H102K	CHIP C	1000PF	K		
C115,116			CC73FCH1H151J	CHIP C	150PF	J		
C117			CK73FB1H223K	CHIP C	0.022UF	K		
C118			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C119			C91-1083-05	FILM	0.47UF	63WV		
C120			CQ92M1H102K	MYLAR	1000PF	K		
C121			CK73FB1H103K	CHIP C	0.010UF	K		
C122			CE04EW1E470M	ELECTRO	47UF	25WV		
C123		*	C91-1102-05	FILM	0.10UF	J		
C124,125			CC73FCH1H151J	CHIP C	150PF	J		
C126			CE04EW1E470M	ELECTRO	47UF	25WV		
C127			CC73FCH1H151J	CHIP C	150PF	J		
C128,129			CE04EW1A101M	ELECTRO	100UF	10WV		
C130-134			CC73FCH1HXXXJ	CHIP C		J		
C135,136			CK73FB1HXXXK	CHIP C		K		
C138-143			CC73FCH1H151J	CHIP C	150PF	J		
C144			CK73FB1H102K	CHIP C	1000PF	K		
C145,146			CC73FCH1H680J	CHIP C	68PF	J		
C147			CK73FB1H102K	CHIP C	1000PF	K		
C148,149			CC73FCH1H680J	CHIP C	68PF	J		
C150			CK73FB1H102K	CHIP C	1000PF	K		
C151,152			CC73FCH1H680J	CHIP C	68PF	J		
C153			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C154			CC73FCH1H120J	CHIP C	12PF	J		
C155			CC73FCH1H060D	CHIP C	6.0PF	D		
C156,157			CK73FB1H103K	CHIP C	0.010UF	K		
C158			CE04EW1H4R7M	ELECTRO	4.7UF	50WV		
C159-161			CK73FB1H103K	CHIP C	0.010UF	K		
C162			CE04EW1A101M	ELECTRO	100UF	10WV		
C163-170			CC73FSL1H221J	CHIP C	220PF	J		
C172			CC73FCH1H470J	CHIP C	47PF	J		
C173			CC73FCH1H040C	CHIP C	4.0PF	C		
C174-176			CC73FCH1H100D	CHIP C	10PF	D		
CN1 ,2			E04-0154-05	RF COAXIAL CABLE RECEPTACLE				

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TP1 -7			E23-0512-05	TERMINAL		
TP9			E23-0512-05	TERMINAL		
TP11			E04-0154-05	RF COAXIAL CABLE RECEPTACLE		
W1		*	E31-3427-05	CONNECTING WIRE 11P		
A1			F11-0817-04	SHIELDING COVER		
A2			F11-0818-24	SHIELDING COVER		
A3			F10-1206-04	SHIELDING PLATE		
CF1			L72-0349-05	CERAMIC FILTER SFJ10.7MA-D		
L1 ,2			L30-0536-05	IFT 20MHZ		
L3 -5			L34-0683-05	COIL 143/154MHZ		
L6 -8		*	L34-4106-05	COIL 82MHZ		
L9			L34-1026-05	COIL 7.5T		
L10			L40-1001-14	SMALL FIXED INDUCTOR 10UH		
L11			L32-0198-05	OSCILLATING COIL 40MHZ		
L12			L40-1001-14	SMALL FIXED INDUCTOR 10UH		
L13			L40-1011-14	SMALL FIXED INDUCTOR 100UH		
L14 ,15			L40-2211-14	SMALL FIXED INDUCTOR 220UH		
L16			L31-0313-05	COIL 10.6MHZ		
L17			L40-1001-14	SMALL FIXED INDUCTOR 10UH		
L18		*	L34-4107-05	COIL 154MHZ		
L19 ,20			L34-0683-05	COIL 143/154MHZ		
L21 ,22			L40-1592-17	SMALL FIXED INDUCTOR 1.5UH		
L23 -25			L40-1001-14	SMALL FIXED INDUCTOR 10UH		
L26 -28			L34-1207-05	COIL 3.5T		
L29			L40-1001-14	SMALL FIXED INDUCTOR 10UH		
L30			L34-1079-05	COIL 1.5T		
L31			L40-1001-14	SMALL FIXED INDUCTOR 10UH		
L32 -34			L34-1079-05	COIL 1.5T		
L35 ,36			L39-0441-05	TROIDAL COIL		
L37		*	L79-0856-05	HELICAL BLOCK 491MHZ		
L38 ,39		*	L79-0857-05	HELICAL BLOCK 491MHZ		
L40			L34-1083-05	COIL 1T		
L41			L30-0281-15	IFT		
R1 -144			RK73FB2AXXXJ	CHIP R J 1/10W		
W2			R92-1061-05	JUMPER REST 0 OHM		
D1			1SV166	CHIP DIODE		
D2			ND487C1-3R	DIODE		
D3			RLS73	CHIP DIODE		
IC1			CX-7925B	IC(DIGITAL SELECT PLL)		
IC1			CX-7925B-1	IC(DIGITAL SELECT PLL)		
IC2			M54459L	IC(PRE SCALER)		
IC3			SN16913P	IC(DUBLE BALANCED MIXERS)		
IC4			CX-7925B	IC(DIGITAL SELECT PLL)		
IC4			CX-7925B-1	IC(DIGITAL SELECT PLL)		
IC5			MB87006A	IC(FREQ SYNTHESIZER PLL)		
IC6			MB504P	IC(MODULUS PRE SCALER)		
IC7			NJM78L05A	IC(VOLTAGE REGULATOR/ +5V)		
Q1 -4			2SC2714(Y)	CHIP TRANSISTOR		
Q5			2SC3098	CHIP TRANSISTOR		
Q6 ,7			2SC2714(Y)	CHIP TRANSISTOR		
Q8			DTC114EK	DIGITAL TRANSISTOR		
Q9 ,10			2SC2714(Y)	CHIP TRANSISTOR		
Q11 ,12			2SK210(GR)	CHIP FET		

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Q13			2SC3098	CHIP TRANSISTOR		
Q14 ,15			2SC2714(Y)	CHIP TRANSISTOR		
Q16 -18			2SC3324(G)	CHIP TRANSISTOR		
Q19 ,20			2SC3098	CHIP TRANSISTOR		
Q21			FMC1	DIGITAL TRANSISTOR		
Q22 -24			DTC114EK	DIGITAL TRANSISTOR		
Q25 -27			2SC3324(G)	CHIP TRANSISTOR		
Q28			2SC3098	CHIP TRANSISTOR		
Q29			2SC3357	CHIP TRANSISTOR		
Q30 ,31			2SC3098	CHIP TRANSISTOR		
Q30 ,31			2SC3356	CHIP TRANSISTOR		
Q32			2SC3357	CHIP TRANSISTOR		
Q33			2SA1213(Y)	CHIP TRANSISTOR		
Z1		*	X59-3450-00	MODULE UNIT LPF		
Z2		*	X59-3440-00	MODULE UNIT 40MHZ VCO		
Z3			X58-3390-01	SUB UNIT 180MHZ VCO		
Z4			X58-3400-00	SUB UNIT 310MHZ VCO		
VCO (X58-3390-01)						
A7			B42-2437-04	SERIAL LABEL		
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			CC73FSL1H101J	CHIP C 100PF J		
C3 ,4			CC73FCH1H120J	CHIP C 12PF J		
C5 ,6			CC73FCH1HXXXD	CHIP C D		
C7			CC73FCH1H030C	CHIP C 3.0PF C		
C8 ,9			CK73FB1H102K	CHIP C 1000PF K		
C10			CC73FCH1H0R5C	CHIP C 0.5PF C		
C11			CK73FB1H102K	CHIP C 1000PF K		
C12			CC73FCH1H010C	CHIP C 1.0PF C		
TC1			C05-0348-05	TRIMMING CAP 6PF		
TP1-3			E23-0486-05	TERMINAL		
A1		*	F11-1085-04	SHIELDING CASE		
A2		*	F11-1086-04	SHIELDING COVER		
A6		*	G13-0904-04	CUSHION		
L1			L33-0690-05	CHOKE COIL 3.3UH		
L2		*	L34-2314-05	COIL (3-1/2)		
A3 -5			N30-2604-41	PAN HEAD MACHINE SCREW		
R1 -7			RK73FB2AXXXJ	CHIP R J 1/10W		
D1			1SV166	CHIP VARI-CAP DIODE		
Q1		*	2SK508NV(K52)	CHIP FET		
Q2			2SC2714(Y)	CHIP TRANSISTOR		
VCO (X58-3400-00)						
A7			B42-2437-04	SERIAL LABEL		
C1			CK73FB1H102K	CHIP C 1000PF K		
C2			CC73FSL1H101J	CHIP C 100PF J		
C3 ,4			CC73FCH1HXXXD	CHIP C D		
C5			CC73FCH1H030C	CHIP C 3.0PF C		
C6 ,7			CC73FCH1HXXXD	CHIP C D		
C8			CK73FB1H102K	CHIP C 1000PF K		
C9			CC73FCH1HR75C	CHIP C 0.75PF C		

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C10			CK73FB1H102K	CHIP C 1000PF K		
C11			CC73FSL1H101J	CHIP C 100PF J		
C12			CK73FB1H102K	CHIP C 1000PF K		
C13			CC73FCH1H010C	CHIP C 1.0PF C		
C14			CK73FB1H102K	CHIP C 1000PF K		
C15			CC73FSL1H101J	CHIP C 100PF J		
TC1			C05-0348-05	TRIMMING CAP 6PF		
TP1 -4			E23-0486-05	TERMINAL		
A1			F11-1085-04	SHIELDING CASE		
A2			F11-1086-04	SHIELDING COVER		
A6			G13-0904-04	CUSHION		
L1			L34-2314-05	COIL (3-1/2T)		
L2			L33-0663-05	CHOKE COIL 1UH		
L3 ,4		*	L40-1092-19	SMALL FIXED INDUCTIR 1UH		
A3 -5			N30-2604-41	PANHEAD		
R1 -6			RK73FB2AXXXJ	CHIP R J 1/10W		
D2			1SV164	CHIP VARI-CAP DIODE		
Q1			2SK508NV(K52)	CHIP FET		
Q2			2SC3356	CHIP TRANSISTOR		
VCO (X59-3440-00)						
C1			CC73FCH1H080D	CHIP C 8.0PF D		
C2			CK73FB1H102K	CHIP C 1000PF K		
C3			CC73FCH1H030C	CHIP C 3.0PF C		
C4			CK73FB1H103K	CHIP C 0.010UF K		
			E23-0471-05	TERMINAL		
L1			L40-1011-48	SMALL FIXED INDUCTOR 100UH		
R1 -7			RK73FB2AXXXJ	CHIP R J 1/10W		
Q1			2SK210(GR)	CHIP FET		
Q2			2SC2714(Y)	CHIP TRANSISTOR		
LPF (X59-3450-00)						
C1			CK73FB1H103K	CHIP C 0.010UF K		
			E23-0471-05	TERMINAL		
R1 -4			RK73FB2AXXXJ	CHIP R J 1/10W		
Q1 -3			2SC3324(G)	CHIP TRANSISTOR		
COMPOSITE UNIT (X60-3040-21)						
			B41-0649-04	CAUTION LABEL(SHIELDING COVER)		
C1			CK45F1H103Z	CERAMIC 0.010UF Z		
			E31-3301-05	CONNECTING WIRE(HET1,HET2)		
		*	E31-3428-25	CONNECTING WIRE		
		*	E31-3429-05	CONNECTING WIRE(FAN)		
J1	1H	*	E04-0170-05	N TYPE RECEPTACLE(ANT)		
		*	F11-1135-03	SHIELDING COVER(FINAL)		
A1	2H		F10-1206-04	SHIELDING PLATE		
A2	2G	*	F01-0960-11	HEAT SINK		

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A3	1H	*	F11-1114-04	SHIELDING COVER(ANT)		
A4	1H	*	F11-1082-13	SHIELDING COVER(FINAL)		
A5	2H	*	F11-1083-02	SHIELDING COVER(RF)		
A6	2G	*	F09-0421-05	FAN		
A7	3H	*	F11-1084-02	SHIELDING COVER(PLL)		
A8			G13-0631-04	CUSHION		
200	2H		J19-0306-05	LEAD HOLDER		
201		*	J32-0907-04	BOSS		
-			J61-0307-05	WIRE BAND		
L1 -3			L92-0118-05	BEAD CORE		
A	1H		N09-0626-04	SCREW		
E	1H		N32-2606-46	FLAT HEAD MACHINE SCREW		
I	1G		N35-3008-46	BINDING HEAD MACHINE SCREW		
J	1H,2H		N87-2606-46	BRAZIER HEAD TAPTITE SCREW		
K	1H,2H		N87-3006-46	BRAZIER HEAD TAPTITE SCREW		
L	1H		N87-3008-46	BRAZIER HEAD TAPTITE SCREW		
N	3G		N88-3006-46	FLAT HEAD TAPTITE SCREW		
R	3H	*	N09-2037-14	SCREW		
S	1H		N35-3004-46	BINDING HEAD MACHINE SCREW		
Z1	3H		X50-3090-21	PLL UNIT		
Z2	2H	*	X44-3070-00	RF UNIT		
Z3	1H	*	X45-3150-00	FINAL UNIT		

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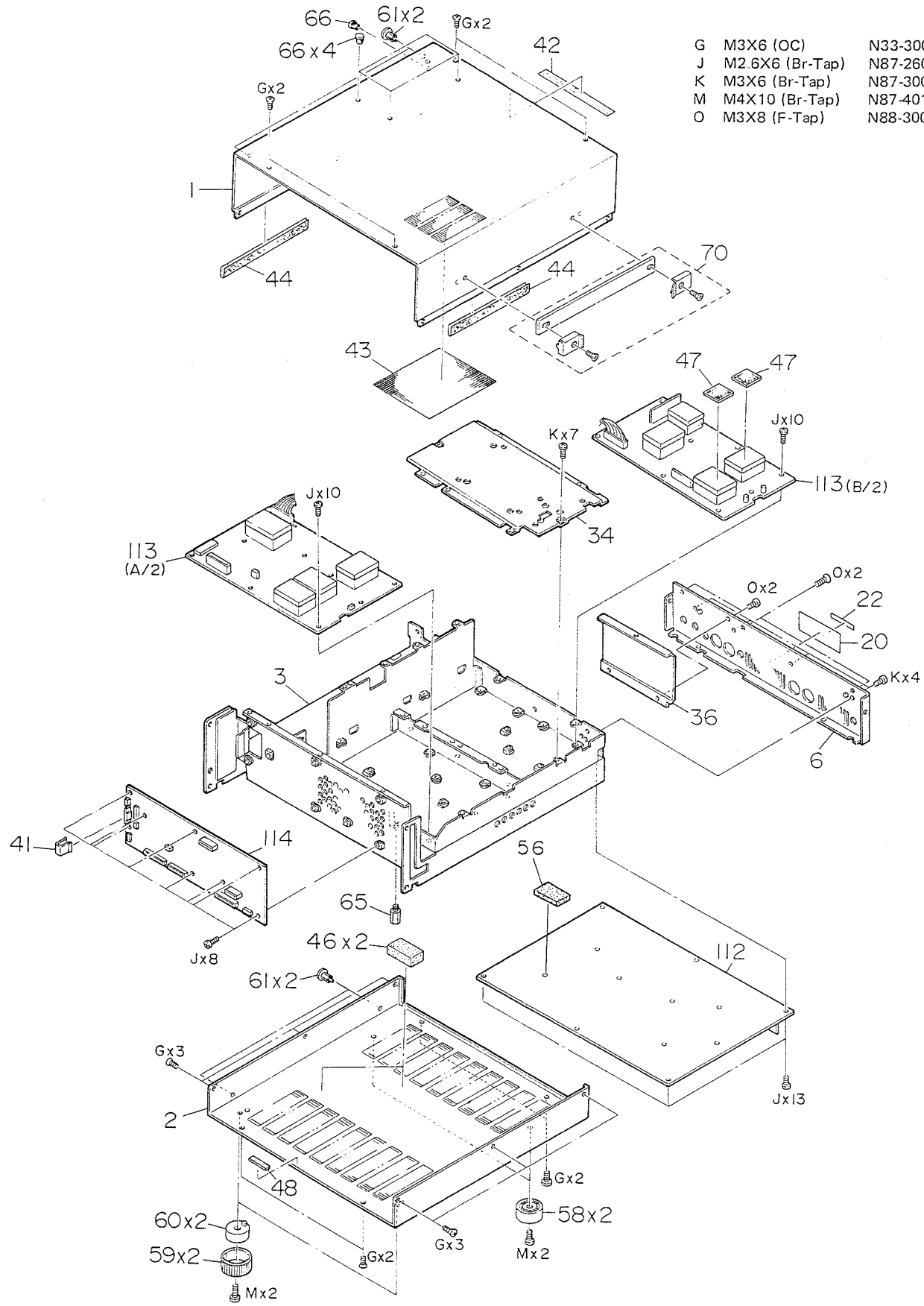
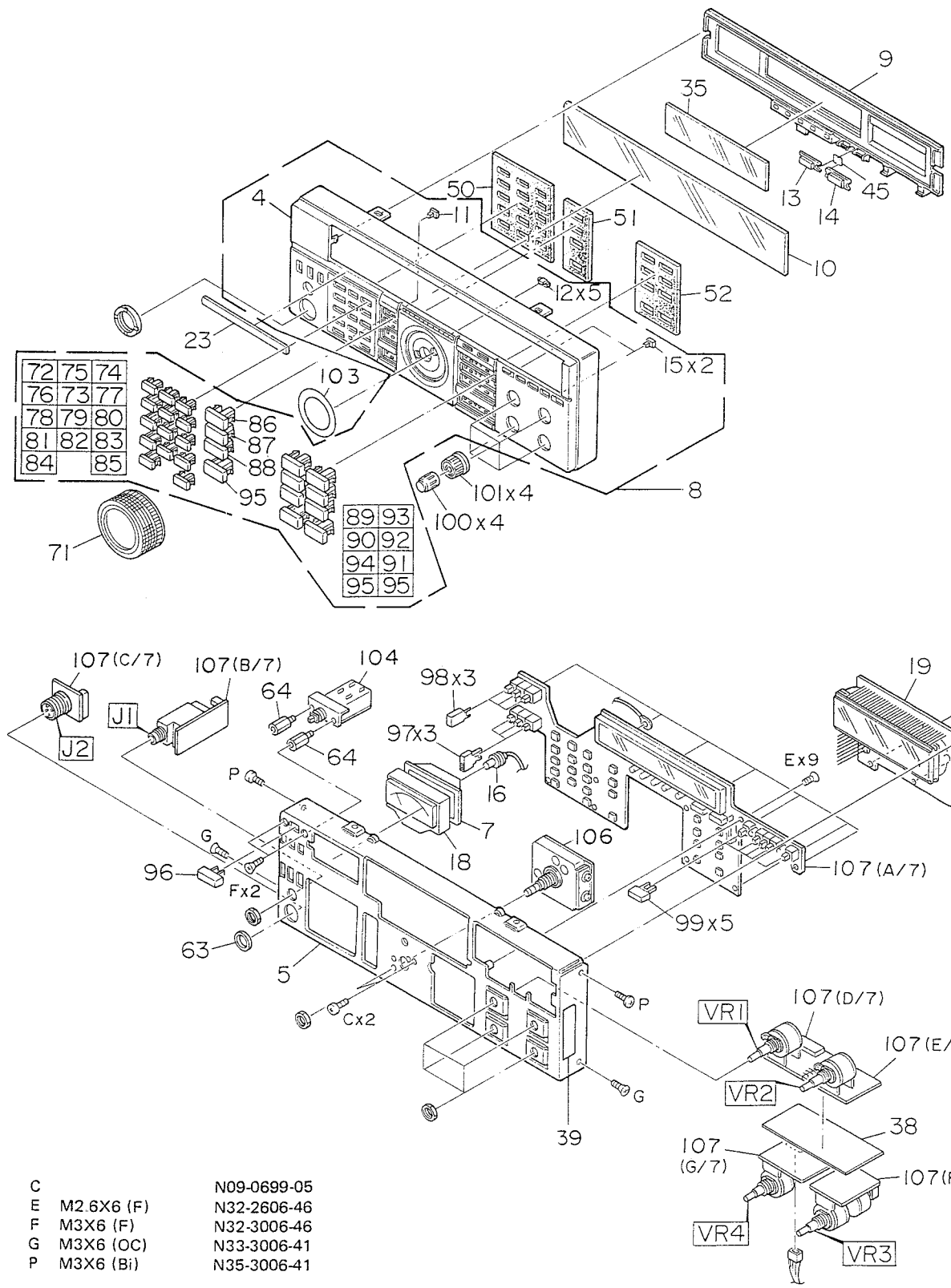
DISASSEMBLY

G	M3X6 (OC)	N33-3006-41
J	M2.6X6 (Br-Tap)	N87-2606-46
K	M3X6 (Br-Tap)	N87-3006-46
M	M4X10 (Br-Tap)	N87-4010-46
O	M3X8 (F-Tap)	N88-3008-46



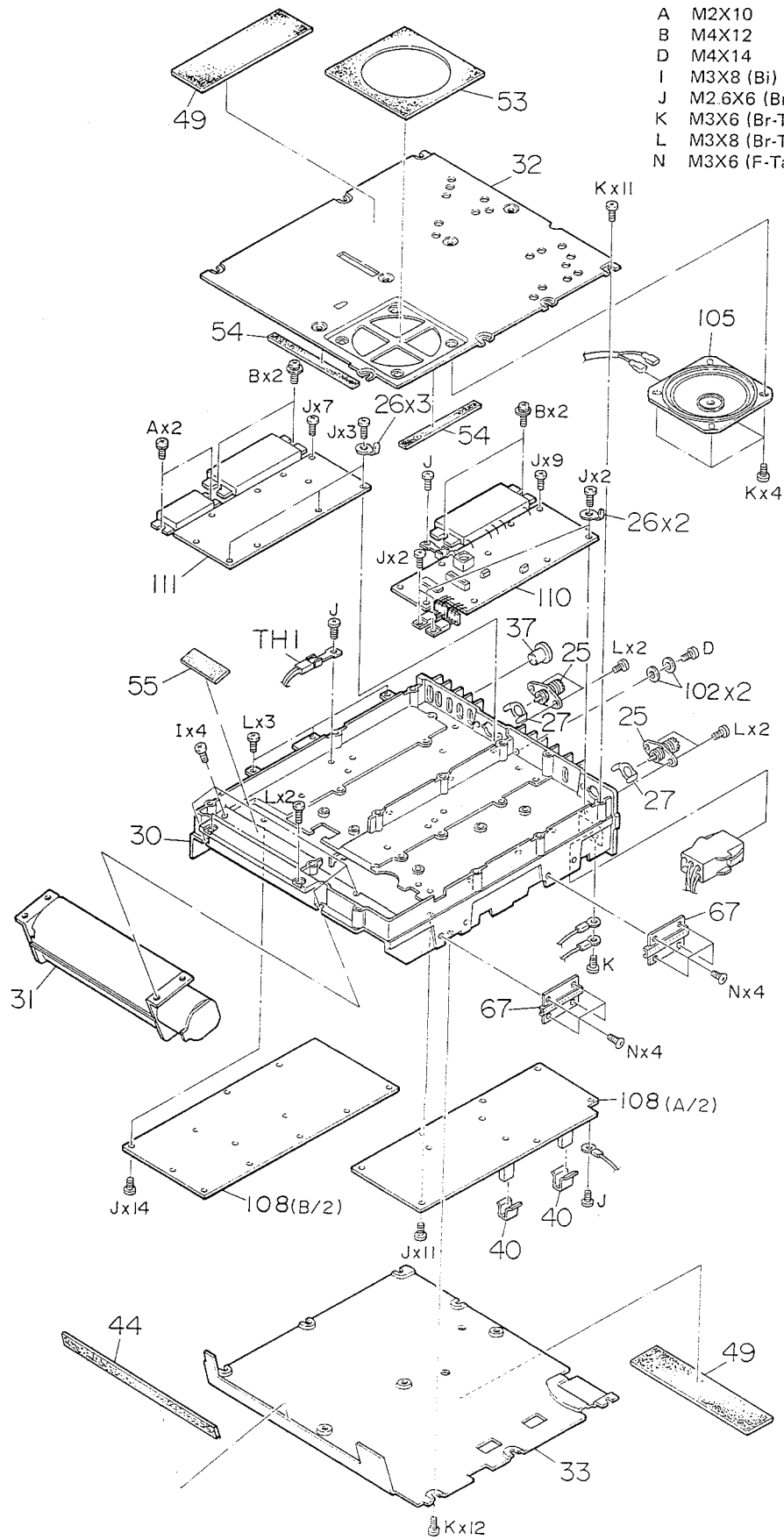
DISASSEMBLY



C		N09-0699-05
E	M2.6X6 (F)	N32-2606-46
F	M3X6 (F)	N32-3006-46
G	M3X6 (OC)	N33-3006-41
P	M3X6 (Bi)	N35-3006-41

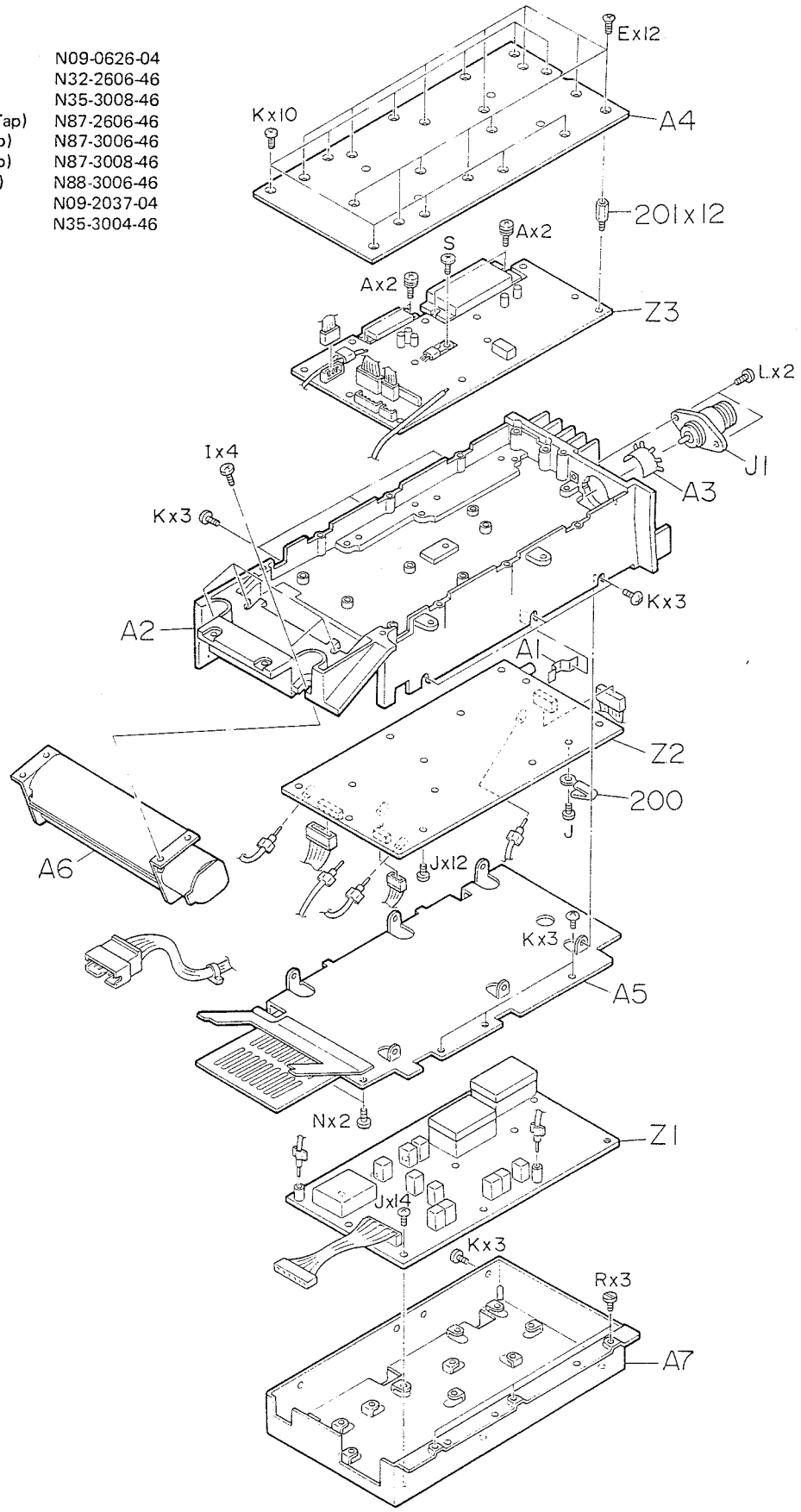
DISASSEMBLY

A	M2X10	N09-0626-04
B	M4X12	N09-0649-05
D	M4X14	N30-4014-41
I	M3X8 (Bi)	N35-3008-46
J	M2.6X6 (Br-Tap)	N87-2606-46
K	M3X6 (Br-Tap)	N87-3006-46
L	M3X8 (Br-Tap)	N87-3008-46
N	M3X6 (F-Tap)	N88-3006-46

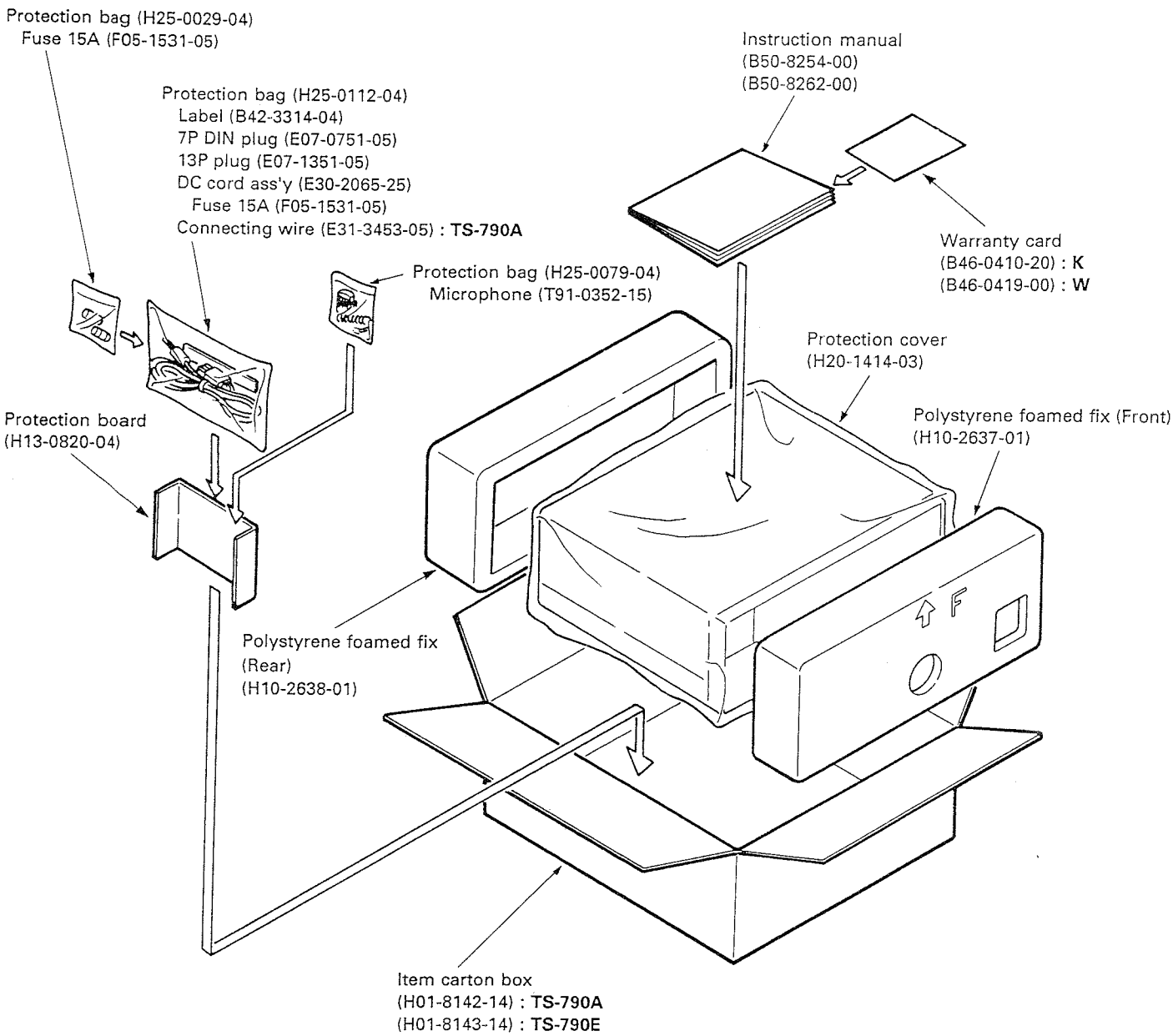


DISASSEMBLY (UT-10 : OPTION)

A	M3X10	N09-0626-04
E	M2.6X6 (F)	N32-2606-46
I	M3X8 (Bi)	N35-3008-46
J	M2.6X6 (Br-Tap)	N87-2606-46
K	M3X6 (Br-Tap)	N87-3006-46
L	M3X8 (Br-Tap)	N87-3008-46
N	M3X6 (F-Tap)	N88-3006-46
R		N09-2037-04
S	M3X4 (Bi)	N35-3004-46



PACKING


Protection bag (H25-0029-04)
Fuse 15A (F05-1531-05)
Protection bag (H25-0112-04)
Label (B42-3314-04)
7P DIN plug (E07-0751-05)
13P plug (E07-1351-05)
DC cord ass'y (E30-2065-25)
Fuse 15A (F05-1531-05)
Connecting wire (E31-3453-05) : TS-790A
Protection bag (H25-0079-04)
Microphone (T91-0352-15)
Instruction manual
(B50-8254-00)
(B50-8262-00)
Warranty card
(B46-0410-20) : K
(B46-0419-00) : W
Protection cover
(H20-1414-03)
Polystyrene foamed fix (Front)
(H10-2637-01)
Protection board
(H13-0820-04)
Polystyrene foamed fix
(Rear)
(H10-2638-01)
F
Item carton box
(H01-8142-14) : TS-790A
(H01-8143-14) : TS-790E

ADJUSTMENT

REQUIRED TEST EQUIPMENT

1. **DC V.M and Tester**
   1) High input impedance
2. **RF VTVM (RF V.M)**
   1) Input impedance : 1MΩ min., 2pF max.
   2) Voltage range : F.S = 10mV to 300V
   3) Frequency range : Up to 450MHz
3. **Frequency Counter (f. counter)**
   1) Input sensitivity : Approx. 50mV
   2) Frequency range : Up to 1300MHz
4. **DC Power Supply**
   1) Voltage : 10V to 17V, variable
   2) Current : 15A min.
5. **Power Meter**
   1) Measurement range : Approx. 50W, 3W, 1W
   2) Frequency range : 1300MHz
6. **AF VTVM (AF V.M)**
   1) Input impedance : 1MΩ min.
   2) Voltage range : F.S = 1mV to 30V
   3) Frequency range : 50Hz to 10kHz
7. **AF Generator (AG)**
   1) Output frequency : 100Hz to 10kHz
   2) Output voltage : 0.5mV to 1V
8. **Linear Detector**
   1) Frequency range : 450MHz
9. **Spectrum Analyzer**
   1) Frequency range : 450MHz
10. **Directional Coupler**
11. **Oscilloscope**
    1) High sensitivity oscilloscope with horizontal input terminal
12. **SSG**
    1) Frequency range : 1300MHz band
    2) Modulation: AM and FM MOD.
    3) Output level : –20dBμ to 100dBμ
13. **Dummy Load**
    1) 8Ω, 5W (approx.)
14. **Noise Generator**
    1) Must generate ignition-like noise containing harmonics beyond 450MHz.
15. **Sweep Generator**
    1) Sweep range : 144MHz and 450MHz bands
16. **Tracking Generator**

PREPARATION

1) Unless otherwise specified, knobs and switches should be set as follows **Table 10**.

POWER SW	ON	RIT SW	OFF
F. LOCK	OFF	AGC FAST	OFF
144 ATT	OFF	NB	OFF
1200 ALT	OFF	MAIN AF VR	MIN
PROC	OFF	SUB AF VR	MIN
MODE	Any freq.	MAIN SQL VR	MIN
FUNCTION	MAIN	SUB SQL VR	MIN
A/B	A	RIT VR	Center
VFO/M	VFO	IF SHIFT VR	Center
MUTE (MAIN)	OFF	MIC VR	MIN
MUTE (SUB)	OFF	RF POWER	MAX

Table 10

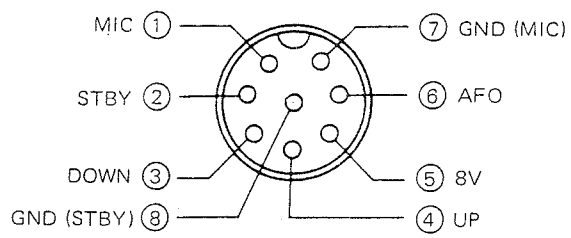
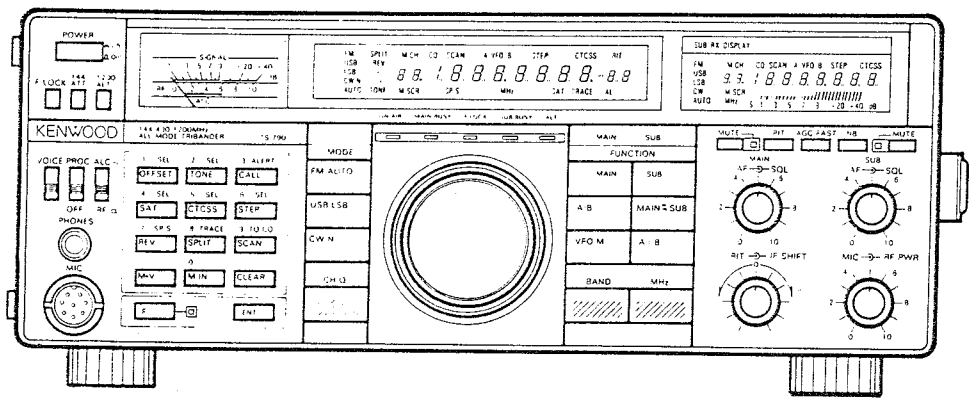


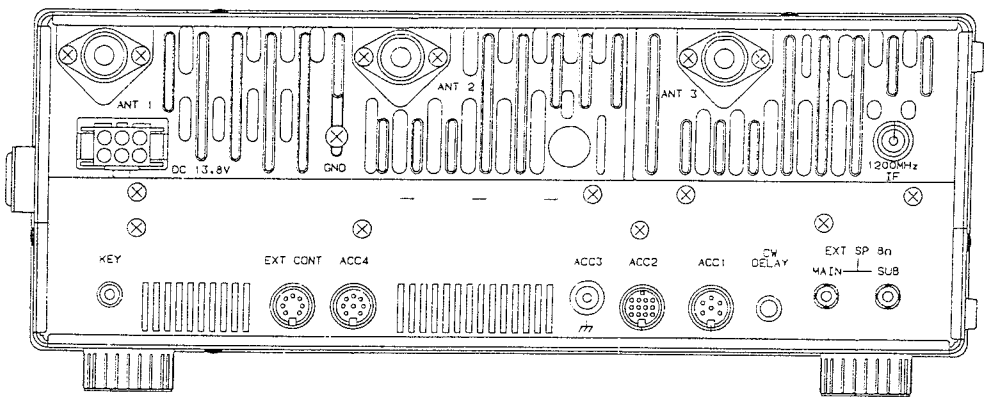
Fig. 27 MIC terminals (view from front panel side)

2) Use an insulated adjusting rod to adjust trimmers and coils.
3) To prevent damaging SSG, never set the stand by switch to SEND while adjusting the receiver section.
4) Be sure to turn the power switch OFF, before connecting the power cable to a power source.
5) SSG output levels are those at the time the output terminal is open.

Caution1. Please connect the dummy load to ANT connector, when adjust a transmit output.
Caution2. In case of repair in the 1.2GHz final unit (option) after repaired a radio conform the receiver sensitivity

ADJUSTMENT





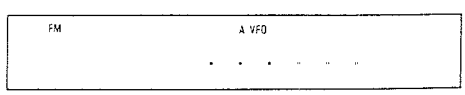
COMMON ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Reset	1) Turn the POWER SW ON, holding the [A=B] SW down. Release the [A=B] SW and select MODE : FM.	MAIN DISPLAY: FM, A VFO, 145.000, AUTO. SUB DISPLAY: FM, A VFO, 433.000, AUTO						
2. Voltage setting (1) AVR 9T	1) MAIN display VFO : 433.000.0 MODE : USB Connect the microphone to MIC jack. STBY : SEND	DVM (Digital voltmeter)	144M Final	CN1-3	144M Final	VR4	9.0V	±0.1V
3. Carrier balance	1) FUNC : MAIN MODE : USB IF unit VR19 : MIN	Oscilloscope (100MHz)	IF	TP6	IF	TC3	MIN	Oscilloscope should require to measurement more than 100MHz.
	2) FUNC : SUB MODE : USB			TP4		TC1		
4. Voltage setting (2) RFG (AGC)	1) MAIN display VFO : 145.020 MODE : USB STBY : REC	DVM	IF	TP1	IF	VR19	2.5V	±0.1V
5. Voltage setting (3) RB voltage	1) VFO : Any frequency MODE : USB FUNC : MAIN (MAIN RB)			TP2		VR21	1.6V	±0.1V
	2) FUNC : SUB (SUB RB)			TP3		VR2		
6. Voltage setting (4) IF SHIFT	1) MODE : USB IF SHIFT : Center (12 o'clock)	DVM	SW (G/7)	W7-2 (IFS)	SW (G/7)	VR6	2.2V	±0.1V

ADJUSTMENT

144MHz PLL SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. TCXO	1) VFO : 145 000.0 MODE : FM	f counter	144M PLL	TP5	144M PLL		102 400000MHz	±10Hz
2. 10.24MHz	1) VFO : 145 000.0 MODE : FM	RF V.M		TP12		L37 L38	Repeat for MAX.	0.08V or more.
3. 30.72MHz	1) VFO : 145 000.0 MODE : FM			CN3-1 (30.72)		L35 L36	Repeat for MAX.	0.15V or more.
4. 51.2MHz	1) VFO : 145 000.0 MODE : FM			TP6		L13 L14	Repeat for MAX.	
5. 102.4MHz	1) VFO : 145 000.0 MODE : FM			TP5		L15 L16	Repeat for MAX.	0.12V (–6dBm) or more.
6. 11.025MHz	1) VFO : 145 020.0 MODE : FM			TP4		L10 L11	Repeat for MAX.	0.3V (2.5dBm) or more.
7. MAIN CAR VCO	1) FUNC : MAIN VFO : 145.000.0 MODE : USB	DVM		TP11		L30	4.0V	±0.1V
	2) MODE : LSB						Check	4.3 ~ 4.7V
8. SUB CAR VCO	1) FUNC : SUB MODE : USB			TP9	144M PLL	L25	4.0V	±0.1V
	2) MODE : LSB						Check	4.3 ~ 4.7V
9. MAIN CAR	1) FUNC : MAIN VFO : 145.000.0 MODE : USB	RF V.M		TP10	144M PLL	L27	MAX. Then adjust L27 to 3.6V.	±0.01V
10. SUB CAR	1) FUNC : SUB MODE : USB			TP8		L22	MAX.	0.3V or more
11. B loop VCO	1) FUNC : MAIN VFO : 145 000.0 MODE : FM	DVM		TP7		L17	2.5V	±0.1V
	2) VFO : 149.999.9						Check	4.5 ~ 5.5V
12. A loop VCO	1) VFO : 144.000.0 MODE : FM			TP2	144M VCO (Z1)	TC1	4.0V	±0.1V
	2) VFO : 145.999.9						Check	4.7 ~ 5.3V
13. 113MHz	1) FUNC : MAIN VFO : 145.020.0 MODE : FM	RF V.M		TP3	144M PLL	L7, L8 L9, L10 L16	Repeat for MAX.	0.08V or more. Turn the core of L8 down from the MAX position when level is not specificated.
14. HET	1) VFO : 145.000.0 MODE : USB			TP1		TC1	MAX.	
15. UNLOCK	1) FUNC : MAIN VFO : 145.000.0	MAIN display				TP2	Connect the TP2 terminal in the 144M PLL unit to the ground.	Display should decimal point.

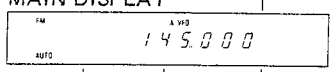


ADJUSTMENT

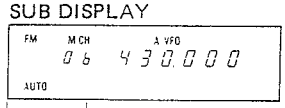
430MHz PLL SYSTEM ADJUSTMENT

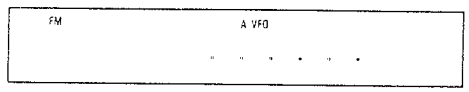
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. 133MHz	1) FUNC : MAIN MAIN display : 433.020 0 MODE : FM	RF V.M	430M PLL	TP55	430M PLL	L72 L73 L74 L75	Repeat for MAX.	0.08V (–9dBm) or more.
2. 40.96MHz	1) VFO : 433.000 0 MODE : FM			TP58		L76 L77	Repeat for MAX.	
3. 122.88MHz	1) VFO : 433.000.0 MODE : FM			TP57		L78 L79	Repeat for MAX	0.20V (–1dBm) or more.
4. 153MHz	1) VFO : 433.020 0 MODE : FM			TP53		L62	MAX.	0.07V (–10dBm) or more.
5. 11.025MHz	1) VFO : 433.020 0 MODE : FM			TP56		L71 L72	Repeat for MAX.	0.25V or more
6. B loop VCO	1) VFO : 430.000.0 MODE : FM	DVM		TP59		L81	2.5V	±0.1V
	2) VFO : 432.999.9						Check	4.5 ~ 5.5V
7. C loop VCO	1) VFO : 430.000.0 MODE : FM			TP54	430M VCO (Z52)	TC1	4.0V	±0.1V
	2) VFO : 430.999.9						Check	4.5 ~ 5.5V
8. A loop VCO	1) VFO : 430.000.0 MODE : FM			TP51	430M VCO (Z50)	TC1	4.0V	±0.1V
	2) VFO : 439.999.9 **M2, T, W** VFO : 449.999.9 **K, M1**						Check	7.5 ~ 9.5V **M2, T, W** 12.0 ~ 15.0V **K, M1**
9. D loop VCO	1) VFO : 430.000.0 MODE : FM			TP60	430M VCO (Z51)	TC1	4.0V	±0.1V
	2) FUNC : SUB SUB display : 144MHz FUNC : MAIN						Check	Display will change to MAIN from SUB. 4.0 ~ 4.3V
10. HET	1) VFO : 435.000.0 **M2, T, W** VFO : 440.000.0 **K, M1**	RF V.M		TP50	430M PLL	TC50	MAX.	
11. HET2	1) VFO : 435.000.0 **M2, T, W** VFO : 440.000.0 **K, M1**			TP61		L84	MAX	0.12V or more.
12. UNLOCK	1) HET1 VFO : 433.000.0 **M2, T, W** VFO : 440.000.0 **K, M1**	MAIN display				TP51	Connect the TP51 or TP61 terminal in the 430M PLL unit to the ground.	Display should decimal point.
	2) HET2 VFO : 433.000.0 **M2, T, W** VFO : 440.000.0 **K, M1**					TP60		

MAIN DISPLAY



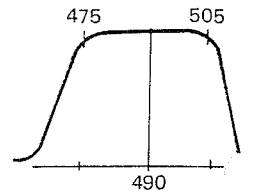
SUB DISPLAY



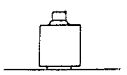
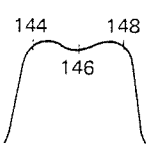


ADJUSTMENT

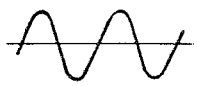
1.2GHz PLL SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. 20.48MHz	1) VFO : 1260.040 MODE : FM	RF V.M	1.2G PLL	TP1	1.2G PLL	L1 L2	MAX.	0.30V or more.
2. 81.92MHz	1) VFO : 1260.040 MODE : FM			TP3		L2, L6 L7, L8	Repeat for MAX.	0.08V (–10dBm) or more.
3. 143.36MHz	1) VFO : 1260.040 MODE : FM			TP2		L2, L3 L4, L5	Repeat for MAX.	0.12V or more.
4. 153.9725MHz	1) VFO : 1260.040 MODE : FM			TP5		L41, L16 L18, L19 L20	Repeat for MAX.	0.07V or more.
5. HET BPF, HET level (490MHz)	1) VFO : 1280.000 MODE : FM Connect the tracking generator to TP11 Disconnect the CN2 on the 1.2GHz PLL unit. Connect the spectrum analyzer to the CN2 terminal. Spectrum amalyzer frequency : 496.4MHz	Tracking genetator Spectrum analyzer		TP11 CN2 (12HET)		L37, L38 L39	Adjust balance for wave.	
	2) VFO : 1280.000 MODE : FM	RF V.M		CN2 (12HET)			Check	0.3V or more.
6. B loop VCO	1) VFO : 1260.000.0 MODE : FM	DVM		TP4	1.2G PLL	L11	2.5V	±0.1V
	2) VFO : 1299.999.9						Check	5.5 ~ 6.5V
7. A loop VCO	1) VFO : 1299.999.9 MODE : FM			TP7	1.2G VCO (Z3)	TC1	17V	±0.3V
	2) VFO : 1260.000.0						Check	7.5 ~ 9.5V
8. C loop VCO	1) VFO : 1299.999.9 MODE : FM			TP9	1.2G VCO (Z4)	TC1	8.0V	±0.3V
	2) VFO : 1260.000.0						Check	14.0 ~ 17.0V

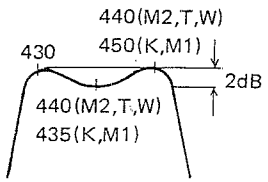
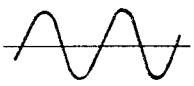
144MHz RECEIVER SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. RX helical	1) VFO : 145.040.0 144ATT : OFF MODE : FM				144M RF	L9	Turn the core of L9 up the 1.5 turn position.	
	Connect the TP2 terminal on the 144M PLL unit to the ground (GND). Disconnect the TP2 terminal from the ground after adjust.	Tracking generator Spectrum analyzer	Rear panel 144M RF	ANT1 (144MHz) CN2 (TP)		L2, L3	Adjust for the wave-form perform shown on right.	VERT MODE : 2dB/DIV 

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
2. Sensitivity	1) FUNC : MAIN VFO : 145.040.0 **T, W** VFO : 146.040.0 **K, M1, M2** MODE : FM SUB AF : MIN MAIN SQL : MIN MAIN AF : Adjust the AF VOL. to 0.63V with 8Ω dummy SSG f : 145.040.0 **T, W** SSG f : 146.040.0 **K, M1, M2** MOD : 1kHz DEV : 5kHz Output : 3.2 ~ 100μV (–103 ~ 73dBm)	SSG 8Ω dummy Oscilloscope AF V.M MAIN S-meter	Rear panel	ANT1 (144MHz) EXT. SP (MAIN)	144M RF	L9 L10 L11 L12 L13	Repeat the adjustment in order of L9, L10, L11, L12 and L13. Repeat for MAX S-meter reading.	Waveform of oscilloscope 
	2) FUNC : SUB SUB VFO : 145.040.0 **T, W** : 146.060.0 **K, M1, M2** MAIN AF : MIN SUB SQL : MIN SUB AF : 0.63V			EXT. SP (SUB)		L14	Repeat for MAX S-meter reading	

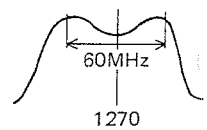
430MHz RECEIVER SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. RX helical	1) VFO : 435.040.0 **M2, T, W** VFO : 440.040.0 **K, M1** MODE : FM Disconnect the CN202 (43HET) on the 430M RF unit. Check that the L206 is about 8mm	Tracking generator Spectrum analyzer	Rear panel 430M RF	ANT2 (430MHz) CN210 (TP)	430M RF	TC201 TC202	MAX gain.	VERT MODE : 2dB/DIV 
						L204 L205	Adjust for the waveform perform	
2. Sensitivity	1) FUNC : MAIN VFO : 435.040.0 **M2, T, W** VFO : 440.040.0 **K, M1** MODE : FM SUB AF : MIN MAIN SQL : MIN MAIN AF : Adjust the AF VOL. to 0.63V with 8Ω dummy SSG f : 435.040.0 **M2, T, W** SSG f : 440.040.0 **K, M1** MOD : 1kHz DEV : 5kHz Output : 3.2 ~ 100μV (–103 ~ 73dBm)	SSG 8Ω dummy Oscilloscope AF V.M MAIN display	Rear panel	ANT2 (430MHz) EXT. SP (MAIN)		L214 L215 L210	Repeat the adjustment in order of L214, L215 and L210 Repeat for MAX S-meter reading.	Waveform of oscilloscope 
						L211 TC203 L208 L209	Repeat the adjustment in order of L211, TC203, L208 and L209 Repeat for MAX S-meter reading.	
	2) FUNC : SUB SUB VFO : 435.040.0 **M2, T, W** : 440.040.0 **K, M1** MAIN AF : MIN SUB SQL : MIN SUB AF : 0.63V			EXT. SP (SUB)		L212	Repeat for MAX S-meter reading.	

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. IF GAIN	1) FUNC : MAIN VFO : 435.040.0 MODE : USB SSG f : 435.041 MOD : OFF Output : 5μV (–93dBm)	SSG 8Ω dummy Oscilloscope AF V.M MAIN S-meter	Rear panel	ANT2 (430MHz) EXT SP (MAIN)	IF	VR17	Set the S-meter to "9".	
	2) FUNC : SUB	SUB S-meter		EXT SP (SUB)		VR14	Set the S-meter to "9".	
4-1 370MHz	1) FUNC : MAIN VFO : 370.000.0 MODE : FM SSG f : 370.000 MOD : 1kHz DEV : 3kHz Output : 3 ~ 10μV	SSG 8Ω dummy Oscillpscope AF V.M	Rear panel	ANT2 (430MHz) EXT SP (MAIN)	430M RF	L228 L229 L234	Repeat for MAX.	
4-2 19.2MHz frequency	2) VFO : 370.000.0 MODE : FM	f. counter	430M RF	CN211 (TP)		TC204	19.2000MHz	±10Hz
5. 870MHz	1) FUNC : MAIN VFO : 870.000.0 MODE : FM SSG f : 870.000 MOD : 1kHz DEV : 3kHz Output : 0.5μV (–113dBm)	SSG 8Ω dummy Oscilloscope AF V.M		TP201 TP202 (GND)		L230 L231 L232 L217 L218 L219 L220	Repeat fpr MAX	

1.2GHz RECEIVER SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1 RX BPF (Helical)	1) Connect the tracking generator to ANT3 terminal. Tracking generator output : –20dBm Disconnect the CN3 (12HET) on the 1.2GHz RF unit. Connect the spectrum analyzer to TP1 terminal.	Tracking generator Spectrum analyzer	Rear panel 1.2G RF	ANT3 (1.2GHz) TP1	1.2G RF	L1, L2	Adjust obtain the proper 30MHz bandwidth.	1270 ± 30MHz Set the output of TP1 to –43dBm with 1270MHz. Band edge level : –1.5dB or less 
2 RX IF	1) VFO : 1268.000.0 Connect the SSG to ANT3 (1.2GHZ) terminal. SSG f : 1268.000 MOD : 1kHz DEV : 5kHz Output : 1mV (–47dBm) Connect the spectrum analyzer to J1 (12IF) terminal on the 1.2GHz RF unit. 1.2GHz RF unit TP2 : Short	SSG Spectrum analyzer	Rear panel 1.2G RF	ANT3 (1.2GHz) J1 (12IF) TP2		L6	Repeat for MAX.	12IF output : –30dBm or more
	2) TP2 : Open						Check	12IF output level should 20dBm down.
3. RIF	1) VFO : 1268.000.0 SSG output : 11μV (–86dBm)	SSG	Rear panel	ANT3 (1.2GHz)	1.2G RF	L9 L12	Set the S-meter "8 ~ 9 + 10dB"	

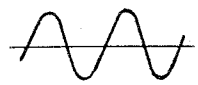
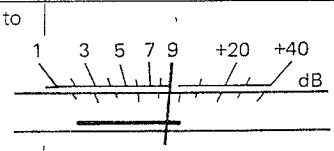
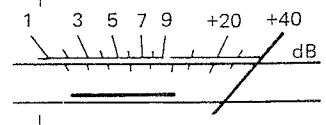
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. IF	1) FUNC : MAIN VFO : 1295.000.0 SUB AF : MIN MODE : FM SSG f : 41.415 MOD : 1kHz DEV : 5kHz Output : 0.27μV (–58dBm)	SSG 8Ω dummy Oscilloscope AF V.M MAIN S-meter	Rear panel	ANT3 (1.2GHz) EXT. SP (MAIN)	IF	L36 L37 L38 L30 L31 L33	Repeat for S-meter reading MAX.	
	2) FUNC : SUB SSG f : 41.315	SUB S-meter		EXT. SP (SUB)		L32	Repeat for MAX	
5. IF GAIN	1) FUNC : MAIN VFO : 1295.000.0 MODE : USB SSG f : 41.415 MOD : OFF Output : 0.4mV (–55dBm)	SSG 8Ω dummy Oscilloscope AF V.M MAIN S-meter	Rear panel	ANT3 (1.2GHz) EXT. SP (MAIN)		VR16	Set the S-meter to "9".	
	2) FUNC : SUB SSG f : 41.315	SUB S-meter		EXT. SP (SUB)		VR15	Set the S-meter to "9".	

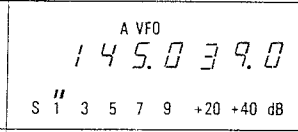
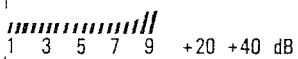
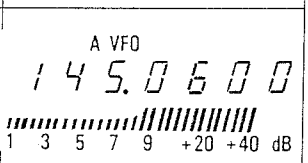
RECEIVER COMMON SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. MAIN IF GAIN (FM)	1) FUNC : MAIN VFO : 145.040.0 **T, W** VFO : 146.040.0 **K, M1, M2** MODE : FM SUB AF : MIN MAIN SQL : MIN SSG f : 145.040 **T, W** SSG f : 146.040 **K, M1, M2** MOD : 1kHz DEV : 5kHz Output : 2 ~ 100μV (–101 ~ –67dBm)	SSG 8Ω dummy Oscilloscope AF V.M MAIN S-meter	Rear panel	ANT1 (144MHz) EXT. SP (MAIN)	IF	L41 L42 L43 VR18	Repeat for S-meter reading MAX. Repeat the adjustment in order of L41 and L42 (3 times).	
2. MAIN discri.	1) VFO : 145.040.0 SSG f : 145.040 MOD : 1kHz DEV : 3kHz Output : 0.5mV (–53dBm) MAIN AF : 6.3V					L54	AF MAX.	
3. MAIN ALT center detection	1) VFO : 145.040.0 SSG f : 145.040 MOD : OFF Output : 5μV (–93dBm)	DC V.M	AFC module (A2)	2 pin (OUT)		VR34	2.5V	±0.05V
4. MAIN IF GAIN (SSB, CW)	1) VFO : 145.040.0 MODE : USB AGC : FAST MAIN AF : 0.63V SSG f : 145.041 MOD : OFF Output : 0.18μV (–123dBm)	SSG 8Ω dummy Oscilloscope AF V.M	Rear panel	ANT1 (144MHz) EXT. SP (MAIN)		L43 L47 L48 L49 L50	Repeat for AF output MAX Repeat the adjustment in order of L43 and L47 (3 times)	
	2) SSG output : 0.16μV (–125dBm)						Check	10dB or more at SSG output 0.16μV (–125dBm)

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
5. MAIN IF NB GAIN	1) SSG output : 10dBμ	DC V M	NB unit	TP1	NB unit	L2, L3	Repeat for DC output MIN.	4.0V or more after adjustment (SSG RF : OFF).
6. MAIN tight squelch sensitivity	1) MAIN SQL : MAX SSG output : 0.5μV (–103dBm)				IF	VR20	MAX. (Fully clockwise) Turn the VR20 counterclockwise to the point at which squelch just opens.	No AF output
7. MAIN SQL threshold point	1) MAIN SQL : Threshold point SSG output : 0.18μV (–123dBm) AGC : FAST After adjustment MAIN SQL : MIN						Adjust to threshold point Turn off the SSG output. Then, turn the SQL vol. counterclockwise to the point at which squelch just opens. Then, turn the SQL vol. clockwise to the point at which squelch just close. SSG RF : ON	SQL VR : 8 : 00 ~ 11 : 00 SQL open.
8. RIT	1) SSG output : 5μV (–93dBm) RIT VR : Center (12 o'clock)	Oscilloscope			SW (G/7)	VR5	Adjust of same frequency to the RIT OFF position.	Receive frequency should change that the RIT vol. will variable 
9-1. S-meter (1) (SSB, CW)	1) S-ø SSG RF : OFF	MAIN S-meter			IF	VR25	Set the S-meter to mechanical "0" point.	
	2) S-1 SSG RF : ON Output : 0.4μV (–115dBm)					VR22	Set the S-meter to "+1".	
	3) S-9 SSG output : 5μV (–93dBm)					VR24	Set the S-meter to "+9".	
9-2. S-meter (2) (FM)	1) VFO : 145.060.0 MODE : FM SSG f : 145.060 MOD : 1kHz DEV : 3kHz Output : 12μV (–86dBm)					VR23	Set the S-meter to "+40"	
10. SUB IF GAIN (FM)	1) FUNC : SUB SUB VFO : 145.040.0 **T, W** SUB VFO : 146.040.0 **K, M1, M2** MODE : FM MAIN AF : MIN SUB SQL : MIN SUB AF : 0.63V SSG f : 145.040 **T, W** SSG f : 146.040 **K, M1, M2** MOD : 1kHz DEV : 5kHz Output : 2 ~ 100μV (–101 ~ –67dBm)	SSG 8Ω dummy Oscilloscope AF V.M SUB S-meter	Rear panel	ANT1 (144MHz) EXT. SP (SUB)		L1 L2 L3 VR10	Repeat for S-meter reading MAX. Repeat the adjustment in order of L1 and L2 (3 times).	

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
11. SUB discri	1) VFO : 145.040.0 SSG f : 145.040 MOD : 1kHz DEV : 3kHz Output : 0.5mV (–53dBm)	SSG 8Ω dummy Oscilloscope AF V.M	Rear panel	ANT1 (144MHz) EXT. SP (SUB)	IF	L13	AF MAX.	
12. SUB ALT center detection	1) VFO : 145.040.0 SSG f : 145.040 MODE : OFF Output : 5μV (–93dBm)	DC V.M	AFC module (A1)	2 pin (OUT)		VR9	2.5V	±0.05V
13. SUB IF GAIN (SSB, CW)	1) VFO : 145.040.0 MODE : USB MAIN AF : MIN SUB SQL : MIN SUB AF : 0.63V SSG f : 145.041 MOD : OFF Output : 1.6μV (–103dBm)					L6	Turn the core of L6 counterclockwise from surface of the coil.	
						L3, L4 L5, L7	Repeat for AF output MAX.	
	2) SSG output : 0.16μV (–125dBm)						Check	S/N : 10dB or more. AF level : 0.63V/8Ω or more.
14. SUB NB GAIN	1) SSG output : 1.6μV (–103dBm)	DC V.M (Multi-voltmeter)	IF	TP5	IF	L16 L17	Repeat for DC voltage MIN	4.0V or more after adjust to SUB NB GAIN when the SSG RF off position.
15-1 SUB S-meter (1) (SSB, CW)	1) S-ø SSG RF : OFF AGC : FAST	SUB S-meter				VR6	Set the SUB S-meter to zero (S1 dot disappeared).	
	2) S-1 SSG RF : ON Output : 4μV (–113dBm)					L6	Set the SUB S-meter to S1 (2 dots).	
	3) S-9 SSG output : 5μV (–93dBm)					VR7	Set the SUB S-meter to S9 Conform the S1 reading after adjust to S-9.	
	4) SUB display : 145.060.0 SSG RF : OFF	DC V.M SUB S-meter	IF	TP1		VR19	2.3V	±0.1V
						VR6	Set the SUB S-meter to S2	
		DC V.M	IF	TP1		VR19	2.5V	±0.1V
	5) SSG output : 4μV (–113dBm)	SUB S-meter				L6	Set the SUB S-meter to S1.	
	6) SSG output : 5μV (–93dBm)					VR7	Set the SUB S-meter to S9.	
15-2 SUB S-meter (2) (FM)	1) VFO : 145.060.0 MODE : FM SSG f : 145.060 MOD : 1kHz DEV : 3kHz Output : 12μV (–86dBm)					VR8	Set the SUB S-meter to "+40" (Full scale).	
16. SUB tight squelch sensitivity	1) VFO : 145.040.0 MODE : USB MAIN AF : MIN SUB SQL : MAX SUB AF : 0.63V SSG f : 145.041 MOD : OFF Output : 0.5μV (–113dBm)					VR1	MIN (counterclockwise)	AF output disappeared.
						VR1	Turn the VR1 clockwise to the point at which squelch just opens.	AF output appeared.

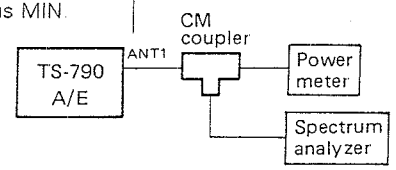
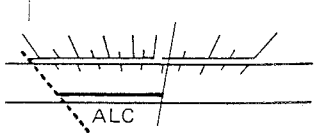
ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
17. SUB threshold sensitivity	1) VFO : 145.040 0 MODE : USB MAIN AF : MIN SUB AF : 0 63V SUB SQL : Threshold point SSG f : 145.041 MOD : OFF Output : 0.18μV (–123dBm) After checked SUB SQL : MIN	SSG 8Ω dummy Oscilloscope AF V.M	Rear panel	ANT1 (144MHz) EXT SP (MAIN)	IF		Adjust to threshold point Turn off the SSG output Then, turn the SQL vol counterclockwise to the point at which squelch just opens Then, the SQL vol clockwise to the point at which squelch just close. Then, SSG RF : ON.	SQL VOL : 8 : 00 ~ 11 : 00 Squelch just opens.
18. MUTE	1) FUNC : MAIN VFO : 145 040.0 MODE : FM SSG f : 145.040 MOD : 1kHz DEV : 3kHz Output : 50μV (–73dBm)					VR4	Set the AF output to 0.63V/8Ω with MAIN MUTE : OFF MAIN MUTE : ON Set the VR4 to 12dB attenuation of the AF output. After adjust to VR4 MAIN MUTE : OFF and MAIN AF : MIN.	MUTE LED : Green — Red Attenuation : 8 ~ 16dB
	2) FUNC : SUB SUB VFO : 145.040 0			EXT. SP (SUB)		VR3	Set the AF output to 0 63V/8Ω with SUB MUTE : OFF SUB MUTE : ON Set the VR3 to 12dB attenuation of the AF output. After adjust to VR3 SUB MUTE : OFF and SUB AF : MIN.	MUTE LED : Green — Red Attenuation : 8 ~ 16dB

144MHz TRANSMITTER SYSTEM ADJUSTMENT

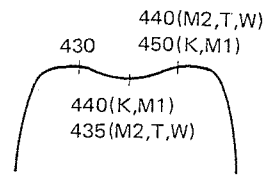
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. FM OSC (TIF)	1) VFO : 144.980 0 **T, W** VFO : 145.980.0 **K, M1, M2** MODE : FM MIC terminal : 50Ω termination Disconnect the 14D and 43D coax cable on the RF unit STBY : SEND	RF V.M	IF	CN35-2 (TIF)	IF	L62	MAX	50mVrms or more.
		f. counter				TC2	10.6950MHz	±100Hz
2. DRIVE	1) VFO : 144.980 0 **T, W** VFO : 145.980 0 **K, M1, M2** MODE : FM SUB AF : MIN MIC VR : MIN RF PWR VR : Set the RF PWR VR clockwise, then set the indication of RF V.M to 2.7Vrms STBY : SEND	RF V.M (50Ω termination)	144M RF	CN8 (14D)	144M RF	L15	MAX	
						L19 L20 L21 L22 TC1	Adjust in order of L19, L20, L21, L22 and TC1. Repeat for MAX.	2.7V or more

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
3. Power	1) VFO : 144.980.0 **T, W** VFO : 145.980.0 **K, M1, M2** MODE : FM 144M final unit VR1 : MIN VR2 : MAX RF PWR VR : 45W Disconnect the CN4 connector on the 144M final unit. STBY : SEND	DC V.M (Tester) Power meter	144M Final Rear panel	TP1 ANT1 (144MHz)	144M Final	TC1 TC2 TC3 TC4	Repeat for MAX.	
	2) NULL					VR3	DC MIN.	
	3) Full power RF PWR VR : MAX						Check	53W or more.
4. APC	1) VFO : 144.980.0 **T, W** VFO : 145.980.0 **K, M1, M2** MODE : FM RF PWR VR : MAX STBY : SEND				144M Final	VR1	47W	±0.5W
5. RF meter	1) ALC/RF : RF STBY : SEND	MAIN S-meter					Check	RF scale : 8 ~ 10
6. Low power	1) RF PWR VR : MIN						Check	1.0 ~ 7.0W RF scale : 1 ~ 4
7. Protection	1) VFO : 147.980.0 MODE : CW ANT1 : Open STBY : SEND	DC A.M (DC power supply galvo-meter)	Rear panel	ANT1 (144MHz)	144M Final	VR2	5.5A	±0.1A
8. 10.7MHz spurious	1) VFO : 147.980.0 STBY : SEND	Power meter CM coupler Spectrum analyzer	Rear panel	ANT1 (144MHz)	144M RF	VR1	fo ± 10.7MHz spurious MIN.	-60dB or more. 
9. SSB power check	1) VFO : 144.980.0 **T, W** VFO : 145.980.0 **K, M1, M2** MODE : USB RF PWR VR : MAX MIC VR : Center (12 o'clock) AG : 1.0kHz/5mV STBY : SEND	Power meter	Rear panel	ANT1 (144MHz)			Check	35W ± 4W
	2) RF PWR VR : MIN							3.0W ± 2.0W
10. ALC meter	1) VFO : 144.980.0 **T, W** VFO : 145.980.0 **K, M1, M2** MODE : USB ALC/RF : ALC RF PWR VR : MAX MIC VR : MIN MIC input : 560Ω termination STBY : SEND	Power meter MAIN S-meter	Rear panel	ANT1 (144MHz)	IF	VR26	Set the ALC meter to mechanical "0" point.	
	2) MIC input : AG 1kHz/2mV				Front panel	MIC VR	Set the ALC meter to mechanical "0" point.	
	3) MIC input : AG 1kHz/4mV				IF	VR27	ALC zone MAX.	

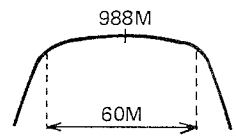
ADJUSTMENT

430MHz TRANSMITTER SYSTEM ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. TX helical	1) VFO : 435 000.0 **M2, T, W** VFO : 440 000.0 **K, M1** Disconnect the CN202 (43HET) on the 430M RF unit. STBY : SEND	Tracking generator Spectrum analyzer	430M RF	CN213 (TP) CN205 (43D)	430M RF	L242 L243	Adjust obtain the proper 20MHz (K, M1) and 10MHz (M2, T, W) band-width	
2. DRIVE	1) VFO : 434 980.0 **M2, T, W** VFO : 439 980.0 **K, M1** MODE : FM SUB AF : MIN MIC VR : MIN RF PWR VR : Set the RF PWR VR clockwise, then set the indication of RF V.M to 2.7Vrms. STBY : SEND	RF V.M (50Ω termination)		CN205 (43D)		L235	MAX	
						L236 L237 L238 L239	Repeat for MAX. adjust in order of L236, L237, L238 and L239.	2.7V or more. (RF PWR VR : MAX)
3. POWER (NULL)	1) VFO : 434 980.0 **M2, T, W** VFO : 439 980.0 **K, M1** MODE : FM 430M final unit VR1 and VR2 : MIN RF PWR VR : 40W STBY : SEND	Power meter DC V.M (Tester)	Rear panel 430M Final	ANT2 (430MHz) TP1 (TP)	430M Final	VR3	DC MIN.	
	2) RF PWR VR : MAX						Check	50W or more.
4. APC	1) VFO : 434 980.0 **M2, T, W** VFO : 439 980.0 **K, M1** MODE : FM 430M final unit VR1 and VR2 : MIN RF PWR VR : MAX STBY : SEND	Power meter	Rear panel	ANT2 (430MHz)	430M Final	VR1	42W	±0.5W
5. RF meter	1) ALC/RF : RF STBY : SEND	MAIN S-meter					Check	RF scale : 8 ~ 10
6. Low power	1) RF PWR VR : MIN STBY : SEND						Check	1.0 ~ 7.0W RF scale : 1 ~ 4
7. Protection (current)	1) VFO : 434 980.0 **M2, T, W** VFO : 439 980.0 **K, M1** MODE : CW ANT2 : Open STBY : SEND	DC A.M (DC power supply galvo-meter)	Rear panel	ANT2 (430MHz)	430M Final	VR2	7.0A	±0.5A
8. SSB power check	1) VFO : 434 980.0 **M2, T, W** VFO : 439 980.0 **K, M1** MODE : USB RF PWR VR : MAX MIC VR : Center (12 o'clock) AG : 1.0kHz/5mV STBY : SEND	Power meter	Rear panel	ANT2 (430MHz)			Check	26.0 ~ 35.0W
	2) RF PWR VR : MIN							3.0W ± 2.0W

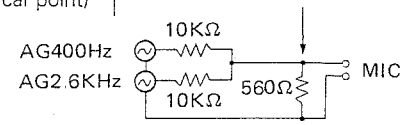
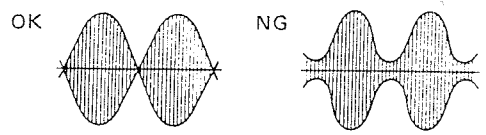
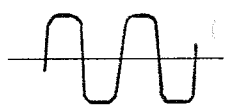
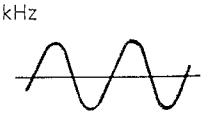
ADJUSTMENT

1.2GHz TRANSMITTER SYSTEM ADJUSTMENT

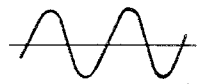
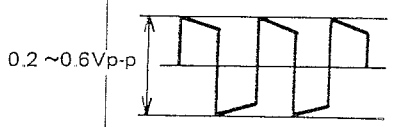
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1 HET BPF (L26 helical)	1) Disconnect the CN13(12HET) connector on the 1.2GHz RF unit Connect the tracking generator to TP4 (HET BPF) Output : 0dBm Connect the spectrum analyzer to TP5 (HET). STBY : SEND	Tracking generator Spectrum analyzer	1.2G RF	TP4 TP5	1.2G RF	L26	Adjust for the waveform perform shown on right.	988 ± 30MHz 
2. HET level check	1) Connect the spectrum analyzer to TP5 (HET). VFO : 1240.000.0 or 1299.999.9 STBY : SEND	Spectrum analyzer	1.2G RF	TP5			Check	–20dBm or more.
3. HET2	1) Connect the CN6 (12HET2) connector from the 1.2GHz PLL unit. Connect the spectrum analyzer to TP6 (HET2). VFO : 1270.000.0 STBY : SEND			TP6	1.2G RF	L27 L28 L29 L30 L31	Repeat for MAX. (245.76MHz)	–20dBm or more.
4 TX BPF (L20, 21 helical)	1) Connect the tracking generator to TP3 (TX BPF) Output : –20dBm Connect the spectrum analyzer to CN5 (12D) STBY : SEND	Tracking generator Spectrum analyzer		TP3 CN5 (12D)		L20 L21	Adjust obtain the proper 1270 ± 30 MHz bandwidth.	12D output level (1270MHz) : –13dBm Band edge level (1240, 1300MHz) : Within 2.0dBm
5. TX IF	1) Connect the SSG to J1 (12IF) connector SSG f : 289MHz Output : –20dBm Connect the spectrum analyzer to TP5 (12D). TP2 (290BPF) : Short STBY : SEND	SSG Spectrum analyzer		J1 (12IF) CN5 (12D) TP2		L14 L15 L17	Repeat for MAX.	12D output level : 0dB or more.
	2) TP2 (290BPF) : Open						Check	12D output level : –20dBm or less.
6 TX IF GAIN	1) VFO : 1295.000 FUNC : MAIN MODE : FM RF PWR VR : MAX STBY : SEND	RF V M (50Ω termination)		CN7-5 (12TIF)	IF	L64 L65 L66 L67 L61 L63	Repeat for MAX.	80mVrms or more.
7 POWER	1) VFO : 1280.000 MODE : FM STBY : SEND	Power meter	Rear panel	ANT3 (1.2GHz)	1.2G Final	TC1 TC2	MAX.	14W or more.
8. APC	1) VFO : 1280.000 MODE : FM STBY : SEND					VR1	12W	

ADJUSTMENT

TRANSMITTER COMMON SYSTEM ADJUSTMENT

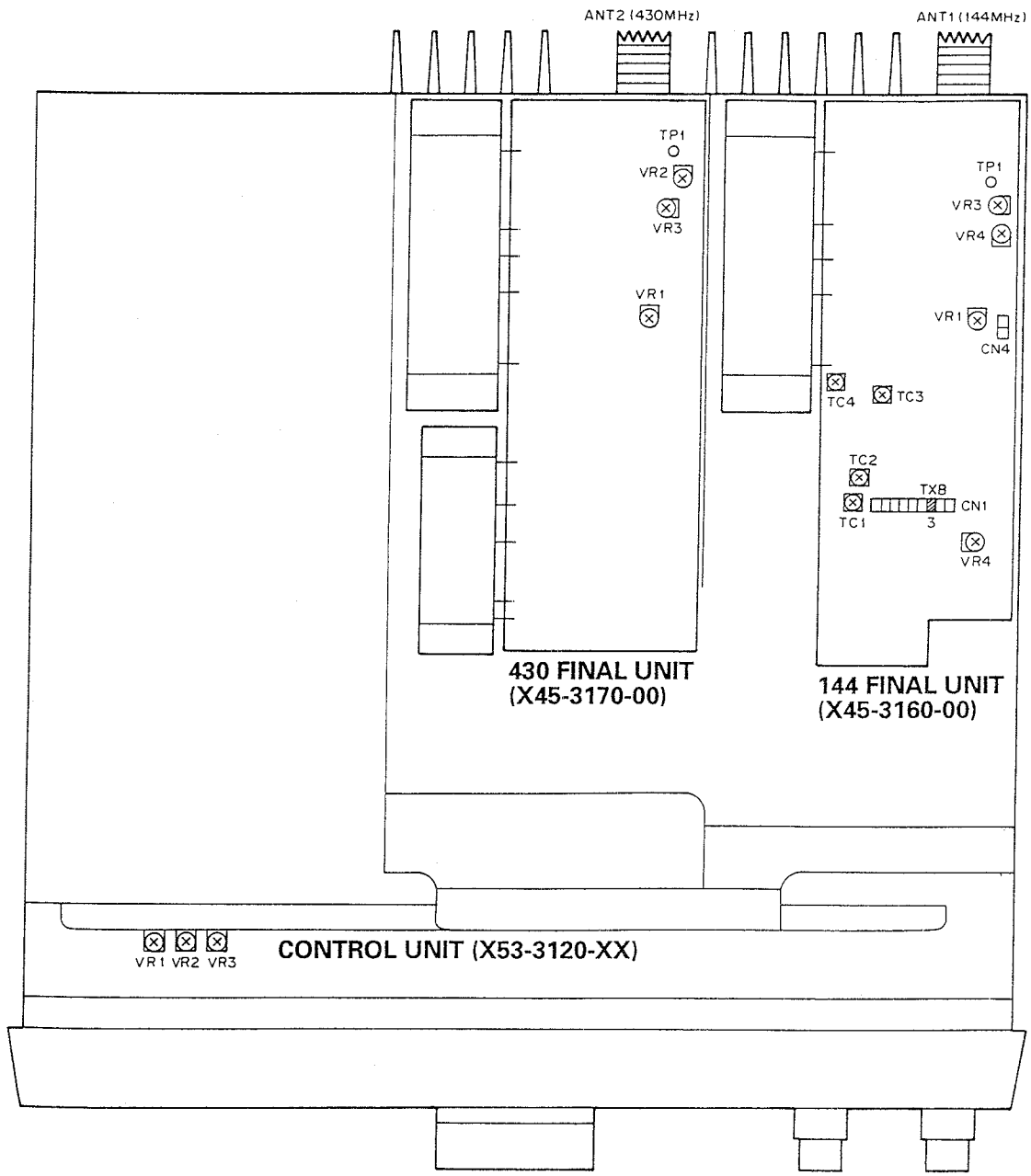
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1 Carrier balance	1) VFO : 434 980.0 **M2, T, W** VFO : 439.980.0 **K, M1** MODE : USB/LSB MIC input : 560Ω termination MIC VR : MIN STBY : SEND	Power meter CM coupler Spectrum analyzer	Rear panel	ANT2 (430MHz)	IF	VR29 VR30	MODE : USB Repeat for MIN After check MODE : LSB	45dB or more
2 Carrier point	1) VFO : 144 980.0 **T, W** VFO : 145 980.0 **K, M1, M2** MIC VR : Center (12 o'clcok) MIC input : AG 400Hz/1mV AG 2.6kHz/1mV STBY : SEND	Power meter CM coupler Oscilloscope AG (2 radios) AF V M	Rear panel	ANT1 (144MHz)	Control	VR3	Set the VR3 to centered (Mechanical point)	Set the AG output to 1mVrms 
	2) MODE : USB STBY : SEND					VR1	Signal should not contain any noise	
	3) MODE : LSB STBY : SEND					VR2		
3 CW level	1) MODE : CW RF/ALC : ALC RF PWER VR : MAX IF unit CN39 : Shorted STBY : SEND	Power meter MAIN S-meter			IF	VR28	ALC zone for MAX.	
4. Processor level	1) MODE : USB MIC input : AG 1kHz/10mV PROC SW : OFF STBY : SEND				Fromt panel	MIC VR	ALC zone for MAX	
	2) PROC SW : ON STBY : SEND				IF	VR37	ALC zone for MAX.	
	3) MIC input : AG 1IHz/1mV STBY : SEND After check PROC SW : OFF						Check	ALC meter reading within ALC zone
5. FM DEV	1) MODE : FM MIC input AG 1kHz/20mV **M2, T, W** AG 1kHz/30mV **K, M1** TONE : OFF (check) STBY : SEND	Power meter CM coupler Linear detector or Modulation analyzer AG Oscilloscope			IF	VR33	±4.5kHz	±0.1kHz 
	2) MIC input AG 1kHz/2mV **M2, T, W** AG 1kHz/3mV **K, M1**					VR32	±3.0kHz	±0.1kHz 
	3) Check to item 1).							

ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
6. CTCSS and TONE **K, M1, M2**	1) MIC input : 560Ω termination [CTCSS] SW : ON STBY : SEND	Power meter CM coupler Linear detector Oscilloscope f. counter	Rear panel	ANT1 (144MHz)			Check	MAIN display : CTCSS LED will light. f : 88.5Hz DEV : ±0.5 ~ 1.0kHz 
	2) VFO : 439 000.0 MODE : FM [TONE] SW : ON STBY : SEND							MAIN display : TONE LED will light. f : 88.5Hz DEV : ±0.5 ~ 1.0kHz
	3) [CTCSS] SW : ON SUB AF : MIN MAIN AF : Center (12o'clock) Set the monitor radio to same frequency with CTCSS ON or OFF.	Monitor radio		EXT. SP (MAIN)			Monitor radio CTCSS : OFF	AF output disappeared. MAIN display : CTCSS LED will light.
							Monitor radio CTCSS : ON	AF output appeared. MAIN display : CTCSS LED will light.
	4) FUNC : SUB [CTCSS] SW : ON MAIN AF : MIN SUB AF : Center (12 o'clock) Set the monitor radio to same frequency with CTCSS ON or OFF.			EXT. SP (SUB)			Monitor radio CTCSS : OFF	AF output disappeared SUB display : CTCSS will light.
							Monitor radio CTCSS : ON	AF output appeared. SUB display : CTCSS will light.
7. TONE **T, W**	1) [TONE] SW : Holding down Connect the f. counter to the linear detector output.						Check	f : 1750Hz DEV : 2.5 ~ 4.5kHz
8. Side tone	1) MODE : CW SUB AF : MIN MAIN AF : MIN KEY : DOWN Connect a CW key (or its equivalent) to the KEY terminal.	Power meter CW KEY 8Ω dummy Oscilloscope AF V M	Rear panel	ANT1 (144MHz) KEY EXT. SP (SUB)	IF	VR35	0.1Vrms Press the key and confirm that signal are transmitted, then set 0.1Vrms.	±0.02Vrms
						VR11 (DELAY)	Change to MAX from MIN position. Then, set centered.	Confirm that time delay will operate.
9. BEEP	1) MAIN AF : MIN IF unit VR5 : Center [MHz] key : Push to 2 or 3 times						Check VR5 : 0.4Vpp 	

ADJUSTMENT

ADJUSTMENT POINT (UPPER)



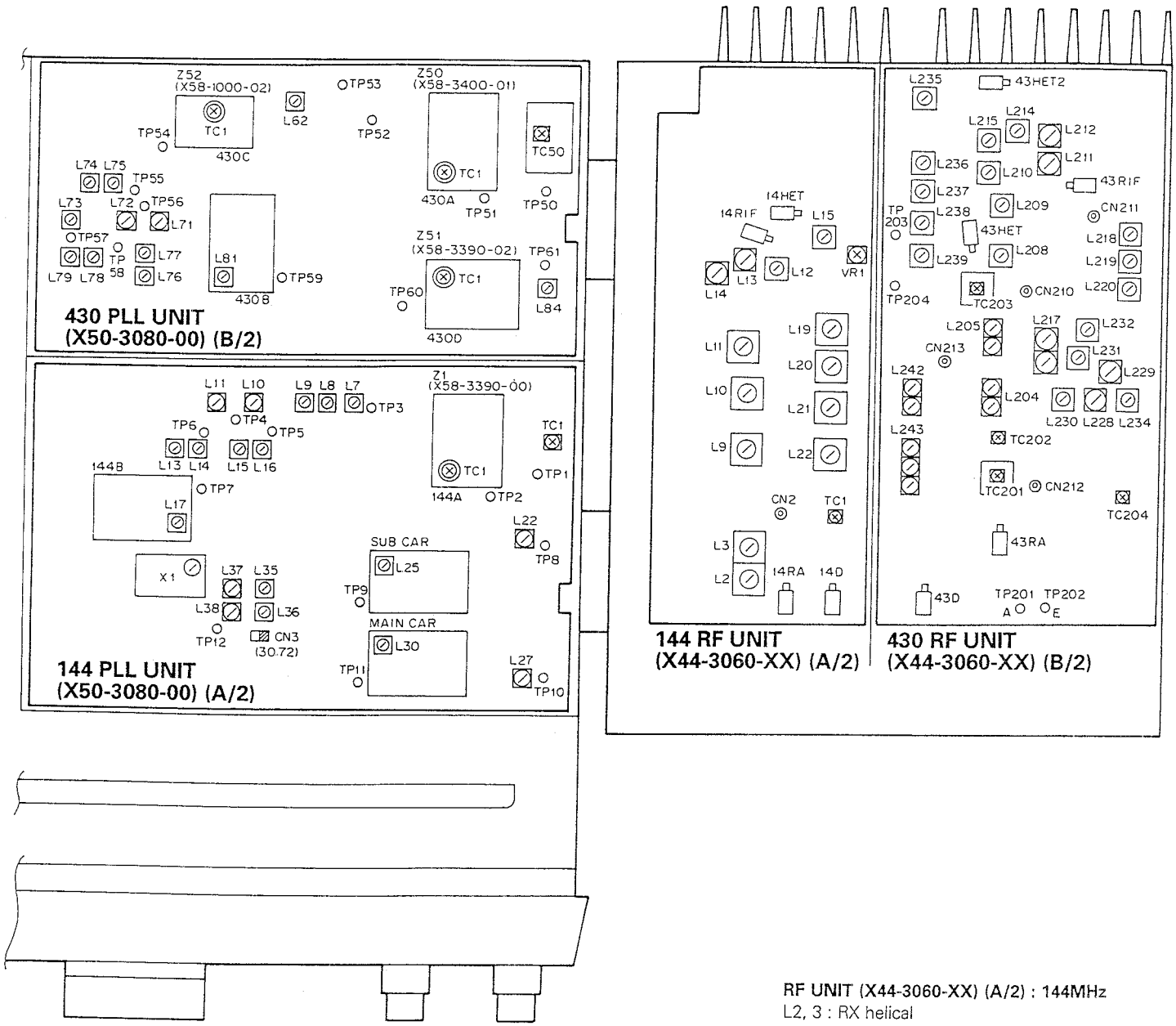
CONTROL UNIT (X53-3120-XX)
VR1 ~ 3 : Carrier point

FINAL UNIT (X45-3170-00) : 430MHz
VR1 : APC
VR2 : Protection
VR3 : POWER (NULL)

FINAL UNIT (X45-3160-00) : 144MHz
VR1 : APC
VR2 : Protection
VR3 : POWER (NULL)
VR4 : TXB (9T)
TC1 ~ 4 : TX POWER

ADJUSTMENT

ADJUSTMENT POINT (RF UNIT, PLL UNIT)



PLL UNIT (X50-3080-00) (A/2) : 144MHz
L7 ~ 10, 16 : 133MHz level
L10, 11 : 11.025MHz level
L13, 14 : 51.2MHz level
L15, 16 : 102.4MHz level
L17 : VCO B loop
L22 : SUB CAR
L25 : SUB CAR VCO
L27 : MAIN CAR
L30 : MAIN CAR VCO
L35, 36 : 30.72MHz level
L37, 38 : 10.24MHz level
TC1 : HET level
VCO2 144A : Z1 (X58-3390-00)
TC1 : VCO A loop

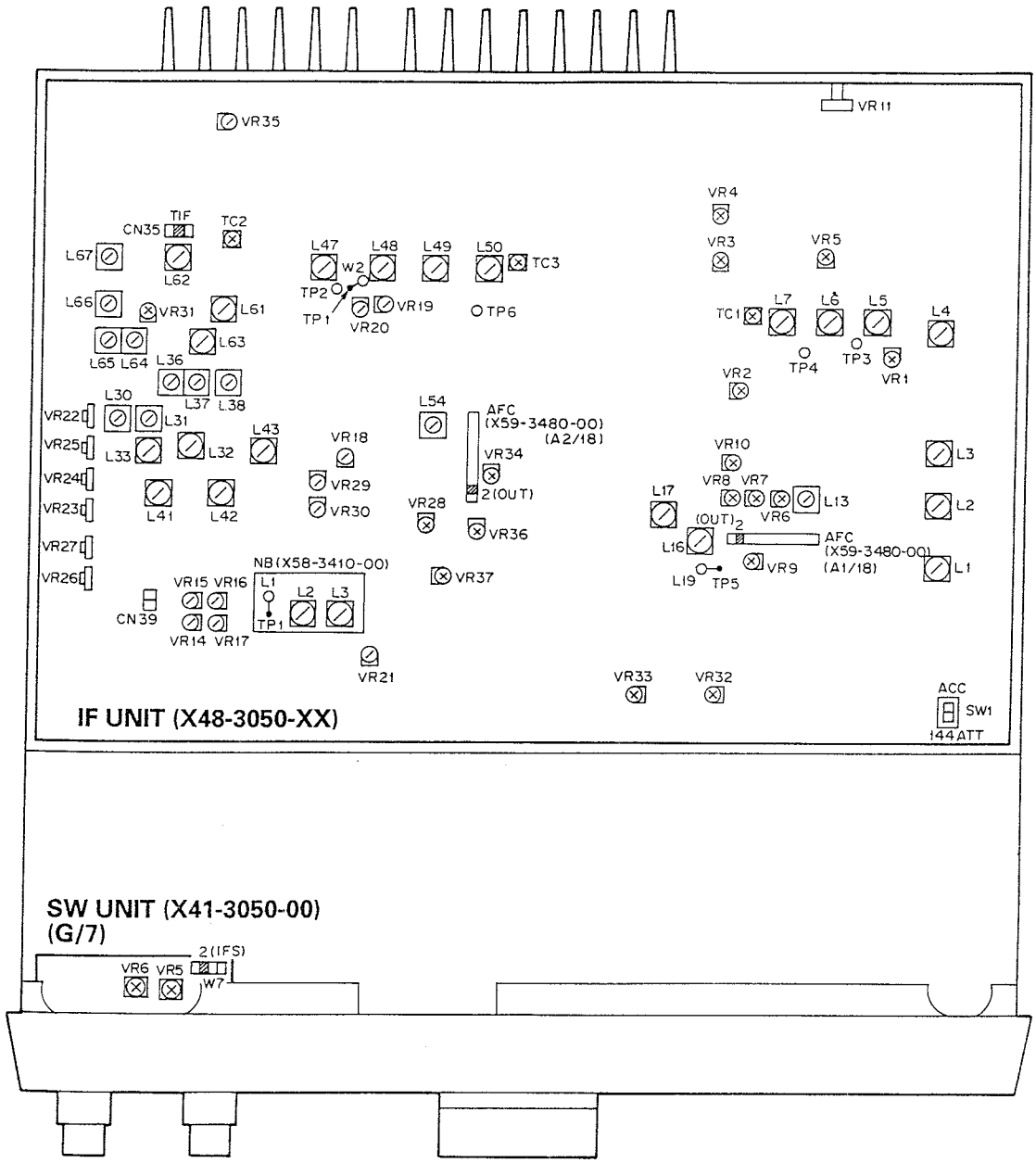
PLL UNIT (X50-3080-00) (B/2) : 430MHz
L62 : 153MHz level
L71, 72 : 11.025MHz level
L72 ~ 75 : 133MHz level
L76, 77 : 40.96MHz level
L78, 79 : 122.88MHz level
L81 : VCO B loop
L84 : HET2 (65MHz) level
TC50 : HET level
VCO 430C : Z52 (X58-1000-02)
TC1 : VCO C loop
VCO2 430D : Z51 (X58-3390-02)
TC1 : VCO D loop
VCO 430A : Z50 (X58-3400-01)
TC1 : VCO A loop

RF UNIT (X44-3060-XX) (A/2) : 144MHz
L2, 3 : RX helical
L9 ~ 13 : RX GAIN
L13 : RX GAIN (MAIN)
L14 : RX GAIN (SUB)
L15, 19 ~ 22 : TX DRIVE
TC1 : TX DRIVE
VR1 : TX 10.7MHz spurious

RF UNIT (X44-3060-XX) (B/2) : 430MHz
L204, 205 : RX helical
L208 ~ 210, 214, 215 : RX GAIN
L211 : RX GAIN (MAIN)
L212 : RX GAIN (SUB)
L217 ~ 220, 230 ~ 232 : 870MHz level
L228, 229, 234 : 370MHz level
L235 ~ 239 : TX DRIVE
TC201, 202 : RX helical
TC203 : RX GAIN
TC204 : 19.2MHz frequency

ADJUSTMENT

ADJUSTMENT POINT (LOWER)

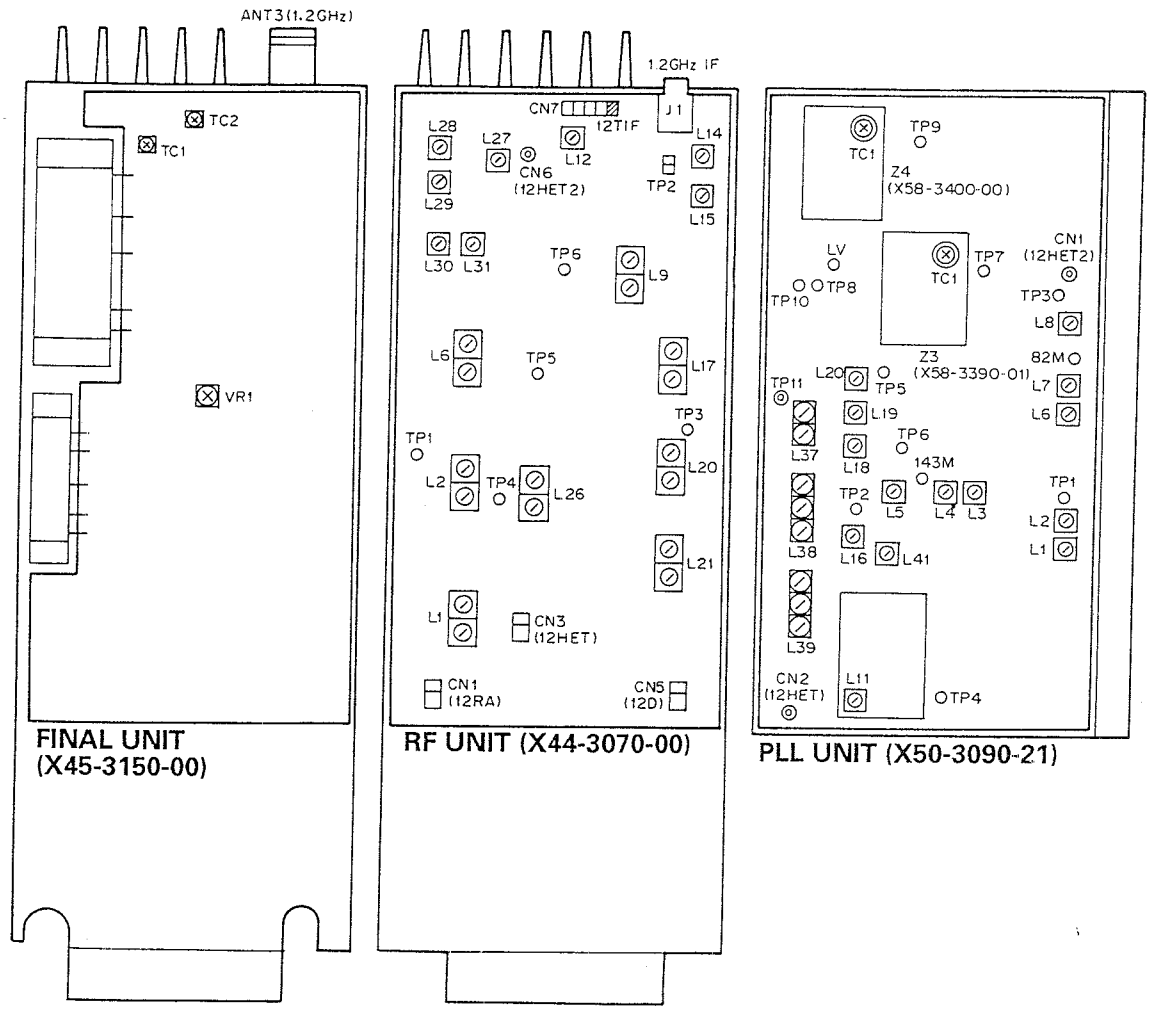


SWITCH UNIT (X41-3050-00)
VR5 : RIT
VR6 : IF SHIFT

IF UNIT (X48-3050-XX)
L1 ~ 3 : SUB common IF
L4 ~ 7 : SUB IF GAIN (SSB, CW)
L13 : SUB discri.
L16, 17 : SUB NB GAIN
L30 ~ 33 : 1.2GHz RX IF
L36 ~ 38 : 30.72MHz level
L41 ~ 43 : MAIN common IF
L47 ~ 50 : MAIN IF GAIN (SSB, CW)
L54 : MAIN discri.
L61, 62 : FM OSC (TIF)
L63 ~ 67 : 1.2GHz TX IF GAIN
TC1 : SUB RX carrier balance
TC2 : FM TX frequency
TC3 : MAIN RX carrier balance
VR1 : SUB tight squelch
VR2 : SUB RB
VR3 : SUB MUTE
VR4 : MAIN MUTE
VR5 : BEEP level
VR6 : SUB SSB S-ø
VR7 : SUB SSB S-9
VR8 : SUB FM S-9
VR9 : SUB ALT REF.
VR10 : SUB IF GAIN (FM)
VR11 : CW DELAY
VR14 : 430MHz IF GAIN (SUB)
VR15 : 1.2GHz IF GAON (SUB)
VR16 : 1.2GHz IF GAIN (MAIN)
VR17 : 430MHz IF GAIN (MAIN)
VR18 : MAIN IF GAIN (FM)
VR19 : RFG (2.5V)
VR20 : MAIN tight squelch
VR21 : MAIN RB
VR22 : MAIN SSB S-1
VR23 : MAIN FM S-9
VR24 : MAIN SSB S-9
VR25 : MAIN SSB S-ø
VR26 : ALC ø
VR27 : ALC 6dB
VR28 : CW level
VR29, 30 : TX carrier balance
VR31 : 1.2GHz TX IF spurious
VR32 : FM MIC GAIN
VR33 : FM DEV.
VR34 : MAIN ALT REF
VR35 : SIDE TONE level
VR36 : EXT. MOD
VR37 : SSB processor
NB (X58-3410-00)
L2, 3 : MAIN IF NB GAIN

ADJUSTMENT

ADJUSTMENT POINT (UT-10) : OPTION



FINAL UNIT (X45-3150-00)
VR1 : APC
TC1, 2 : APC

RF UNIT (X44-3070-00)
L1, 2 : RX BPF
L6 : RX IF
L9, 12 : RIF
L14, 15, 17 : TX IF
L20, 21 : TX BPF
L26 : HET BPF
L27 ~ 31 : HET2

PLL UNIT (X50-3090-21)
L1, 2 : 20.48MHz level
L2 ~ 5 : 143.36MHz level
L2, 6 ~ 8 : 81.92MHz level
L11 : VCO B loop
L16, 18 ~ 20, 41 : 153.9725MHz level
L37 ~ 39 : HET BPF (490MHz)
180M VCO : Z3 (X58-3390-01)
TC1 : VCO A loop
310M VCO : Z4 (X58-3400-00)
TC1 : VCO C loop

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
SWITCH UNIT (X41-3050-00)			
CN1	1	GND	GND
	2	LRDY	SUB LCD ASS'Y RESET output
	3	FDT	SUB LCD ASS'Y serial data
	4	LCK	SUB LCD ASS'Y serial clock
	5	LLE	SUB LCD ASS'Y enable
	6	5V	+5V
	7	LAMP	SUB LCD ASS'Y pilot lamp voltage
	8	GND	GND for lamp
CN3	1	SBL	SUB LED input
	2	MBL	MAIN LED input
	3	LCK	SUB LCD ASS'Y serial clock
	4	NC	Not used
	5	GND	GND
	6	GND	GND
	7	RES	SUB CPU reset input
	8	FBY	MAIN display BUSY
	9	FLE	MAIN display enable
	10	FDT	MAIN display serial data
	11	FCK	MAIN display serial clock
	12	LLE	SUB LCD ASS'Y enable
	13	LRDY	SUB LCD ASS'Y reset
	14	5V	+5V
CN4	1	GND	GND
	2	MU	MIC UP output
	3	MD	MIC DOWN output
	4	S0	Key scan input (S0)
	5	S1	Key scan input (S1)
	6	S2	Key scan input (S2)
	7	S3	Key scan input (S3)
	8	K0	Key return output (K0)
	9	K1	Key return output (K1)
	10	K2	Key return output (K2)
	11	K3	Key return output (K3)
	12	S4	Key scan input (S4)
	13	S5	Key scan input (S5)
	14	S6	Key scan input (S6)
	15	S7	Key scan input (S7)
	16	GND	GND
CN6	1	MD	MIC DOWN input
	2	MU	MIC UP input
	3	8V	+8V
CN7	1	TON	TONE output
	2	BEP	BEEP output
	3	GND	GND
CN8	1	GND	GND
	2	PC2	APC input
	3	PC3	APC output
	4	PC5	APC input (Q77,80 on IF unit)
	5	PC6	APC output
	6	MV3	MIC amp. input (from MIC GAIN VR)
	7	MV2	MIC amp. output (to Q69 on IF unit)
	8	GND	GND
CN9	1	MAV	MAIN volume control output
	2	SAV	SUB volume control output
	3	AVC	Elect. volume ref. input
	4	AVG	Elect. volume IC GND
	5	MSQ	MAIN SQL output
	6	SSQ	SUB SQL output
	7	GND	GND
CN10	1	GND	GND
	2	MIC	MIC output (from microphone)
	3	GND	GND
	4	SS	MIC PTT output
	5	AF0	AF input for VOX-4
	6	GND	GND
	7	8V	+8V
	8	MU	MIC UP output (from microphone)
	9	MD	MIC DOWN output (from microphone)
CN11	1	PHS	Headphone information
	2	8V	+8V
	3	GND	GND
	4	SSP	SUB AF PA input
	5	EXS	SUB EXT SP
	6	GND	GND
	7	EXM	MAIN EXT SP
	8	MSP	MAIN AF PA input
CN12	1	8V	+8V
	2	RB	G2 (gate2) voltage of RX SSB IF amp input
	3	MAGS	MAIN AGC select (to AGC SW)
	4	SAGS	SUB AGC select (to AGC SW)
	5	NBS	NB SW output (graunded when NB on)
	6	PWR	RF level select output (from ALC/RF SW)
	7	ALM	ALC level select output (from ACL/RF SW)
	8	MSM	MAIN S-meter input
	9	PRS	Processor output voltage (+8V appeared when PROC on)
	10	14ATT	144RF ATT operation (+8V appeared when ATT on)
	11	MAL	MAIN AF LED input voltage
	12	SAL	SUB AF LED input voltage
W6	1	SB	+13.8V input
	2	GND	GND
W7	1	RIT	RIT output
	2	IFS	IF SHIFT output
	3	VRE	Control unit +8V
	4	GND	GND
		SM	S-meter input voltage
		GND	GND
		LAMP	Pilot lamp voltage
		LAMP	Pilot lamp GND
RF UNIT (X44-3060-XX) (A/2) : 144MHz			
CN1		14RA	144MHz RX ANT input
CN2		TP	Test point (144MHz RX helical)
CN3		14HET	144MHz PLL input (127 ~ 162MHz)
CN4	1	TIF	TX IF input (10.695MHz)
	2	GND	GND
CN5	1	SB	+13.8V DC input voltage (from POWER SW)
	2	GND	GND
	3	GND	GND
CN6	1	GND	GND
	2	GND	GND
	3	CB	+13.8V DC output voltage (from SB)
	4	CB	+13.8V DC output voltage (from SB)
	5	CB	+13.8V DC output voltage (from SB)
	6	GND	GND
CN7	1	SB	+13.8V DC output voltage (from POWER SW)
	2	8V	+8V DC output (from IC1)

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
	3	5V	+5V DC output (from IC2)
	4	GND	GND
CN8		14D	144MHz DRIVE output (144 ~ 148MHz)
CN9	1	9T43	+9V voltage output when TX (to 430MHz RF unit)
	2	TXB	+9V voltage input when TX (from 144MHz final unit)
	3	TXB	+9V voltage input when TX (from 144MHz final unit)
	4	14TXB	+9V voltage output when 144MHz TX
	5	14W	+5V voltage input when wide 144MHz wide band operation (from IF unit)
	6	14AGC	144MHz AGC voltage input (from IF unit)
	7	14ATT	144MHz ATT input (+8V appeared when ATT on)
	8	RXS	+8V voltage input when RX
	9	14M	144MHz MAIN BAND signal input
	10	14S	144MHz SUB BAND signal input
	11	8C	+8V voltage input
	12	CV	144MHz VCO input (DC voltage)
CN10	1	14SRIF	144MHz SUB RX IF output (10.595MHz)
	2	GND	GND
CN11		14MRIF	144MHz MAIN RX IF output (10.695MHz)
RF UNIT (X44-3060-XX) (B/2) : 430MHz			
CN201		43RA	430MHz RX ANT input
CN202		43HET	430MHz PLL input (354 ~ 374MHz)
CN203		43HET2	CAR input MAIN : 65.23MHz, SUB : 65.33MHz
CN204	1	GND	GND
	2	43TIF	430MHz TX IF input (10.695MHz)
CN205		43D	430MHz DRIVE output (430 ~ 450MHz)
CN206	1	43TXB	+9V voltage output when 430MHz TX
	2	GND	GND
CN207	1	43W1	+8V voltage input when 430MHz wide band operation
	2	43W2	+8V voltage input when 430MHz wide band opeartion
	3	8C	+8V voltage input
	4	43S	430MHz SUB BAND signal input
	5	43M	430MHz MAIN BAND signal input
	6	RXS	+8V voltage input when RX
	7	43AGC	430MHz AGC voltage input
	8	NC	Not used
	9	9T43	+9V voltage input when TX
CN208	1	43SRIF	430MHz SUB RX IF output (10.595MHz)
	2	GND	GND
CN209		43MRIF	430MHz MAIN RX IF output (10.695MHz)
CN210		TP	Test point (430 ~ 450MHz RX helical)
CN211		TP	Test point (19.2MHz)
CN212		TP	Test point (RX helical when 430MHz wide band operation)
CN213		TP	Test point (430 ~ 450MHz TX helical)
RF UNIT (X44-3070-00) : 1.2GHz			
CN1		12RA	1.2GHz RX ANT input
CN2	1	12TXB	+9V voltage output when 1.2GHz TX
	2	12RXB	+8V voltage output when 1.2GHz RX
	3	-6	-6V voltage input
CN3		12HET	1.2GHz PLL input (486 ~ 506MHz)
CN4	1	GND	GND
	2	12V	+12V voltage input when TX
	3	12AGC	1.2GHz AGC voltage
	4	12CB	1.2GHz common +B (13.8V)
	5	12RXB	+8V voltage input when 1.2GHz RX
	6	12TXB	+9V voltage input when 1.2GHz TX
	7	-6	-6V voltage input
CN5		12D	1.2GHz DRIVE output (1240 ~ 1300MHz)
CN6		12HET2	PLL HET input (81.92MHz)
CN7	1	GND	GND
	2	12RIF	1.2GHz RX IF MAIN : 41.415MHz, SUB : 41.315MHz
	3	NC(GND)	Not used
	4	GND	GND
	5	12TIF	1.2GHz TX IF (41.415MHz)
J1		12IF	1.2GHz IF (MAIN : 287.175MHz, SUB : 287.075MHz)
FINAL UNIT (X45-3150-00) : 1.2GHz			
CN1	1	FAN-	Fan starter output voltage
	2	FAN+	+13.8V (from POWER SW)
CN2	1	SB	+13.8V (from POWER SW)
	2	-6	-6V voltage input
	3	12RXB	+8V voltage input when 1.2GHz RX
	4	12TXB	+9V voltage input when 1.2GHz TX
	5	NC(GND)	Not used
	6	12VR	1.2GHz protection detect output
	7	12VF	1.2GHz ALC detect output
CN3	1	B	+13.8V DC input
	2	B	+13.8V DC input
	3	12V	+12V voltage input when TX
	4	12V	+12V voltage input when TX
W1		12D	1.2GHz DRIVE input (1240 ~ 1300MHz)
W2		12RA	1.2GHz RX RF amp. output
FINAL UNIT (X45-3160-00) : 144MHz			
CN1	1	TXS	+8V voltage input when TX
	2	GND	GND
	3	TXB	+9V voltage output when TX
	4	TXB	+9V voltage output when TX
	5	TXB	+9V voltage output when TX
	6	TXB	+9V voltage output when TX
	7	14TXB	+9V voltage input when 144MHz TX
	8	12V	+12V voltage output when TX
	9	NC	Not used
CN2	1	B	+13.8V input (from 430MHz final unit)
	2	B	+13.8V input (from 430MHz final unit)
	3	GND	GND
	4	GND	GND
	5	12V	+12V voltage output when TX (to 430MHz final unit)
CN3	1	FAN-	Fan starter output
	2	FAN+	+13.8V DC (from POWER SW)
CN4	1	14VR	144MHz protection detect output
	2	14VF	144MHz ALC detect output
CN5	1	43TH	Temperature detect input
	2	M	Fan detect input
CN6	1	SB	+13.8V input (from POWER SW)
	2	SB	+13.8V output (to 430MHz final unit)

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
CN7	1	PD	POWER DOWN output
	2	GND	GND
W22		14RA	144MHz RX ANT output
W23		14D	144MHz DRIVE input
FINAL UNIT (X45-3170-00) : 430MHz			
CN1	1	B	+13.8V output (to POWER SW)
	2	B	+13.8V output (to POWER SW)
	3	B	+13.8V output (to 1.2GHz final unit)
	4	B	+13.8V output (to 1.2GHz final unit)
	5	B	+13.8V output (to 144MHz final unit)
	6	B	+13.8V output (to 144MHz final unit)
	7	12V	+12V voltage input when TX (from 144MHz final unit)
	8	GND	GND
	9	GND	GND
CN2	1	SB	+13.8V input (from 144MHz final unit)
	2	B	+13.8V DC input (from 6P plug)
	3	B	+13.8V DC input (from 6P plug)
CN3	1	12VR	1.2GHz protection detect input
	2	12VF	1.2GHz ALC detect input
	3	14VR	144MHz protection detect input
	4	14VF	144MHz ALC detect input
	5	PRO	All band protection output
	6	12VF	1.2GHz protection detect output
	7	43VF	430MHz protection detect output
	8	14VF	144MHz protection detect output
	9	43TXB	+9V voltage input when 430MHz TX
	10	GND	GND
	11	M	Fan detect output
	12	43TH	Temperature detect output
	13	TH	Thermister detect input
	14	GND	GND
W1		43D	430MHz DRIVE input
W2		43RA	430MHz RX ANT output
IF UNIT (X48-3050-XX)			
CN1		12SRIF	1.2GHz SUB RX IF input (10.595MHz)
CN2	1	GND	GND
	2	14SRIF	144MHz SUB RX IF input (10.595MHz)
	3	GND	GND
	4	43SRIF	430MHz SUB RX IF input (10.595MHz)
CN3	1	SAL	SUB AF LED output (to SW unit)
	2	MAL	MAIN AF LED output (to SW unit)
	3	14ATT	144MHz ATT control input (from SW unit)
	4	PRS	Processor control input
	5	MSM	MAIN S-meter output
	6	ALM	ALC meter input
	7	PWR	RF meter input
	8	NBS	NB control input (grounded when NB on)
	9	SAGS	SUB AGC select
	10	MAGS	MAIN AGC select
	11	RB	RX SSB IF AGC ref. voltage
	12	8V	+8V
CN4	1	TXD	TX data input } Parsonal computer control signal
	2	RXD	RX dtat output
	3	GND	GND
	4	CTS	TX available data output
	5	RTS	TX request data input
	6	GND	GND
	7	DGD	Digital GND
	8	GND	GND

Connector No.	Terminal No.	Terminal Name	Terminal Function
CN5		RCA	ACC3 (RCA)
CN6 (ACC1)	1	DGD	} Parsonal computer control signal I/O
	2	TXD	
	3	RXD	
	4	CTS	
	5	RTS	
	6	NC	
CN7 (ACC2)	1	SAF	SUB AF output voltage (Ref. 300mV/47Ω)
	2	ACC	Connect to ACC3 pin jack of CN5 with parallel
	3	MAF	MAIN AF output voltage (Ref. 300mV/47Ω)
	4	GND	GND
	5	MSQ	GND level when MAIN SQL opened
	6	MSM	MAIN S-meter output
	7	SSQ	GND level when SUB SQL opened
	8	GND	GND
	9	DTS	STBY terminal for terminal only
	10	SSM	SUB S-meter output
	11	ANI	Data signal input from terminal
	12	GND	GND
	13	SS	STBY terminal (grounded when TX)
CN8	1	CTC	Clock output } to SUB CTCSS unit
	2	RD	Tone detect AF output
	3	5C	+5V voltage output
	4	GND	GND
	5	DET	"H" level when tone detected
	6	CTD	Tone data output
	7	CTS	Enable output
CN9	1	OUT	} FM AF line output when operated SUB CTCSS
	2	IN	
CN10	1	CB	+13.8V (from POWER SW)
	2	GND	GND
	3	GND	GND
	4	VD	VS-2 input
CN11	1	PHS	"H" level when connected headphone
	2	8V	+8V
	3	GND	GND
	4	CB	Common +13.8V
CN12	1	AF0	AF output for VOX-4
	2	GND	GND
CN13	1	SP	Internal speaker output
	2	GND	GND
CN14	1	GND	GND
	2	SSP	SUB AF PA output
	3	EXS	Connect the SUB EXT. SP jack
	4	GND	GND
	5	EXM	Connect the MAIN EXT. SP jack
	6	MSP	MAIN AF PA output
CN16	1	MAV	MAIN volume control input
	2	SAV	SUB volume control input
	3	AVC	Elect volume ref. output
	4	AVG	GND
	5	MSQ	MAIN SQL input
	6	SSQ	SUB SQL input
CN17	1	HV	+24V
	2	CV	PLL VCO voltage (DC voltage)
CN18		SCAR	SUB CAR input (10.592 ~ 10.598MHz)
CN19		EXT. S	Connect the SUB EXT. SP jack
CN20		EXT. M	Connect the MAIN EXT. SP jack

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
CN21	1	MCD	MAIN CTCSS detect signal
	2	NC	Not used
	3	NC	Not used
	4	SEP	Speaker separate signal
	5	SMUT	SUB MUTE signal
	6	MMUT	MAIN MUTE signal
	7	SABK	SUB audio stage blanking signal
	8	DEN	SUB CTCSS data (enable)
	9	SCT	SUB CTCSS signal
	10	ATV	1.2GHz TIF STOP signal
	11	SBL	SUB BUSY LED signal
	12	SBC	SUB BUSY output
	13	SRBK	SUB IF stage blanking signal
	14	NC	Not used
	15	NC	Not used
	16	SSCB	SUB SSB, CW mode signal
	17	SFMB	SUB FM mode signal
	18	SSM	SUB S-meter output
	19	DL2	CW semi-break-in delay signal MAIN discri output signal
	20	DL1	CE break-in delay ref. voltage
	21	NC	Not used
	22	SDIS	SUB ALT discri output signal
	23	NC	Not used
	24	SCD	SUB CTCSS detect signal
CN22	1	GND	GND
	2	ANI	External modulation AF output
CN30	1	12RIF	1.2GHz RX IF input MAIN : 41.415MHz, SUB : 41.315MHz
	2	GND	GND
	3	GND	GnD
	4	30.72	30.72MHz input (from PLL unit)
CN31	1	GND	GND
	2	FMD	FM modulation input (from FM MIC amp.)
CN32	1	-6	-6V
	2	12TXB	+9V voltage appeared when 1.2GHz TX
	3	12RXB	+8V voltage appeared when 1.2GHz RX
	4	12CB	1.2GHz common +B (+13.8V)
	5	12AGC	1.2GHz AGC voltage output
	6	PD	POWER DOWN input
	7	GND	GND
CN33		10.24M	10.24MHz ref. OSC input
CN34	1	12TIF	1.2GHz TX IF output (41.415MHz)
	2	GND	GND
CN35	1	GND	GND
	2	TIF	144MHz TX IF output (10.695MHz)
	3	ICN	Internal connection
CN36	1	ICN	Internal connection
	2	PC6	TIF gain control
	3	PC5	TIF gain control
	4	PC3	ALC threshold control
	5	PC2	ALC threshold control
	6	GND	GND
CN38 (ACC4)	1	ALC	Internal ALC output voltage
	2	GND	GND
	3	NC	Not used
	4	ATV	1.2GHz TIF STOP signal input
	5	NC	Not used
	6	12TXB	+9V voltage output when 1.2GHz TX
	7	CB	Common +B (+13.8V)
	8	SS	STBY terminal

Connector No.	Terminal No.	Terminal Name	Terminal Function
CN39	1		Shorted when use to ALC meter (all mode)
	2		
CN40	1	OUT	FM AF line output when operated MAIN CTCSS
	2	IN	
CN41	1	CTC	Clock output (to MAIN CTCSS unit)
	2	RD	Tone detect AF output
	3	5C	+5V voltage output
	4	GND	GND
	5	DET	"H" level when tone detected
	6	CTD	Tone data output
	7	CTS	Enable output
CN42		KEY	Connect to the KEY jack
CN43 (EXT CONT)	1	430TXG	"GND" level when 430MHz TX
	2	SS	STBY terminal (GND : transmit)
	3	ALC	External ALC input 1
	4	1.2TXG	"GND" level when 1.2GHz TX
	5	ALC	External ALC input 2
	6	144TXG	"GND" level when 144MHz TX
	7	ALC	External ALC input 3
CN44	1	BEP	BEEP input
	2	TON	TONE input
	3	GND	GND
	4	FMM	FM MIC amp. input (to AF MIC amp.)
	5	GND	GND
	6	GND	GND
	7	FMD	FM modulation output
CN45	1	FMM	FM MIC amp. output
	2	GND	GND
	3	GND	GND
	4	MV2	SSB MIC amp. input
	5	MV3	SSB MIC amp. output (from IC10)
CN46	1	GND	GND
	2	MIC	MIC input (from microphone)
	3	SS	STBY terminal (MIC PTT)
CN47	1	GND	GND
	2	CB	Common +B (+13.8V)
CN48	1	TXB	+9V voltage appeared when TX
	2	TXB	+9V voltage appeared when TX
	3	TXS	TXB control signal output
	4	GND	GND
	5	14VF	144MHz ALC detect input
	6	43VF	430MHz ALC detect input
	7	12VF	1.2GHz ALC detect input
	8	PRO	All band protection detect input
	9	GND	GND
CN49		MCAR	MAIN CAR input (10.692 ~ 10.698MHz)
CN50	1	43W2	Band information
	2	43W1	Band information
	3	14W	Band information
	4	14S	144MHz SUB band signal
	5	14M	144MHz MAIN band signal
	6	43S	430MHz SUB band signal
	7	43M	430MHz MAIN band signal
	8	14ATT	144MHz ATT
	9	8V	+8V
	10	8V	+8V
	11	RXS	Band RXB control signal output
	12	RXS	Band RXB control signal output
	13	43AGC	430MHz AGC voltage
	14	14AGC	144MHz AGC voltage
	15	CV	VCO voltage (DC voltage)
CN51		14MRIF	144MHz MAIN RX IF input

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
CN52		43MRIF	430MHz MAIN RX IF input
CN53		12SRIF	1.2GHz SUB RX IF output
CN54	1	GND	GND
	2	CKY	TX control signal output when semi-break-in
	3	MFMB	MAIN FM +B input (+8V)
	4	MSSB	MAIN SSB +B input (+8V)
	5	MCWB	MAIN CW +B input (+8V)
	6	MCNB	MAIN CW-N +B input (+8V)
	7	MRBK	MAIN IF stage blanking signal
	8	MBL	MAIN BUSY LED
	9	MBC	MAIN BUSY output
	10	MEN	MAIN CTCSS data (enable)
	11	VCK	CTCSS clock input
	12	VDT	CTCSS dtat input
	13	MCT	MAIN CTCSS control input
	14	MABK	MAIN audio stage blanking signal
	15	CRX	Not used
	16	CTX	STBY signal input
	17	CSS	STBY signal output
	18	12M	1.2GHz MAIN band signal
	19	12S	1.2GHz SUB band signal
	20	43M	430MHz MAIN band signal
	21	43S	430MHz SUB band signal
	22	14M	144MHz MAIN band signal
	23	14S	144MHz SUB band signal
	24	14W	144MHz wide band signal
	25	43W1	430MHz wide band signal (360MHz)
	26	43W2	430MHz wide band signal (900MHz)
CN55	1	ANI	External modulation AF input
	2	GND	GND
NB (X58-3410-00) : PC board located in IF unit			
W1	1	MNBI	Signal input (10.695MHz)
	2	GND	GND
	3	GND	GND
	4	MNBG	Blanking signal output
W2	1	MSCR	MAIN SSB, CW mode signal input
	2	NBS	MAIN NB switch input (grounded when NB on)
	3	GND	GND
PLL UNIT (X50-3080-00) (A/2) : 144MHz			
CN1	1	GND	GND
	2	8V	+8V
	3	8V	+8V
	4	120P	UT-10 option information output from CN2 connector (120P)
	5	SCLE	SUB CAR PLL IC (IC7) latch pulse
	6	MCLE	MAIN CAR PLL IC (IC10) latch pulse
	7	43LE4	430MHz D loop latch pulse (to 43LE4 of W1)
	8	PCK	PLL serial clock
	9	PDT	PLL serial data
	10	14LE1	144MHz A loop (IC2) latch pulse
	11	14LE2	144MHz B loop (IC4) latch pulse
	12	14B1	144MHz PLL wide band data Normally : "L", 150MHz or more : "L"
	13	NC	Not used
	14	14UL	144MHz A loop UNLOCK information
	15	43LE1	430MHz A loop latch pulse (to 43LE1 of W1)
	16	43LE2	430MHz B loop latch pulse (to 43LE2 of W1)
	17	43LE3	430MHz C loop latch pulse (to 43LE3 fo W1)
	18	43UL	430MHz UNLOCK information (from 43UL of W1)
	19	12LE1	1.2GHz A loop latch pulse (to 12LE1 of CN2)
	20	12LE2	1.2GHz B loop latch pulse (to 12LE2 of CN2)
	21	12LE3	1.2GHz C loop latch pulse (to 12LE3 of CN2)
	22	12UL	1.2GHz PLL UNLOCK information
CN2	1	120P	UT-10 option information "L" : Used, "H" : Not used
	2	PCK	PLL serial clock
	3	PDT	PLL serial data
	4	12LE1	1.2GHz A loop (IC4) latch pulse
	5	12LE3	1.2GHz C loop (IC5) latch pulse
	6	12UL	1.2GHz A and C loop UNLOCK information
	7	12LE2	1.2GHz B loop (IC1) latch pulse
	8	HV	+24V (for VCO vari-cap diode)
	9	8V	+8V
	10	GND	GND
	11	10.24	10.24MHz ref. OSC output for 1.2GHz
CN3	1	30 72	10.24MHz x 3 (to IF unit)
	2	GND	GND
CN4		10.24M	10.24MHz OSC for FM mode (to IF unit)
CN5		MCAR	MAIN CAR (10.692 ~ 10.698MHz)
CN6		SCAR	SUB CAR (10.592 ~ 10.598MHz)
CN7	1	HV	+24V
	2	CV	PLL VCO voltage (DC voltage)
CN8		14HET	144MHz PLL output MAIN : 133.305 ~ 137.305MHz SUB : 133.405 ~ 137.405MHz
CN9	1	PCK	PLL serial clock
	2	PDT	PLL serial data
	3	43UL	430MHz A and D loop UNLOCK information "H" : Lock, "L" : Unlock
	4	43LE3	430MHz C loop (IC51) latch pulse
	5	43LE2	430MHz B loop (IC54) latch pulse
	6	43LE1	430MHz A loop (IC50) latch pulse
	7	43LE4	430MHz D loop (IC55) latch pulse
	8	HV	+24V (for VCO vari-cap diode)
	9	8V	+8V
	10	5V	+5V (for PLL IC)
	11	10.24	10.24MHz ref OSC output for 430MHz
	12	GND	GND
PLL UNIT (X50-3080-00) (B/2) : 430MHz			
CN50		43HET	430MHz 1st HET output (354 ~ 374MHz)
CN51		43HET2	430MHz 2nd HET output (65MHz)
W1	1	PCK	PLL serial clock
	2	PDT	PLL serial data
	3	43UL	430MHz A and D loop UNLOCK information "H" : Lock, "L" : Unlock
	4	43LE3	430MHz C loop (IC51) latch pulse
	5	43LE2	430MHz B loop (IC54) latch pulse
	6	43LE1	430MHz A loop (IC50) latch pulse
	7	43LE4	430MHz D loop (IC55) latch pulse

TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
	8	HV	+24V (for VCO vari-cap diode)
	9	8V	+8V
	10	5V	+5V (for PLL IC)
	11	10.24	10.24MHz ref. OSC output for 430MHz
	12	GND	GND
PLL UNIT (X50-3090-21) : 1.2GHz			
CN1		12HET2	1.2GHz 2nd HET/3 (81.92MHz)
CN2		12HET	1.2GHz 1st HET/2 (81.92MHz) (476.41 ~ 506.41MHz)
W1	1	10.24	10.24MHz ref. OSC input for 1.2GHz
	2	GND	GND
	3	8V	+8V
	4	HV	+24V (for VCO vari-cap diode)
	5	12LE2	1.2GHz B loop (IC1) latch pulse
	6	12UL	1.2GHz A and C loop UNLOCK information
	7	12LE3	1.2GHz C loop (IC5) latch pulse
	8	12LE1	1.2GHz A loop (IC4) latch pulse
	9	PDT	PLL serial data
	10	PCK	PLL serial clock
	11	120P	UT-10 option information (normally GND)
CONTROL UNIT (X53-3120-XX)			
CN1	1	12UL	1.2GHz UNLOCK information input "L" : Unlock
	2	12LE3	1.2GHz PLL C loop enable signal
	3	12LE2	1.2GHz PLL B loop enable signal
	4	12LE1	1.2GHz PLL A loop enable signal
	5	43UL	430MHz UNLOCK information input "L" : Unlock
	6	43LE3	430MHz PLL C loop enable signal
	7	43LE2	430MHz PLL B loop enable signal
	8	43LE1	430MHz PLL A loop enable signal
	9	14UL	144MHz UNLOCK information input "L" : Unlock
	10	NC	Not used
	11	14B1	144MHz PLL bandpass indicate
	12	14LE2	144MHz PLL B loop enable signal
	13	14LE1	144MHz PLL A loop enable signal
	14	PDT	PLL data output
	15	PCK	PLL data clock output
	16	43LE4	430MHz PLL D loop enable signal
	17	MCLE	MAIN CAR PLL enable signal
	18	SCLE	SUB CAR PLL enable signal
	19	120P	1.2GHz option (UT-10) judgement "L" : Used
	20	8V	+8V
	21	8V	+8V
	22	GND	GND
CN2	1	RIT	RIT volume input
	2	IFS	IF SHIFT volume input
	3	VRE	RIT and IF SHIFT volume ref. power supply output
	4	GND	GND
CN3	1	NC	Not used
	2	8V	+8V
	3	5V	+5V
	4	GND	GND
	5	GND	GND
CN4	1	SD	Voice data } Option
	2	SCK	Voice data clock } VS-2

Connector No.	Terminal No.	Terminal Name	Terminal Function
	3	BSY	Utterance BUSY signal "H" : Utterance } Option VS-2
	4	STR	Utterance start signal "H" : Start } Option VS-2
	5	5C	DC power supply (+5V) } Option VS-2
	6	GND	GND } Option VS-2
CN5	1	5V	+5V (for display)
	2	LRDY	LCD indicator on "H" : Indicator on
	3	LLE	LCD indicator data enable
	4	FCK	SUB CPU data clock for FL tube
	5	FDT	SUB CPU data for FL tube LCD indicator data output
	6	FLE	SUB CPU data enable signal for FL tube
	7	FBY	Data BUSY signal for FL tube
	8	RES	SUB CPU reset signal for FL tube "L" : Reset
	9	GND	GND
	10	GND	GND
	11	NC	Not used
	12	LCK	LCD indicator data clock
	13	MBL	MAIN BUSY LED output
	14	SBL	SUB BUSY LED output
CN6	1	43W2	430MHz wide band signal (360MHz) } ON : 8V OFF : 0V
	2	43W1	430MHz wide band signal (900MHz) } ON : 8V OFF : 0V
	3	14W	144MHz wide band signal } ON : 8V OFF : 0V
	4	14S	144MHz SUB band signal } ON : 8V OFF : 0V
	5	14M	144MHz MAIN band signal } ON : 8V OFF : 0V
	6	43S	430MHz SUB band signal } ON : 8V OFF : 0V
	7	43M	430MHz MAIN band signal } ON : 8V OFF : 0V
	8	12S	1.2GHz SUB band signal } ON : 8V OFF : 0V
	9	12M	1.2GHz MAIN band signal } ON : 8V OFF : 0V
	10	CSS	STBY input "L" : SEND, "H" : REC
	11	CTX	TX indication "H" : TTL level when TX
	12	CRX	RX indication "H" : TTL level when RX
	13	MABK	MAIN AF blanking "H" : Blanking
	14	MCT	MAIN CTCSS ON/OFF "H" : CTCSS on
	15	VDT	CTCSS (TSU-5) data
	16	VCK	CTCSS (TSU-5) clock
	17	MEN	MAIN CTCSS (TSU-5) enable
	18	MBC	MAIN BUSY control "H" : BUSY
	19	MBL	MAIN BUSY LED
	20	MRBK	MAIN RF blanking "L" : Blanking
	21	MCNB	MAIN CW-N mode signal } ON : 8V OFF : 0V
	22	MCWB	MAIN CW mode signal } ON : 8V OFF : 0V
	23	MSSB	MAIN SSB mode signal } ON : 8V OFF : 0V
	24	MFMB	MAIN FM mode signal } ON : 8V OFF : 0V
	25	CKY	Keying input "L" : Keying
	26	GND	GND
CN7	1	GND	GND
	2	S7	Key matrix select output "L" : Select
	3	S6	Key matrix select output "L" : Select
	4	S5	Key matrix select output "L" : Select
	5	S4	Key matrix select output "L" : Select
	6	K3	Key matrix input
	7	K2	Key matrix input
	8	K1	Key matrix input
	9	K0	Key matrix input
	10	S3	Key matrix select output "L" : Select
	11	S2	Key matrix select output "L" : Select
	12	S1	Key matrix select output "L" : Select
	13	S0	Key matrix select output "L" : Select
	14	MD	MIC DOWN SW input "L" : ON
	15	MU	MIC UP SW input "L" : ON
	16	GND	GND

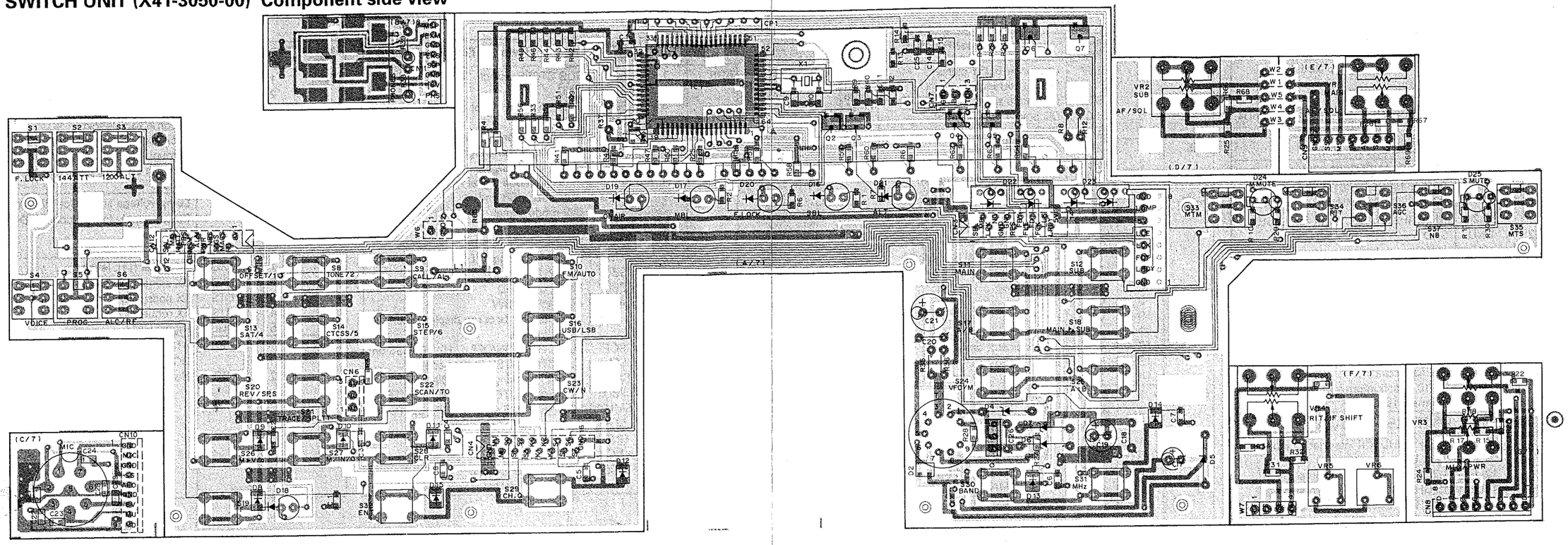
TERMINAL FUNCTIONS

Connector No.	Terminal No.	Terminal Name	Terminal Function
CN8	1	SCD	SUB CTCSS detect "L" : Signal detect
	2	GND	GND
	3	SDIS	SUB deviation signal
	4	GND	GND
	5	DL1	Ref voltage for CW delay volume
	6	DL2	CW delay volume signal
	7	SSM	SUB S-meter signal
	8	SFMB	SUB FM mode signal
	9	SSCB	SUB LSB, USB and CW mode signal (ON : 8V, OFF : 0V)
	10	NC	Not used
	11	NC	Not used
	12	SRBK	SUB RF blanking "L" : Blanking
	13	SBC	SUB BUSY control "H" : BUSY
	14	SBL	SUB BUSY LED
	15	ATV	ATV indicate SW ATV indicator become display when added voltage
	16	SCT	SUB CTCSS ON/OFF "H" : CTCSS on
	17	SEN	SUB CTCSS (TSU-5) data enable
	18	SABK	SUB AF blanking "H" : Blanking
	19	MMUT	MAIN AF MUTE signal "H" : MUTE on
	20	SMUT	SUB AF MUTE signal "H" : MUTE on
	21	SEP	Separate SW "H" : Separate
	22	GND	GND
	23	NC	Not used
	24	MCD	MAIN CTCSS detect "L" : Signal detect

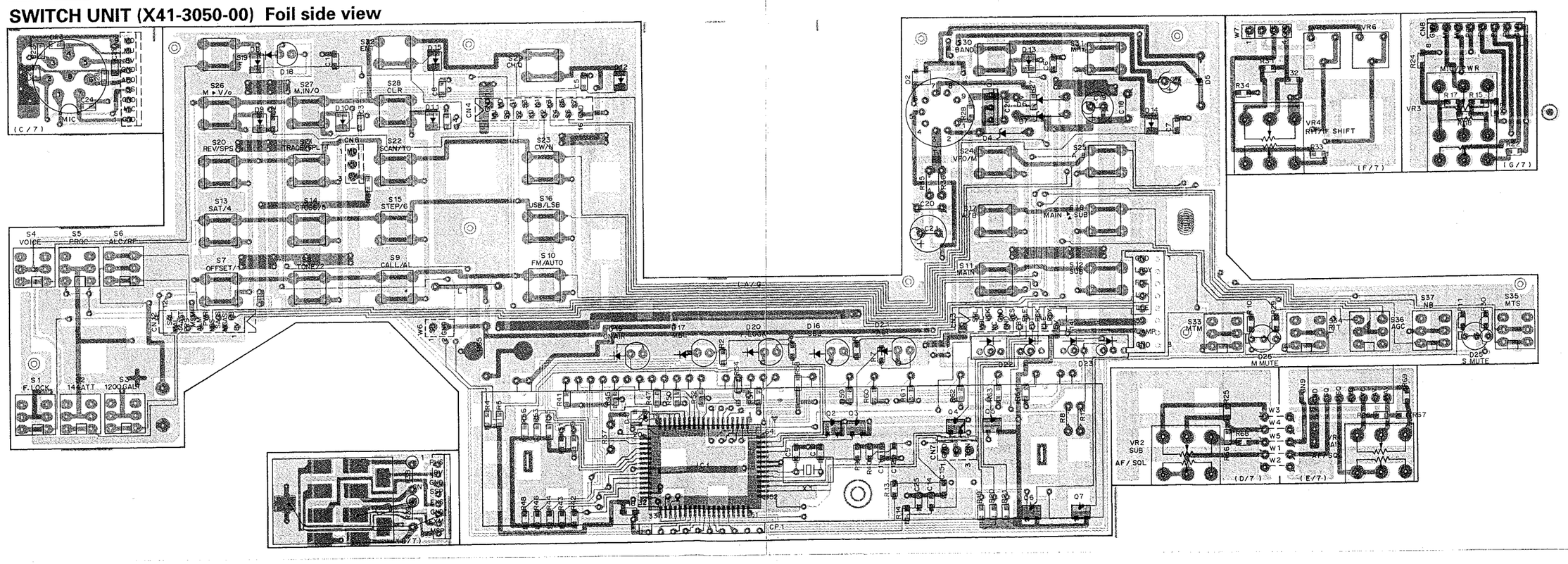
Connector No.	Terminal No.	Terminal Name	Terminal Function
CN9	1	5V	+5V DC power supply voltage
	2	SL1	Solenoid voltage
	3	SL2	Will start to solenoid when voltage become to solenoid
	4	EN3	Click encoder pulse (50 slit) (Encoder ass'Y)
	5	EN2	Through encoder pluse (250 slit) (Encoder ass'Y)
	6	EN1	Through encoder pluse (250 slit) (Encoder ass'Y)
	7	GND	GND
CN10	1	SB	Lump voltage supply for SW unit Power supply for FL tube DC-DC convertor
	2	GND	GND
CN11	1	TXD	TX signal (TTL level) (Parsonal computer interface)
	2	RXD	RX signal (TTL level) (Parsonal computer interface)
	3	CTS	TX possibility (TTL level) (Parsonal computer interface)
	4	RTS	TX request (TTL level) (Parsonal computer interface)
	5	DGD	Digital GND
CN12	1	SB	+13 8V (Solenoid startor, meter lump, DC-DC convertor for FL tube)
	2	NC	Not used

TS-790A/E PC BOARD VIEWS

SWITCH UNIT (X41-3050-00) Component side view



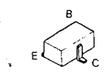
SWITCH UNIT (X41-3050-00) Foil side view



SWITCH UNIT (X41-3050-00)

SW UNIT (X41-3050-00) (A/7)

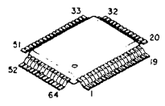
DTA143EK



IC1	: μPD75206G-531-1B
Q1	: 2SC3668(Y)
Q2 ~ 7	: DTA143EK
D1	: RD9.1M-B2
D2	: RD7.5M-B2
D4	: RD43EB
D5	: 1SS81
D6	: RD27EB2
D7	: US1090
D8 ~ 15	: RLS73
D16 ~ 18, 20	: B30-0856-05
D19	: B30-0855-05
D21	: B30-0857-05
D22	: B30-0862-05
D23	: B30-0863-05
D24, 25	: B30-0864-05

2SC3668

75206G-531-1B



Unused numbers
C13
R16

AI FIP14KM7

MCH CD SCAN A VFO B STEP * CTCSS RIT

8888.8888 88 88

M.SCR SP.S ATV MHz SAT TRACE AL

R46–R64 47K

R35 2.2 1/6W

R36 2.2 1/6W

~21.2V

DC-DC CONV FOR FL TUBE

T1

D2 D4 D5 Q1

C17 10 16V RC2

C19 47 50V RC2

C18 .047

R28 3.9K

R27 100

C26 .0022

C20 0.47

C21 220 25V

L1 100μ

R65 47 1/2W

13.6V

D7 D6

D16 D17

R1 220

R2 220

SBL

MBL

R19 10K

R20 10K

R21 10K

R37 3.9K 1/6W

D1

D18 D19

R4 180

R5 470

F

DN AIR

Q2 Q3

R6 150

R7 150

D20 D21

F LOCK

ALT

IC1

μPD75206G-531-1B

SUB CPU

4.194304 MHz

C9 15P

C10 15P

2.43V

2.7V

R40 82K

R9 68K

C11 .001

C12 .0015

C16 .01

R3 100

Q4 Q5 Q6 Q7

D22 D23 D24 D25

R8 68 1/6W

R12 68 1/6W

R10 470

R29 120

R11 470

R30 120

R13 470

C15 .01

R14 22K

C25 .01

C14 .001

CP1

MAIN

SUB

MAIN MUTE

SUB MUTE

D8–D15 470P

ALT S3

OFFSET/I S7

TONE/2 S8

CALL/AL S9

AUTO/FM S10

MAIN S11

SUB S12

MAIN MUTE S33

VOICE S4

SAT/4 S13

CTCSS/5 S14

STEP/6 S15

LSB/USB S16

A/B S17

M≷S S18

RIT S34

F S19

REV/SP.S S20

SPLIT/TRACE S21

SCAN/TO/CO S22

CW/N S23

VFO/M S24

A=B S25

SUB MUTE S35

F LOCK S1

M►V/. S26

M.IN/O S27

CLEAR S28

CH.Q S29

BAND S30

MHz S31

ENT S32

W6

PL

10.4V

LCD-1-GND
LCD-1-LRDY
LCD-1-FDT
LCD-1-LCK
LCD-1-LLE
LCD-1-5V
LCD-1-LMP
LCD-1-GND

CONT-10-SB
CONT-10-GND

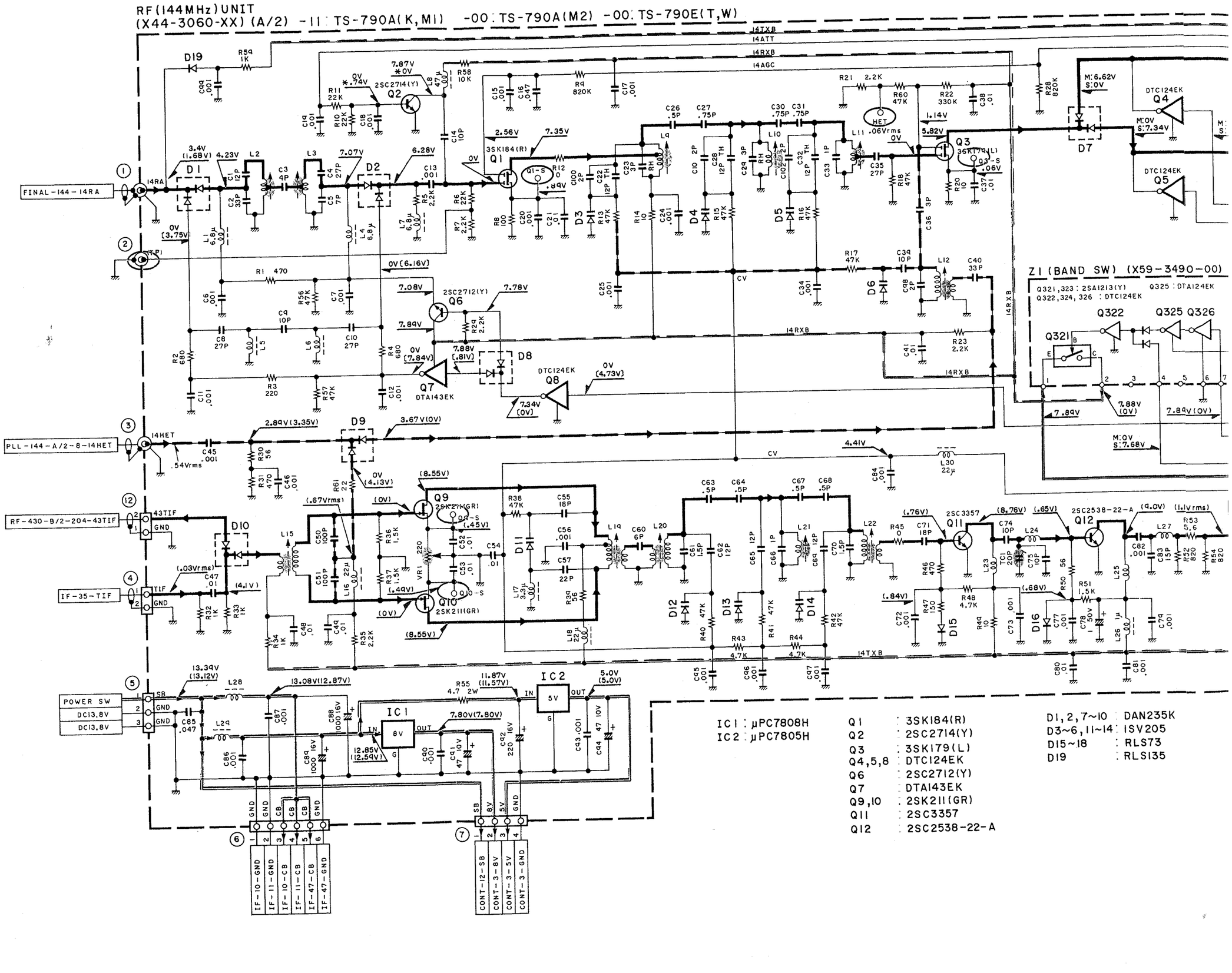
CONT-5-SBL
CONT-5-MBL
CONT-5-LCK
CONT-5-GND
CONT-5-GND
CONT-5-RES
CONT-5-FBY
CONT-5-FLE
CONT-5-FDT
CONT-5-FCK
CONT-5-LLE
CONT-5-LRDY
CONT-5--5V

SW-C/7-10-MD
SW-C/7-10-MU
SW-C/7-10-8V

CONT-7-GND
CONT-7-MU
CONT-7-MD
CONT-7-S0
CONT-7-S1
CONT-7-S2
CONT-7-S3
CONT-7-K0
CONT-7-K1
CONT-7-K2
CONT-7-K3
CONT-7-S4
CONT-7-S5
CONT-7-S6
CONT-7-S7
CONT-7-GND

TS-790A/E CIRCUIT DIAGRAM

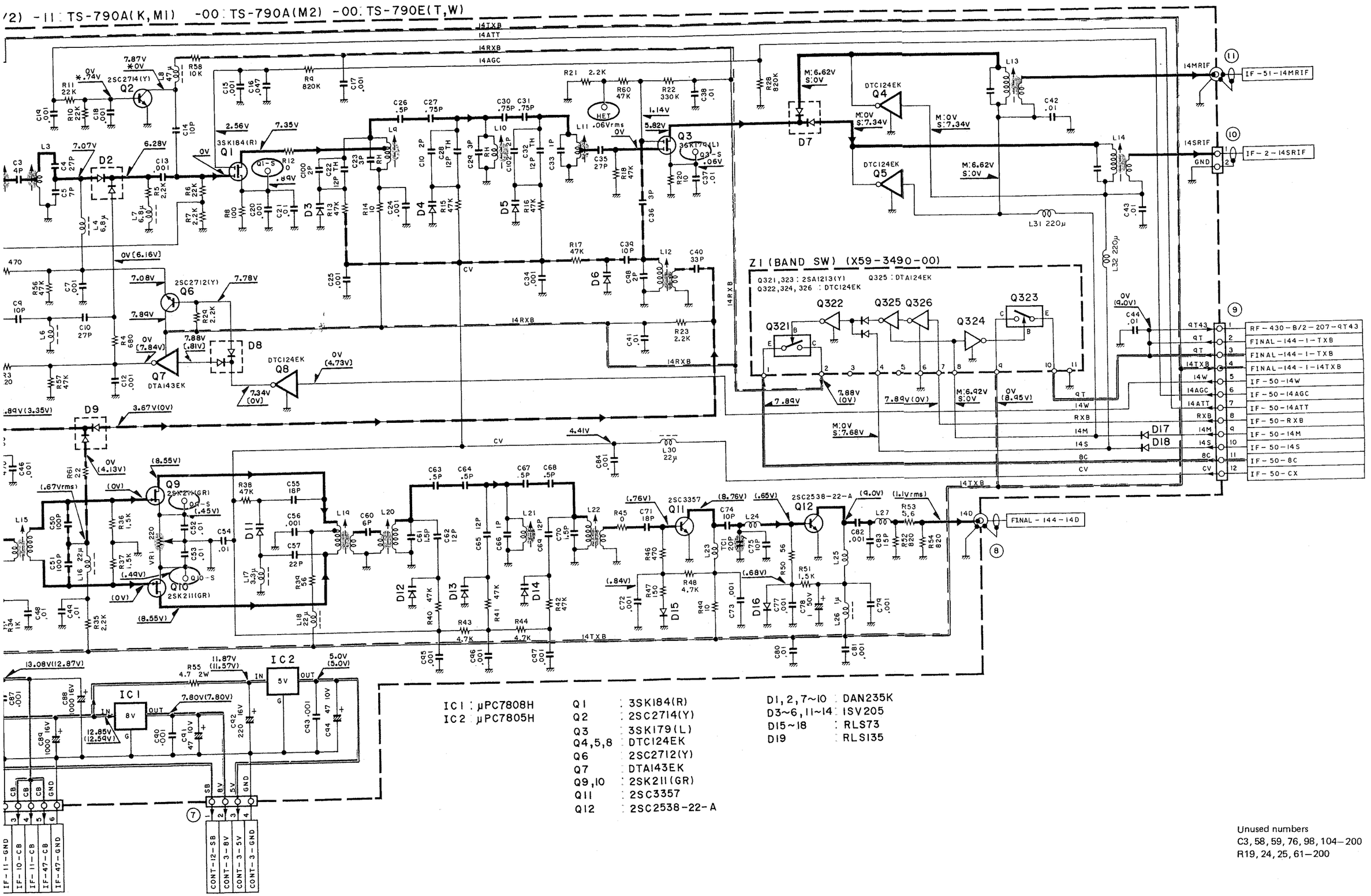
RF UNIT (X44-3060-XX) (A/2) : 144MHz -00 : M2, T, W -11 : K, M1



f:145.02 RX
( ):FM TX(12W)

(X44-3060-XX) (A/2) : 144MHz -00 : M2, T, W -11 : K, M1

(A/2) -11 : TS-790A(K,M1) -00 : TS-790A(M2) -00 : TS-790E(T,W)



IC1 : μPC7808H
IC2 : μPC7805H

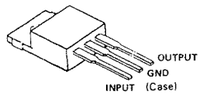
Q1	: 3SK184(R)
Q2	: 2SC2714(Y)
Q3	: 3SK179(L)
Q4,5,8	: DTC124EK
Q6	: 2SC2712(Y)
Q7	: DTA143EK
Q9,10	: 2SK211(GR)
Q11	: 2SC3357
Q12	: 2SC2538-22-A

D1,2,7~10	: DAN235K
D3~6,11~14	: 1SV205
D15~18	: RLS73
D19	: RLS135

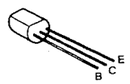
Unused numbers
C3, 58, 59, 76, 98, 104–200
R19, 24, 25, 61–200

DTA143EK
DTC124EK
2SC2712
2SC2714

μPC7805H
μPC7808H



2SC2538-22-A

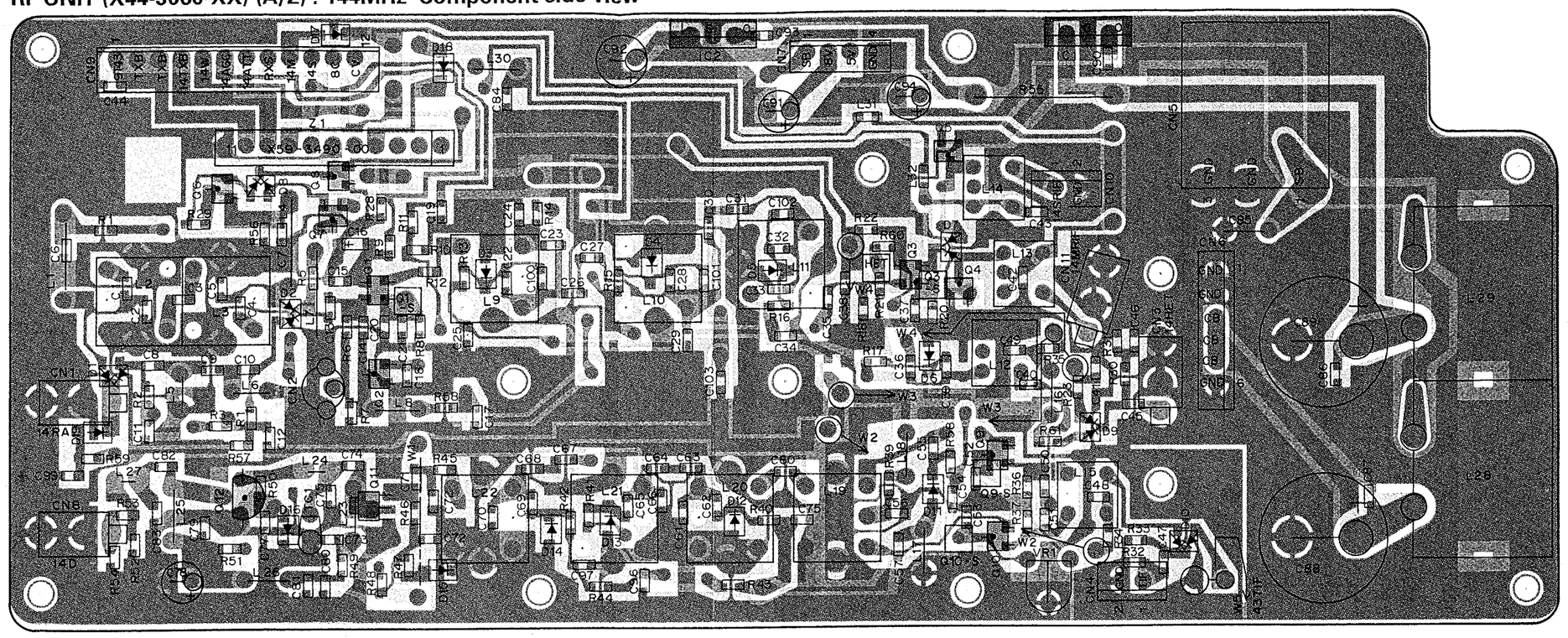


2SC3357

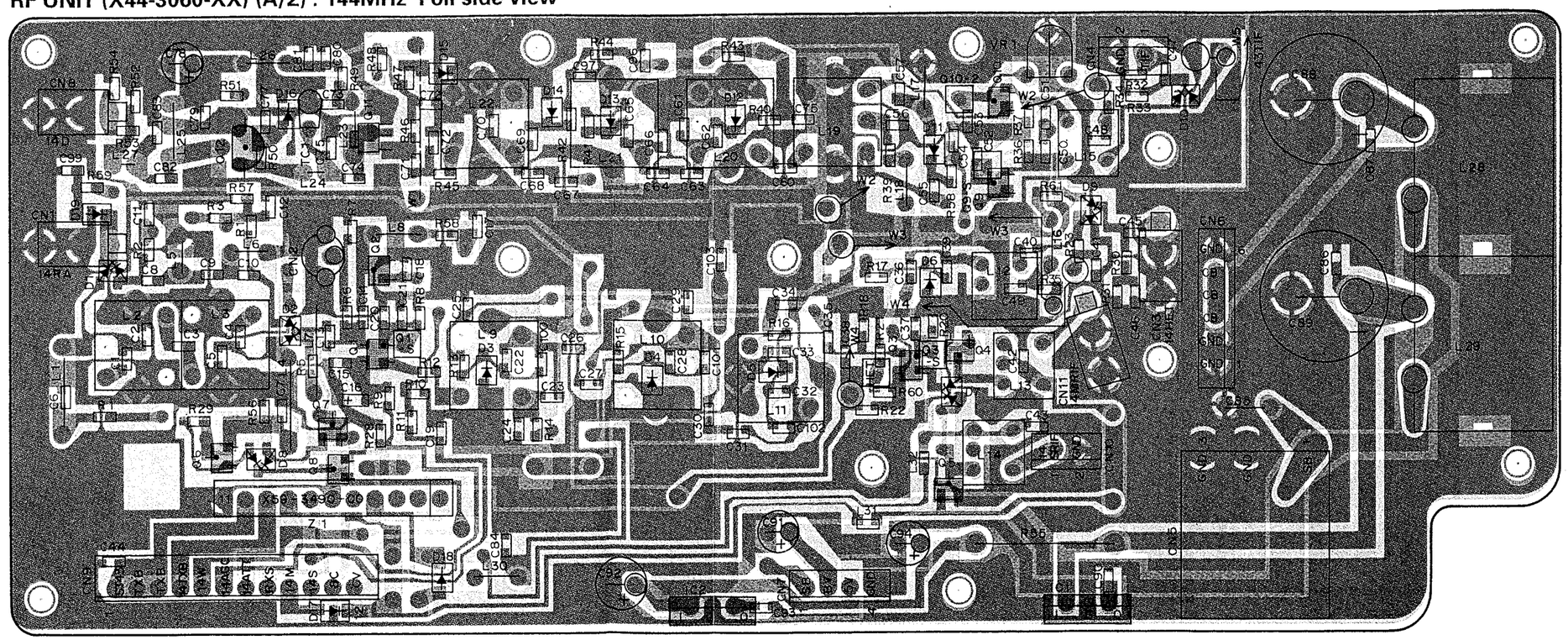
2SK211

3SK179
3SK184

RF UNIT (X44-3060-XX) (A/2) : 144MHz Component side view

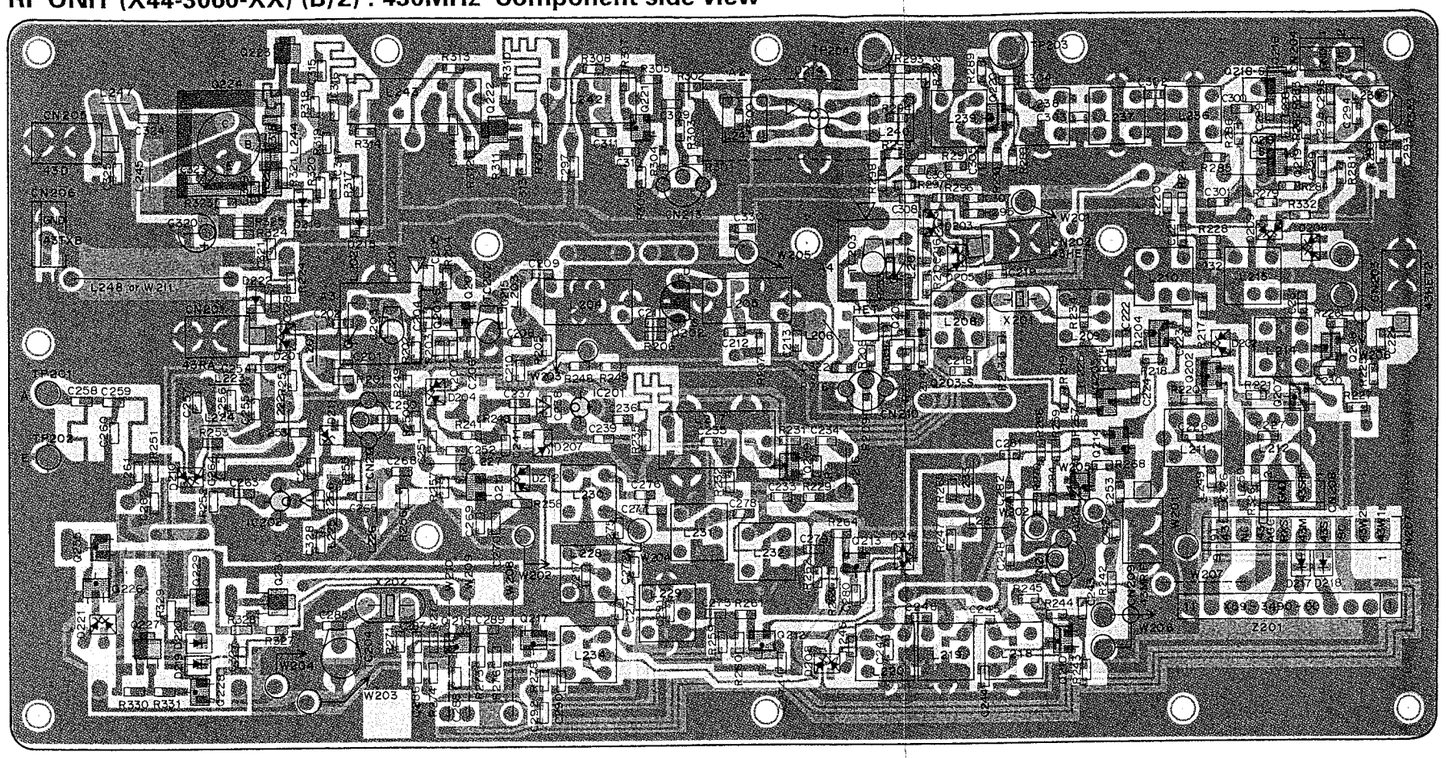


RF UNIT (X44-3060-XX) (A/2) : 144MHz Foil side view

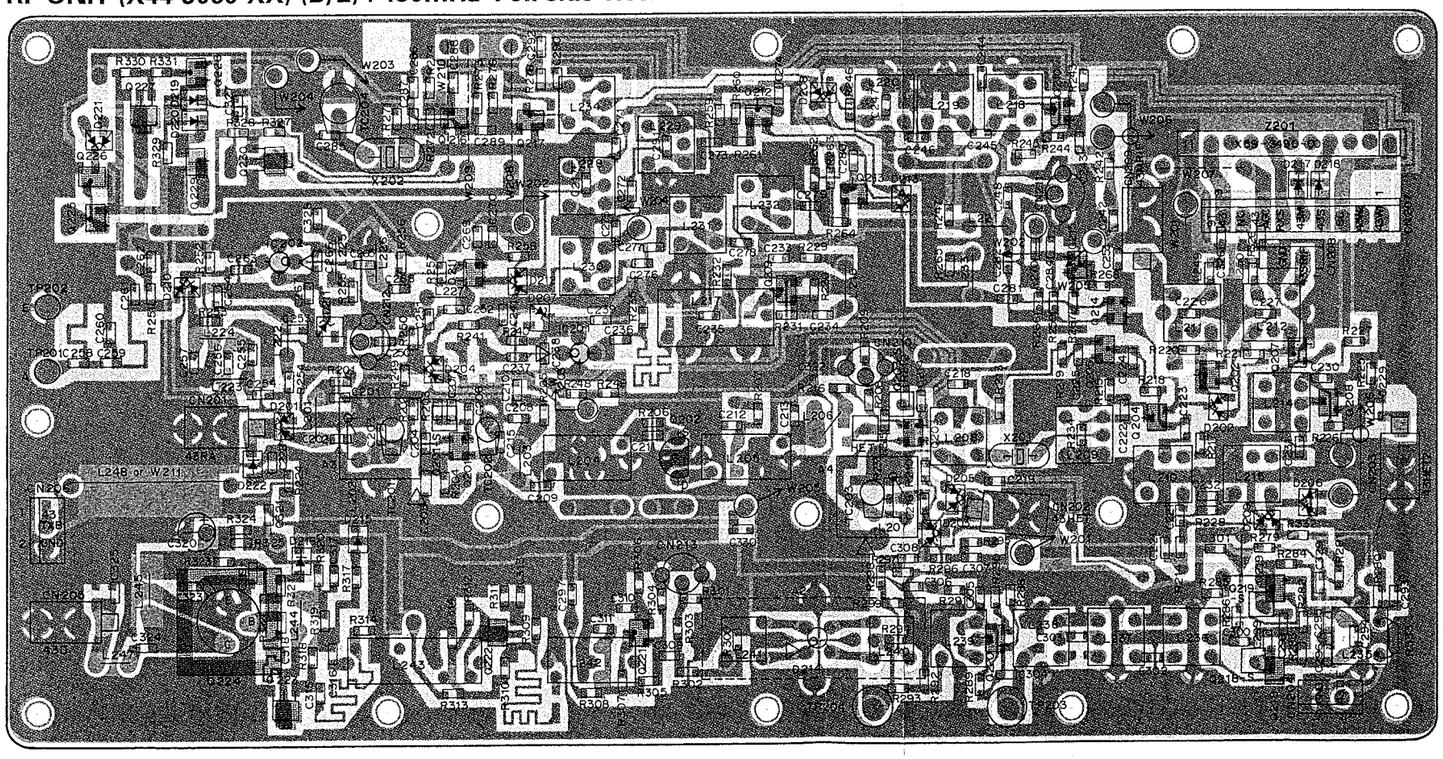


TS-790A/E PC BOARD VIEWS

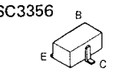
RF UNIT (X44-3060-XX) (B/2) : 430MHz Component side view



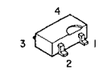
RF UNIT (X44-3060-XX) (B/2) : 430MHz Foil side view



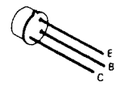
DTA143EK
DTC124EK
2SC2714
2SC3098
2SC3356



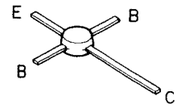
3SK179
3SK184



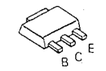
2SC2762



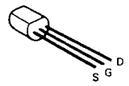
μPC1651G



2SC3357



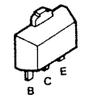
2SK125



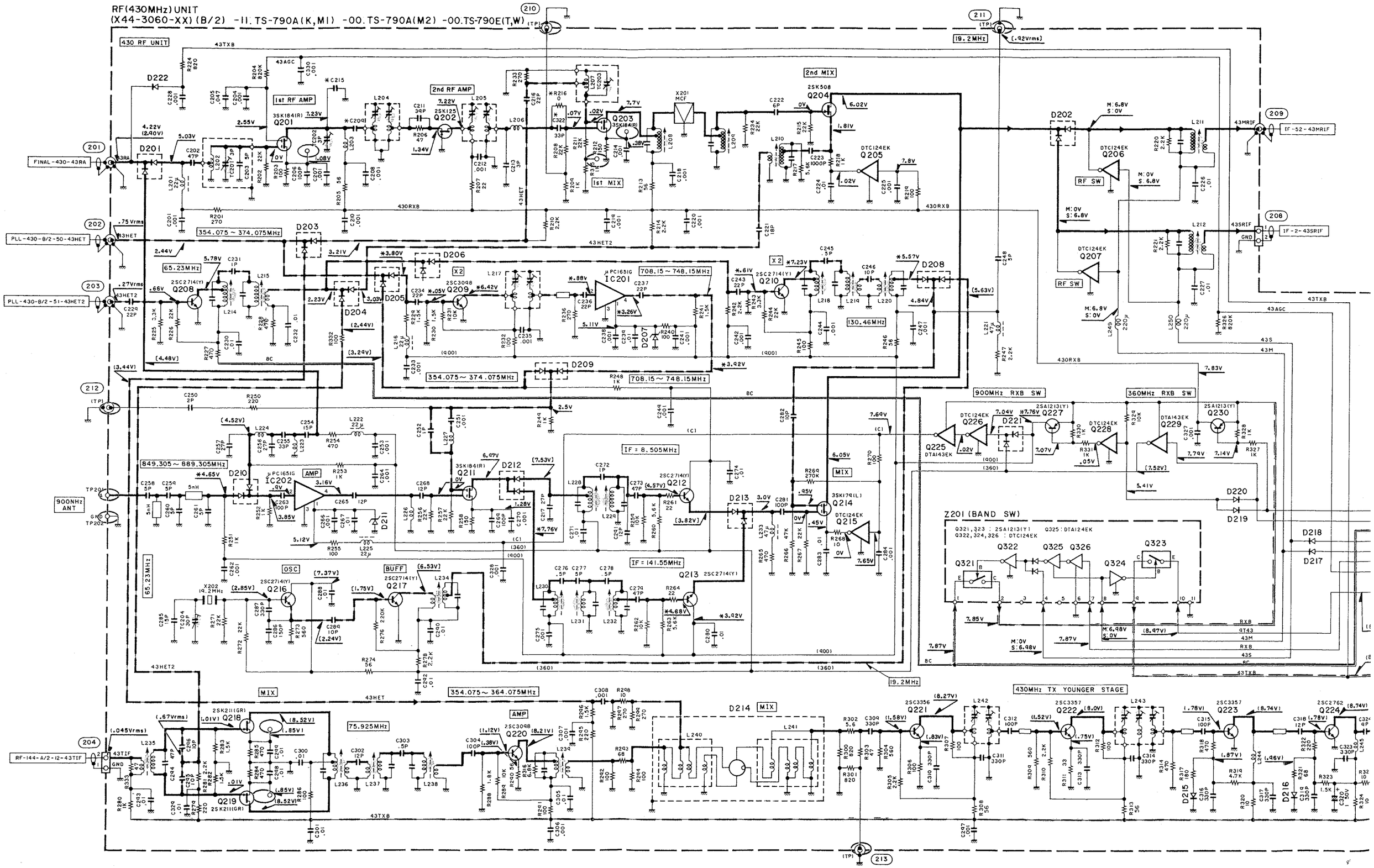
2SK211

2SK508

2SA1213



RF UNIT (X44-3060-XX) (B/2) : 430MHz -00 : M2, T, W -11 : K, M1



CIRCUIT DIAGRAM TS-790A/E

I1 : K, M1

90A(M2) -00:TS-790E(T,W)

IC201,202 : μPC1651G

Q201,203,211 : 3SK184(R)
Q202 : 2SK125
Q204 : 2SK508(K53)
Q205~207,215,226,228 : DTC124EK
Q208,210,212,213,216,217 : 2SC2714(Y)
Q209,220 : 2SC3098
Q218,219 : 2SK211(GR)
Q221 : 2SC3356
Q222,223 : 2SC3357
Q224 : 2SC2762
Q225,229 : DTA143EK
Q227,230 : 2SA1213(Y)
Q214 : 3SK179(L)
D201~206,208~210,212,213,221 : DAN235K
D207,211 : RD5.1MB2
D214 : ND487C1-3R
D215~220 : RLS73
D222 : RLS135

			C209	C215	C322	R216	L248
TS-790A	K,M1	~11	2P	1P	X	O	O
	M2	~00	1.5P	2P	O	X	W211
TS-790E	T,W	~00	1.5P	2P	O	X	W211

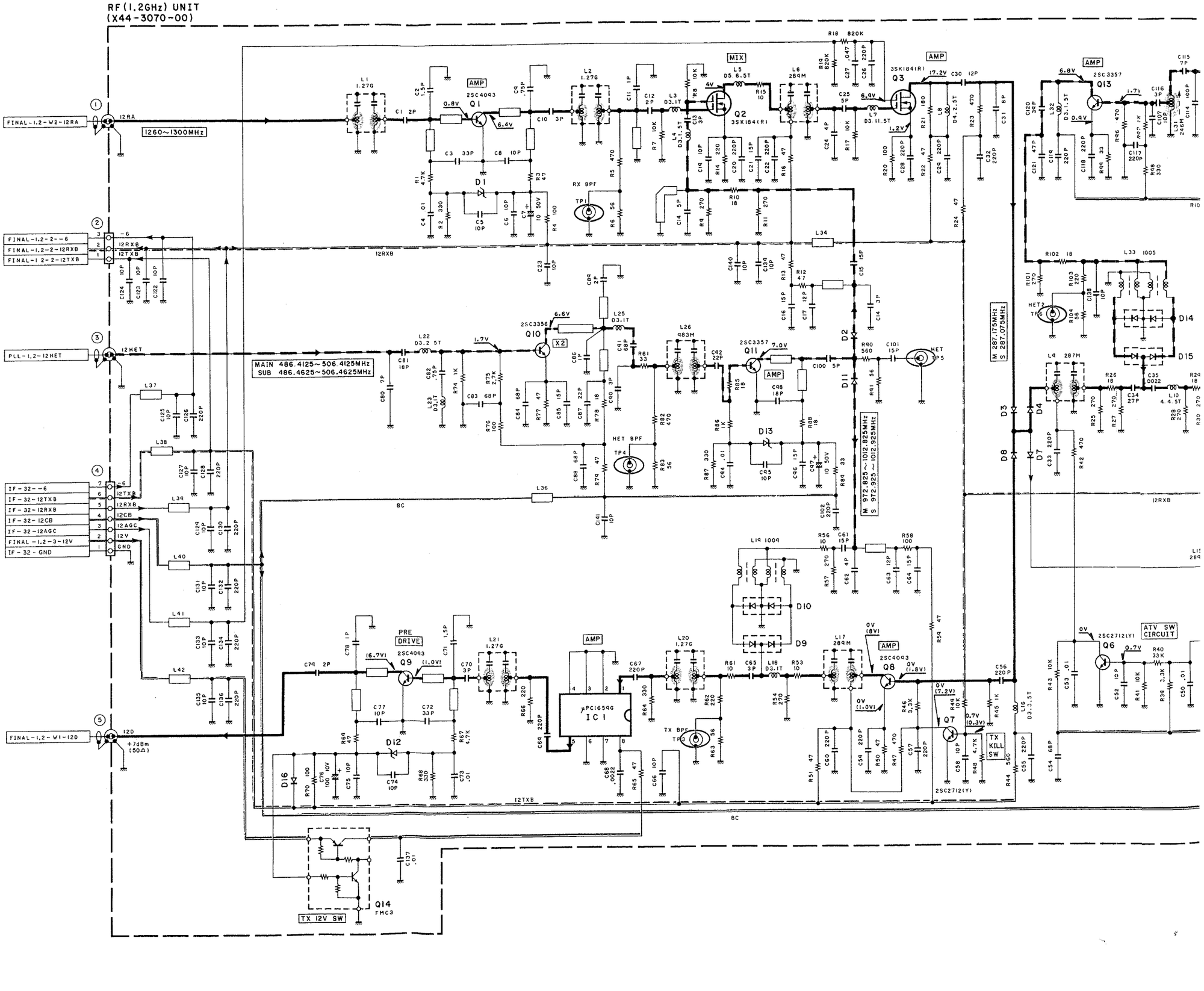
O : USED
X : NOT USED

Unused numbers
C203, 240
R236–240, 275, 277, 287, 316

f : 435.02 RX
( ) : FM TX (12W)
* : 144ATT

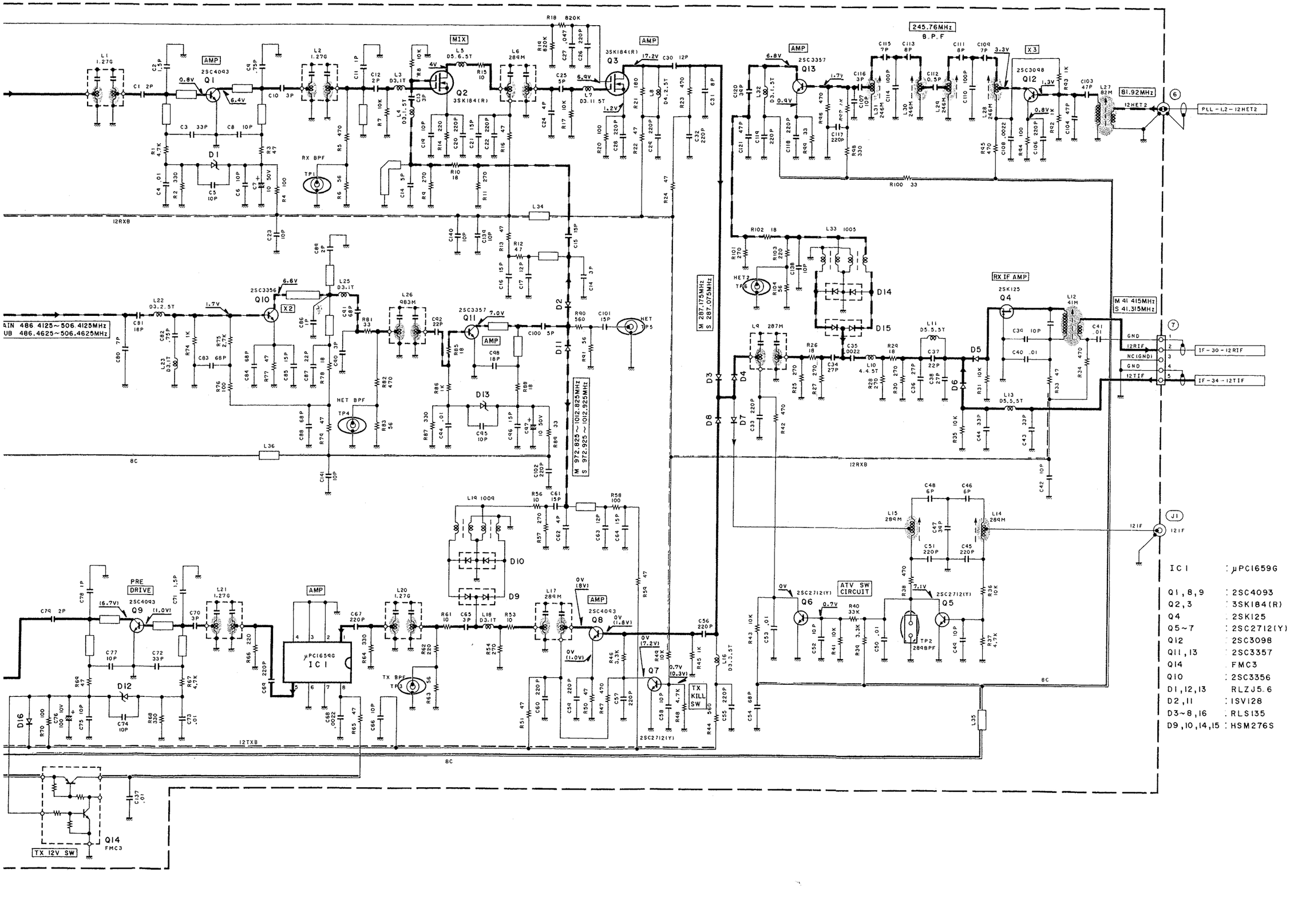
TS-790A/E CIRCUIT DIAGRAM

RF UNIT (X44-3070-00) : 1.2GHz (OPTION)



(X44-3070-00) : 1.2GHz (OPTION)

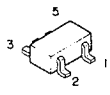
Unused numbers
C93, 99, 105
R32, 52, 55, 60, 71–73, 80, 84



IC1	: μPC1659G
Q1, 8, 9	: 2SC4093
Q2, 3	: 3SK184(R)
Q4	: 2SK125
Q5~7	: 2SC2712(Y)
Q12	: 2SC3098
Q11, 13	: 2SC3357
Q14	: FMC3
Q10	: 2SC3356
D1, 12, 13	: RLZJ5.6
D2, 11	: 1SV128
D3~8, 16	: RLS135
D9, 10, 14, 15	: HSM276S

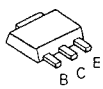
RF UNIT (X44-3070-00) : 1.2GHz (OPTION) Component side view

FMC3

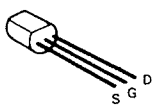


2SC2712
2SC3098
2SC3356

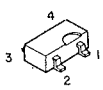
2SC3357



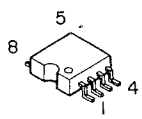
2SK125

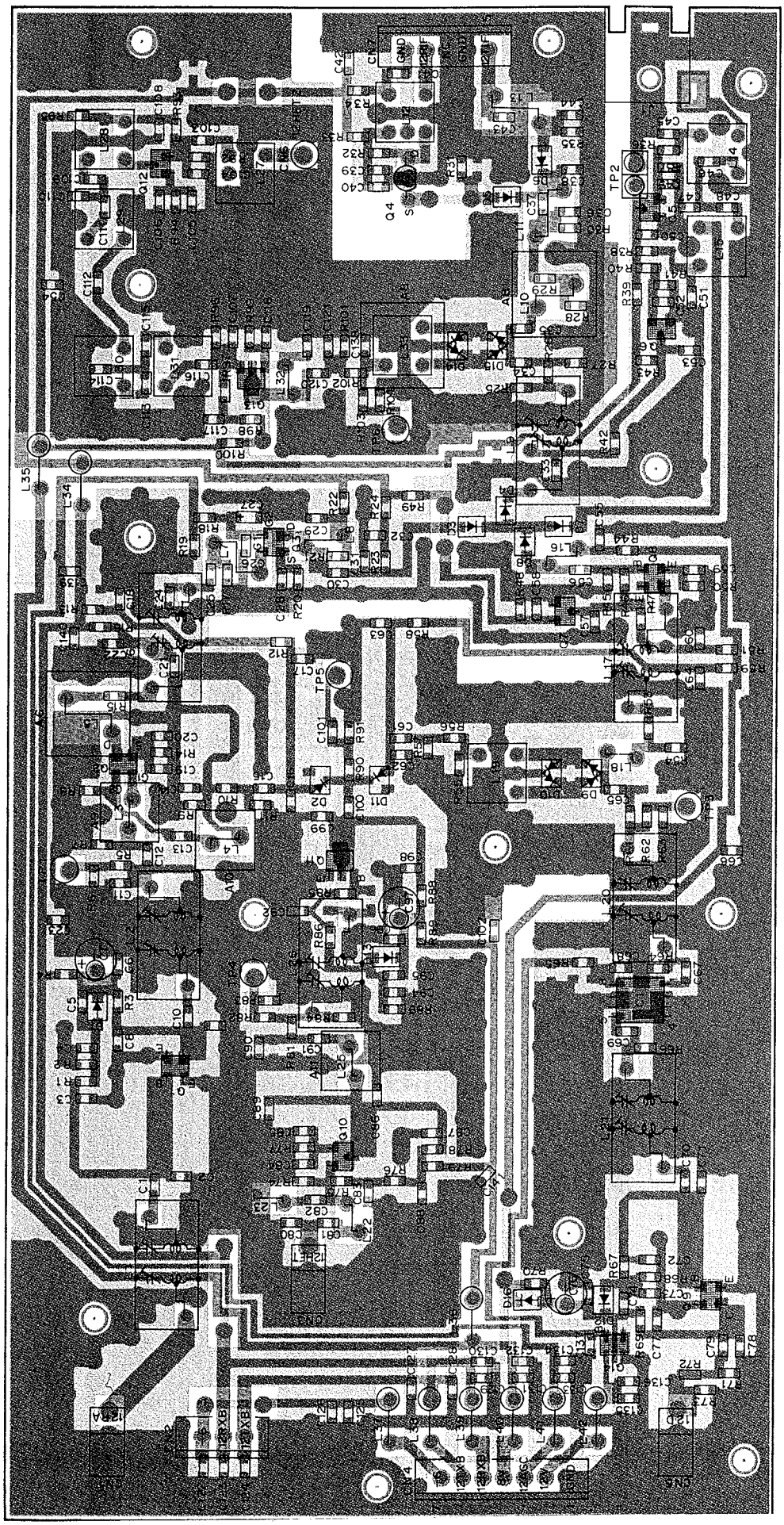


2SC4093
3SK184



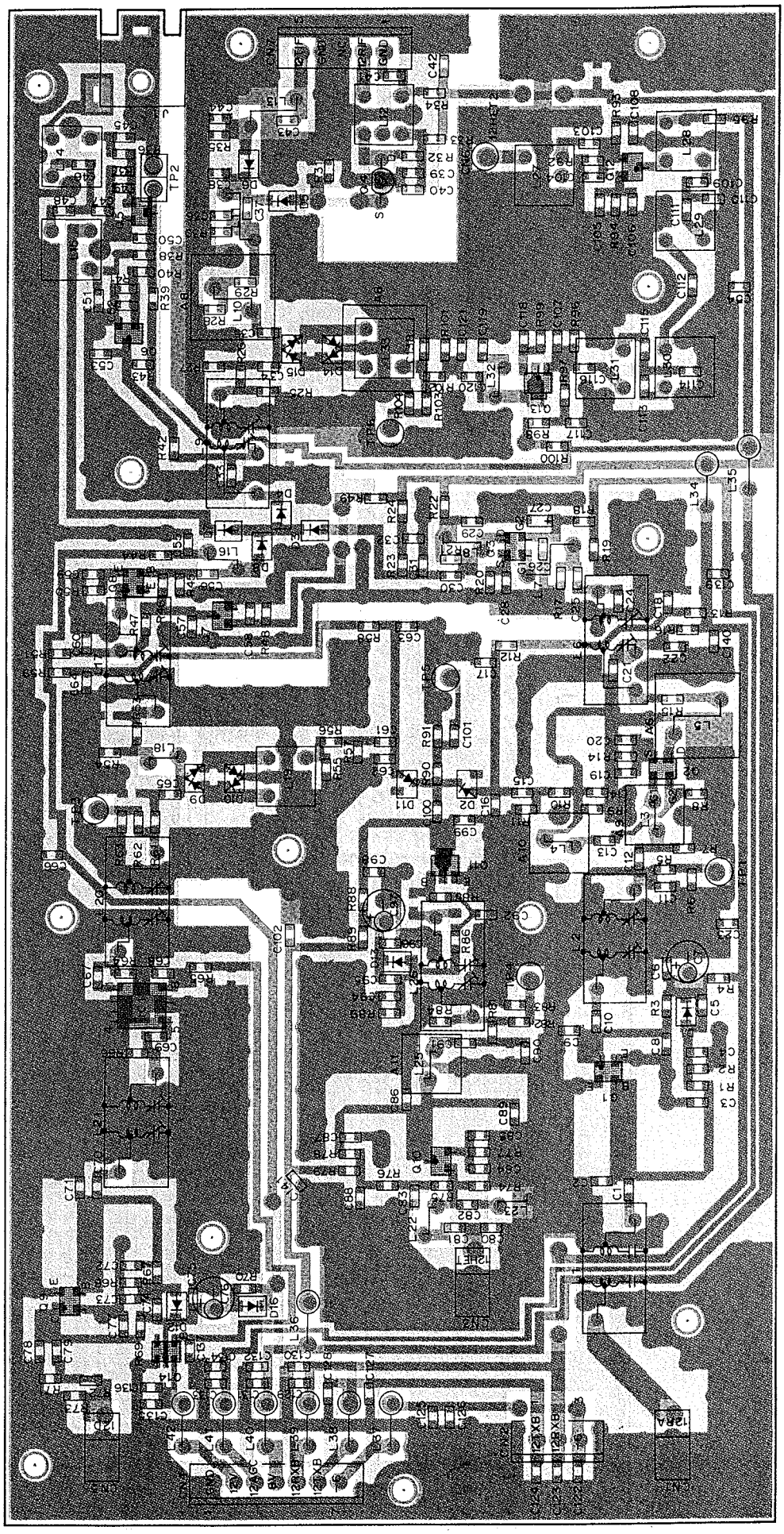
μPC1659G





PC BOARD VIEWS TS-790A/E

RF UNIT (X44-3070-00) : 1.2GHz (OPTION) Foil side view

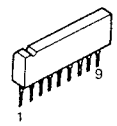


TS-790A/E PC BOARD VIEWS

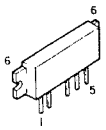
FINAL UNIT (X45-3150-00) : 1.2GHz (OPTION) Component side vie

2SA1162
2SC2712

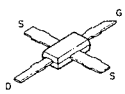
BA718

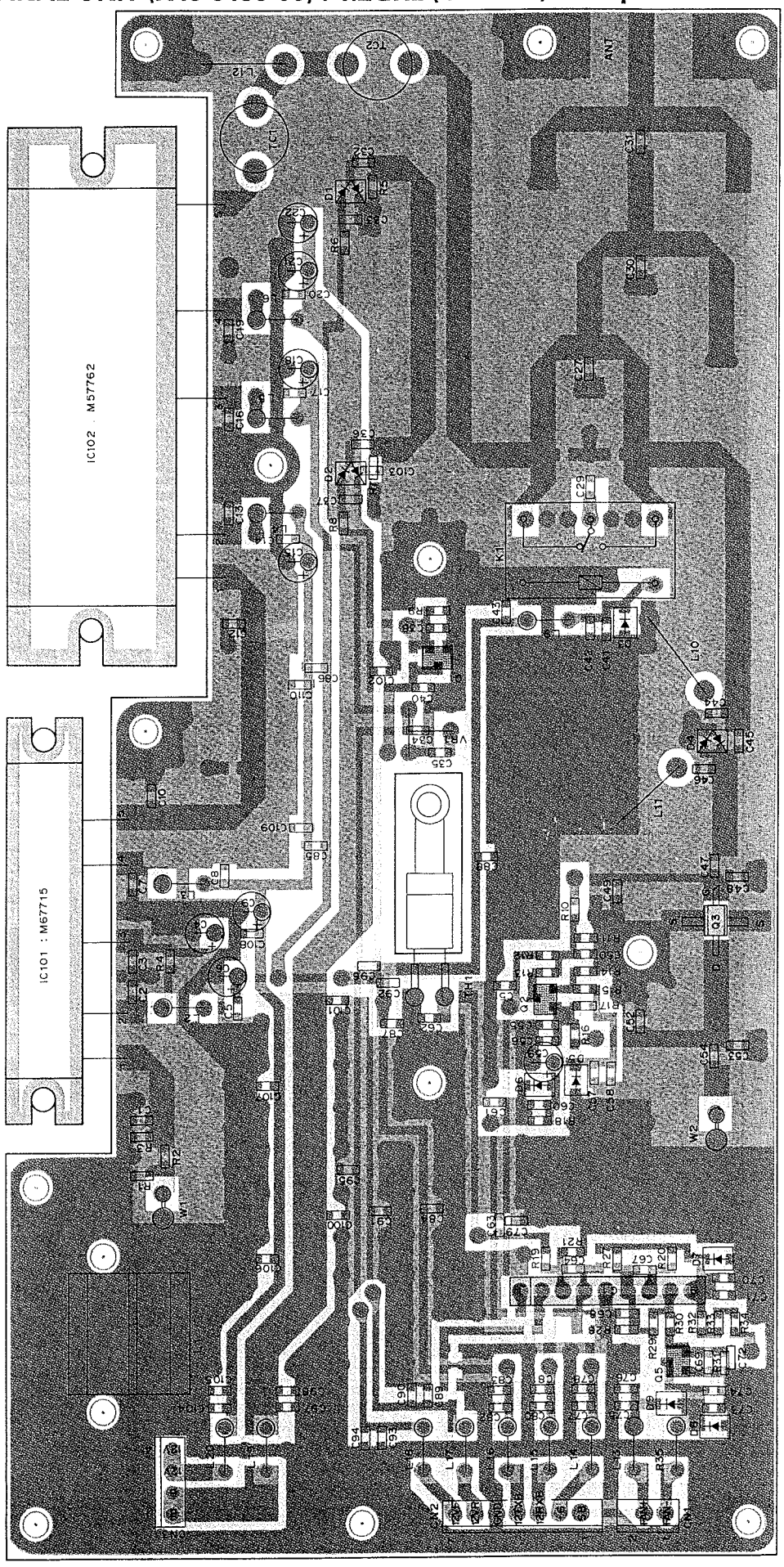


M67715
M67762



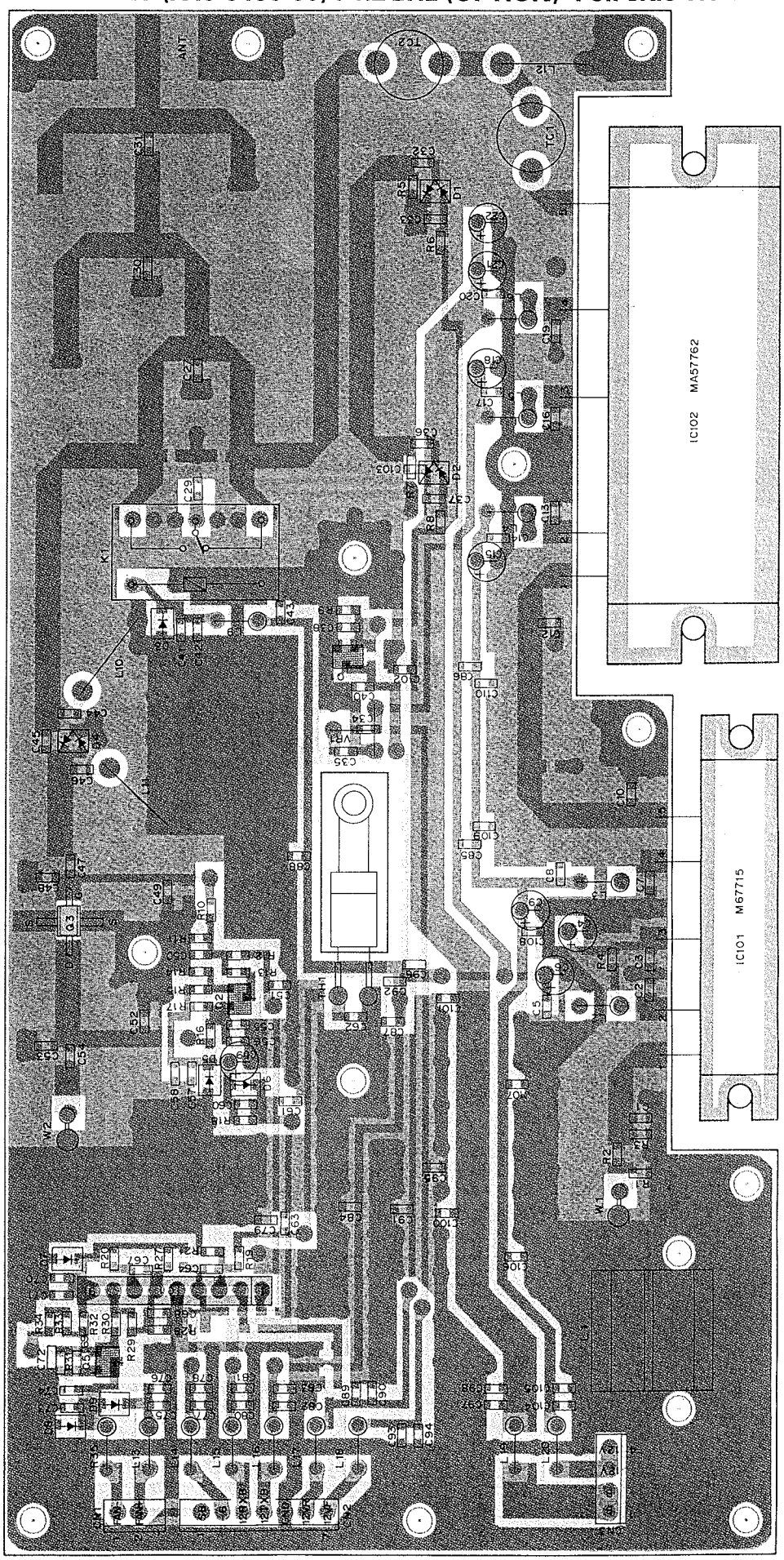
MGF1502



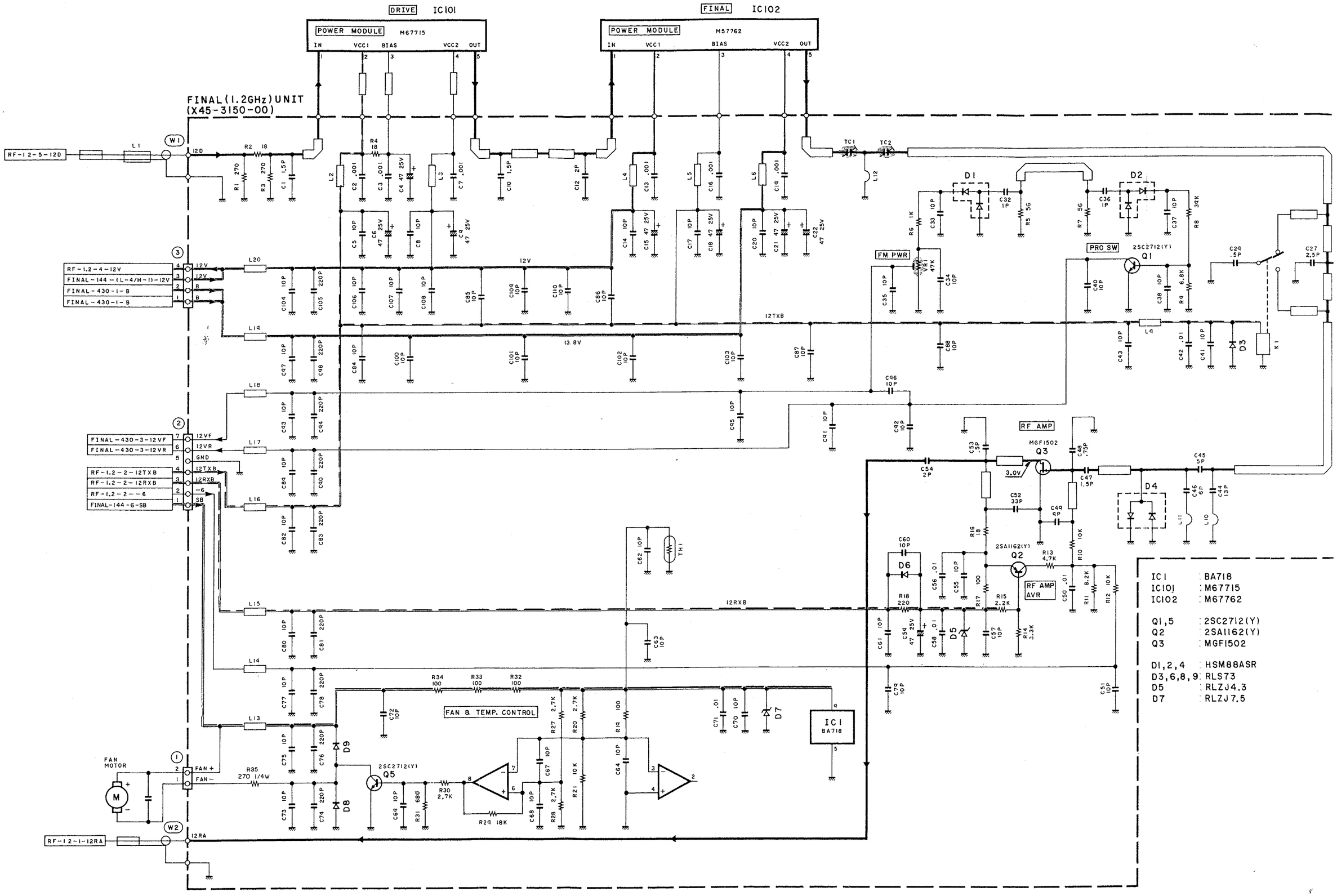


N

FINAL UNIT (X45-3150-00) : 1.2GHz (OPTION) Foil side view

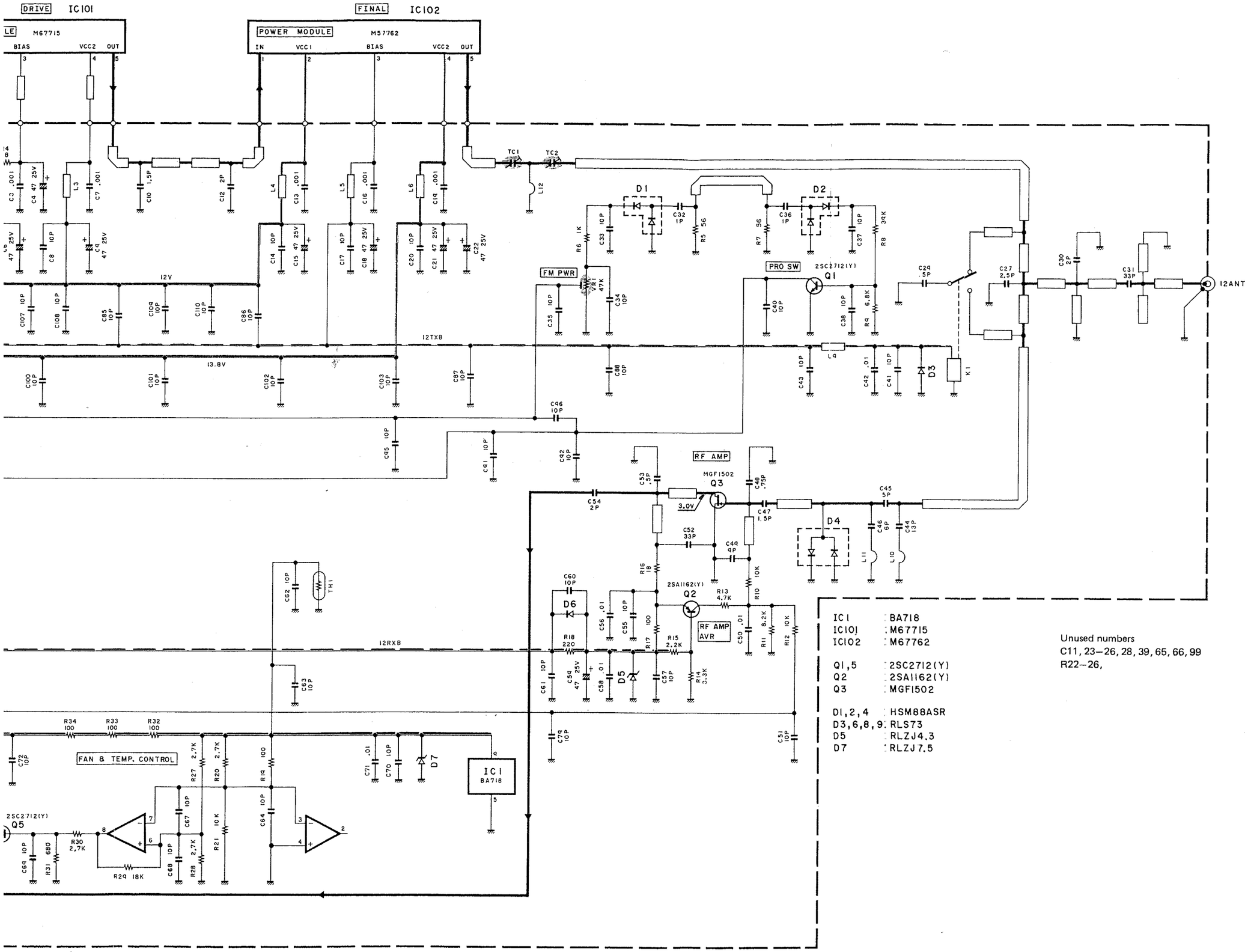


FINAL UNIT (X45-3150-00) : 1.2GHz (OPTION)



IC1	BA718
IC101	M67715
IC102	M67762
Q1,5	2SC2712(Y)
Q2	2SA1162(Y)
Q3	MGF1502
D1,2,4	HSM88ASR
D3,6,8,9	RLS73
D5	RLZJ4.3
D7	RLZJ7.5

CIRCUIT DIAGRAM TS-790A/E

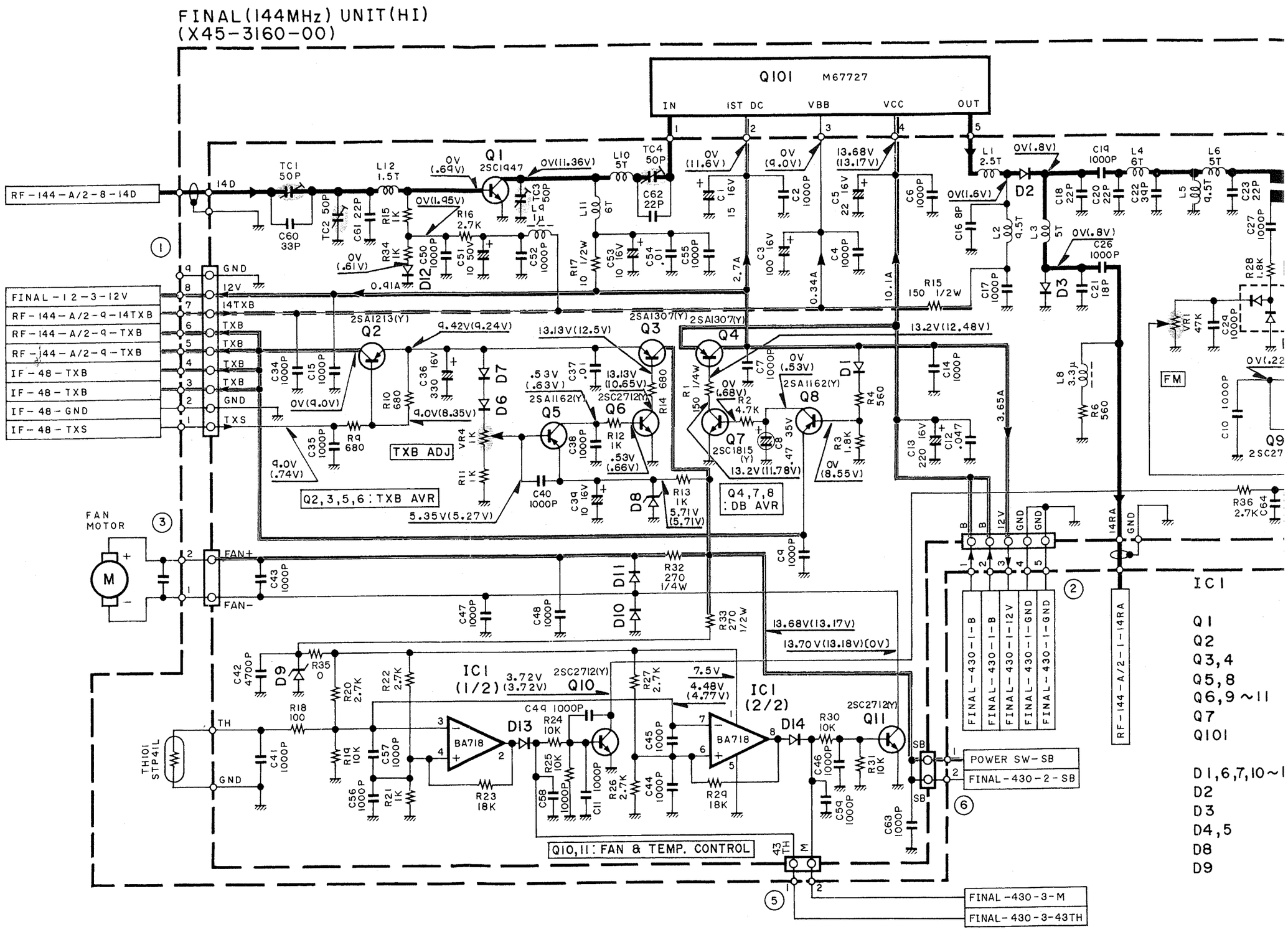


IC1	: BA718
IC101	: M67715
IC102	: M67762
Q1,5	: 2SC2712(Y)
Q2	: 2SA1162(Y)
Q3	: MGF1502
D1,2,4	: HSM88ASR
D3,6,8,9	: RLS73
D5	: RLZJ4.3
D7	: RLZJ7.5

Unused numbers
C11, 23–26, 28, 39, 65, 66, 99
R22–26,

TS-790A/E CIRCUIT DIAGRAM

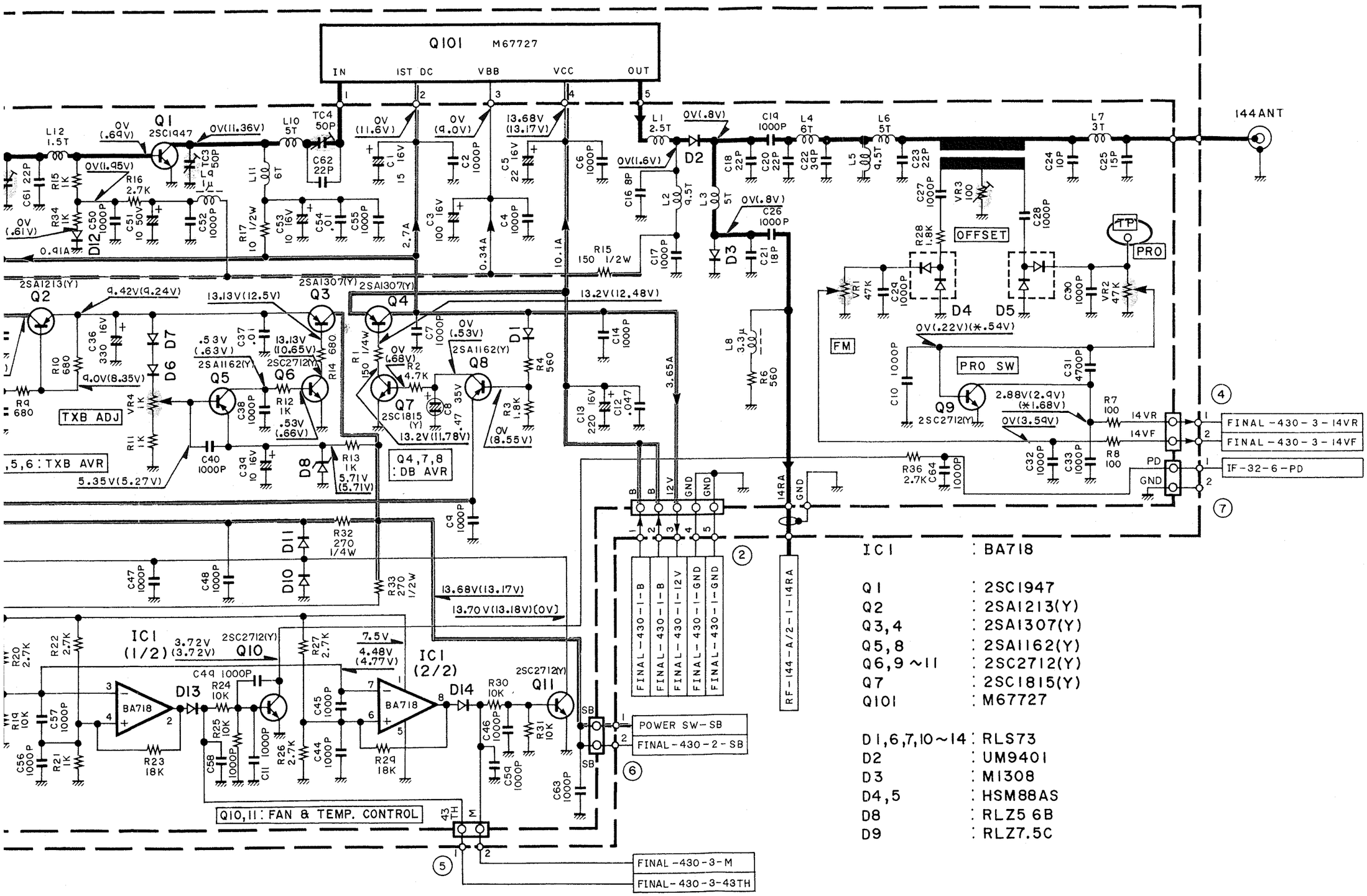
144MHz FINAL UNIT (X45-3160-00)



AL UNIT (X45-3160-00)

UNIT(HI)

f : 145.02 RX
( ) : FM TX (47W)
* : ANT OPEN
[ ] : FAN OPERATING

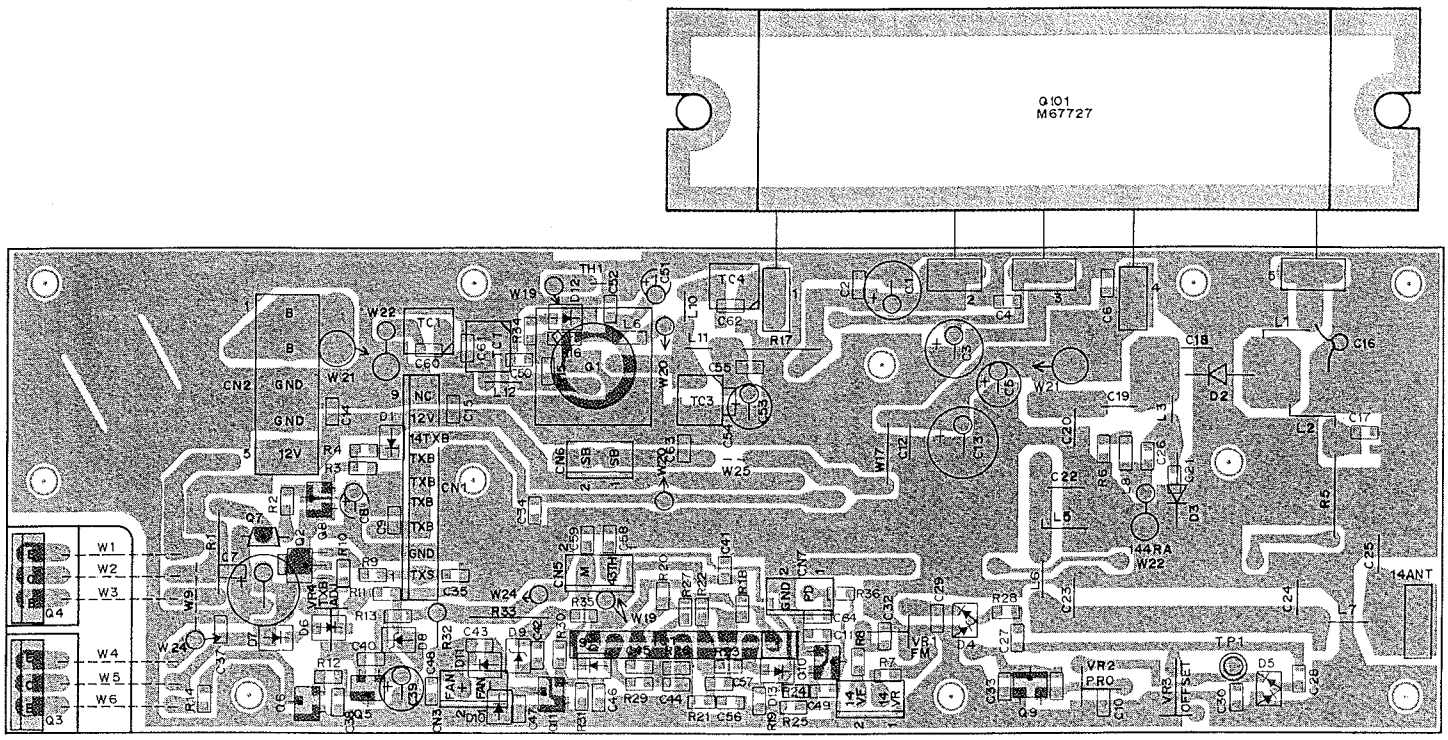


IC1 : BA718

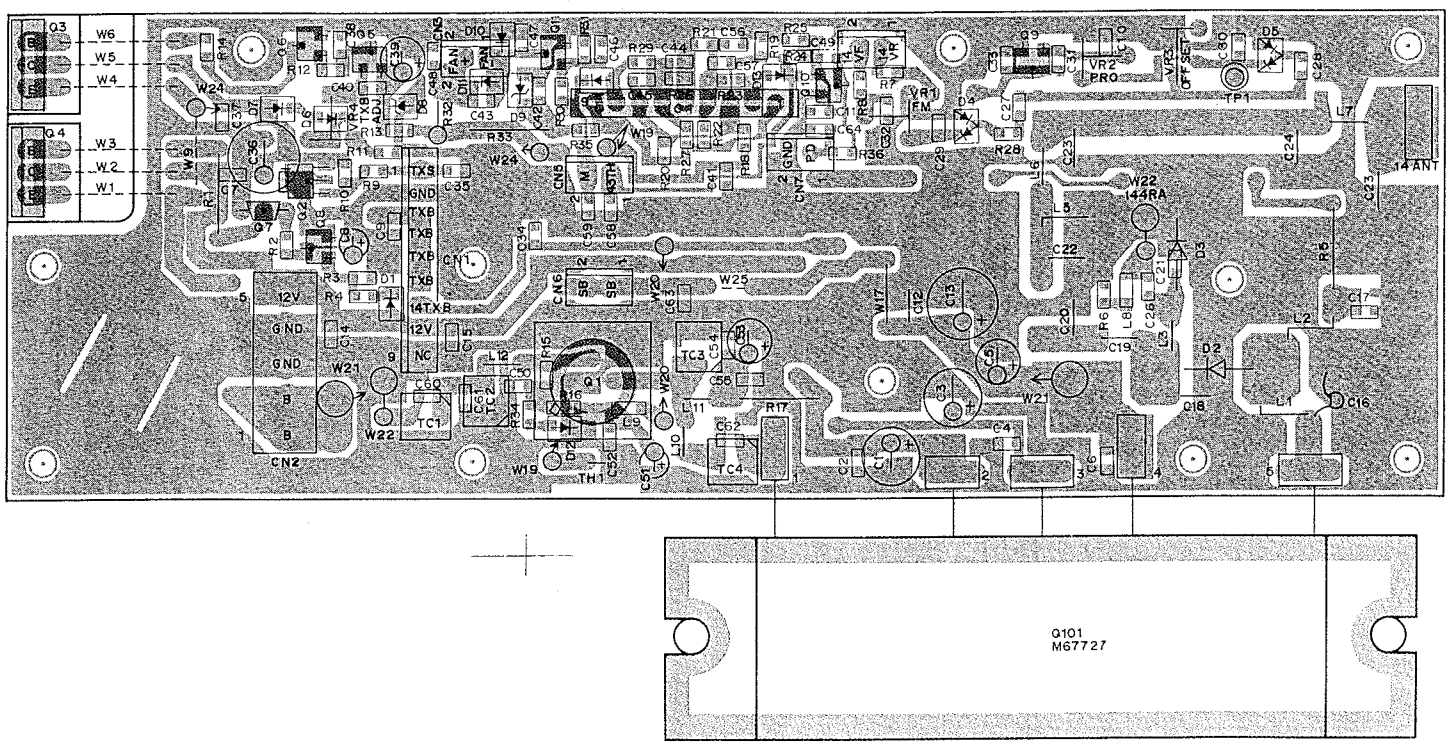
Q1 : 2SC1947
Q2 : 2SA1213(Y)
Q3,4 : 2SA1307(Y)
Q5,8 : 2SA1162(Y)
Q6,9 ~11 : 2SC2712(Y)
Q7 : 2SC1815(Y)
Q101 : M67727

D1,6,7,10~14 : RLS73
D2 : UM9401
D3 : M1308
D4,5 : HSM88AS
D8 : RLZ5.6B
D9 : RLZ7.5C

144MHz FINAL UNIT (X45-3160-00) Component side view

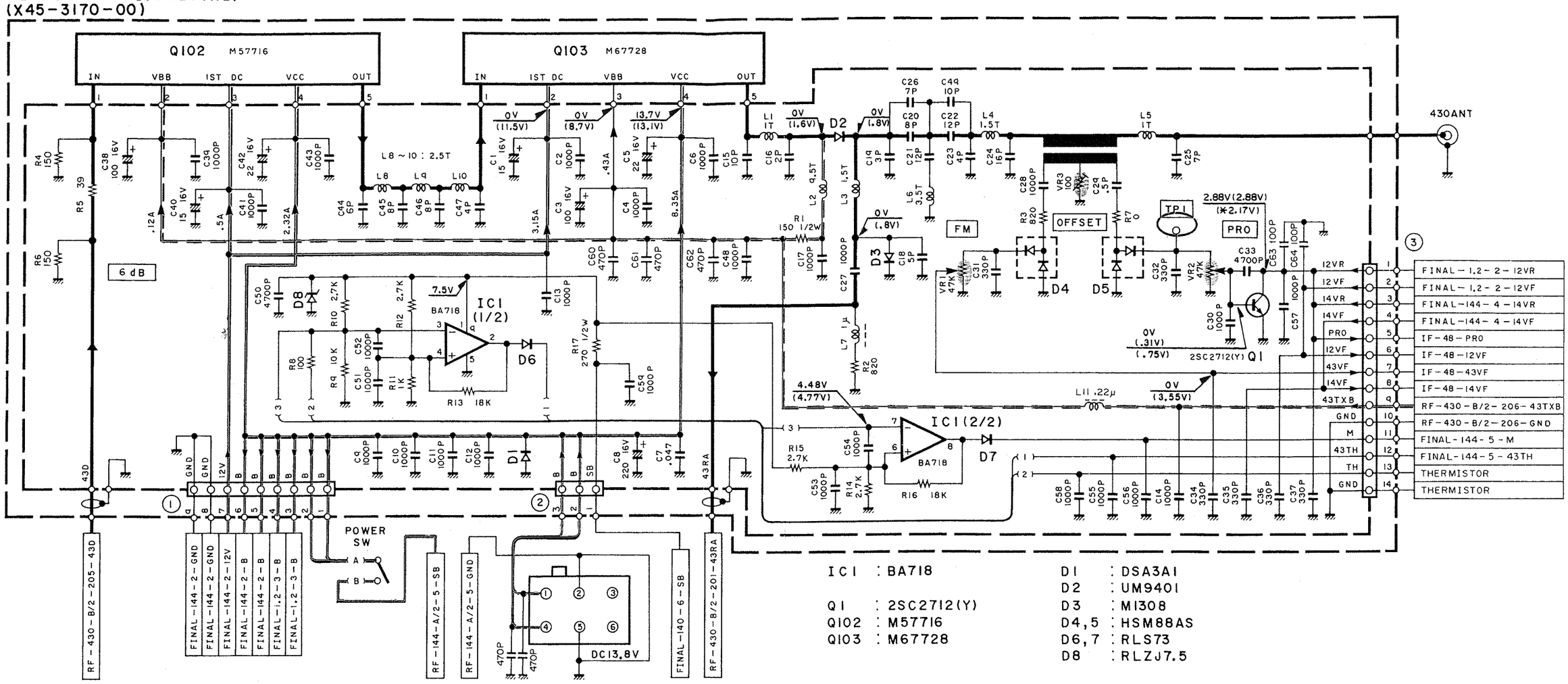


144MHz FINAL UNIT (X45-3160-00) Foil side view



430MHz FINAL UNIT (X45-3170-00)

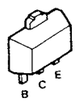
FINAL(430MHz)UNIT(HI)
(X45-3170-00)



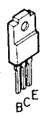
f : 435.02 RX
( ) : FM TX(47W)
✳ : ANT OPEN

2SA1162
2SC2712

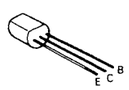
2SA1213



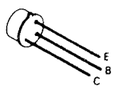
2SA1307



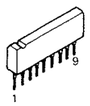
2SC1815



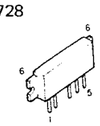
2SC1947



BA718

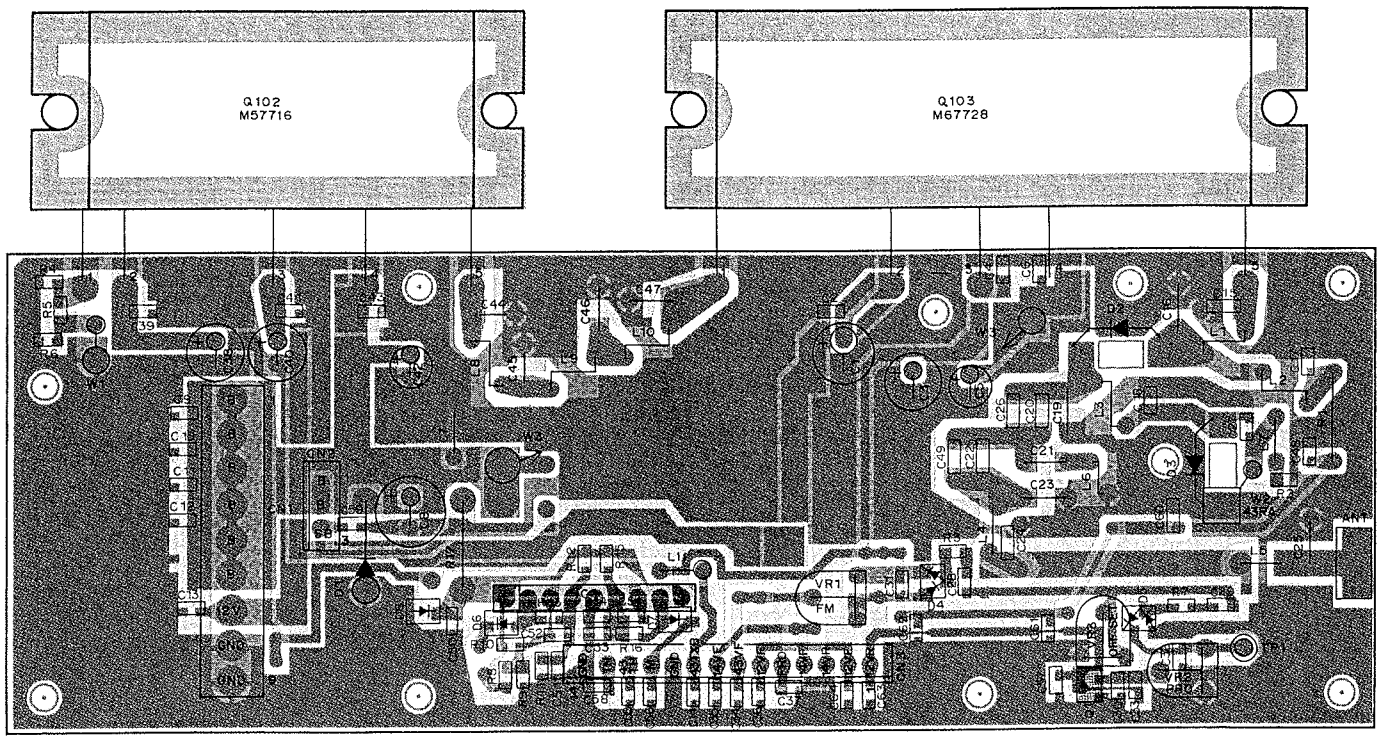


M57716
M67727
M67728

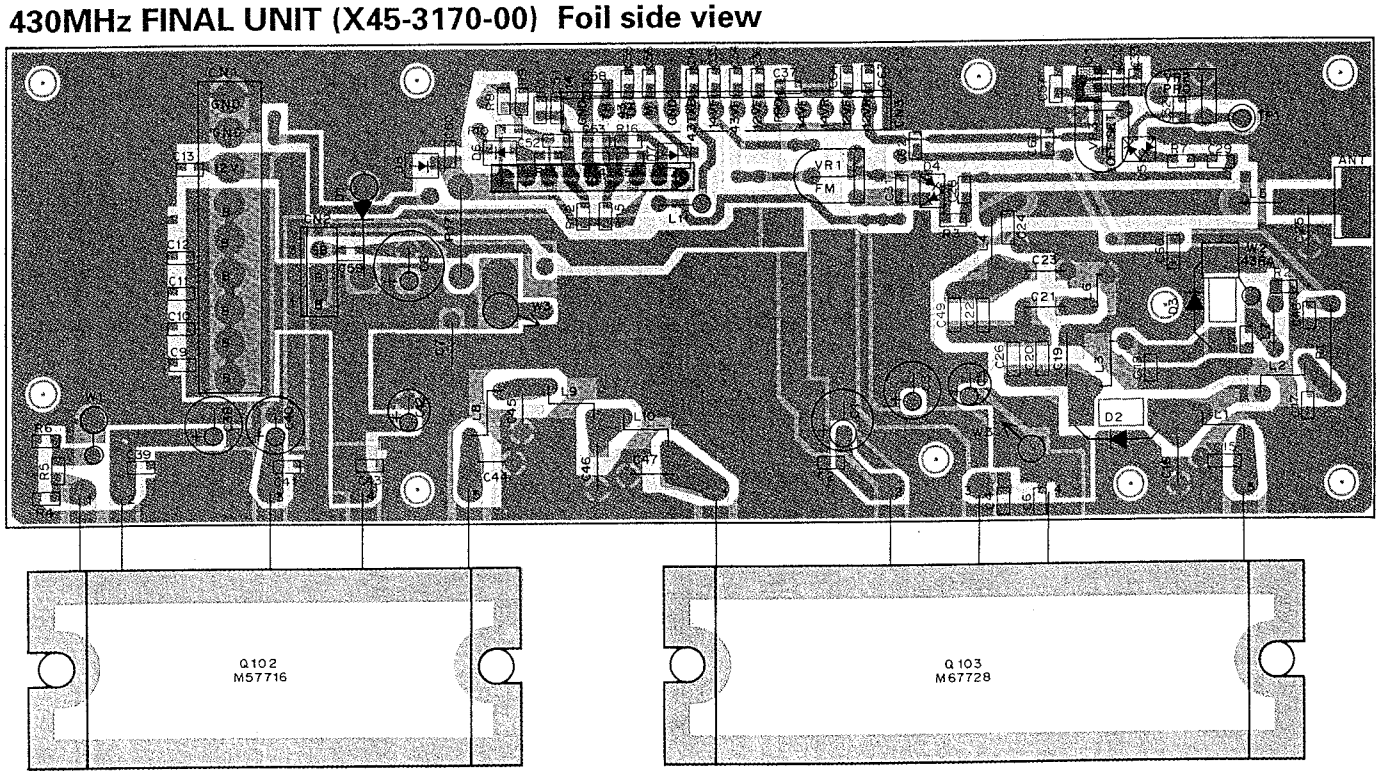


PC BOARD VIEWS/CIRCUIT DIAGRAM TS-790A/E

430MHz FINAL UNIT (X45-3170-00) Component side view

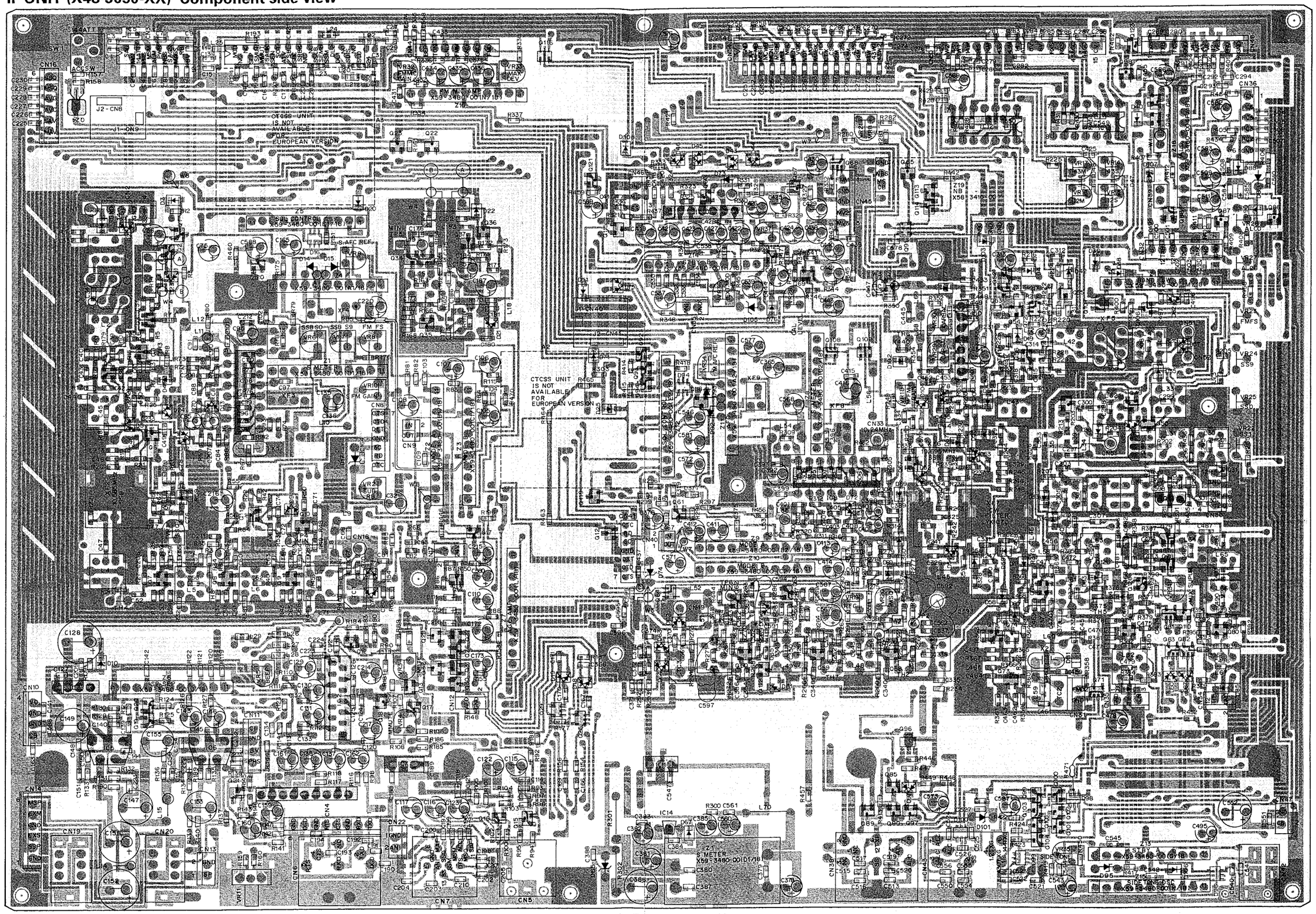


430MHz FINAL UNIT (X45-3170-00) Foil side view

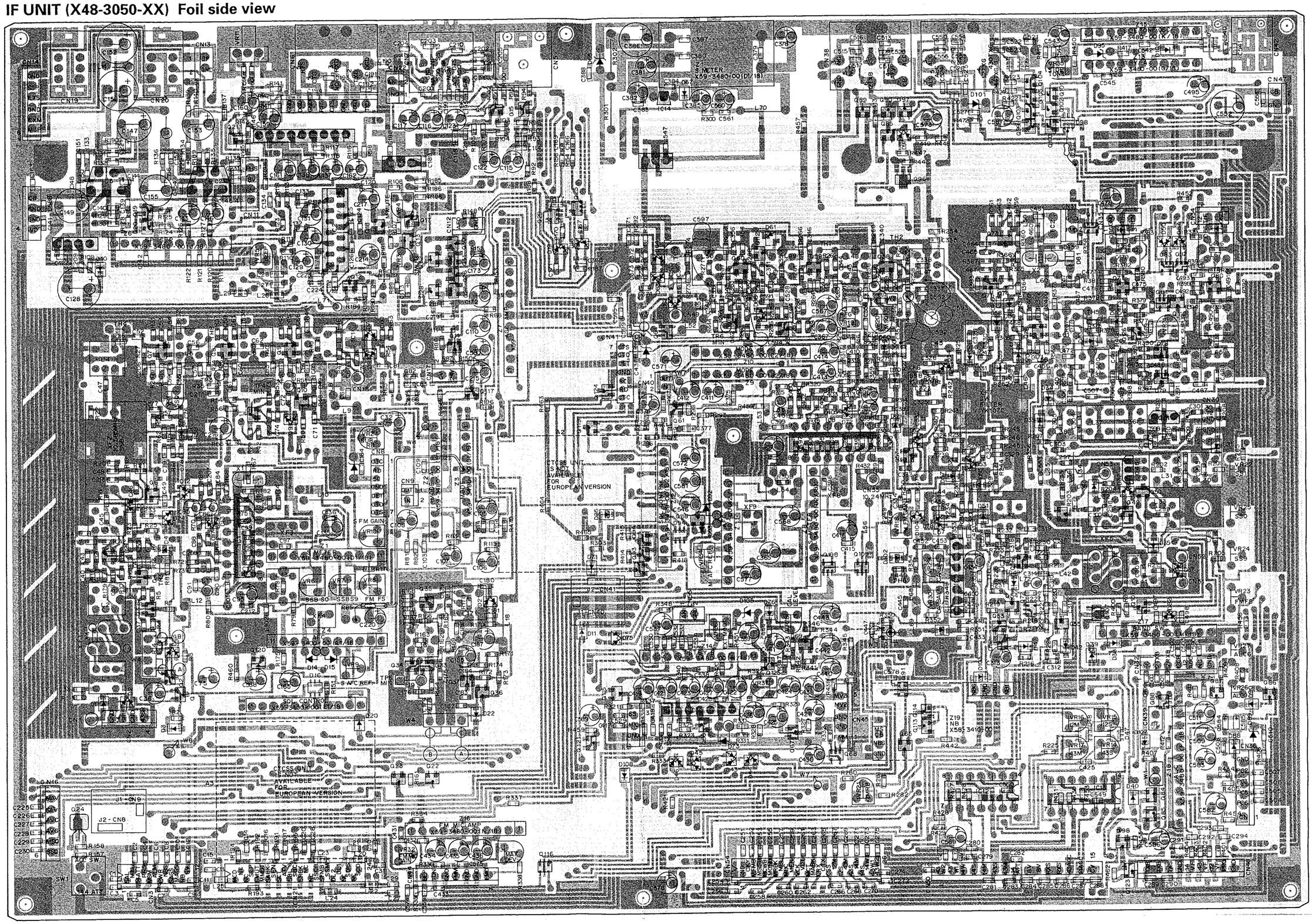


TS-790A/E PC BOARD VIEWS

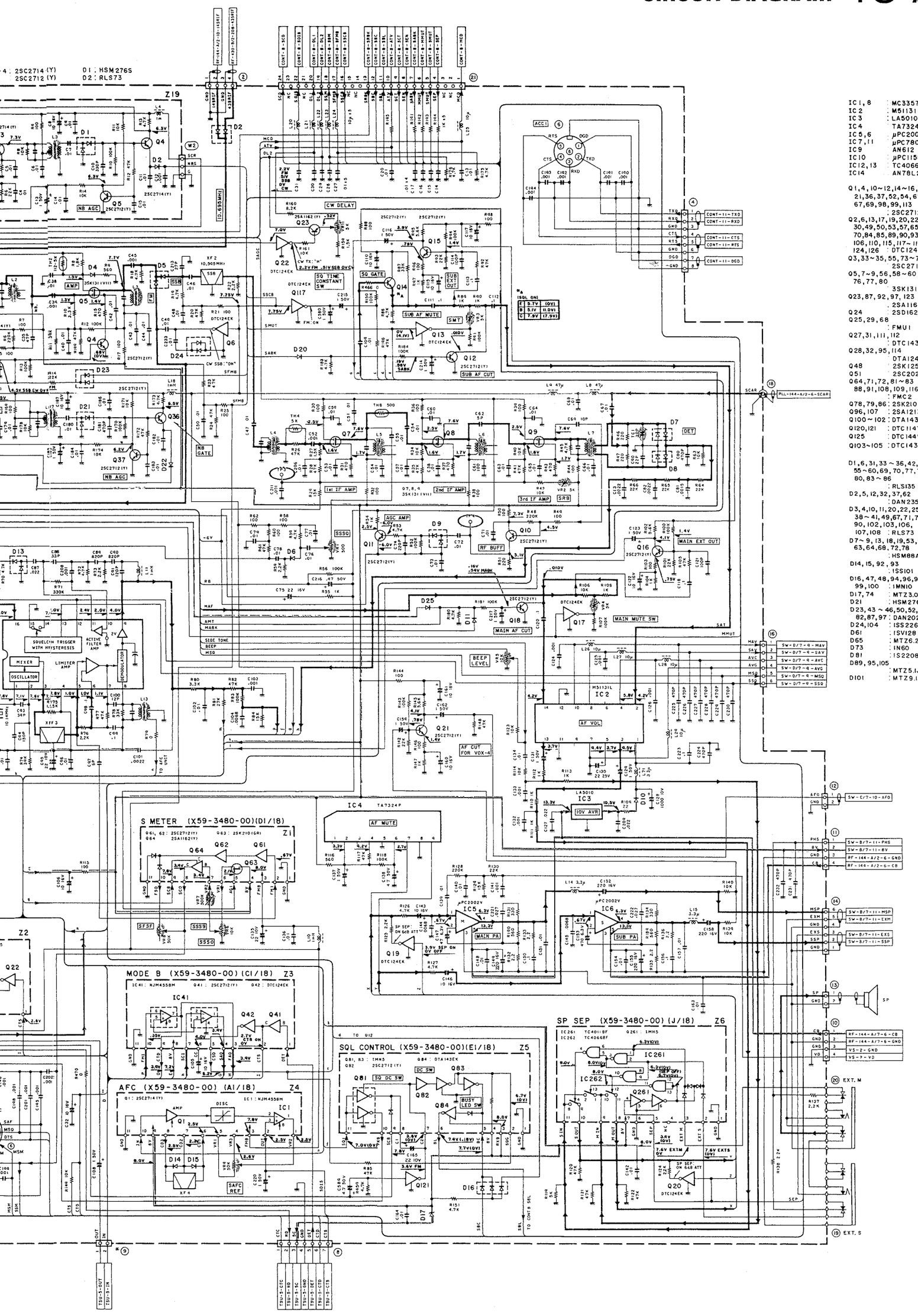
IF UNIT (X48-3050-XX) Component side view



IF UNIT (X48-3050-XX) Foil side view



CIRCUIT DIAGRAM TS-790A/E



IC1, 8 : MC3357P
IC2 : M51131L
IC3 : LA5010
IC4 : TA7324P
IC5, 6 : μPC2002V
IC7, 11 : μPC7808H
IC9 : AN612
IC10 : μPC1158H2
IC12, 13 : TC40668P
IC14 : AN78L24

Q1, 4, 10~12, 14~16, 18 21, 36, 37, 52, 54, 61~63 67, 69, 98, 99, 113 : 2SC2712 (Y)
Q2, 6, 13, 17, 19, 20, 22, 26 30, 49, 50, 53, 57, 65, 66 70, 84, 85, 89, 90, 93, 94, 106, 110, 115, 117~119, 124, 126 : DTC124EK
Q3, 33~35, 55, 73~75 : 2SC2714 (Y)
Q5, 7~9, 56, 58~60 76, 77, 80 : 3SK131 (V11)
Q23, 87, 92, 97, 123 : 2SA1162 (Y)
Q24 : 2SD1624 (S)
Q25, 29, 68 : FMU1
Q27, 31, 111, 112 : DTC143TK
Q28, 32, 95, 114 : DTA124EK
Q48 : 2SK125-5
Q51 : 2SC2026
Q64, 71, 72, 81~83 88, 91, 108, 109, 116 : FMC2
Q78, 79, 86 : 2SK210 (GR)
Q96, 107 : 2SA1213 (Y)
Q100~102 : DTA143TK
Q120, 121 : DTC114TK
Q125 : DTC144WK
Q103~105 : DTC143EK

D1, 6, 31, 33~36, 42, 51 55~60, 69, 70, 77, 79 80, 83~86 : RLS135
D2, 5, 12, 32, 37, 62 : DAN235(K)
D3, 4, 10, 11, 20, 22, 25 38~41, 49, 67, 71, 76, 88 90, 102, 103, 106, 107, 108 : RLS73
D7~9, 13, 18, 19, 53, 54 63, 64, 68, 72, 78 : HSM88AS
D14, 15, 92, 93 : ISS101
D16, 47, 48, 94, 96, 98 99, 100 : 1MN10
D17, 74 : MTZ3.0JA
D21 : HSM276S
D23, 43~46, 50, 52, 75 82, 87, 97 : DAN202(K)
D24, 104 : ISS226
D61 : ISV128
D65 : MTZ6.2JA
D73 : IN60
D81 : IS2208
D89, 95, 105 : MTZ5.1JA
D101 : MTZ9.1JA

Used numbers (X48-3050-XX)
19, 32, 92, 119, 234–250, 366, 446, 494, 512, 518, 535, 536, 539, 563–566, 570, 576
33, 99, 152, 182, 197–200, 223, 253, 326, 339

Unused numbers (X59-3480-00)
C8–20, 23–40, 46–60, 66–100, 108–120, 122–140, 146–160, 167–200, 205–220, 222–240, 243–280, 289–300, 302–320, 325–340
R14–20, 30–40, 50–60, 68–80, 86–100, 114–120, 130–140, 150–160, 168–180, 186–200, 211–220, 232–240, 246, 247, 254–260, 265–280, 298–300, 307–320, 325–340

E F G H I

Q1~4 : 2SC2714 (Y)
Q5 : 2SC2712 (Y)

NB (X58-3410-00)

AGC AMP (X59-3480-00) (L/18) Z7

S METER (X59-3480-00)(D2/18) Z8

MODE B (X59-3480-00)(C2/18) Z10

MODE A (X59-3480-00)(B2/18) Z9

STBY A (X59-3480-00) (G/18) Z13

AFC (X59-3480-00)(A2/18) Z11

STBY B (X59-3480-00) (H/18) Z14

MODE A (X59-3480-00)(B1/18) Z2

SIDETONE OSC (X59-3480-00)(K/18) Z15

Z1 DC-DC

IC12 TC4066BP

IC13 TC4066BP

IC14 AN78L24

IC8 MC3357P

IC7 UB7808

IC11 UB7806

IC101 NJM4558M

IC141 NJM4558M

IC121 TC4066BF

IC21 TC4066BF

IC1 MC3357P

		Connector ⑤ ㊷
TS-940A	K,M -11	○
TS-940E	T,W -61	X

○:USED X:NOT USED

μPC1158H2

μPC2002V

2SC2026

2SK125-5

2SK210

3SK131

2SA1213

2SD1624S

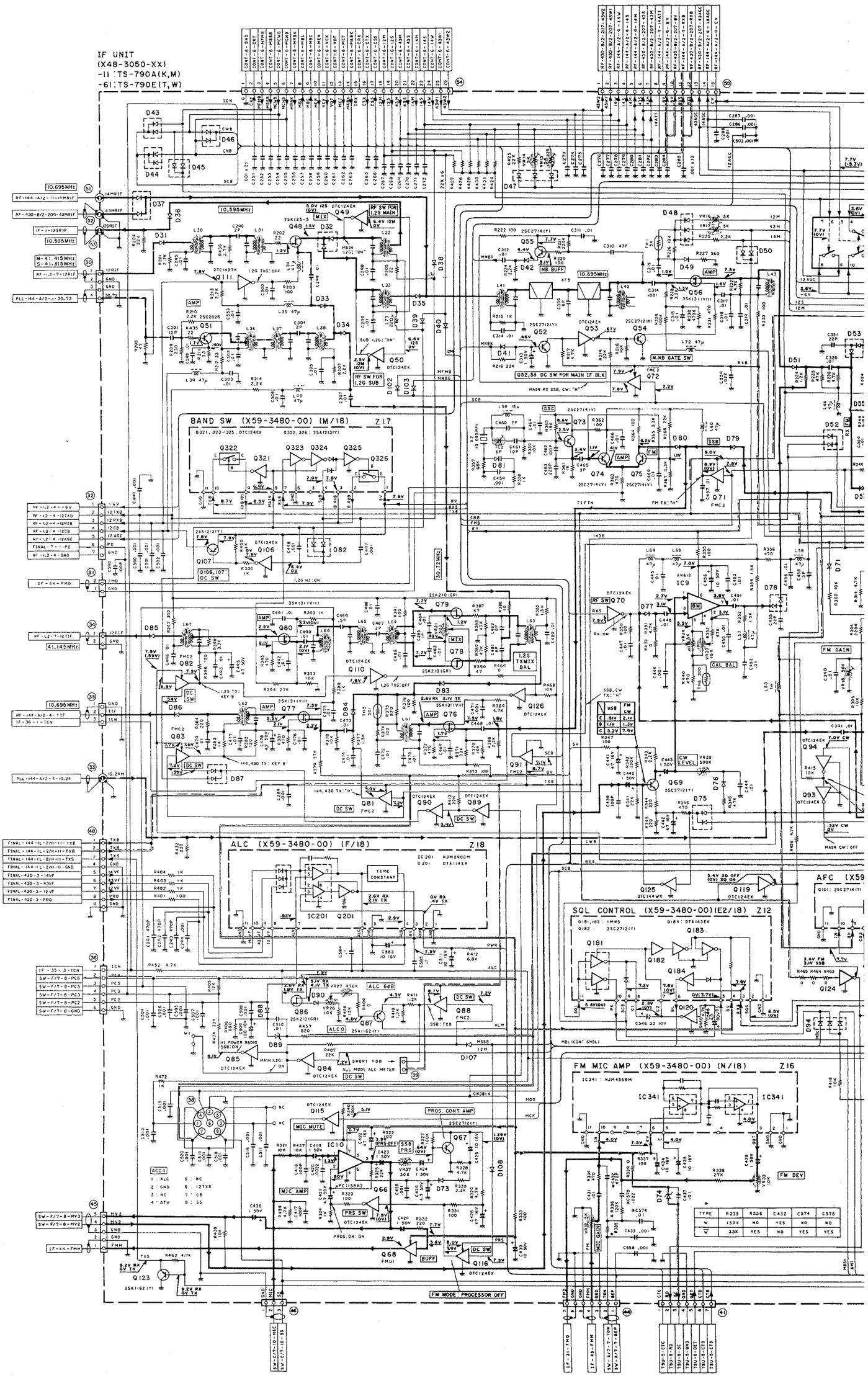
TA7324P

μPC7808H

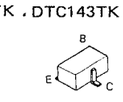
OUTPUT
GND
INPUT (Case)

Unused numbers (X48-3
C18, 19, 32, 92, 119, 23
R16, 33, 99, 152, 182,

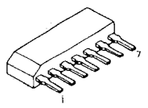
IF UNIT (X48-3050-XX) -11 : TS-790A -61 : TS-790E



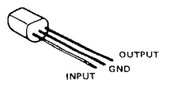
DTA124EK DTC124EK DTC144WK
DTA143TK DTC143EK 2SA1162
DTC114TK DTC143TK 2SC2712
2SC2714



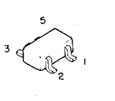
AN612



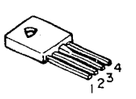
AN78L24



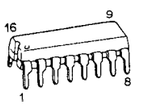
FMC2
FMU1



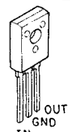
LA5010



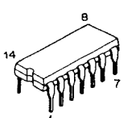
MC3357P



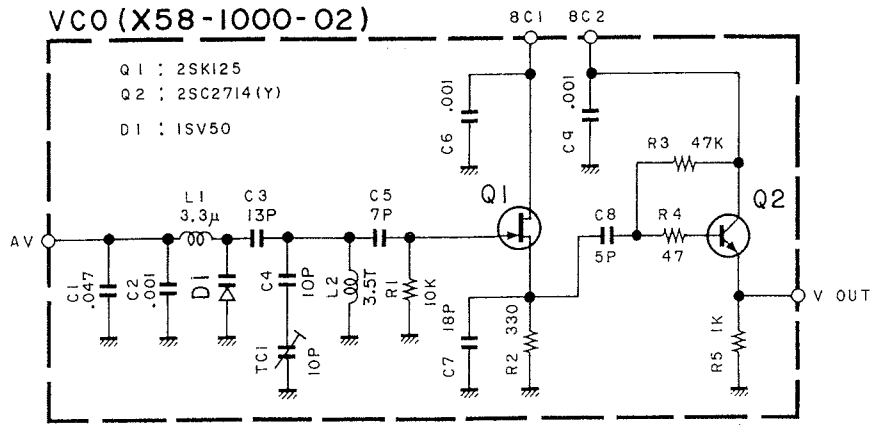
M51131L



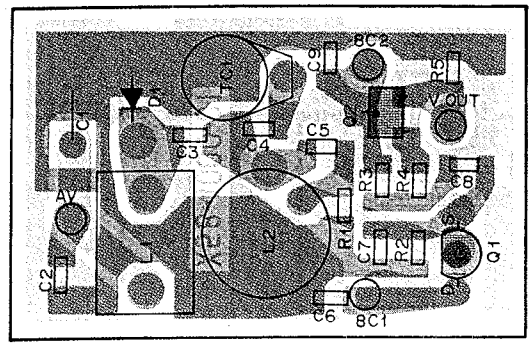
TC4066BP



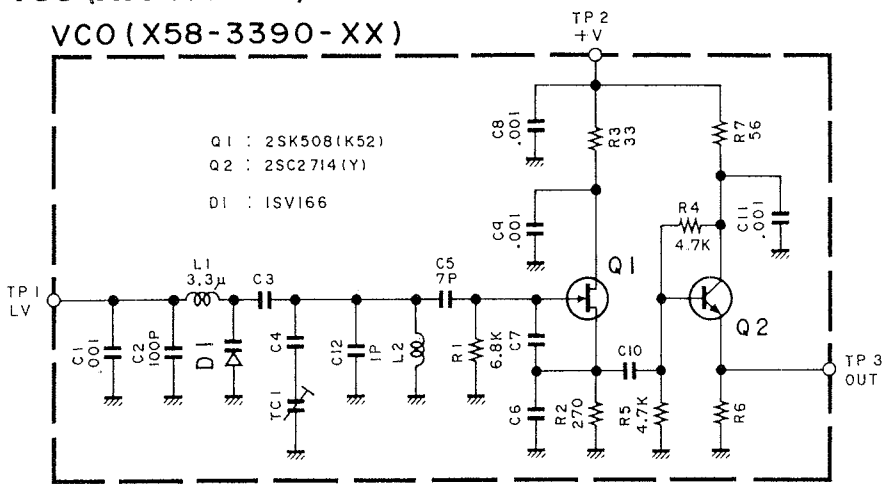
VCO (X58-1000-02)



VCO (X58-1000-02) Component side view

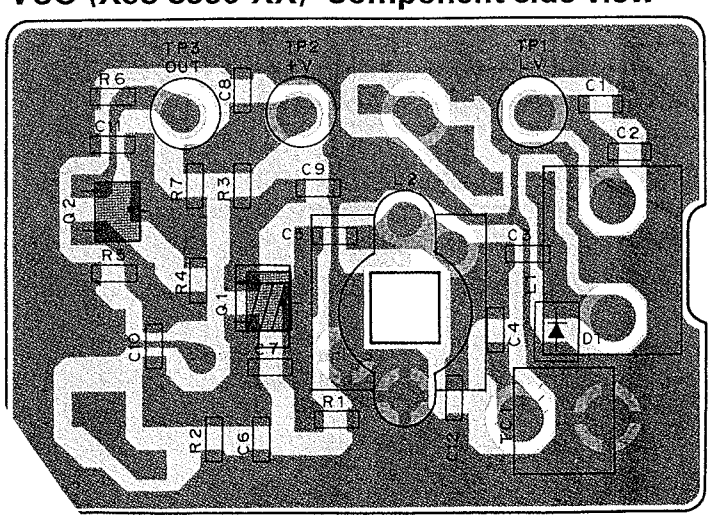


VCO (X58-3390-XX)

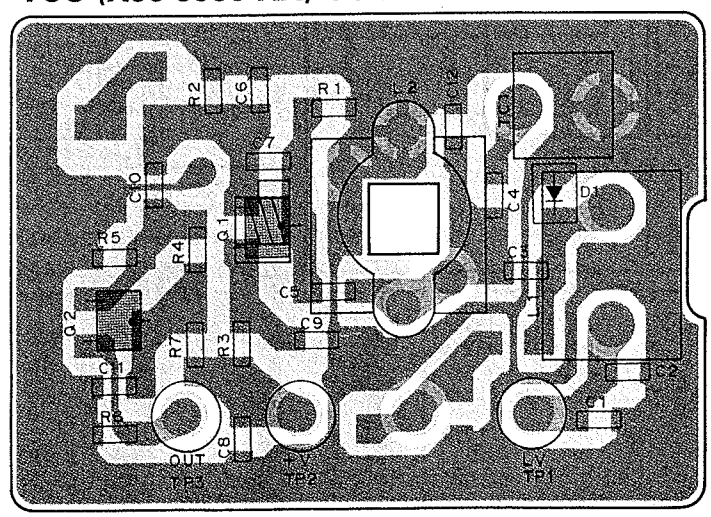


	L2	C3	C4	C6	C7	C10	C12	TC1	R6
144M A X58-3390-00	4 1/2	22P	10P	12P	3P	3P	NO	10P	470
1200M A X58-3390-01	3 1/2	12P	12P	10P	3P	0.5P	YES	6P	270
430M D X58-3390-02	10 1/2	18P	22P	18P	12P	2P	NO	10P	470

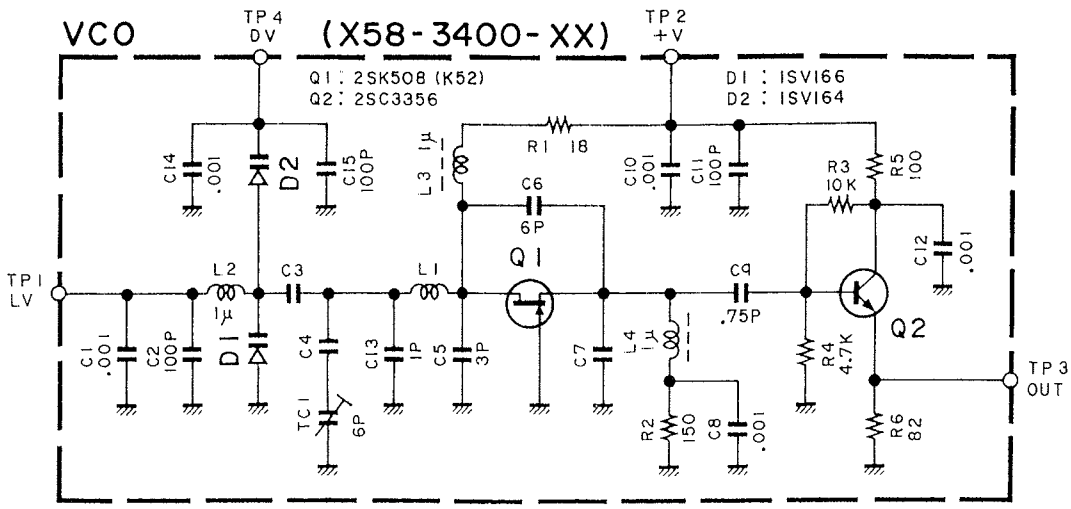
VCO (X58-3390-XX) Component side view



VCO (X58-3390-XX) Foil side view

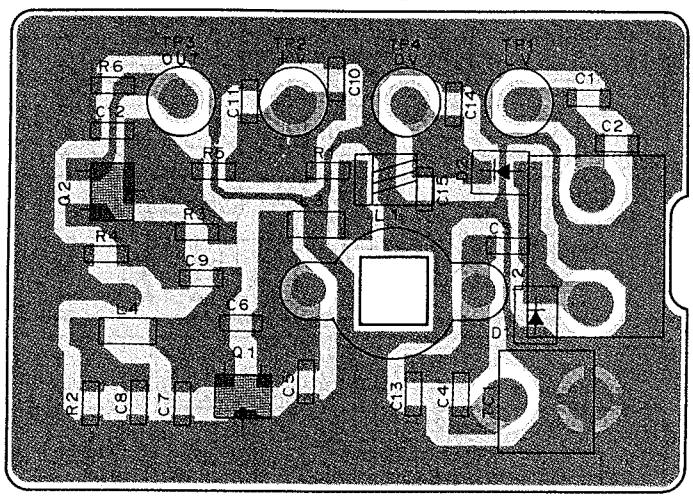


VCO (X58-3400-XX)

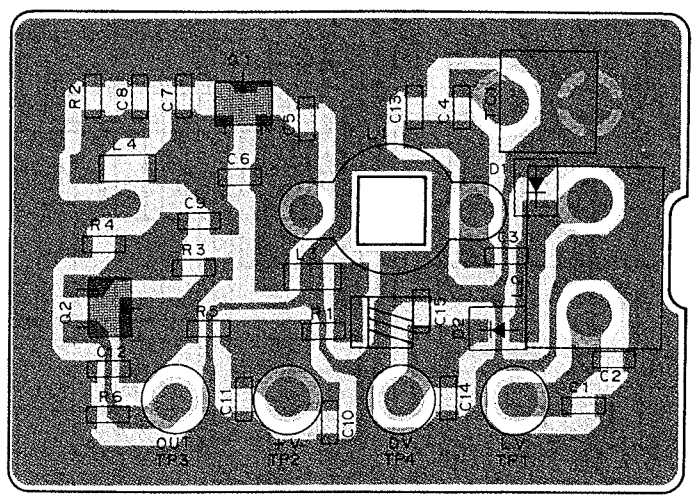


	D1	D2	L1	C3	C4	C7	C13	C14	C15
1200M C X58-3400-00	NO	YES	3 1/2	10P	8P	10P	YES	YES	YES
430M A X58-3400-01	YES	NO	2 1/2	12P	10P	8P	NO	NO	NO

VCO (X58-3400-XX) Component side view

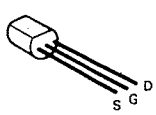


VCO (X58-3400-XX) Foil side view



2SC2714
2SC3324
2SC3356

2SK125



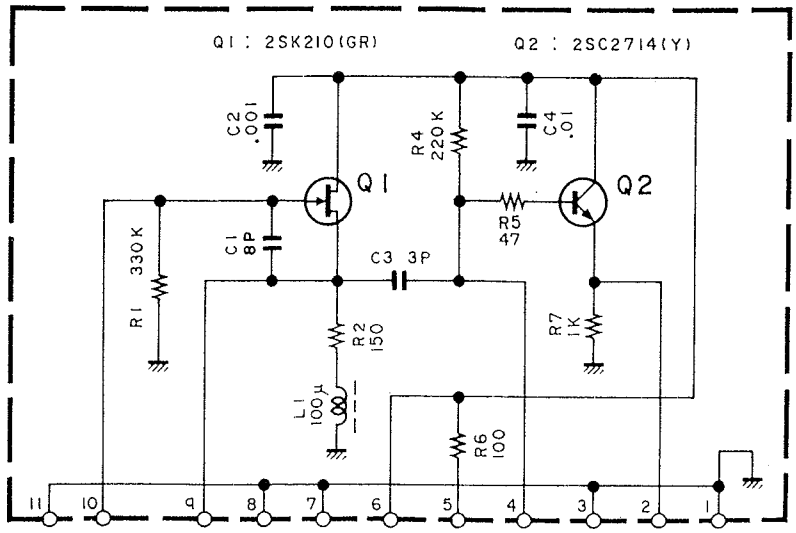
2SK210

2SK508NV

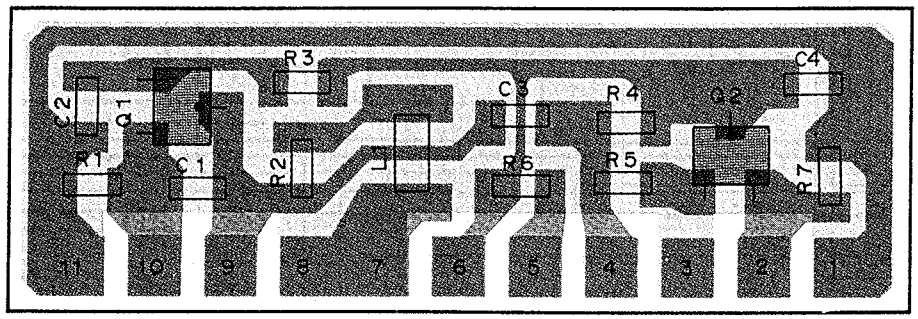
PC BOARD VIEWS/CIRCUIT DIAGRAMS TS-790A/E

VCO (X59-3440-00)

VCO (X59-3440-00)

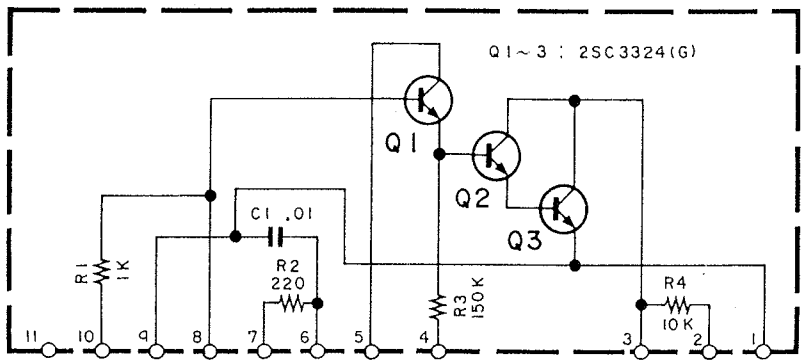


VCO (X59-3440-00) Foil side view

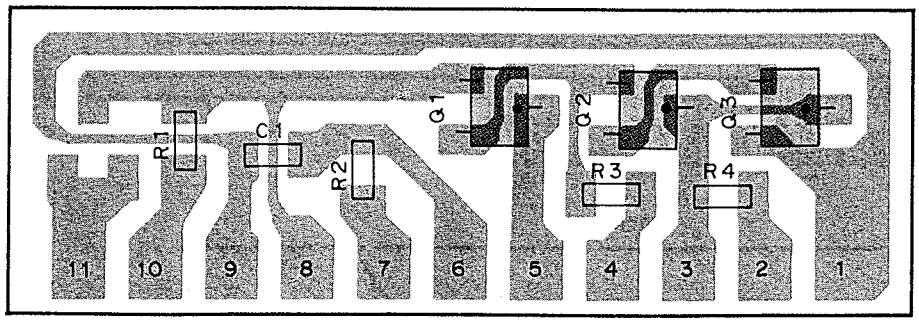


LPF (X59-3450-00)

LPF (X59-3450-00)

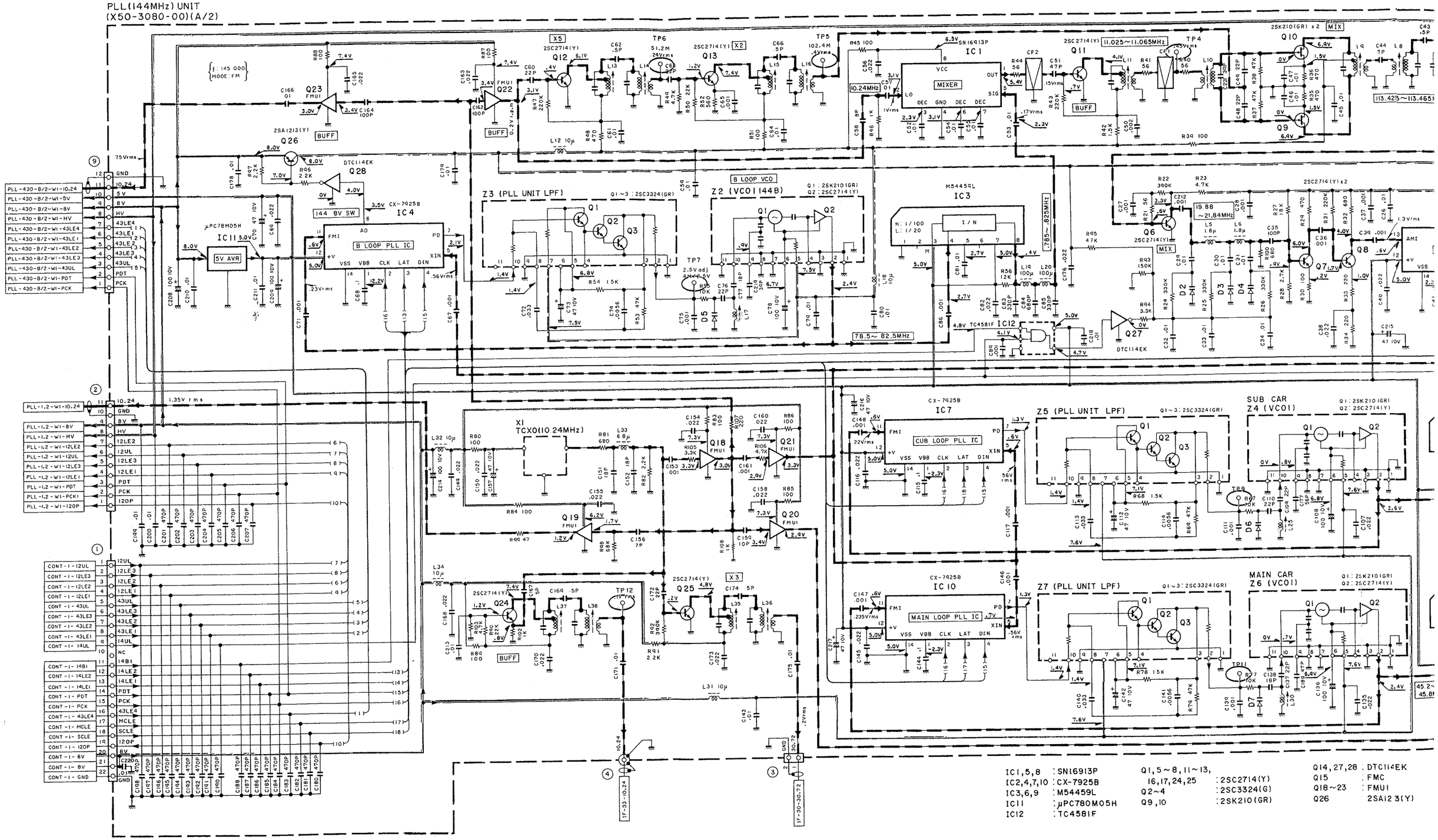


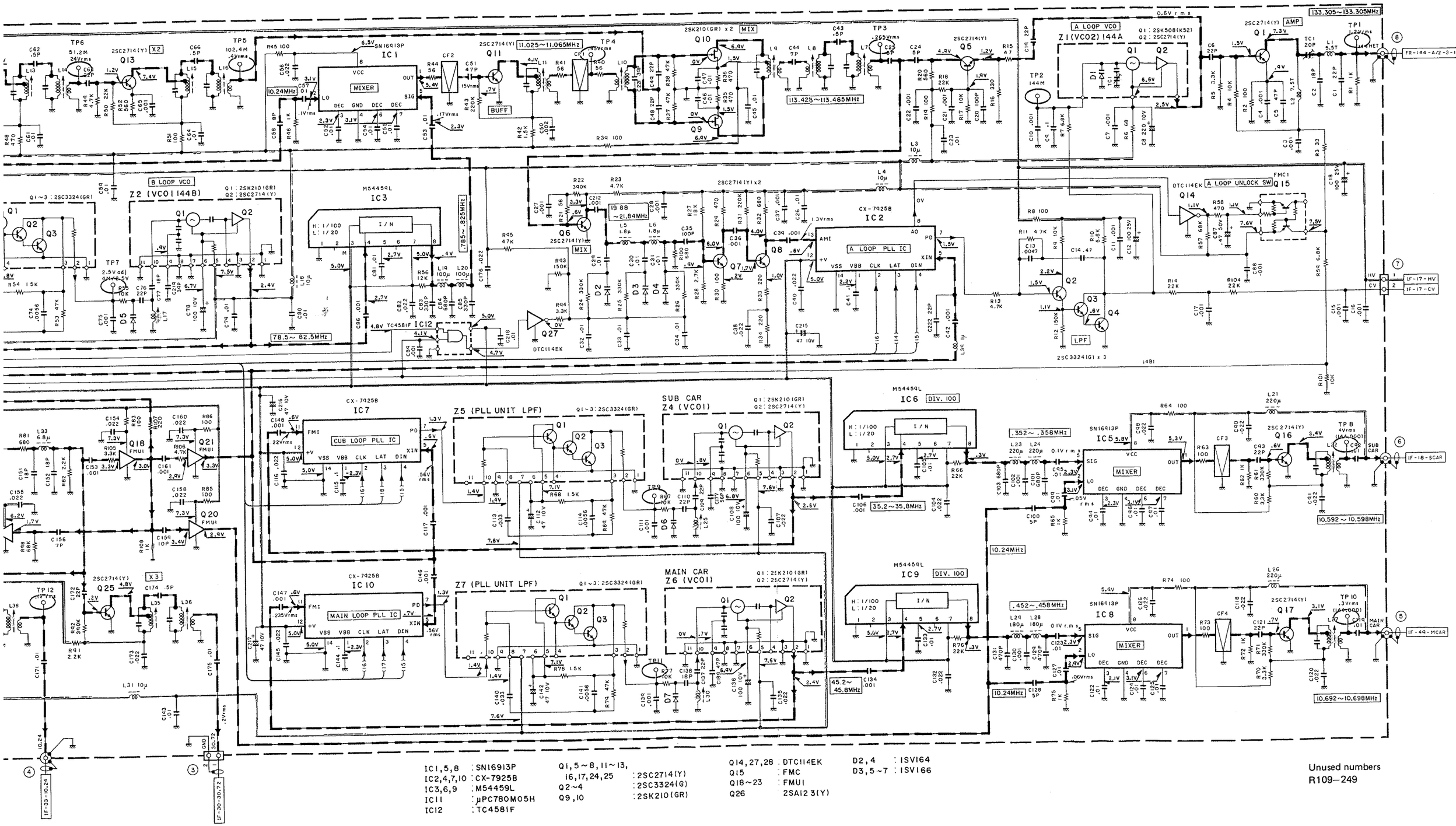
LPF (X59-3450-00) Foil side view



TS-790A/E CIRCUIT DIAGRAM

PLL UNIT (X50-3080-00) (A/2) : 144MHz



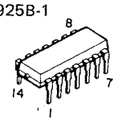


IC1,5,8	: SN16913P	Q1,5~8,11~13, 16,17,24,25	: 2SC2714(Y)	Q14,27,28	: DTC114EK	D2,4	: ISV164
IC2,4,7,10	: CX-7925B	Q2~4	: 2SC3324(G)	Q15	: FMC	D3,5~7	: ISV166
IC3,6,9	: M5445QL	Q9,10	: 2SK210(GR)	Q18~23	: FMU1		
IC11	: µPC780M05H			Q26	: 2SA1213(Y)		
IC12	: TC4581F						

Unused numbers
R109–249

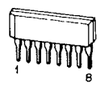
DTC114EK
2SC2714
2SC3324

CX-7925B
CX-7925B-1

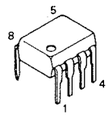


FMC1
FMU1

M54459L

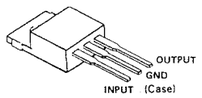


SN16913P



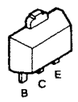
TC4S81F

μPC78M05H

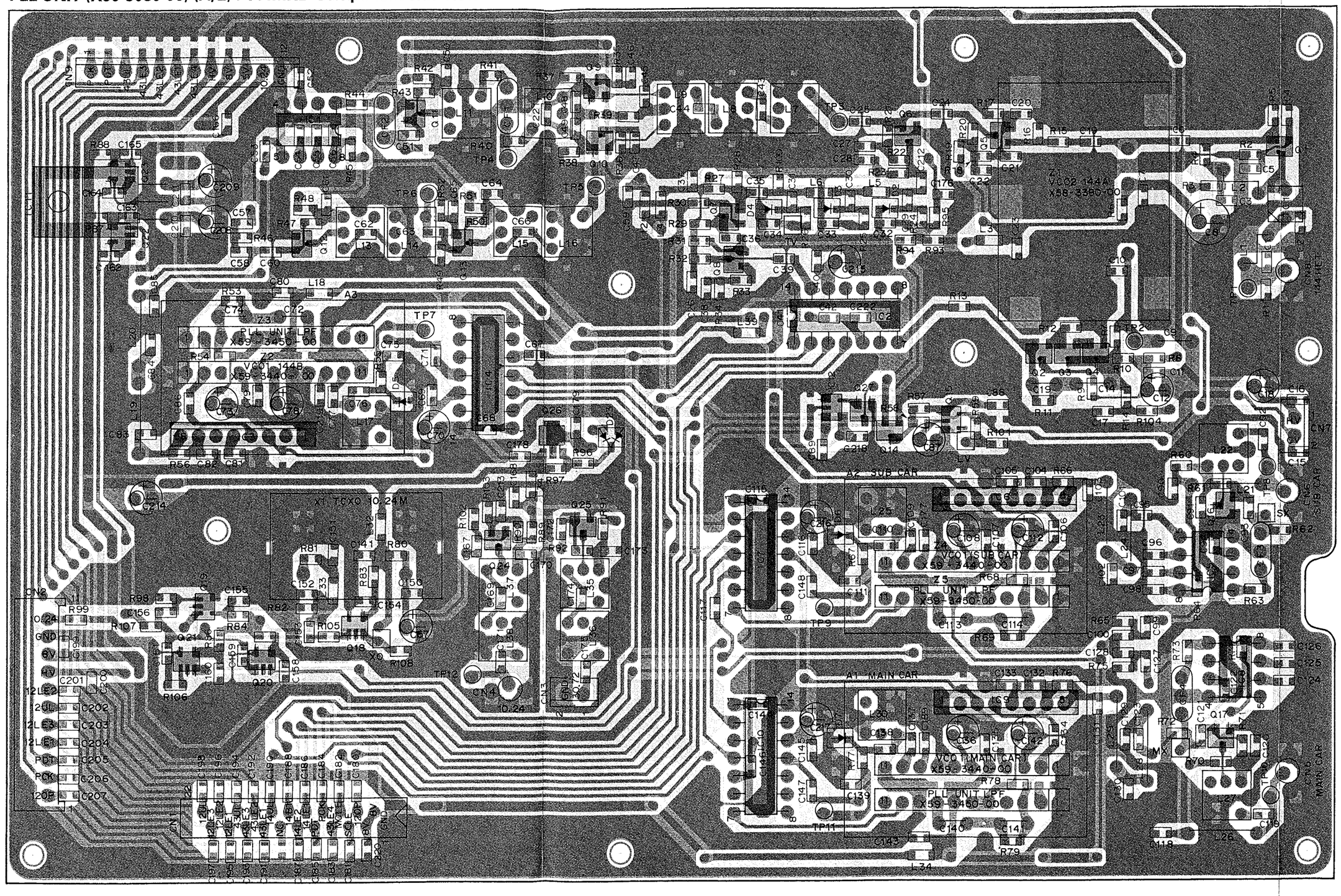


2SK210

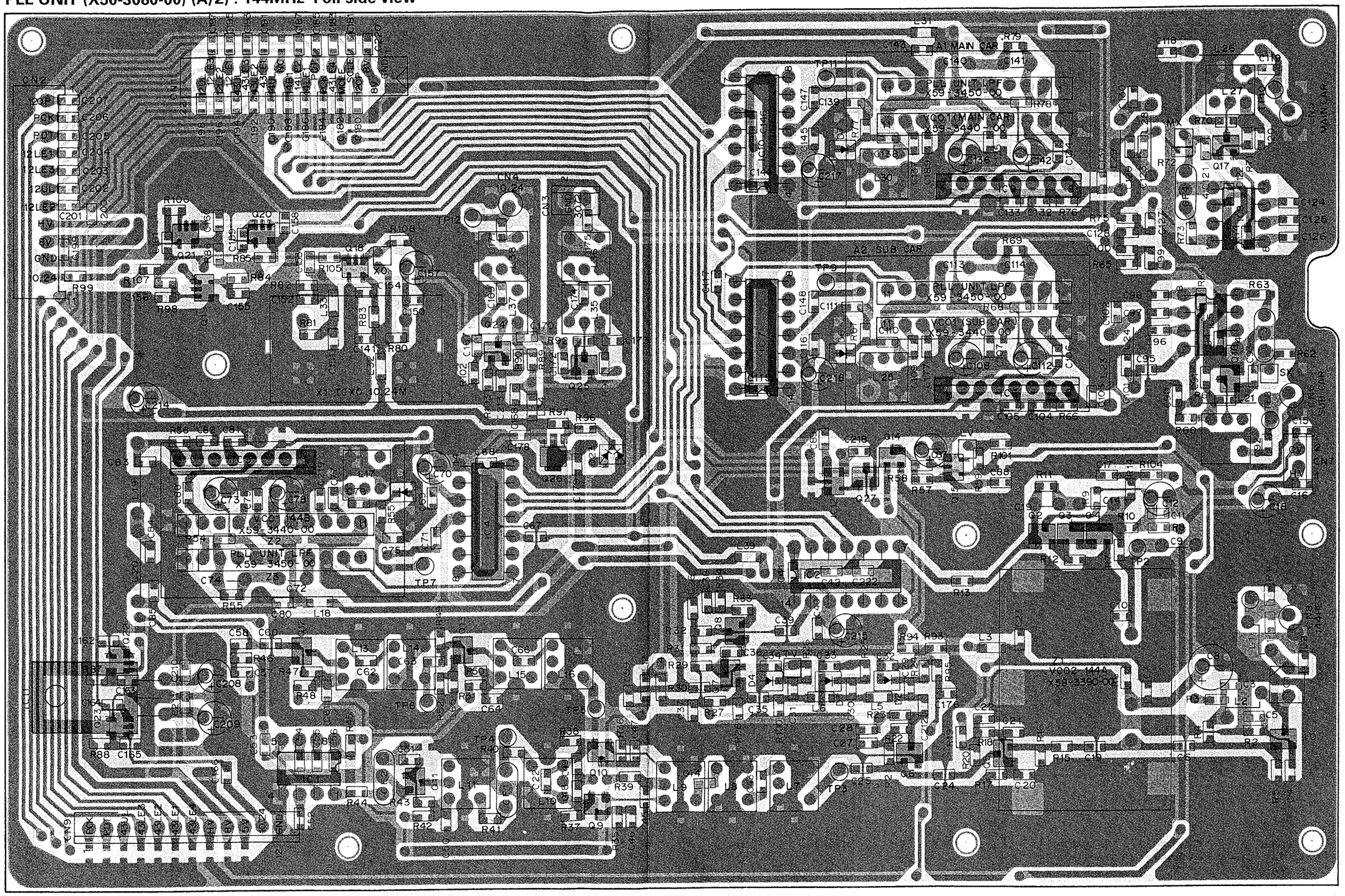
2SA1213



PLL UNIT (X50-3080-00) (A/2) : 144MHz Component side view

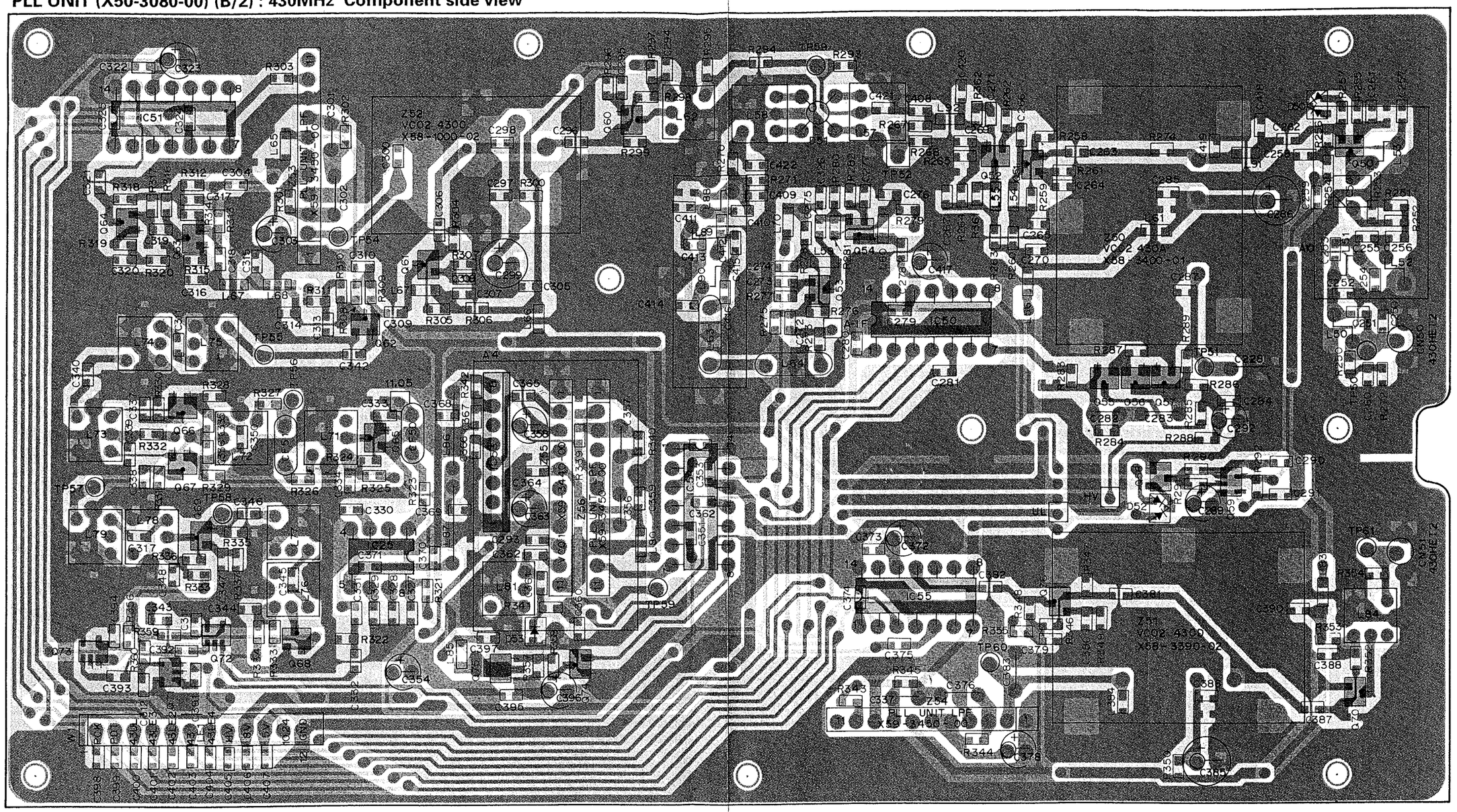


PLL UNIT (X50-3080-00) (A/2) : 144MHz Foil side view



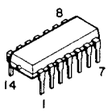
TS-790A/E PC BOARD VIEWS

PLL UNIT (X50-3080-00) (B/2) : 430MHz Component side view



DTC114EK
2SC2714
2SC3098
2SC3324
2SC3356

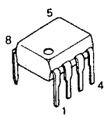
CX-7925B
CX-7925B-1



FMC1
FMU1

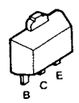
M54459L

SN16913P

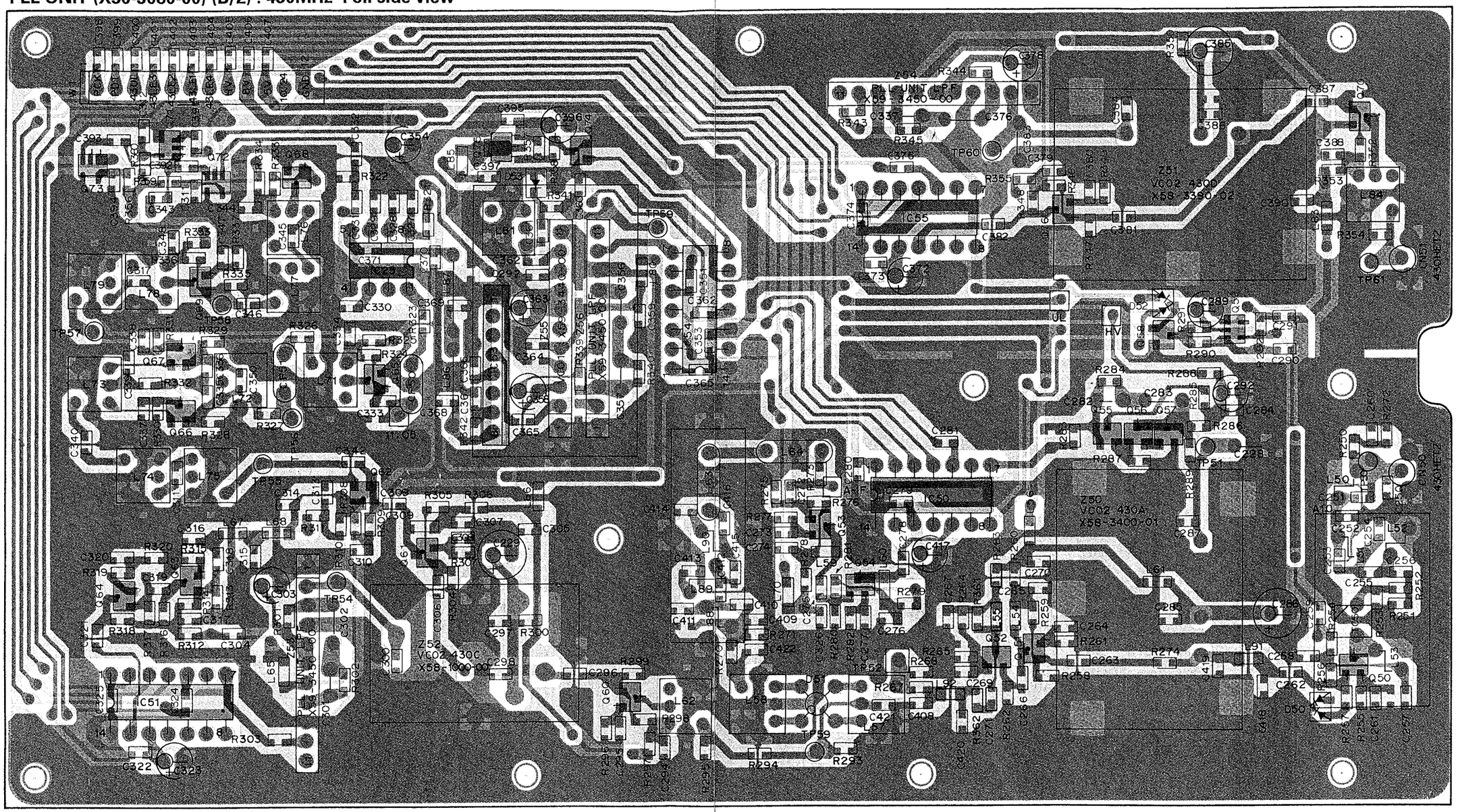


2SK210

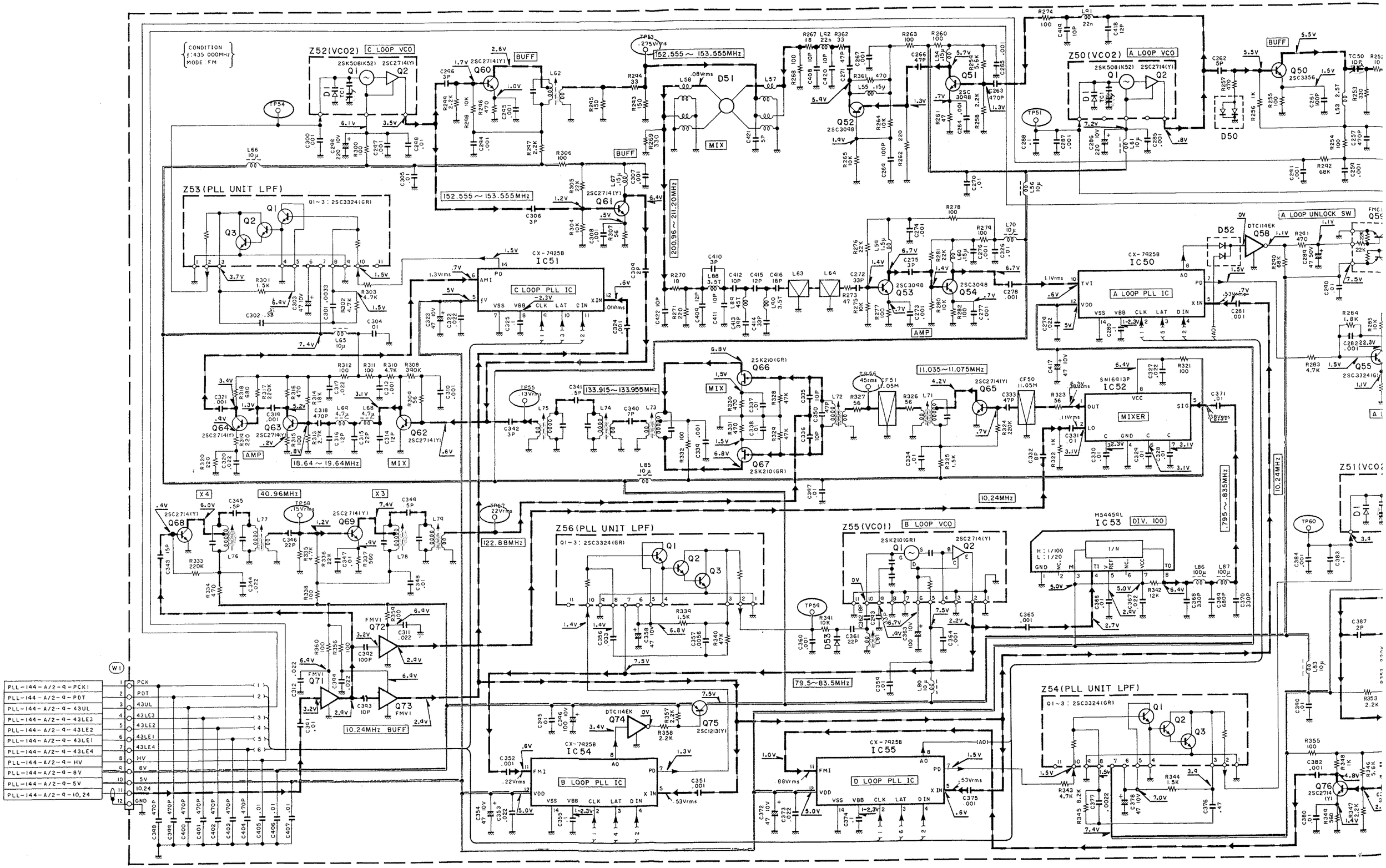
2SA1213



PLL UNIT (X50-3080-00) (B/2) : 430MHz Foil side view

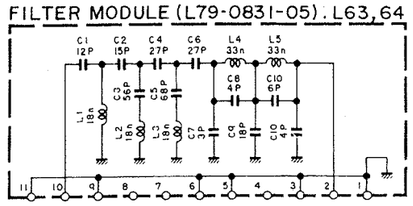


PLL UNIT (X50-3080-00) (B/2) : 430MHz



IC50,51,54,55	CX-7925B
IC52	SN16913P
IC53	M54459L
Q50	2SC3356
Q51~54	2SC3098
Q55~57	2SC3324(G)
Q58,74	DTC114EK
Q59	FMC2
Q60~65,68~70,76	2SC2714(Y)
Q66,67	2SK210
Q71~73	FMV1
Q75	2SC1213(Y)
D50,52	1SS226
D51	ND487CI-3R
D53	1SV166

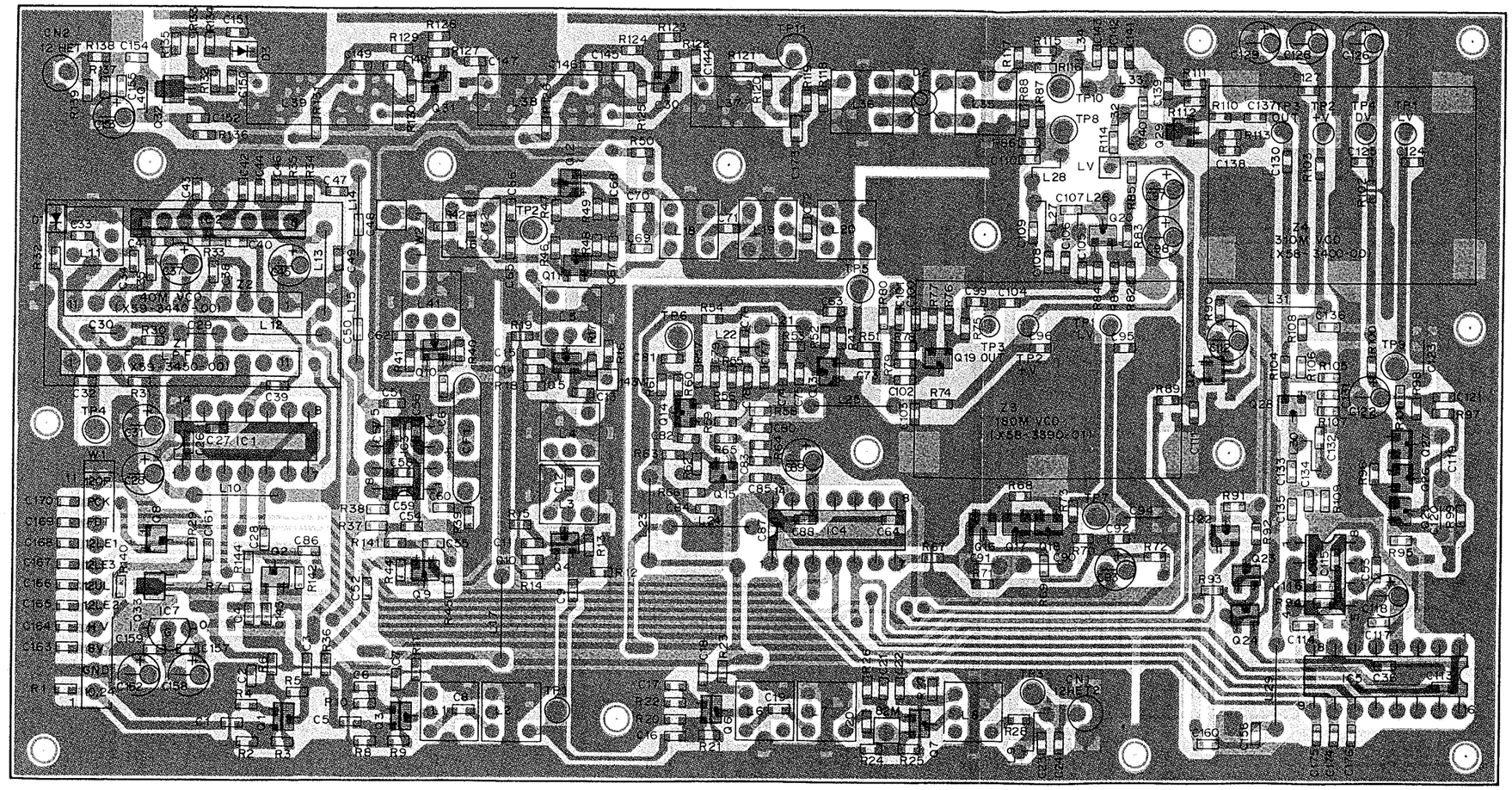
FILTER MODULE (L79-0831-05). L63,64



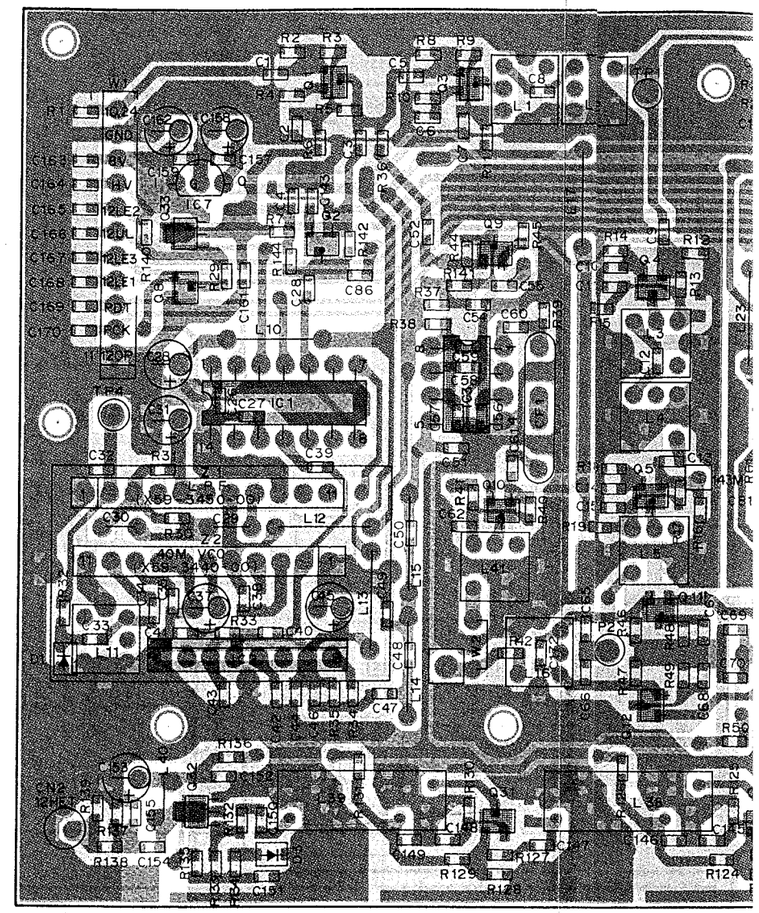
Unused numbers
C268, 389
R251, 266, 269, 351

TS-790A/E PC BOARD VIEWS

PLL UNIT (X50-3090-21) : 1.2GHz (OPTION) Component side view



PLL UNIT (X50-3090-21) : 1.2GHz (OPTION) Foil side view

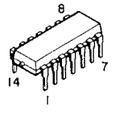


DTC114EK
2SC2714
2SC3098
2SC3324
2SC3356

2SC3357

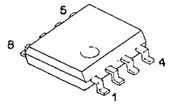
2SK210

CX-7925B
CX-7925B-1

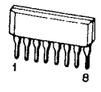


FMC1

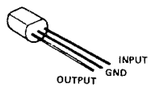
MB504P



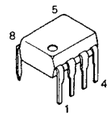
M54495L



NJM78L05A

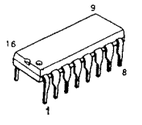


SN16913

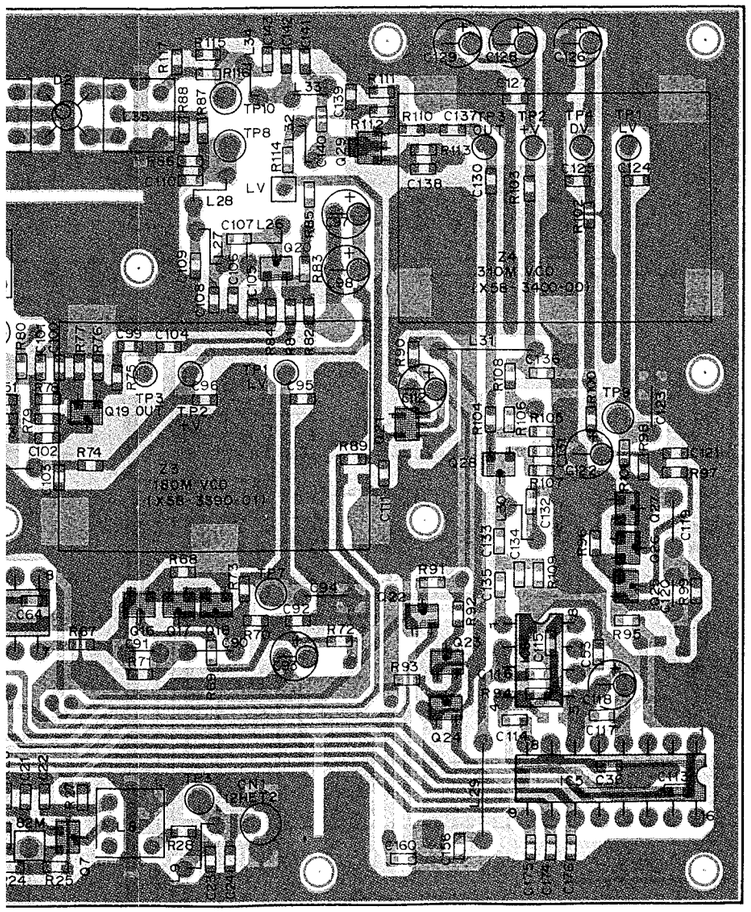


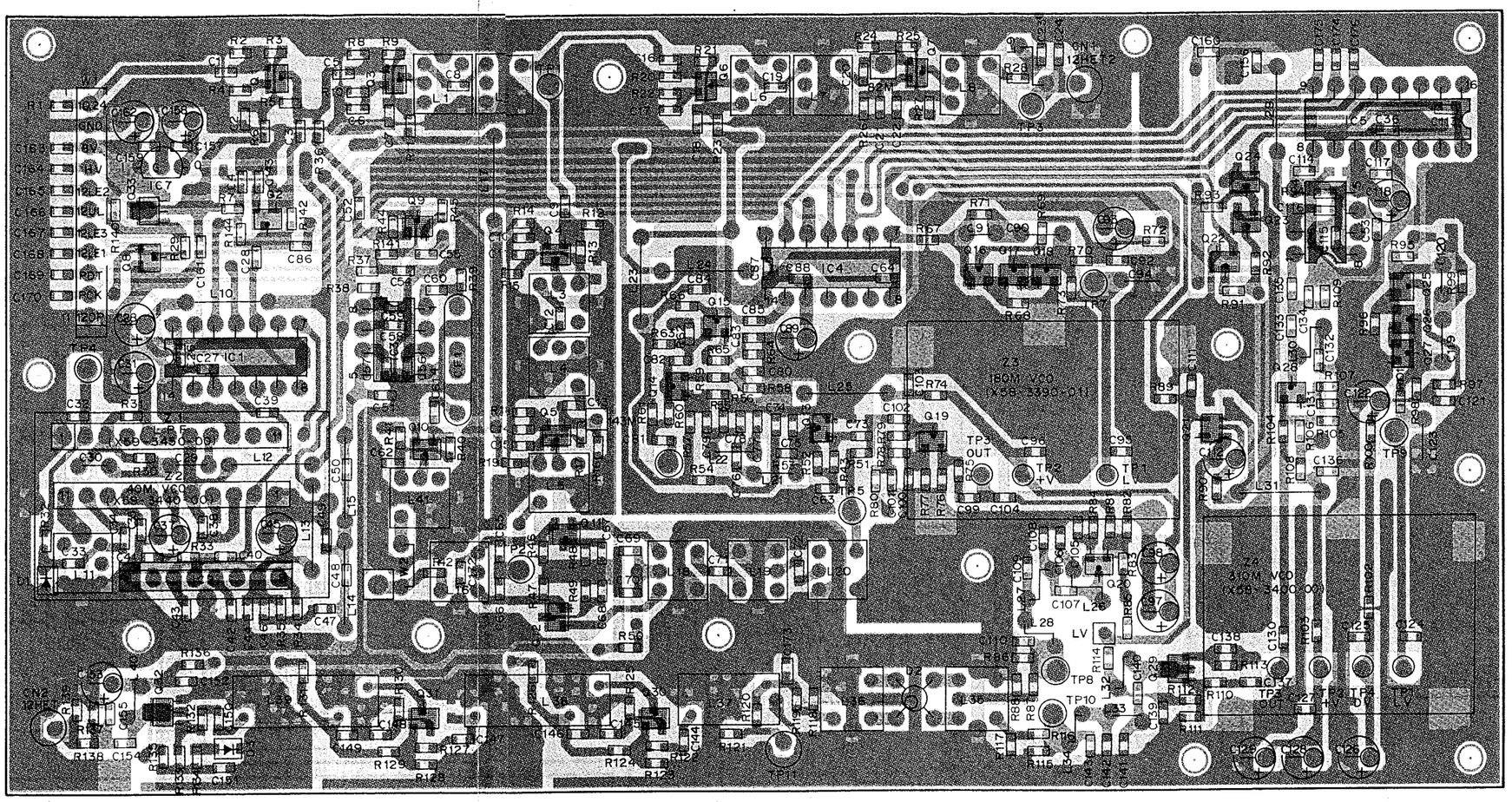
2SA1213

MB87006A

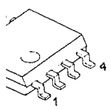


PLL UNIT (X50-3090-21) : 1.2GHz (OPTION) Foil side view

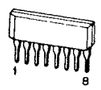




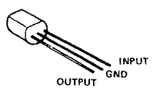
M54495L



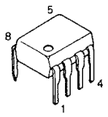
NJM78L05A



SN16913

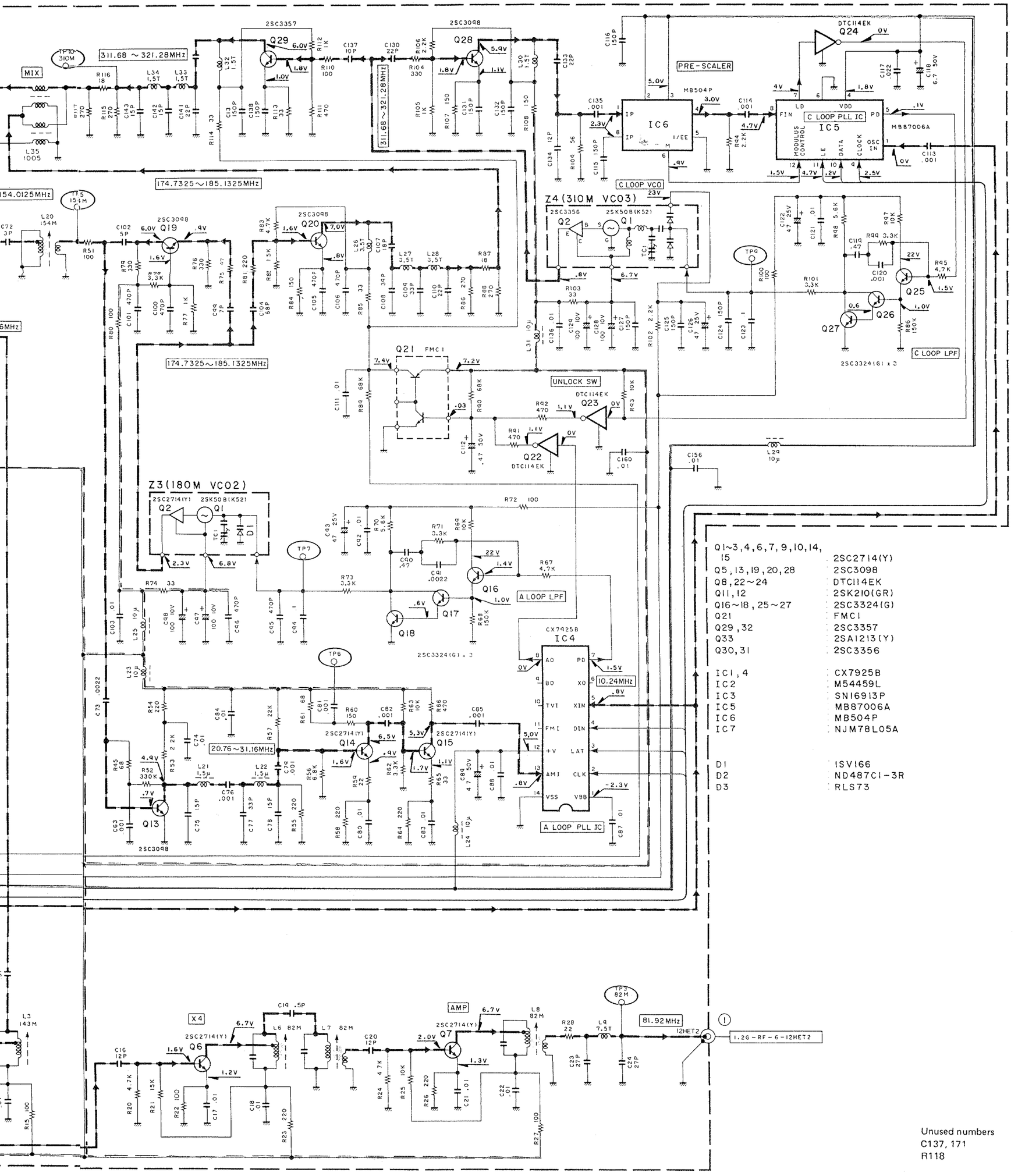


2SA1213



MB87006A

CIRCUIT DIAGRAM TS-790A/E

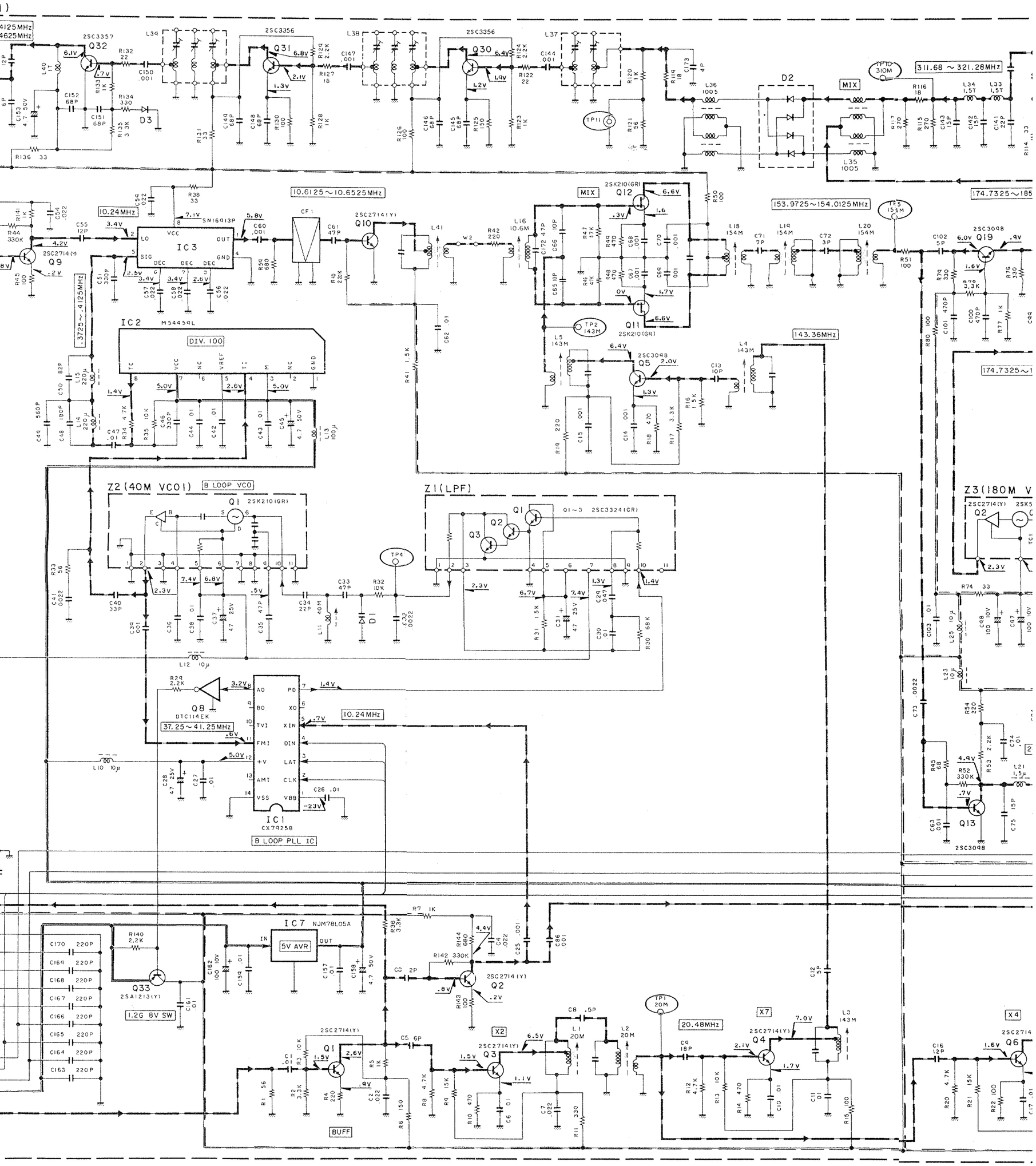


Q1~3,4,6,7,9,10,14,15	2SC2714(Y)
Q5,13,19,20,28	2SC3098
Q8,22~24	DTC114EK
Q11,12	2SK210(GR)
Q16~18,25~27	2SC3324(G)
Q21	FMC1
Q29,32	2SC3357
Q33	2SA1213(Y)
Q30,31	2SC3356
IC1,4	CX7925B
IC2	M54459L
IC3	SN16913P
IC5	MB87006A
IC6	MB504P
IC7	NJM78L05A
D1	1SV166
D2	ND487C1-3R
D3	RLS73

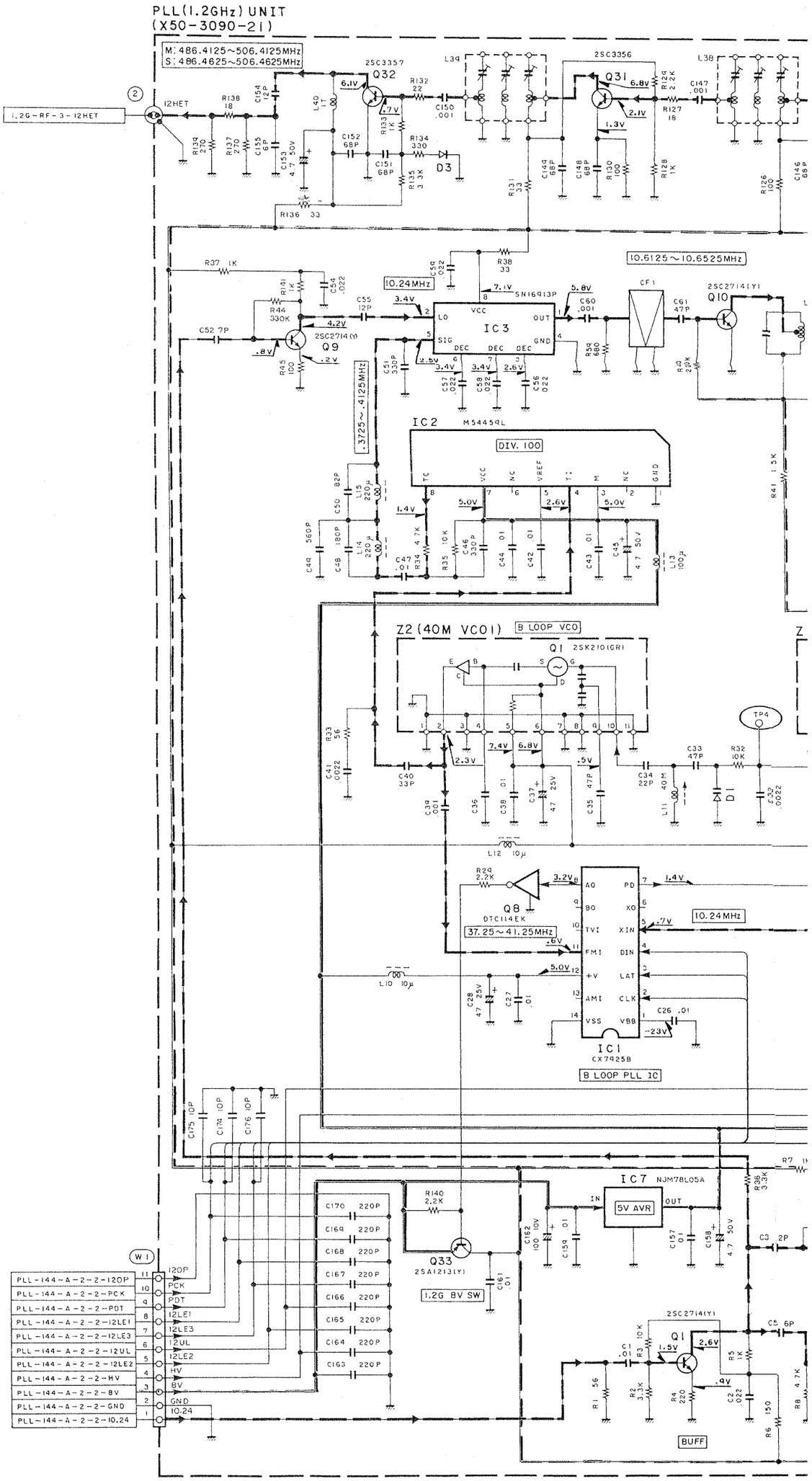
Unused numbers
C137, 171
R118

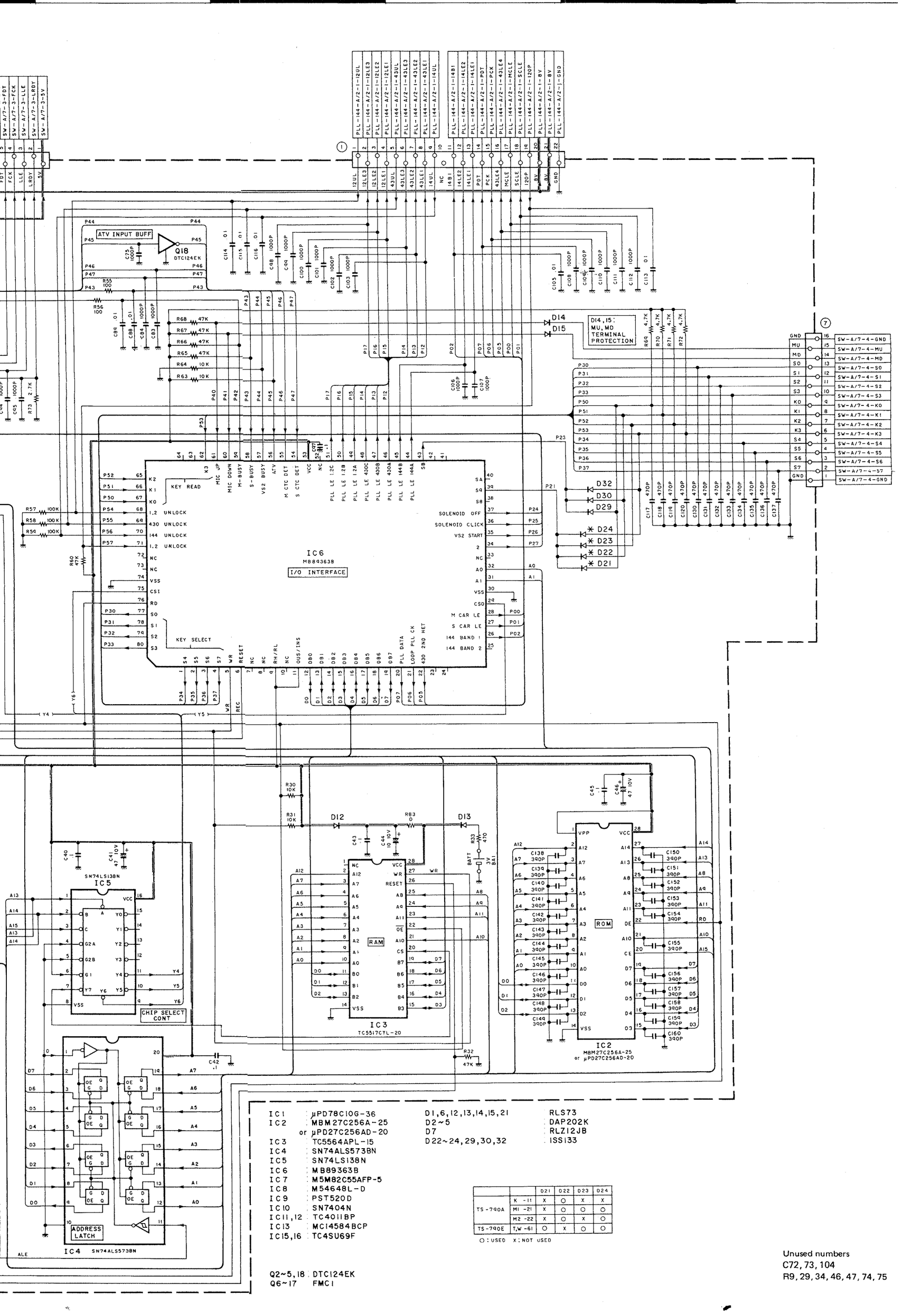
GHz (OPTION)

NIT
)



PLL UNIT (X58-3090-21) : 1.2GHz (OPTION)





IC1	μPD78C10G-36
IC2	MBM27C256A-25
	or μPD27C256AD-20
IC3	TC5564APL-15
IC4	SN74ALS573BN
IC5	SN74LS138N
IC6	MB89363B
IC7	M5M82C55AFP-5
IC8	M54648L-D
IC9	PST520D
IC10	SN7404N
IC11,12	TC4011BP
IC13	MC14584BCP
IC15,16	TC4SU69F

D1,6,12,13,14,15,21	RLS73
D2~5	DAP202K
D7	RLZ12JB
D22~24,29,30,32	1SS133

		D21	D22	D23	D24
TS-790A	K -11	X	○	X	X
	M1 -21	X	○	○	○
	M2 -22	X	○	X	○
TS-790E	T,W -61	○	X	○	○

○ : USED X : NOT USED

Q2~5,18	DTC124EK
Q6~17	FMC1

Unused numbers
C72, 73, 104
R9, 29, 34, 46, 47, 74, 75

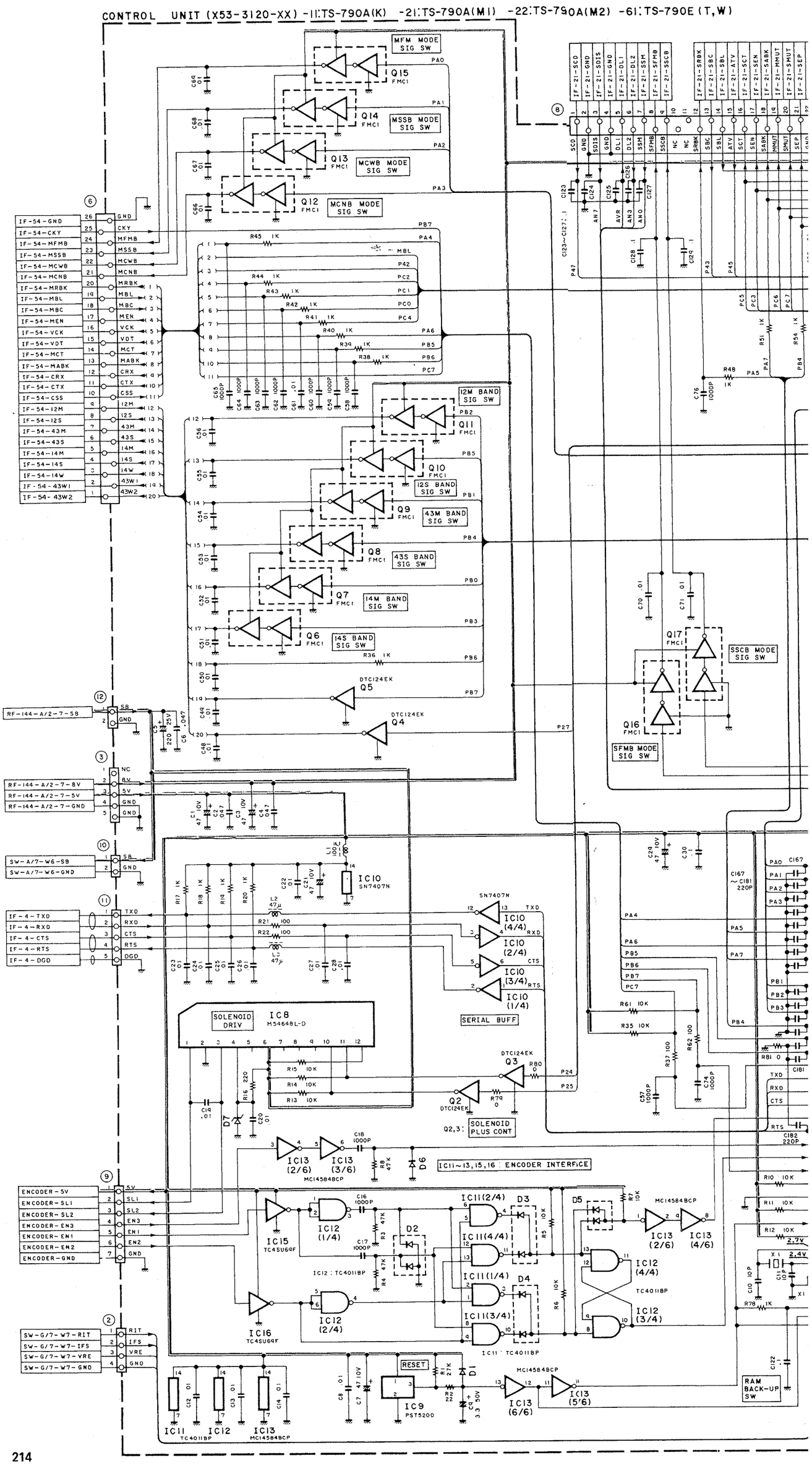
A/E CIRCUIT DIAGRAM CONTROL UNIT (X53-3120-XX) -11 : K -21 : M1 -22 : M2 -61 : T, W

CONTROL UNIT (X53-3120-XX) -11:TS-790A(K) -21:TS-790A(M1) -22:TS-790A(M2) -61:TS-790E(T,W)

MFM MODE SIG SW
MSSB MODE SIG SW
MCWB MODE SIG SW
MCNB MODE SIG SW
12M BAND SIG SW
12S BAND SIG SW
43M BAND SIG SW
43S BAND SIG SW
14M BAND SIG SW
14S BAND SIG SW
SSCB MODE SIG SW
SFMB MODE SIG SW
SERIAL BUFF
SOLENOID DRIV
SOLENOID PLUS CONT
RESET
RAM BACK-UP SW
IC1 μPD78C10G
IC4
IC7 M57M82C55AFP-5 I/O INTERFACE
IC8 M54648L-D
IC9 PST5200
IC10 SN7407N
IC11 TC4011BP
IC12 TC4011BP
IC13 MC14584BCP
IC15 TC4SU69F
IC16 TC4SU69F
Q1 FMC1
Q2 DTC124EK
Q3 DTC124EK
Q4 DTC124EK
Q5 DTC124EK
Q6 FMC1
Q7 FMC1
Q8 FMC1
Q9 FMC1
Q10 FMC1
Q11 FMC1
Q12 FMC1
Q13 FMC1
Q14 FMC1
Q15 FMC1
Q16 FMC1
Q17 FMC1
CPU
I/O INTERFACE
ENCODER INTERFACE
IC11~13,15,16 : ENCODER INTERFACE
Q2,3: SOLENOID PLUS CONT
IC12 : TC4011BP
IC11 : TC4011BP
X1 : 11.0592MHz

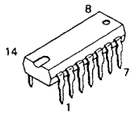
TS-790A/E CIRCUIT DIAGRAM

CONTROL UNIT (X53-3120-XX) -11 : K -21 : M1



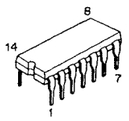
DTC124EK

SN7404N

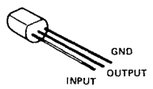


FMC1

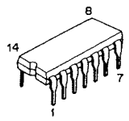
TC4SU69F



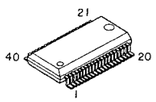
PST520D



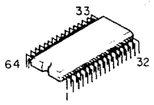
TC4011BP
MC14584BCP



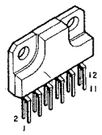
M5M82C55AFP-5



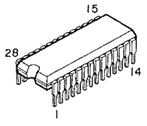
μPD78C10G-36



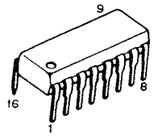
M54648L-D



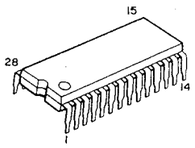
TC5564APL-15



SN74LS138N



27C256A-25JAN1
27C256AD-20JAN1



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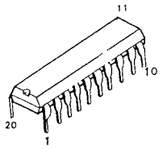
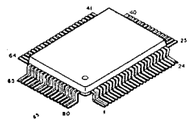
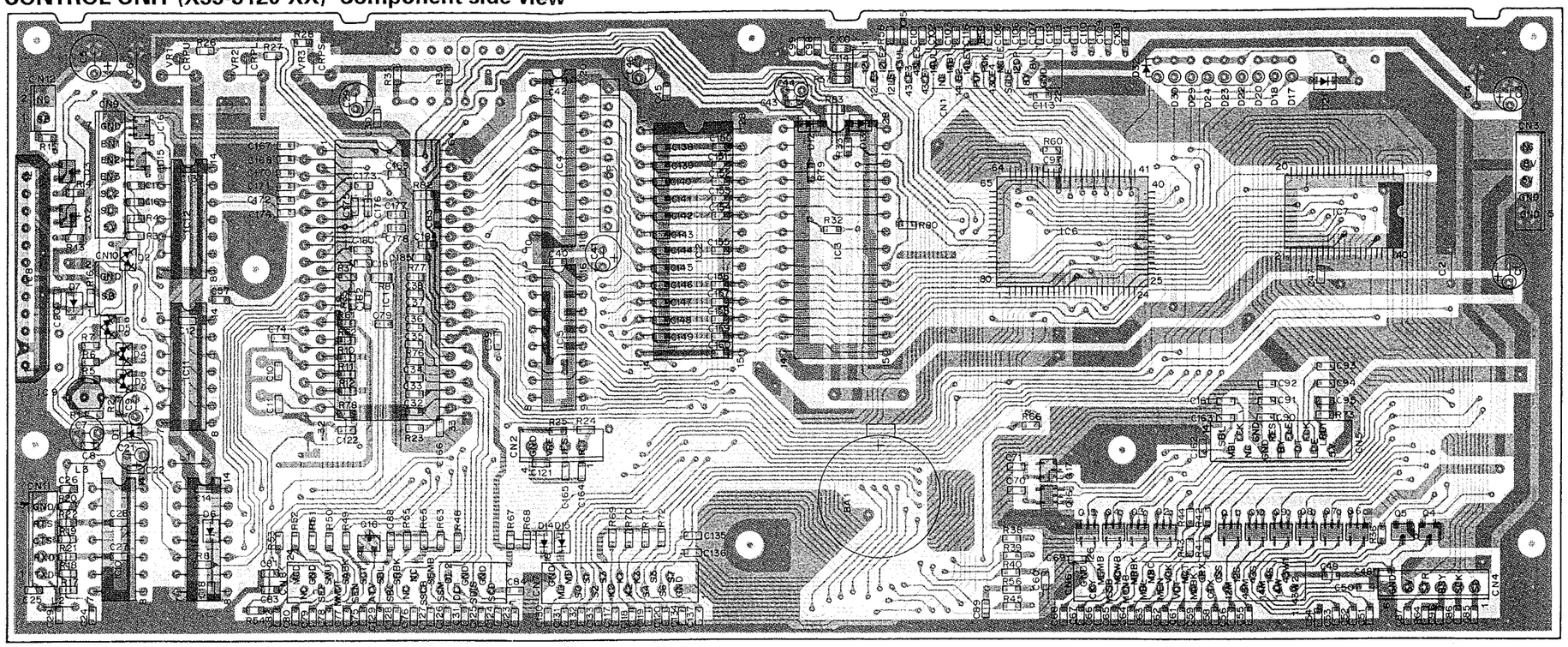


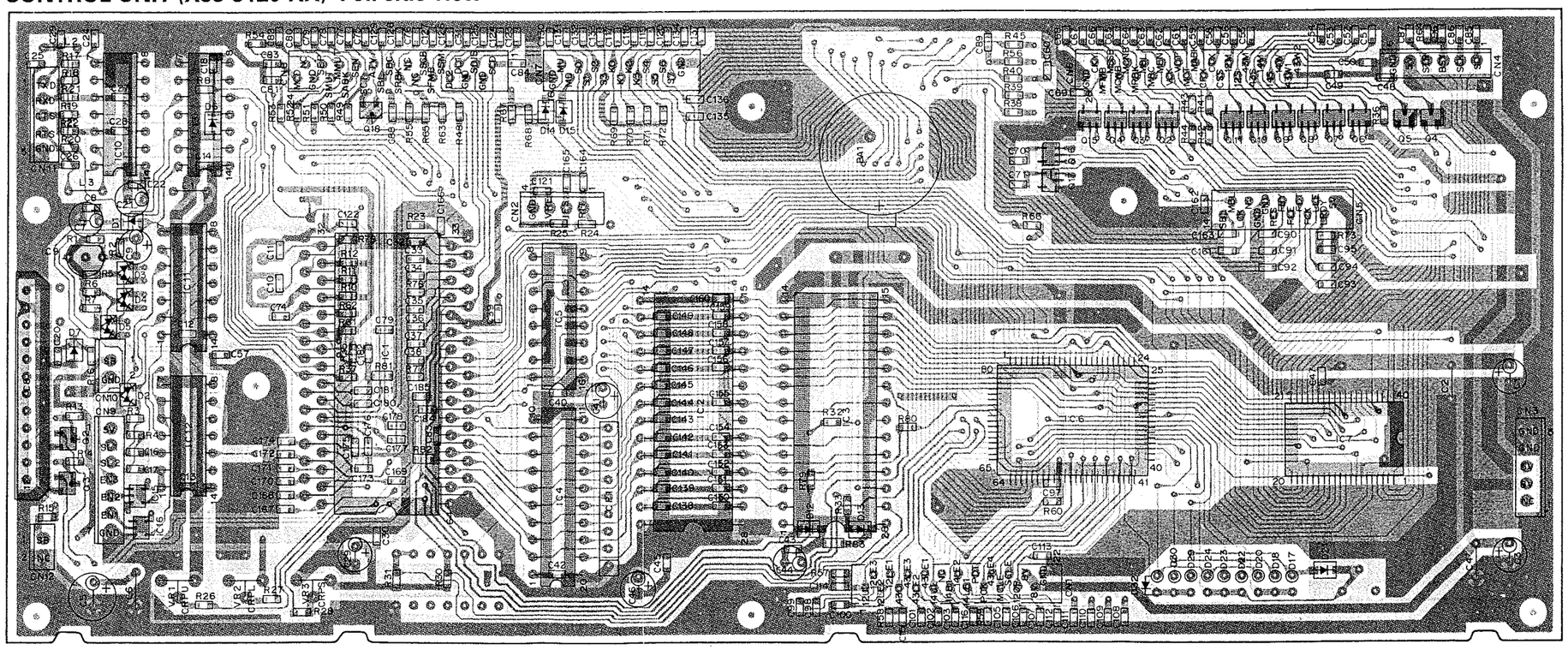
MB89363B



CONTROL UNIT (X53-3120-XX) Component side view



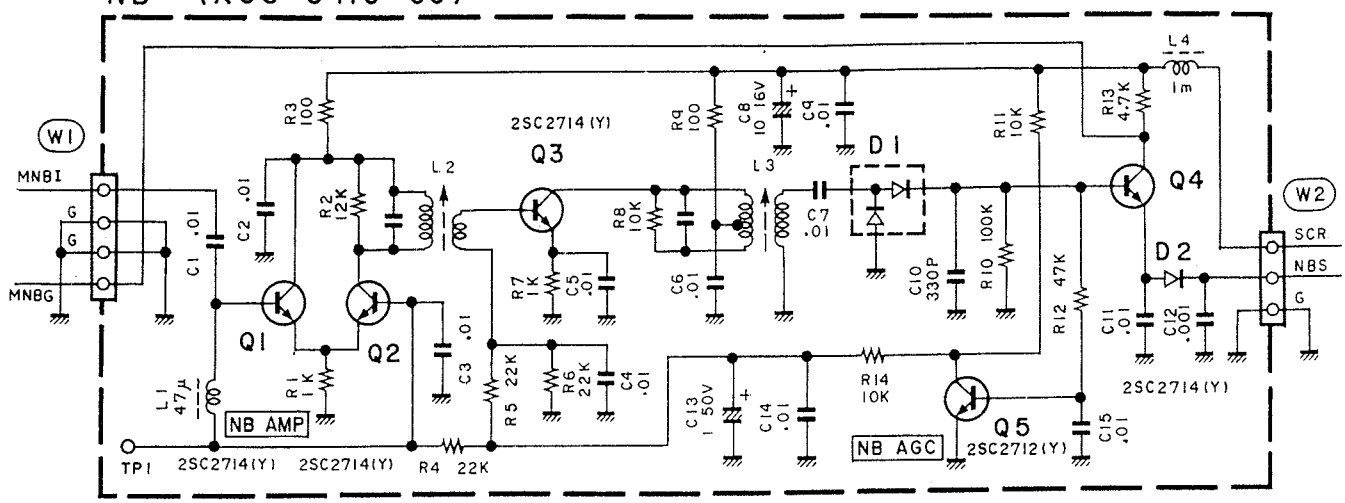
CONTROL UNIT (X53-3120-XX) Foil side view



TS-790A/E PC BOARD VIEWS/CIRCUIT DIAGRAMS

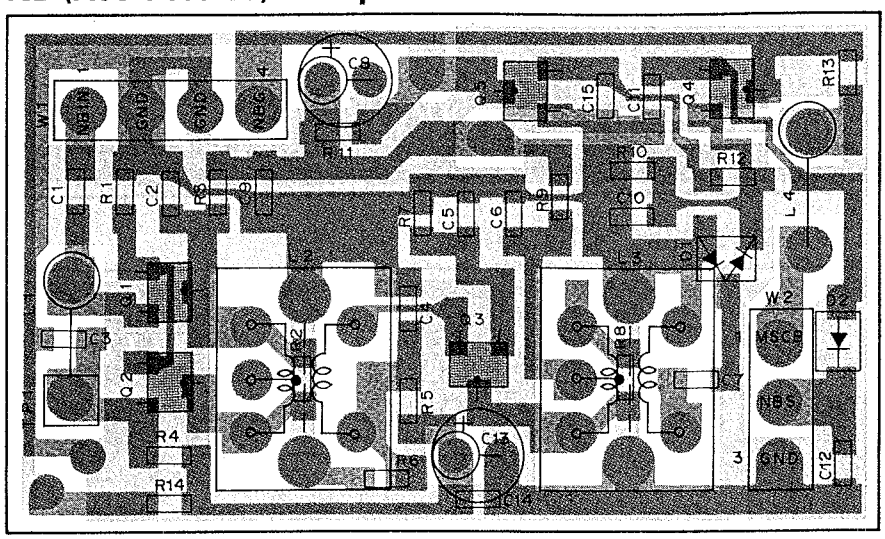
NB (X58-3410-00)

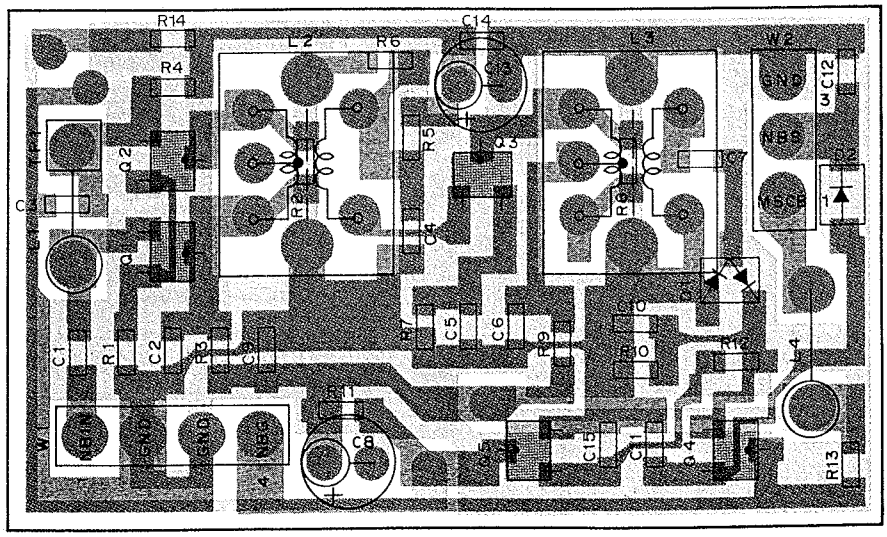
NB (X58-3410-00)



Q1～4 : 2SC2714(Y)　　D1 : HSM276S
Q5 : 2SC2712(Y)　　D2 : RLS73

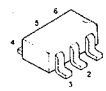
NB (X58-3410-00) Component side view



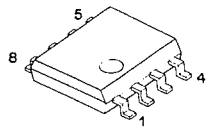


2SC2712
2SC2714

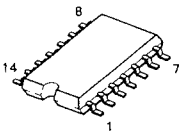
IMH5



NJM4558M

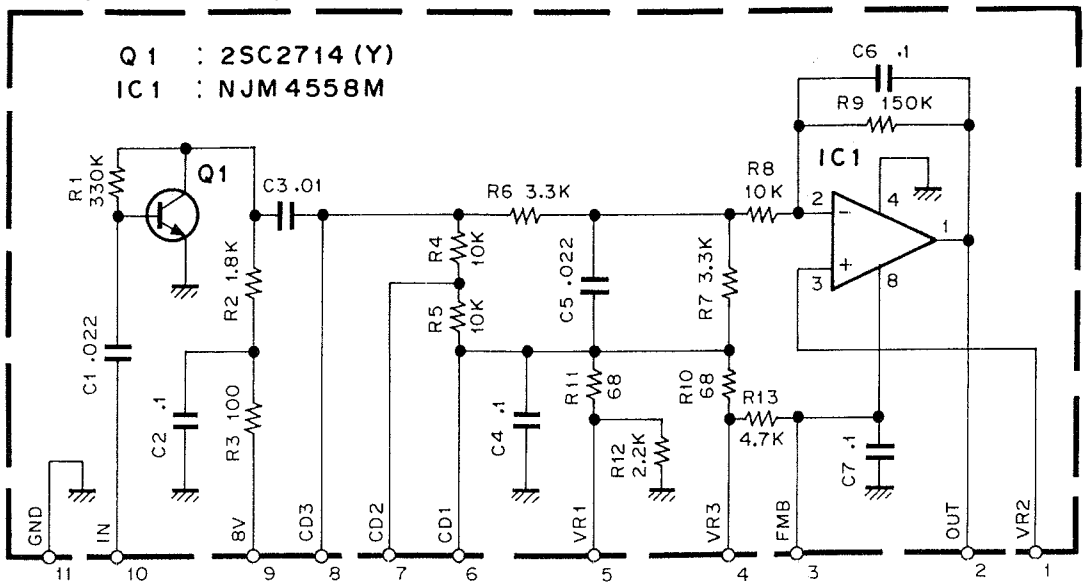


TC4066BF



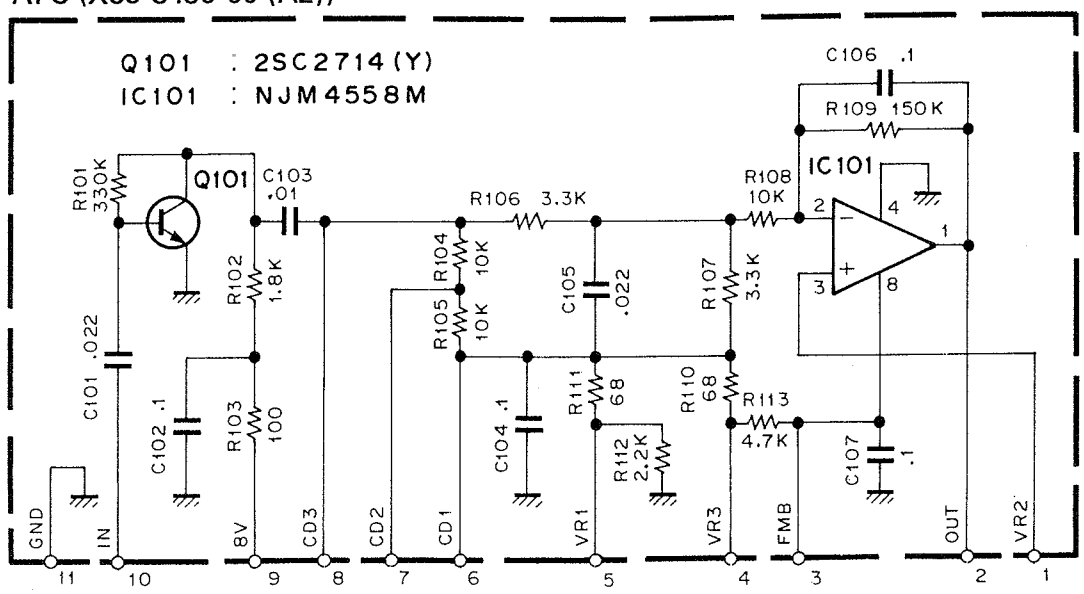
AFC (X59-3480-00 (A1))

AFC (X59-3480-00 (A1))

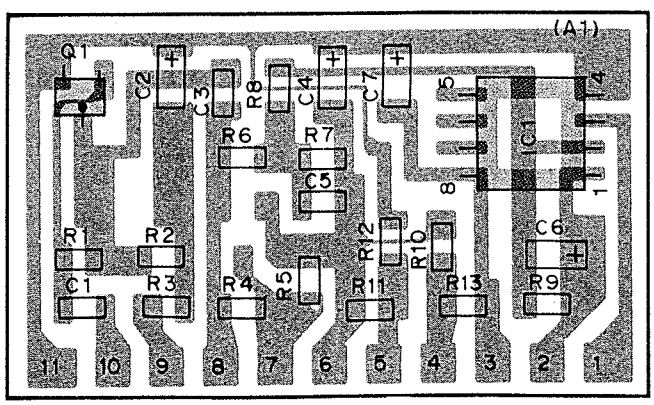


AFC (X59-3480-00 (A2))

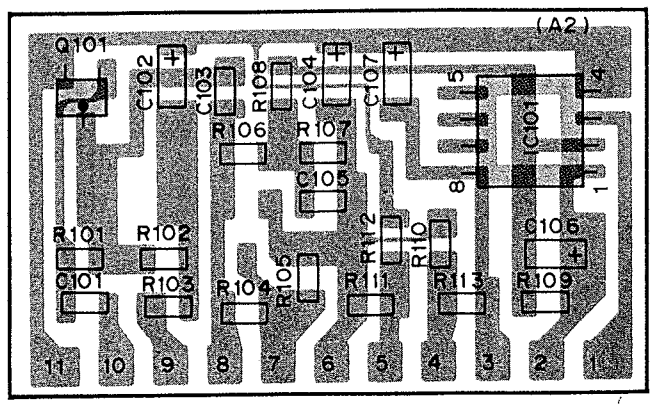
AFC (X59-3480-00 (A2))



AFC (X59-3480-00 (A1)) Foil side view



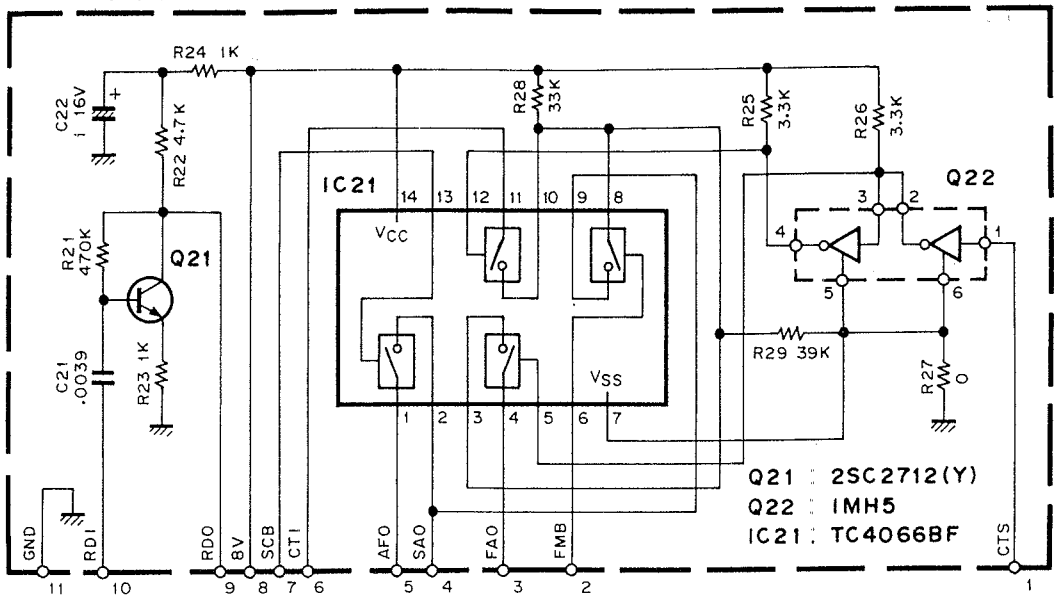
AFC (X59-3480-00 (A2)) Foil side view



PC BOARD VIEWS/CIRCUIT DIAGRAMS TS-790A/E

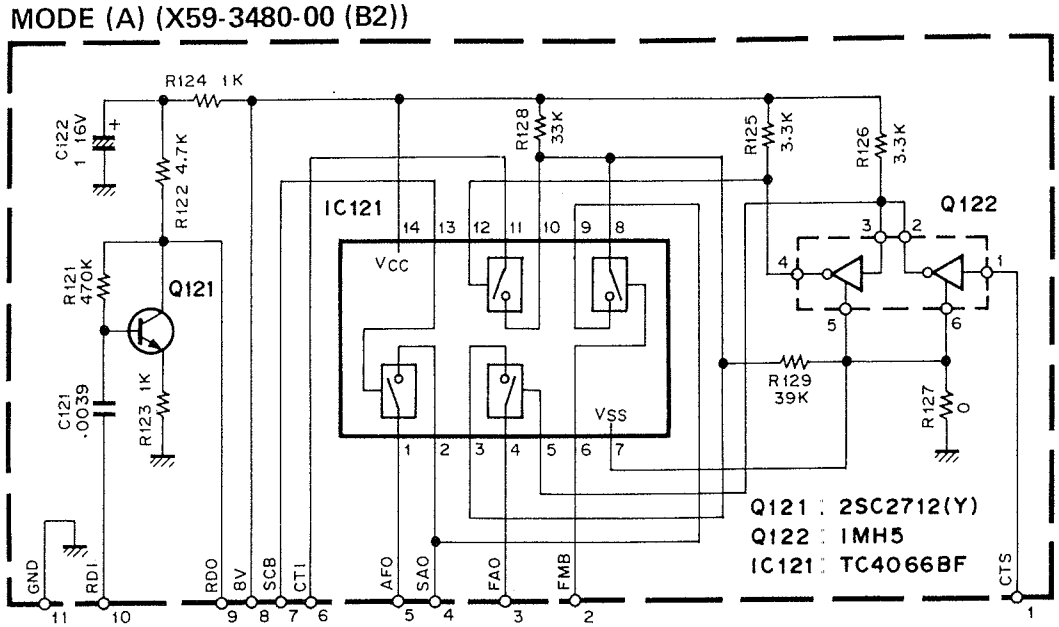
MODE (A) (X59-3480-00 (B1))

MODE (A) (X59-3480-00 (B1))

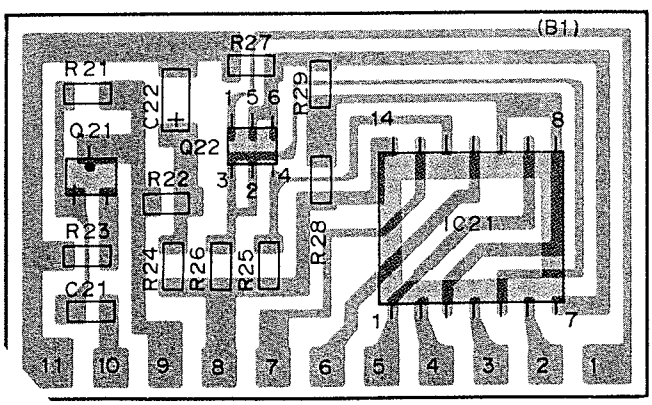


MODE (A) (X59-3480-00 (B2))

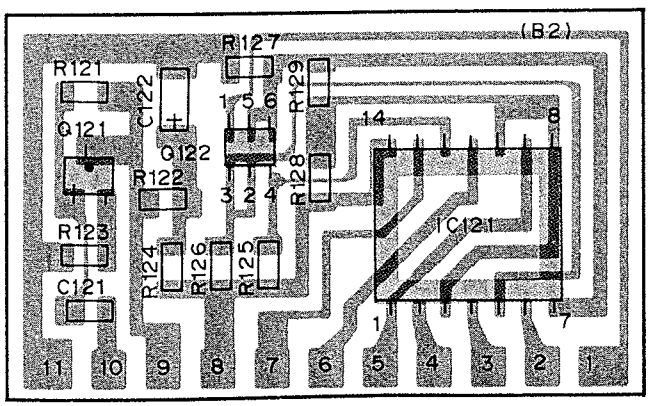
MODE (A) (X59-3480-00 (B2))



MODE (A) (X59-3480-00 (B1)) Foil side view



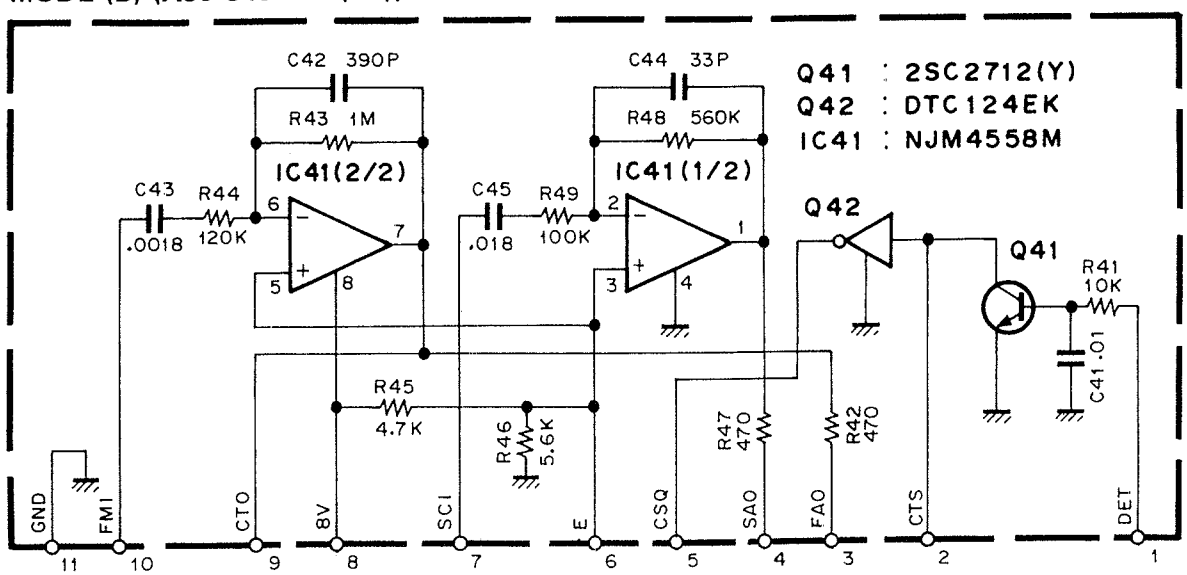
MODE (A) (X59-3480-00 (B2)) Foil side view



TS-790A/E PC BOARD VIEWS/CIRCUIT DIAGRAMS

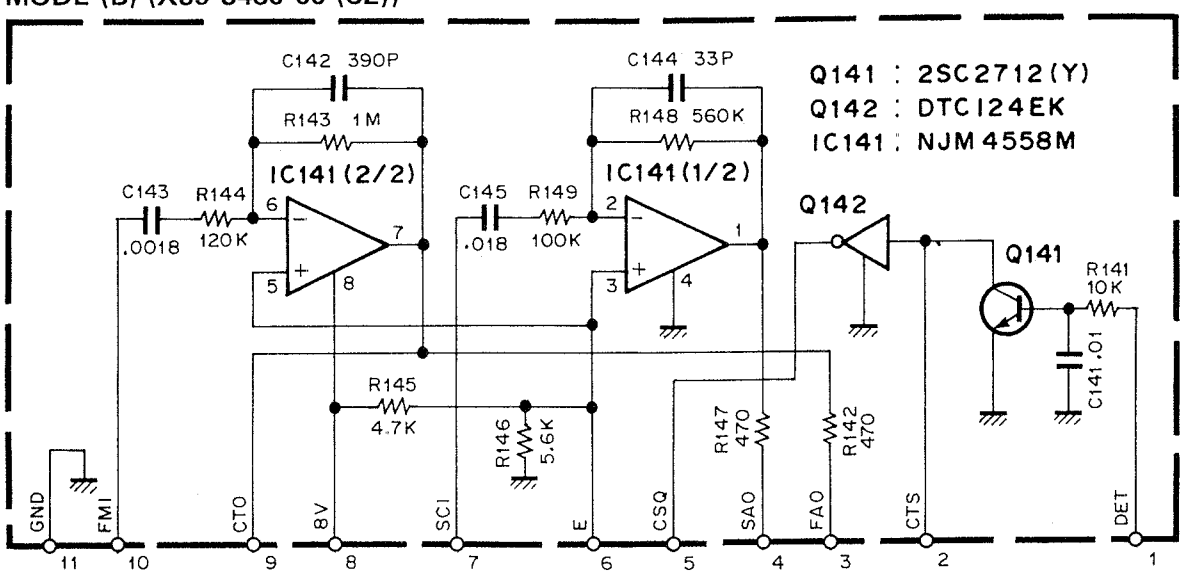
MODE (B) (X59-3480-00 (C1))

MODE (B) (X59-3480-00 (C1))

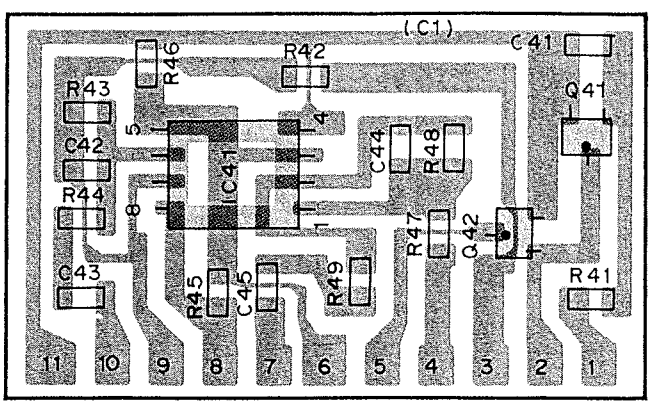


MODE (B) (X59-3480-00 (C2))

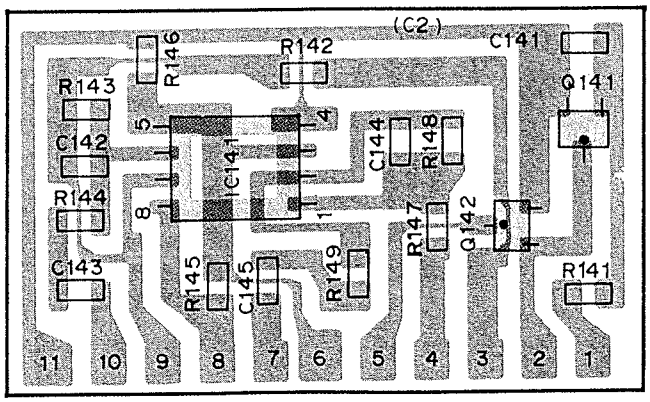
MODE (B) (X59-3480-00 (C2))



MODE (B) (X59-3480-00 (C1)) Foil side view



MODE (B) (X59-3480-00 (C2)) Foil side view

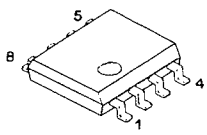


PC BOARD VIEWS/CIRCUIT DIAGRAMS TS-790A/E

DTC124EK
2SA1162
2SC2712

2SK210

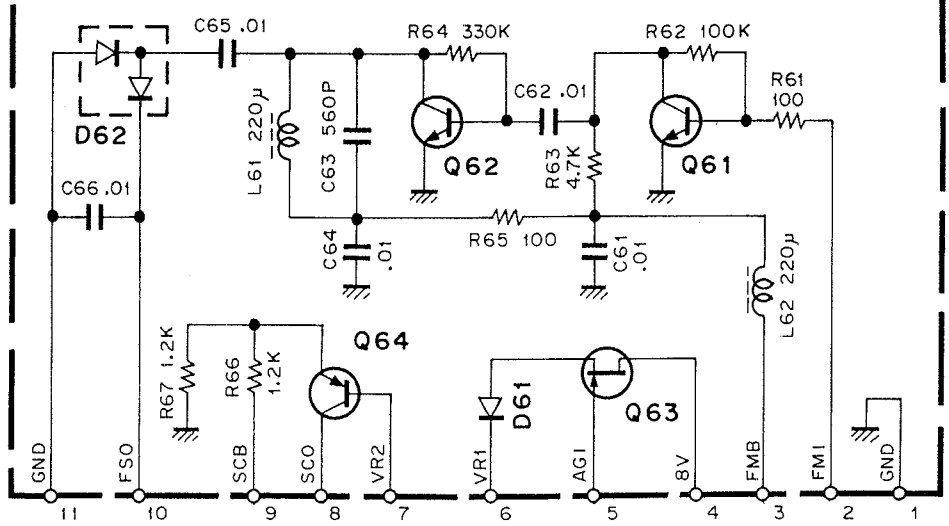
NJM4558M



S METER (X59-3480-00 (D1))

S METER (X59-3480-00 (D1))

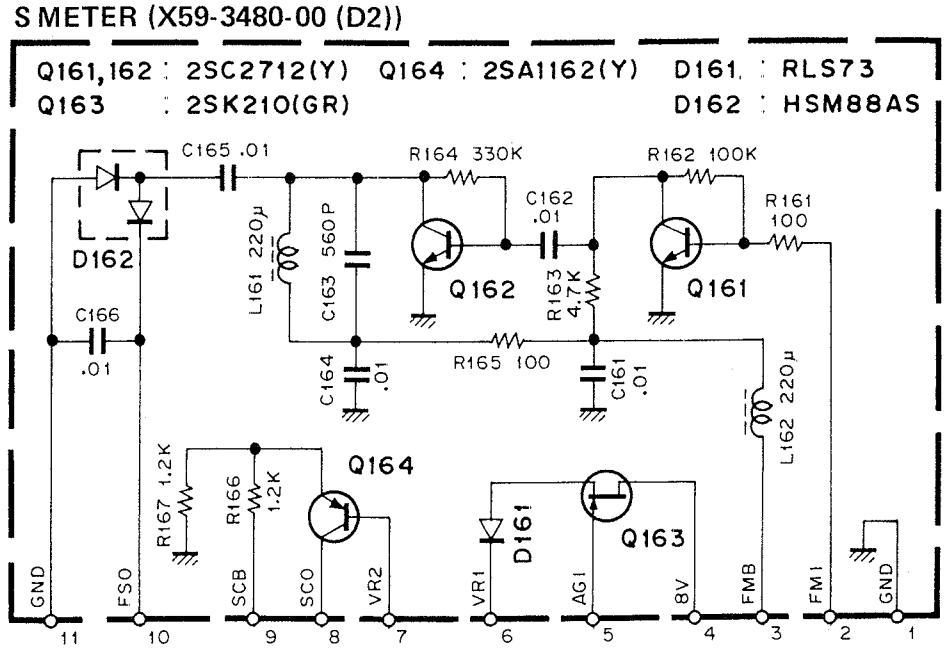
Q61,62 : 2SC2712(Y) Q64 : 2SA1162(Y) D61 : RLS73
Q63 : 2SK210(GR) D62 : HSM88AS



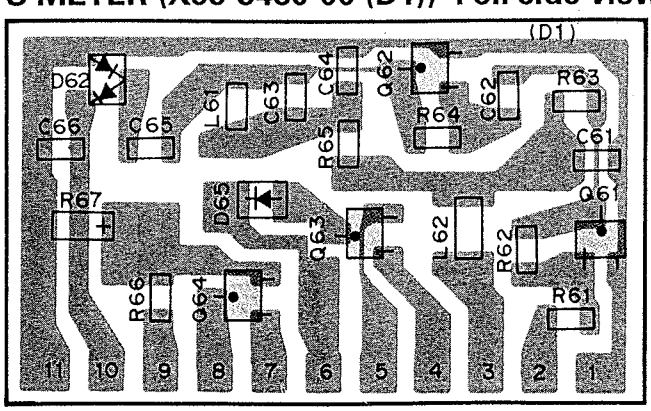
S METER (X59-3480-00 (D2))

S METER (X59-3480-00 (D2))

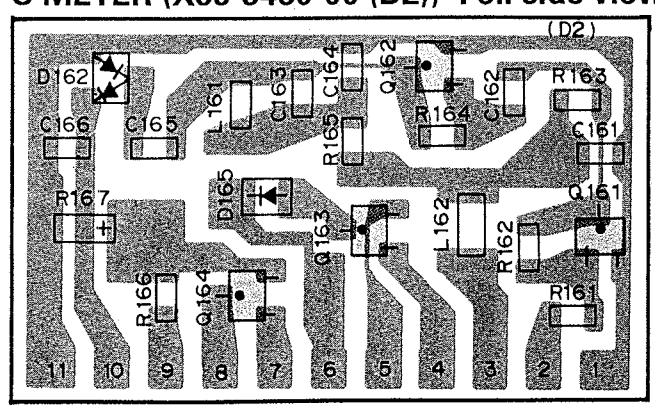
Q161,162 : 2SC2712(Y) Q164 : 2SA1162(Y) D161 : RLS73
Q163 : 2SK210(GR) D162 : HSM88AS



S METER (X59-3480-00 (D1)) Foil side view



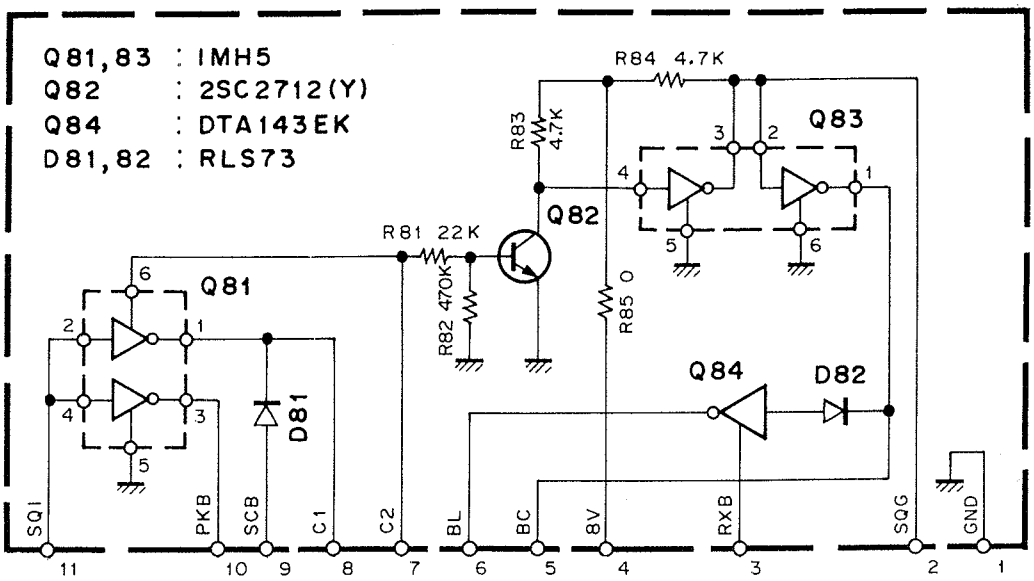
S METER (X59-3480-00 (D2)) Foil side view



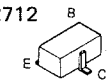
TS-790A/E PC BOARD VIEWS/CIRCUIT DIAGRAMS

SQL CONTROL (X59-3480-00 (E1))

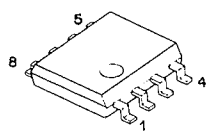
SQL CONTROL (X59-3480-00 (E1))



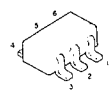
DTA114EK
DTA143EK
DTC124EK
2SA1162
2SC2712



NJM2903M

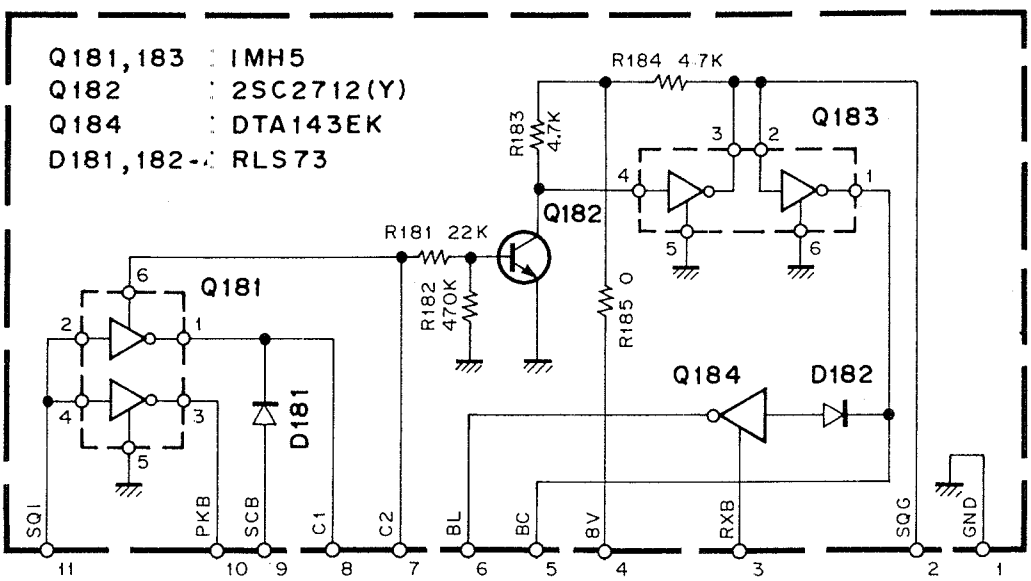


IMH5

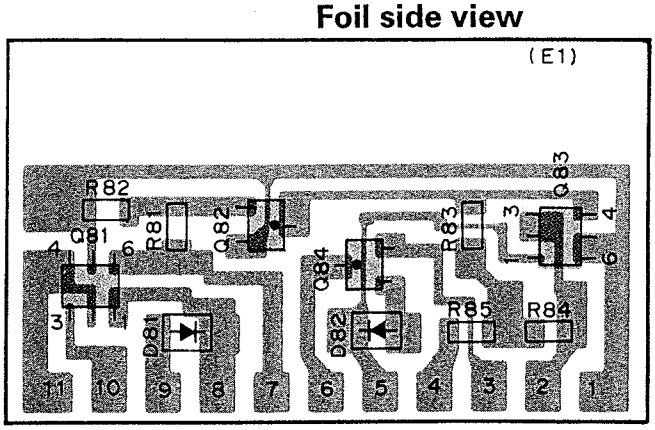


SQL CONTROL (X59-3480-00 (E2))

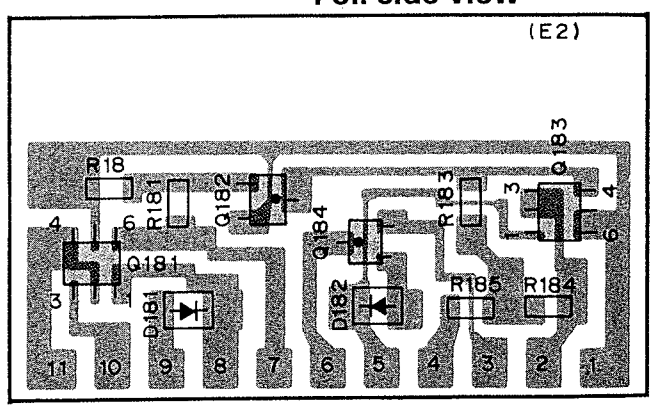
SQL CONTROL (X59-3480-00 (E2))



SQL CONTROL (X59-3480-00 (E1))
Foil side view



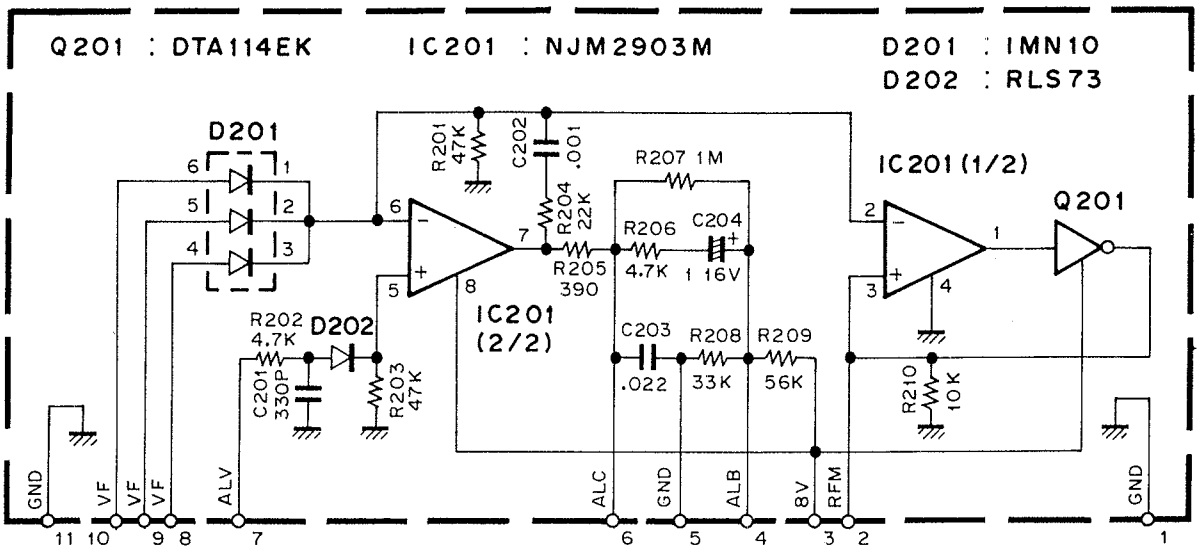
SQL CONTROL (X59-3480-00 (E2))
Foil side view



PC BOARD VIEWS/CIRCUIT DIAGRAMS TS-790A/E

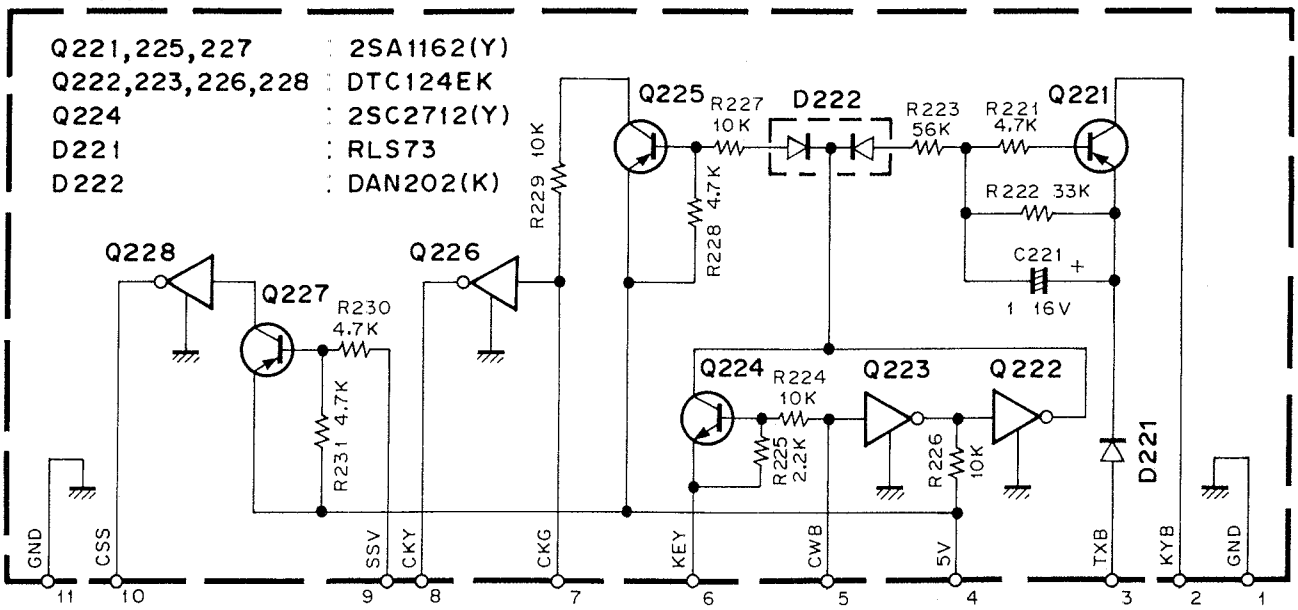
ALC (X59-3480-00 (F))

ALC (X59-3480-00 (F))

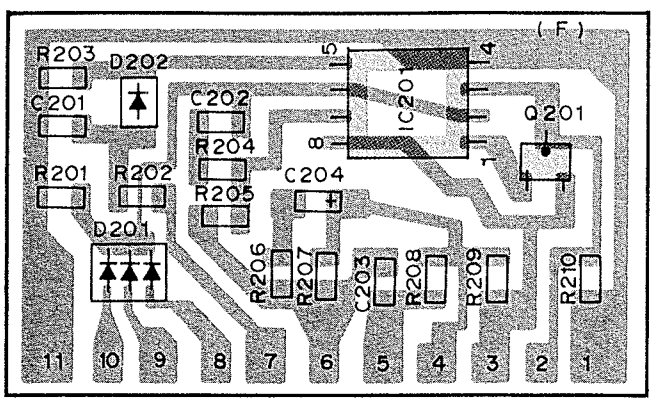


STBY (A) (X59-3480-00 (G))

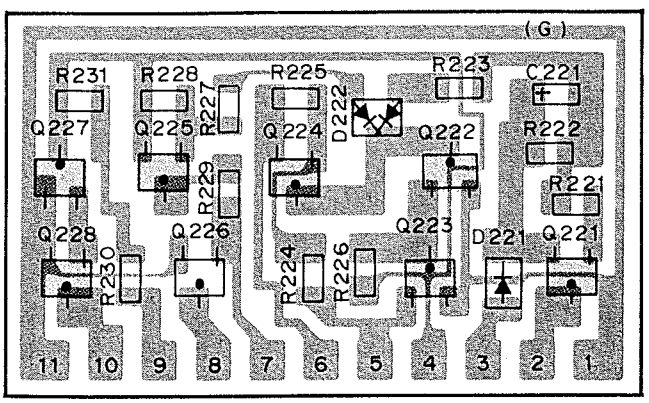
STBY (A) (X59-3480-00 (G))



ALC (X59-3480-00 (F)) Foil side view



STBY (A) (X59-3480-00 (G)) Foil side view

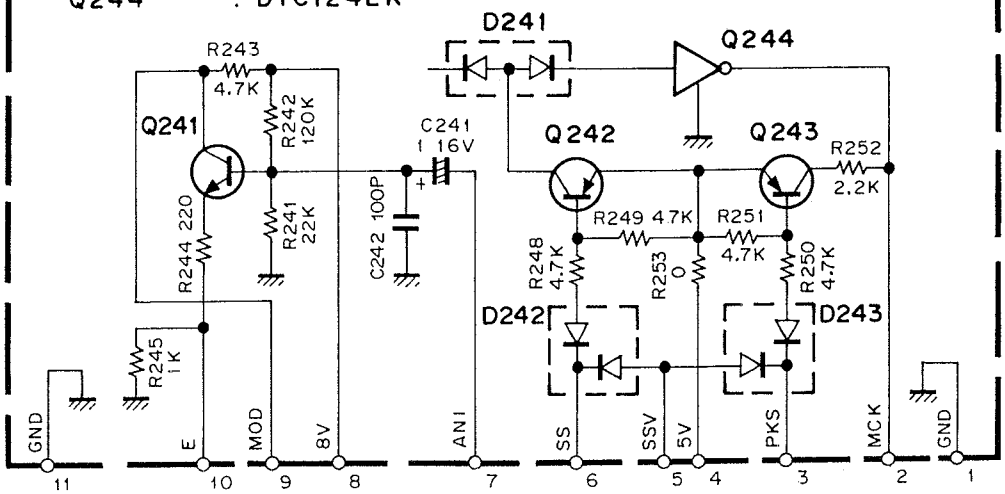


TS-790A/E PC BOARD VIEW/CIRCUIT DIAGRAM

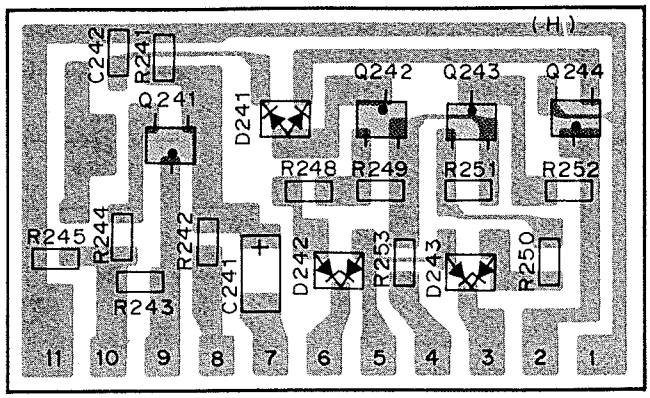
STBY (B) (X59-3480-00 (H))

STBY (B) (X59-3480-00 (H))

Q241 : 2SC2712(Y)
Q242,243 : 2SA1162(Y)
Q244 : DTC124EK
D241 : DAP202(K)
D242,243 : DAN202(K)

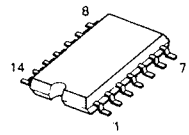


STBY (B) (X59-3480-00 (H)) Foil side view

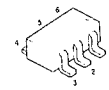


DTC124EK
2SA1162
2SC2712

TC4011BF
TC4066BF



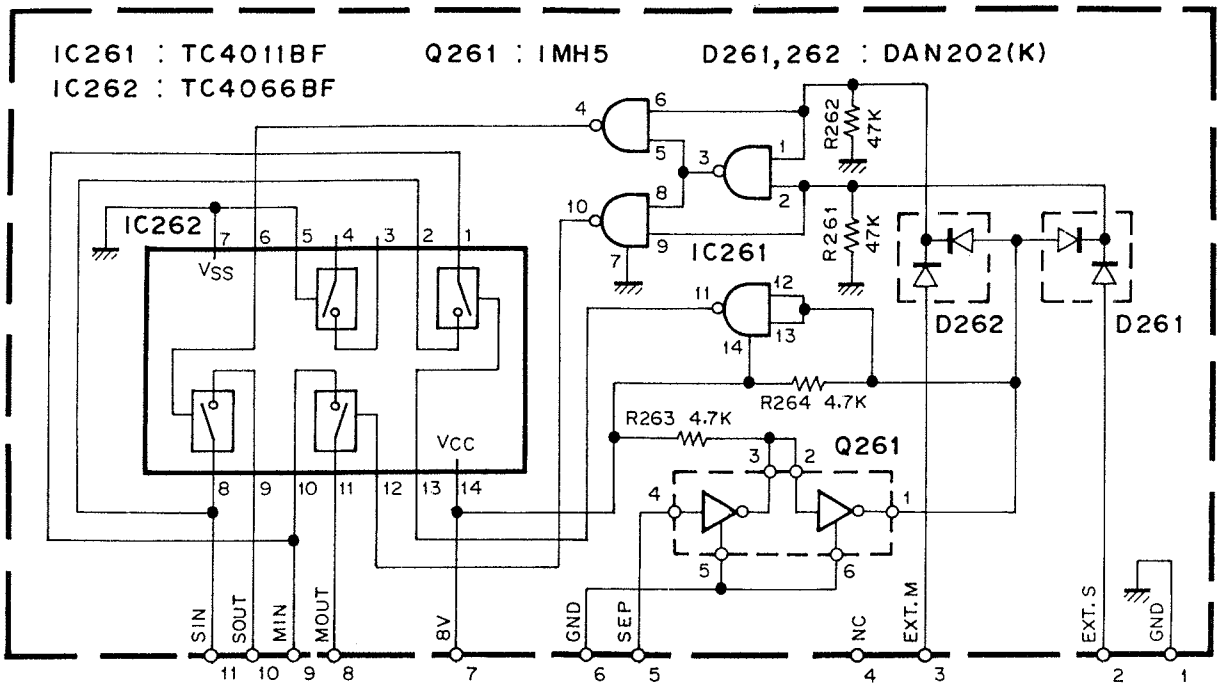
IMH5



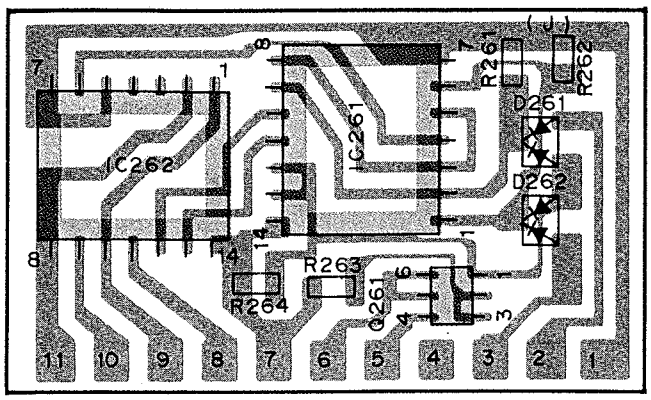
PC BOARD VIEW/CIRCUIT DIAGRAM TS-790A/E

SP SEP (X59-3480-00 (J))

SP SEP (X59-3480-00 (J))



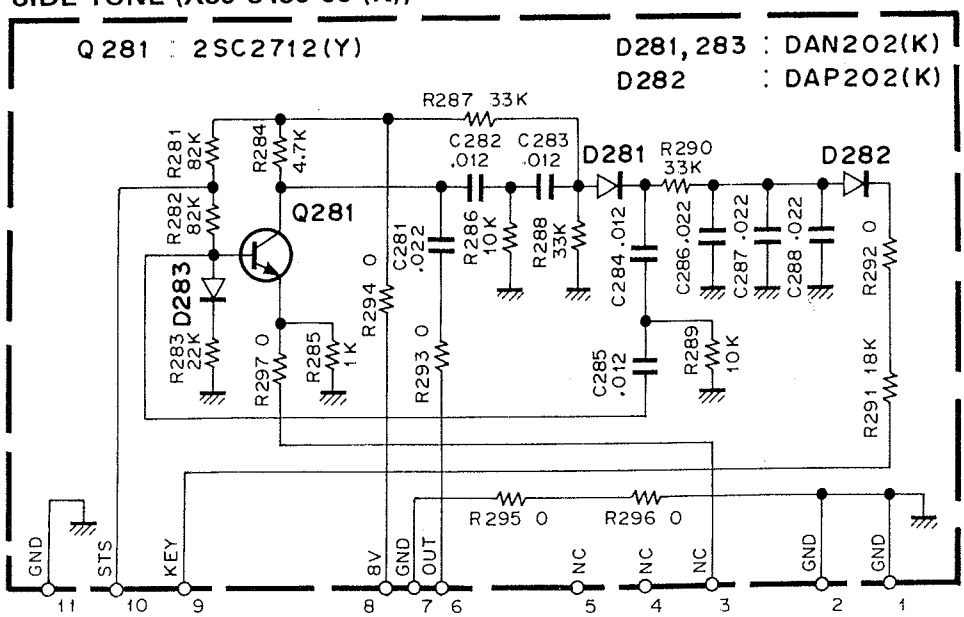
SP SEP (X59-3480-00 (J)) Foil side view



TS-790A/E PC BOARD VIEWS/CIRCUIT DIAGRAMS

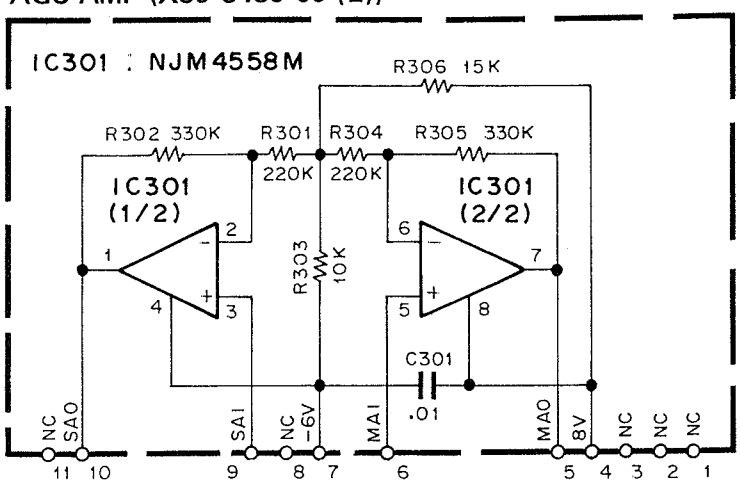
SIDE TONE (X59-3480-00 (K))

SIDE TONE (X59-3480-00 (K))

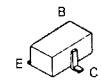


AGC AMP (X59-3480-00 (L))

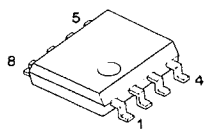
AGC AMP (X59-3480-00 (L))



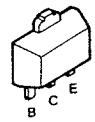
DTA124EK
DTC124EK
2SC2712



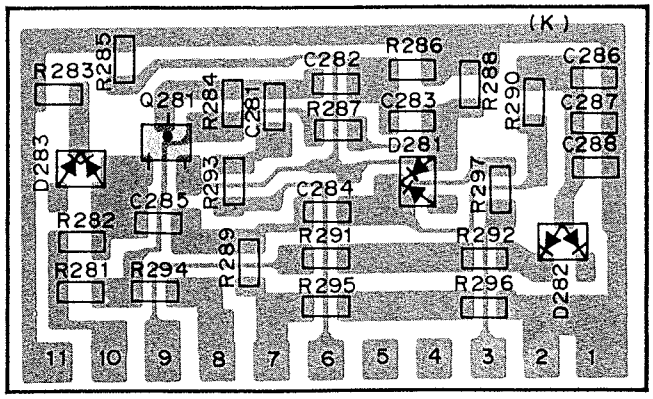
NJM4558M



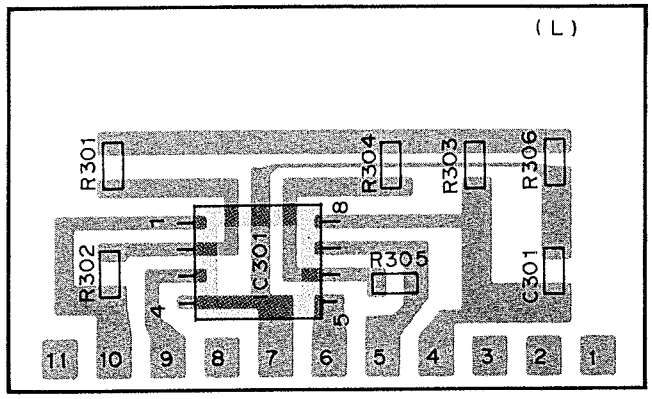
2SA1213



SIDE TONE (X59-3480-00 (K)) Foil side view

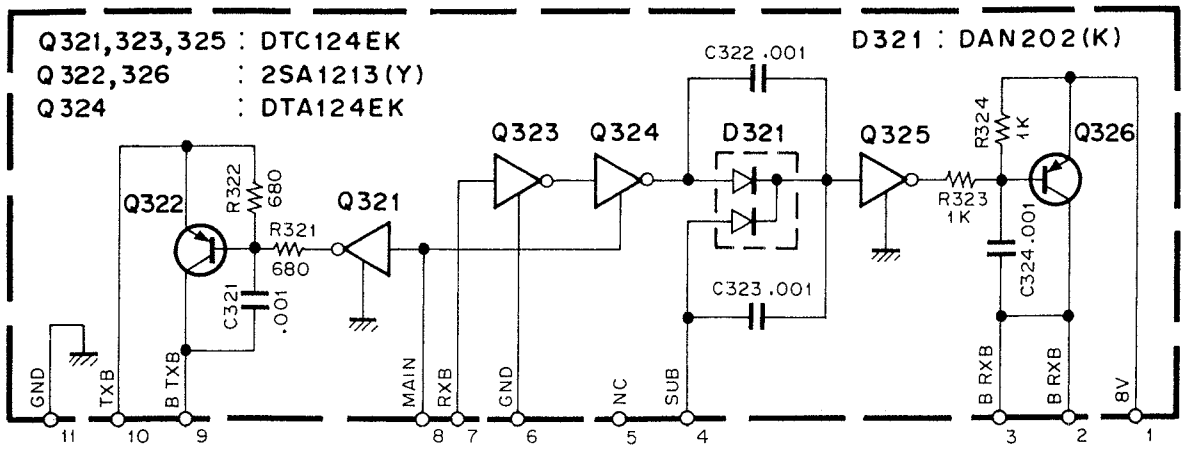


AGC AMP (X59-3480-00 (L)) Foil side view



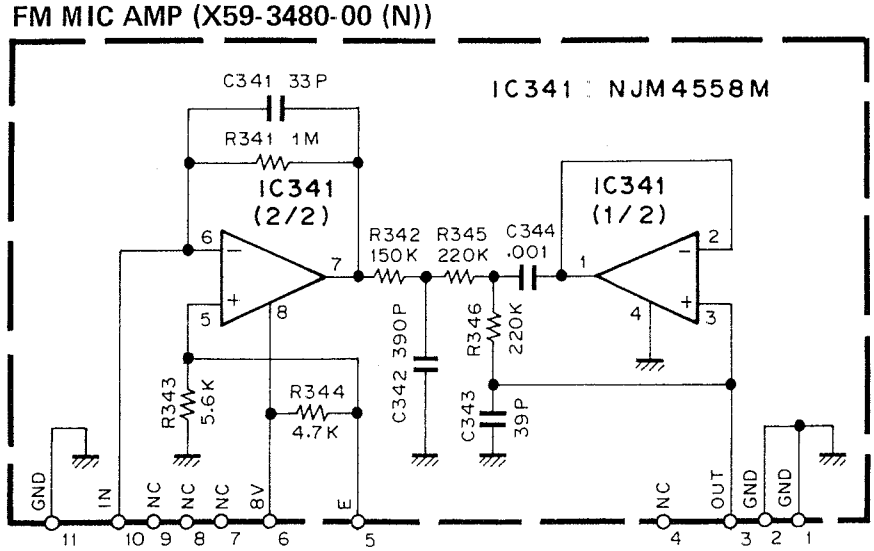
BAND SW (X59-3480-00 (M))

BAND SW (X59-3480-00 (M))



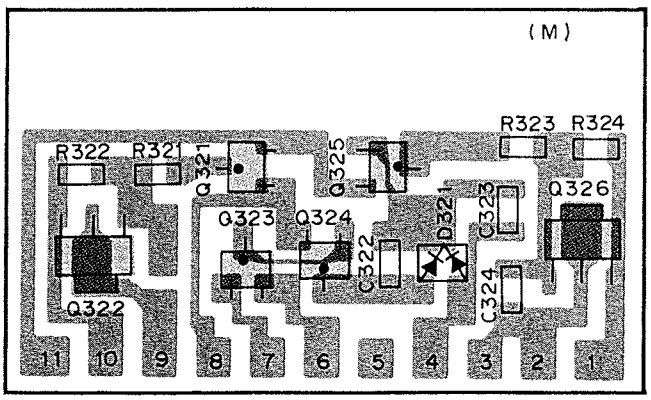
AF MIC AMP (X59-3480-00 (N))

FM MIC AMP (X59-3480-00 (N))



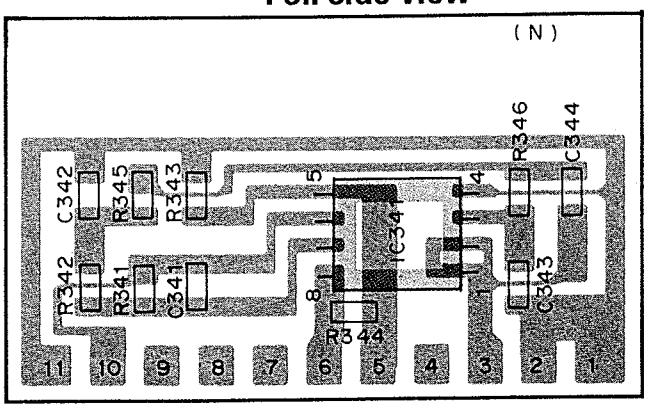
BAND SW (X59-3480-00 (M))

Foil side view



FM MIC AMP (X59-3480-00 (N))

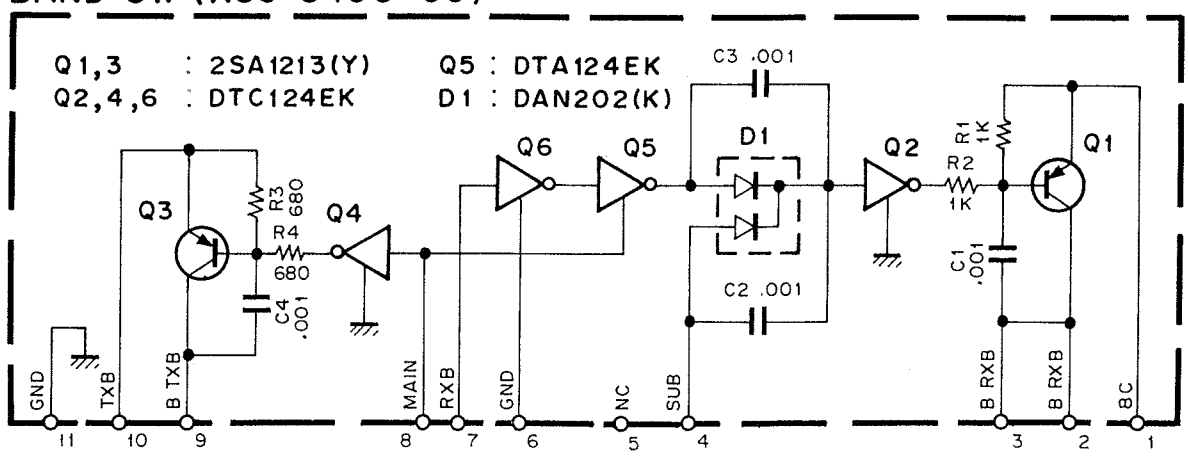
Foil side view



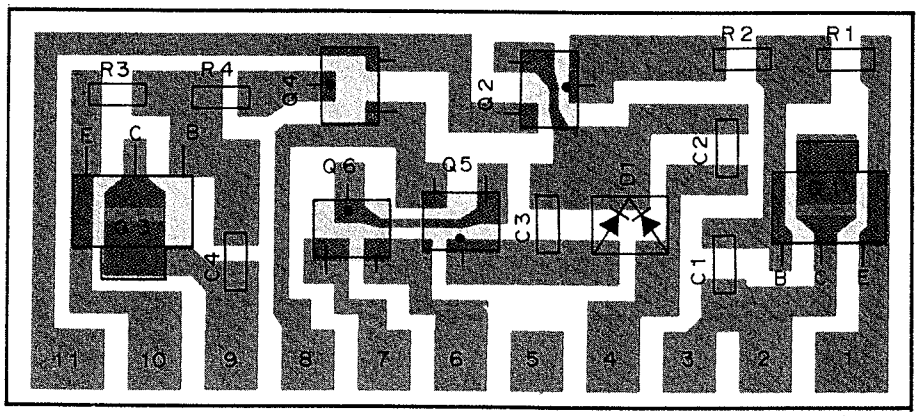
TS-790A/E PC BOARD VIEW/CIRCUIT DIAGRAM

BAND SW (X59-3490-00)

BAND SW (X59-3490-00)

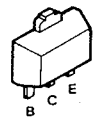


BAND SW (X59-3490-00) Foil side view



DTA124EK
DTC124EK

2SA1213



SCHEMATIC DIAGRAM TS-790A/E

CONTROL UNIT
(X53-3120-XX)
-11: TS-790A(K)
-21: TS-790A(M1)
-22: TS-790A(M2)
-61: TS-790E(T,W)

SW UNIT (X41-3050-00) (D/7)

SW UNIT (X41-3050-00)(E/7)

SW UNIT (X41-3050-00)(B/7)

SW UNIT (X41-3050-00)(C/7)

LCD MODULE ASS'Y

SW UNIT (X41-3050-00)(A/7)

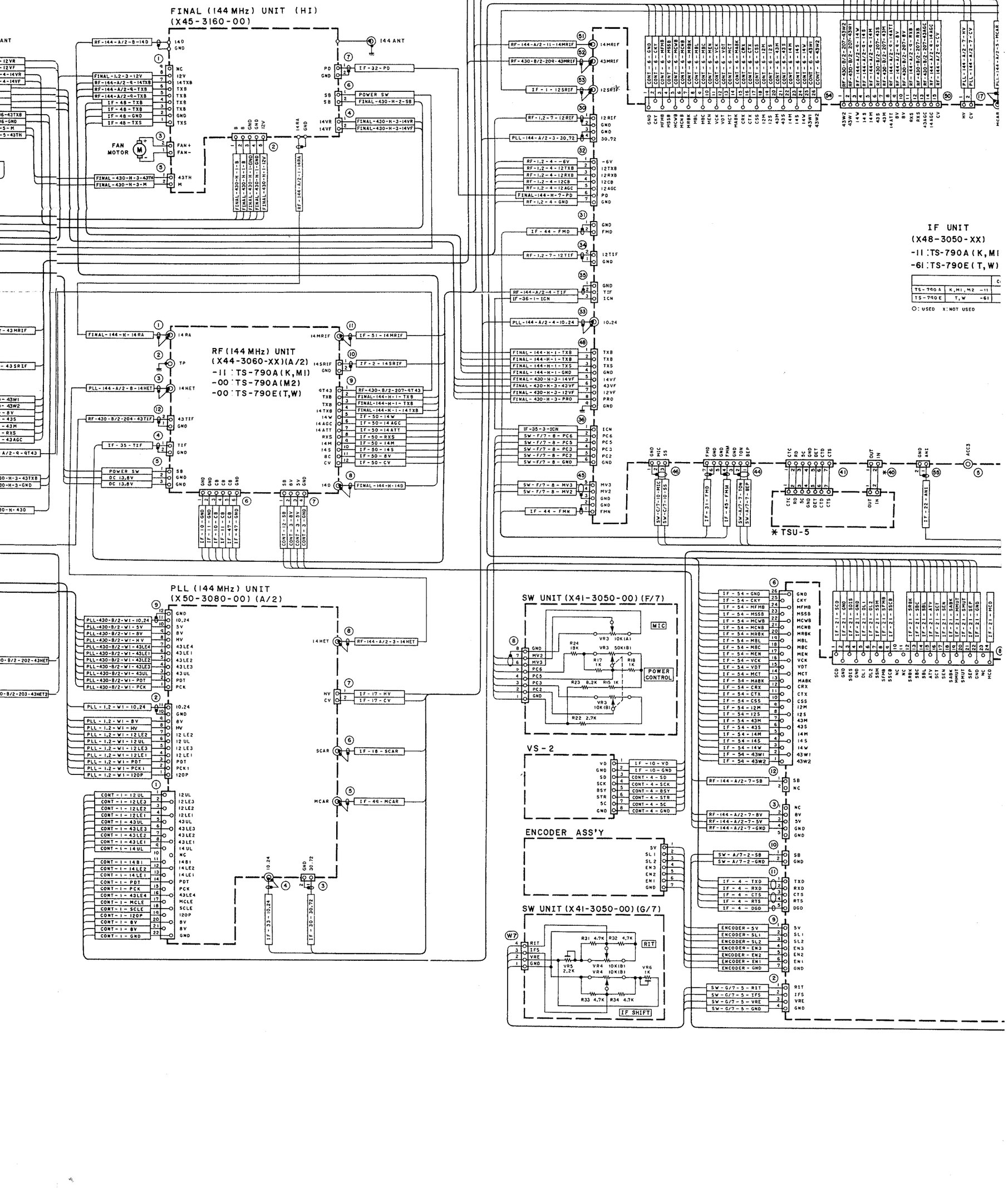
S METER

EXT. M

EXT. S

SP

* TSU-5


FINAL (144 MHz) UNIT (HI)
(X45-3160-00)
RF (144 MHz) UNIT
(X44-3060-XX)(A/2)
-11 : TS-790A(K,MI)
-00 : TS-790A(M2)
-00 : TS-790E(T,W)
PLL (144 MHz) UNIT
(X50-3080-00) (A/2)
SW UNIT (X41-3050-00) (F/7)
VS-2
ENCODER ASS'Y
SW UNIT (X41-3050-00) (G/7)
IF UNIT
(X48-3050-XX)
-11 : TS-790A(K,MI
-61 : TS-790E(T,W)
TS-790A K,MI,M2 -11
TS-790E T,W -61
O: USED X: NOT USED
* TSU-5
FAN MOTOR
POWER SW
POWER CONTROL
MIC
IF SHIFT
144 ANT

(X60-3040-21) (OPTION)

FINAL (1.2GHz) UNIT
(X45-3150-00)

IC101 IC102

W1 12D
12V 12V B B
12VF 12VR GND 12TXB 12RXB -6V SB
FAN+ FAN-
FAN MOTOR
W2 12RA
12ANT

RF (1.2GHz) UNIT
(X44-3070-00)

12RA
-6V 12RXB 12TXB
12HET
-6V 12TXB 12RXB 12CB 12AGC 12V GND
12D
12HET2
GND 12RIF NC GND 12TIF
12IF J1

PLL (1.2GHz) UNIT
(X50-3090-21)

12HET
W1 12OP PCK PDT 12LE1 12LE3 12UL 12LE2 HV 8V GND 10.24
12HET2

-6V 12TXB 12RXB 12CB 12AGC 12V GND SB GND 12RIF NC GND 12TIF 12VR 12VF B B
IF-32--6V
IF-32-12TXB
IF-32-12RXB
IF-32-12CB
IF-32-12AGC
IF-32-GND
FINAL-144-H-1-12V
POWER SW
IF-30-12RIF
IF-34-12TIF
FINAL-430-H-3-12VR
FINAL-430-H-3-12VF
FINAL-430-H-1-B
FINAL-430-H-1-B

12OP PCK PDT 12LE1 12LE3 12UL 12LE2 HV 8V GND 10.24
PLL-144-A/2-2-12OP
PLL-144-A/2-2-PCK
PLL-144-A/2-2-PDT
PLL-144-A/2-2-12LE1
PLL-144-A/2-2-12LE3
PLL-144-A/2-2-12UL
PLL-144-A/2-2-12LE2
PLL-144-A/2-2-HV
PLL-144-A/2-2-8V
PLL-144-A/2-2-10.24

FINAL (430MHz) UNIT (HI)
(X45-3170-00)

430 ANT
12VR 12VF 14VR 14VF PRO 12VF 43VF 14VF 43TXB GND M 43TH TH GND
FINAL-1.2-2-12VR
FINAL-1.2-2-12VF
FINAL-144-H-4-14VR
FINAL-144-H-4-14VF
IF-48-PRO
IF-48-12VF
IF-48-43VF
IF-48-14VF
RF-430-B/2-206-43TXB
RF-430-B/2-206-GND
FINAL-144-H-5-M
FINAL-144-H-5-43TH
TH

430 GND GND GND 12V B B B B B
RF-430-B/2-205-430
FINAL-144-H-2-GND
FINAL-144-H-2-GND
FINAL-144-H-2-12V
FINAL-144-H-2-B
FINAL-144-H-2-B
FINAL-1.2-3-B

POWER SW

SB B B
RF-144-A/2-5-SB
FINAL-144-H-6-SB
DC13.8V
470P 470P

43RA GND
RF-144-A/2-5-GND
RF-430-B/2-201-430

FINAL-430-H-43RA
PLL-430-B/2-50-43HET
PLL-430-B/2-51-43HET2
900MHz ANT
TP201 A
TP202 GND
RF-144-A/2-12-43TIF

RF (430MHz) UNIT
(X44-3060-XX)(B/2)
-11: TS-790A(K,M1)
-00: TS-790A(M2)
-00: TS-790E(T,W)

TP TP TP TP

43RA 43HET 43HET2 43TIF GND

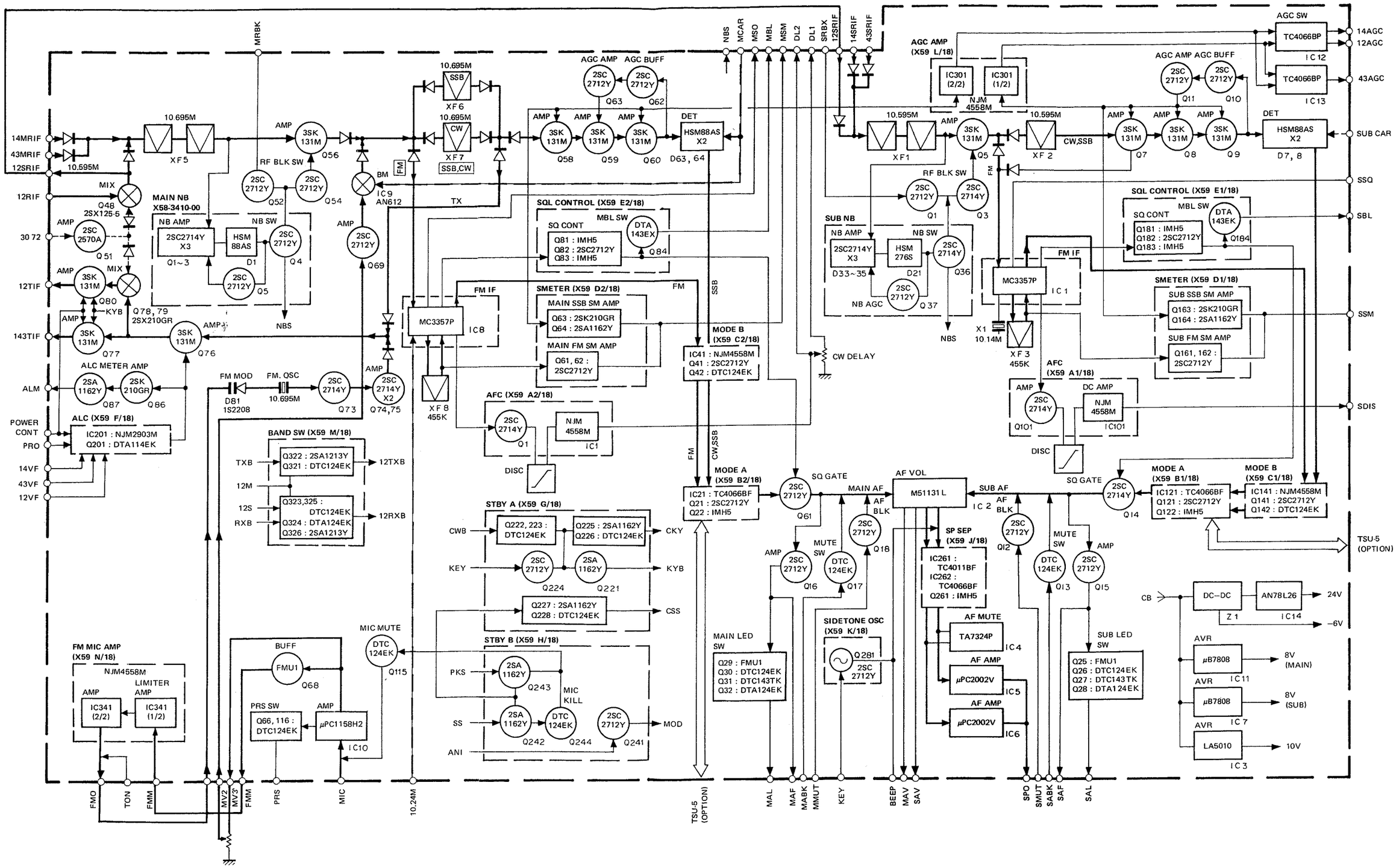
43MRIF
IF-52-43MRIF
43SRIF GND
IF-2-43SRIF
43WI 43W2 8C 43S 43M RXS 43AGC NC QT43
IF-50-43WI
IF-50-43W2
IF-50-8V
IF-50-43S
IF-50-43M
IF-50-RXS
IF-50-43AGC
RF-144-A/2-9-QT43
43TXB GND
FINAL-430-H-3-43TXB
FINAL-430-H-3-GND
430
FINAL-430-H-430

PLL (430MHz) UNIT
(X50-3080-00)(B/2)

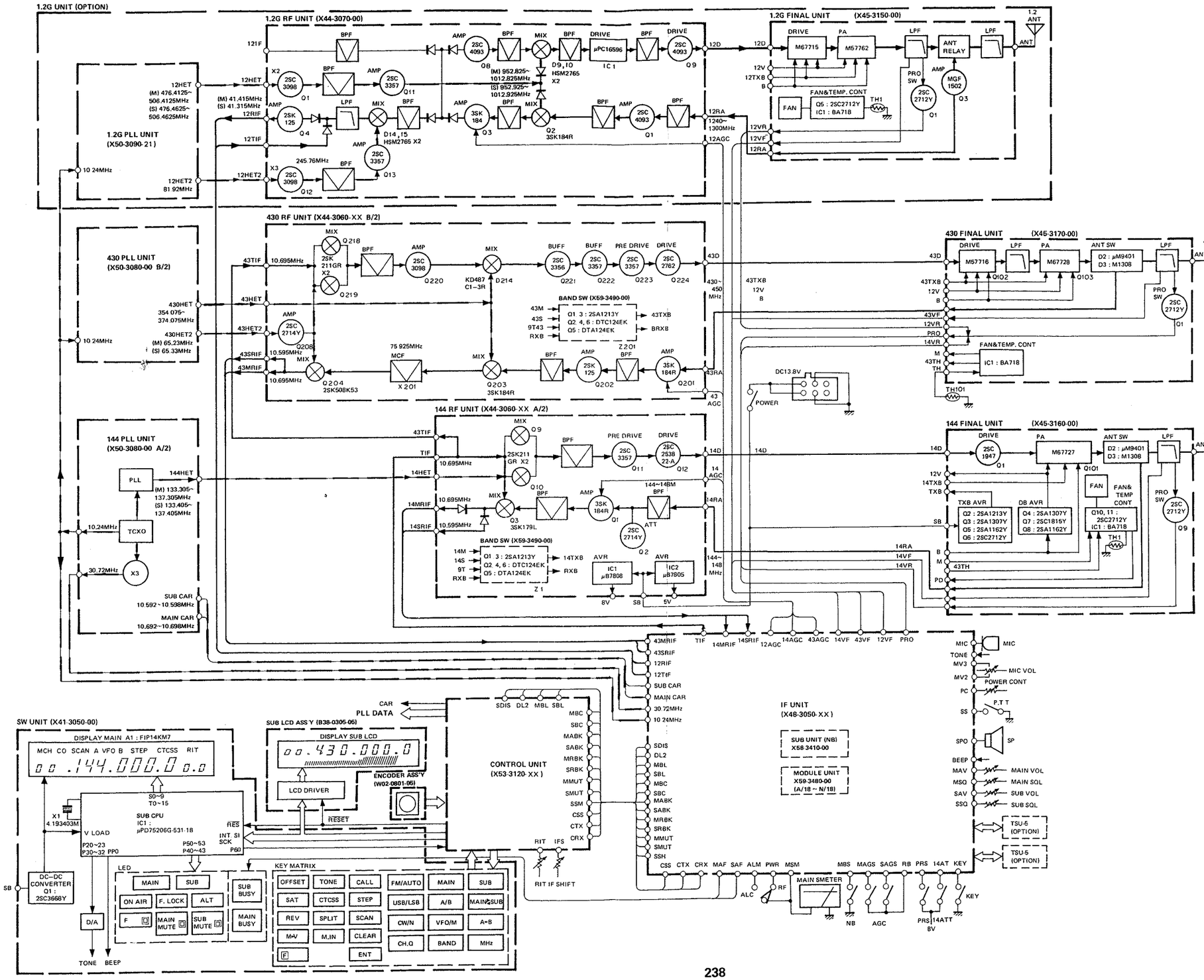
W1
PLL-144-A/2-9-PCK1 PLL-144-A/2-9-PDT PLL-144-A/2-9-43UL PLL-144-A/2-9-43LE3 PLL-144-A/2-9-43LE2 PLL-144-A/2-9-43LE1 PLL-144-A/2-9-43LE4 PLL-144-A/2-9-HV PLL-144-A/2-9-8V PLL-144-A/2-9-5V PLL-144-A/2-9-10.24
PCK PDT 43UL 43LE3 43LE2 43LE1 43LE4 HV 8V 5V 10.24 GND

43HET
RF-430-B/2-202-43HET
43HET2
RF-430-B/2-203-43HET2

BLOCK DIAGRAM

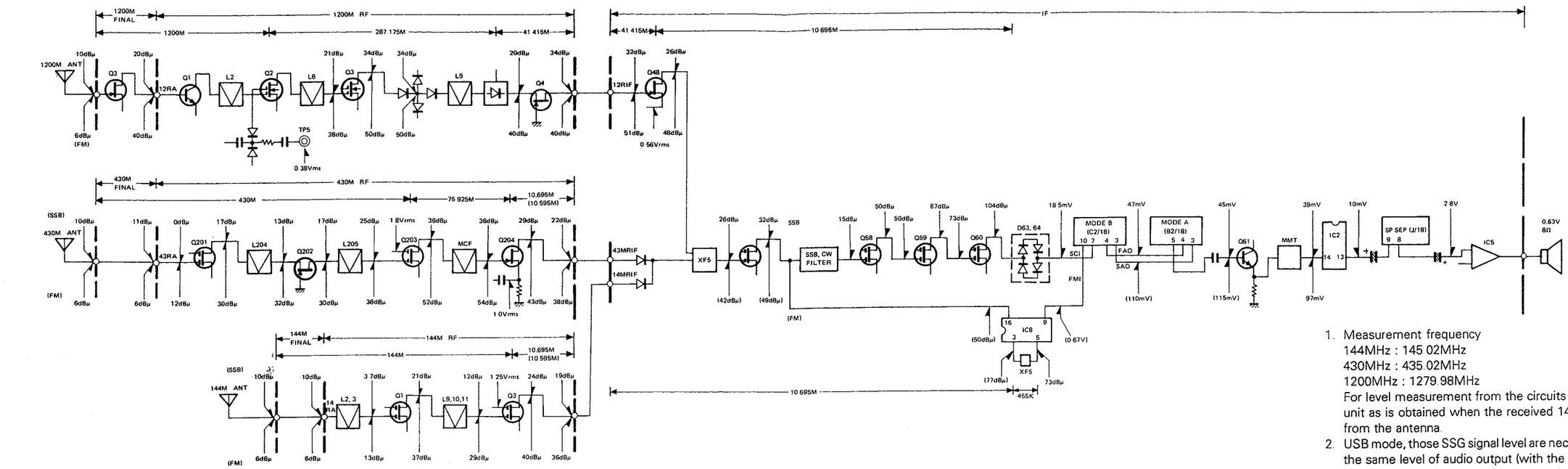


BLOCK DIAGRAM



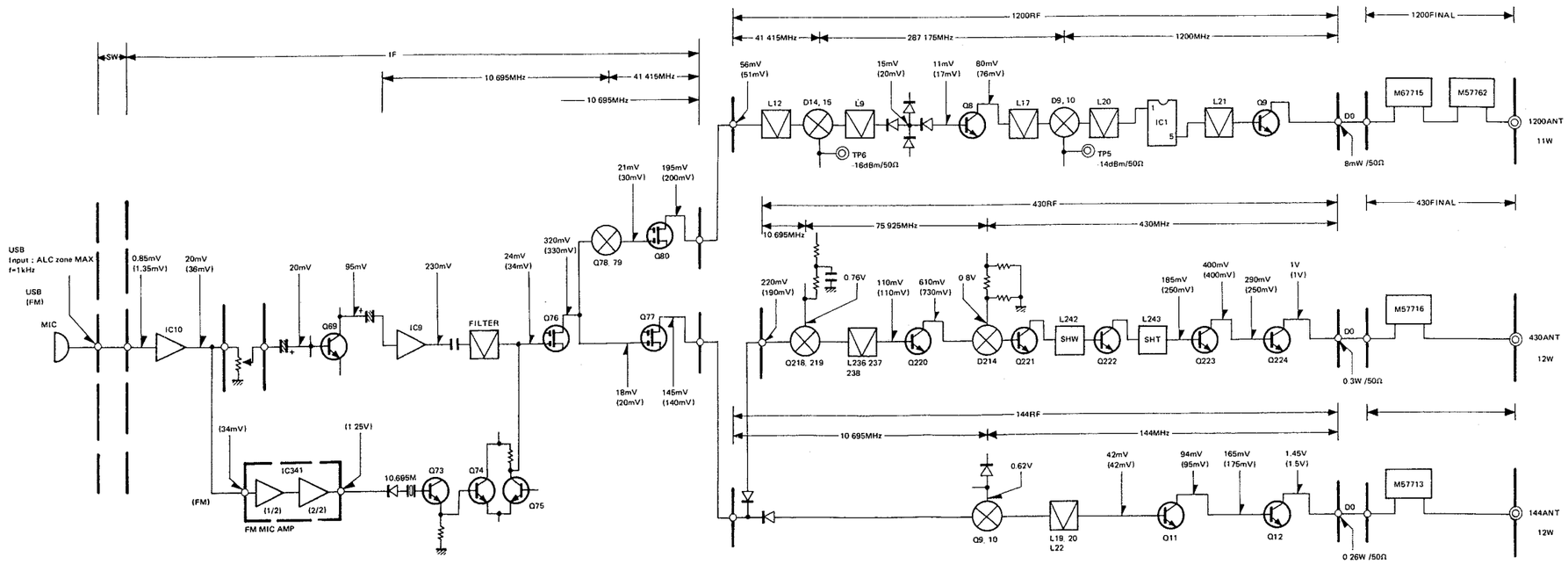
LEVEL DIAGRAM

RX SECTION



1. Measurement frequency
   144MHz : 145.02MHz
   430MHz : 435.02MHz
   1200MHz : 1279.98MHz
   For level measurement from the circuits following the XF5 of IF unit as is obtained when the received 144MHz signal is applied from the antenna.
2. USB mode, those SSG signal level are necessary in order to obtain the same level of audio output (with the AF volume fixed) when 0.63V/8Ω audio signals are obtained (using the AF GAIN VR) from 145.02MHz, 435.02MHz and 1279.98MHz, –6dBμ or –10dBμ signal input from antenna.
3. For FM mode, this SSG signal level is necessary in order to obtain the dame level audio output as is obtained when the S meter reading of 0dBμ or 6dBμ signal is applied from the antenna.
4. The level of output from the circuits following the ring detector and FM demodulator is the same as the AF output level (MOD : 1kHz).
5. SSG output was measured using a 0.01μF capacitor.

TX SECTION



1. IF unit : 144MHz transmit mode
   For level measurement from the circuits following the Q78 and Q79 as is obtained when the transmit mode.
2. In IF and RF sections, measurements are taken by an RF VTVM in the FM mode.
   In AF section, it is taken by an AF VTVM in the USB mode
   For level measurement before pin DO in the RF unit, the coaxial cable connected to pin DO is disconnected and then the 50Ω dummy connected in the RF unit.
3. The audio input voltage in the USB mode, is a 1kHz signal tone which gives a nearly full scale reading within the ALC range.
   In the FM mode, it is that which gives the standard modulation degree (±3kHz deviation).

PS-31 (DC POWER SUPPLY)

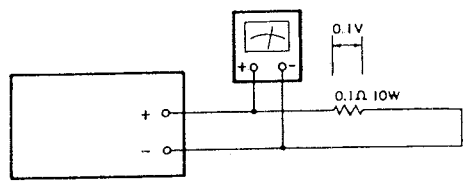
PS-31 SPECIFICATIONS

VERSIONS / SPECIFICATIONS	PS-31		
	U.S.A.	Europe and General markets	U.K. and Oceania
Power requirements	120 VAC ± 10%, 60 Hz	*120/220 ~ 240 VAC ± 10%, 50/60 Hz	240 VAC ± 10%, 50/60 Hz
Output voltage	13.8 VDC (Reference)		
Rated output current	20 A (25% duty cycle) 15 A (50% duty cycle)		
Output voltage regulation	Within ± 0.7 V (at 120/220 ~ 240 VAC ± 10% variation with 15A) Within ± 0.7 V (at load current variation from 2 to 15A)		
Ripple voltage	Less than 20 mVrms (at 13.8 VDC/15A)		
Power consumption	Approx. 500 W (at 13.8 VDC/20A)		
Dimensions (W × H × D) Dimensions in [ ] include projections.	180 × 120 × 310 mm [183 × 134 × 343 mm] 6-27/32" × 4-23/32" × 12-7/32" [7-7/32" × 5-9/32" × 13-1/2"]		
Weight	Approx. 7.9 kg (17.4 lbs)		

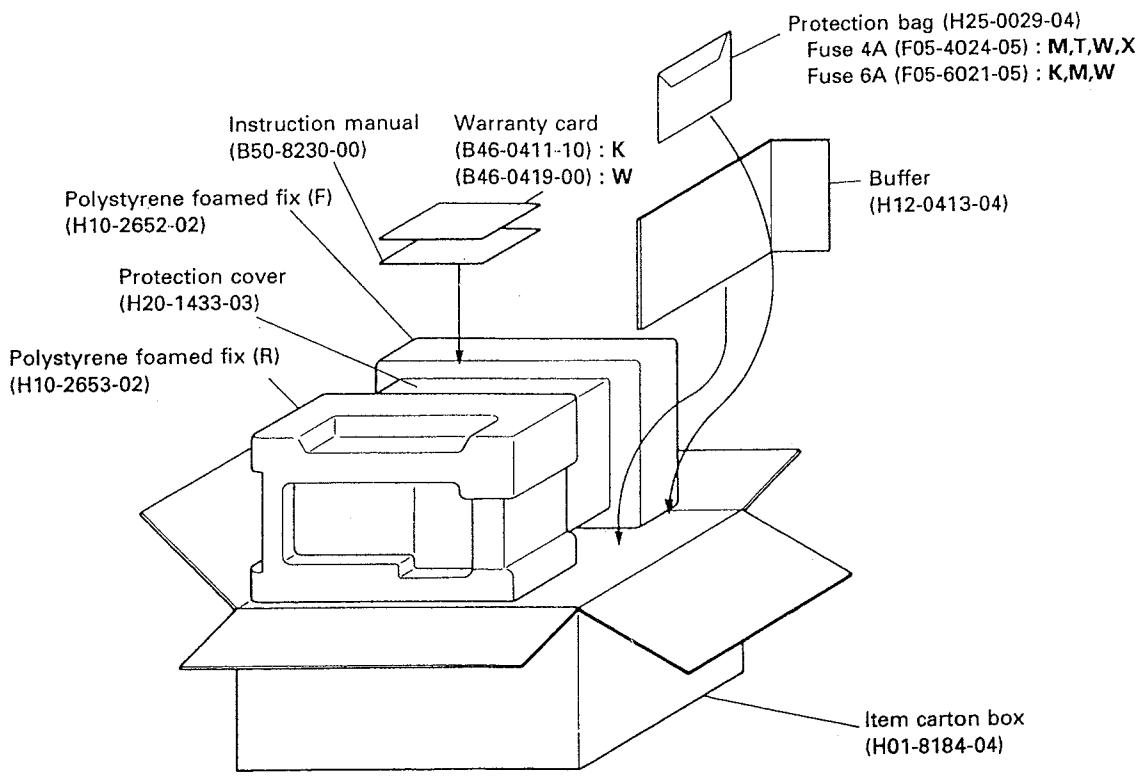
NOTES:
1. Rating are subject to change without notice due to advancements in technology
2. *: Switchable. AC voltage is preset to 220 ~ 240 VAC at the factory.

PS-31 ADJUSTMENT

1. POWER : OFF
2. Connect the 0.1Ω 10W resistor to output terminal.
3. POWER switch is turned on, then adjust obtain the proper 0.1V voltage by VR2.



PS-31 PACKING

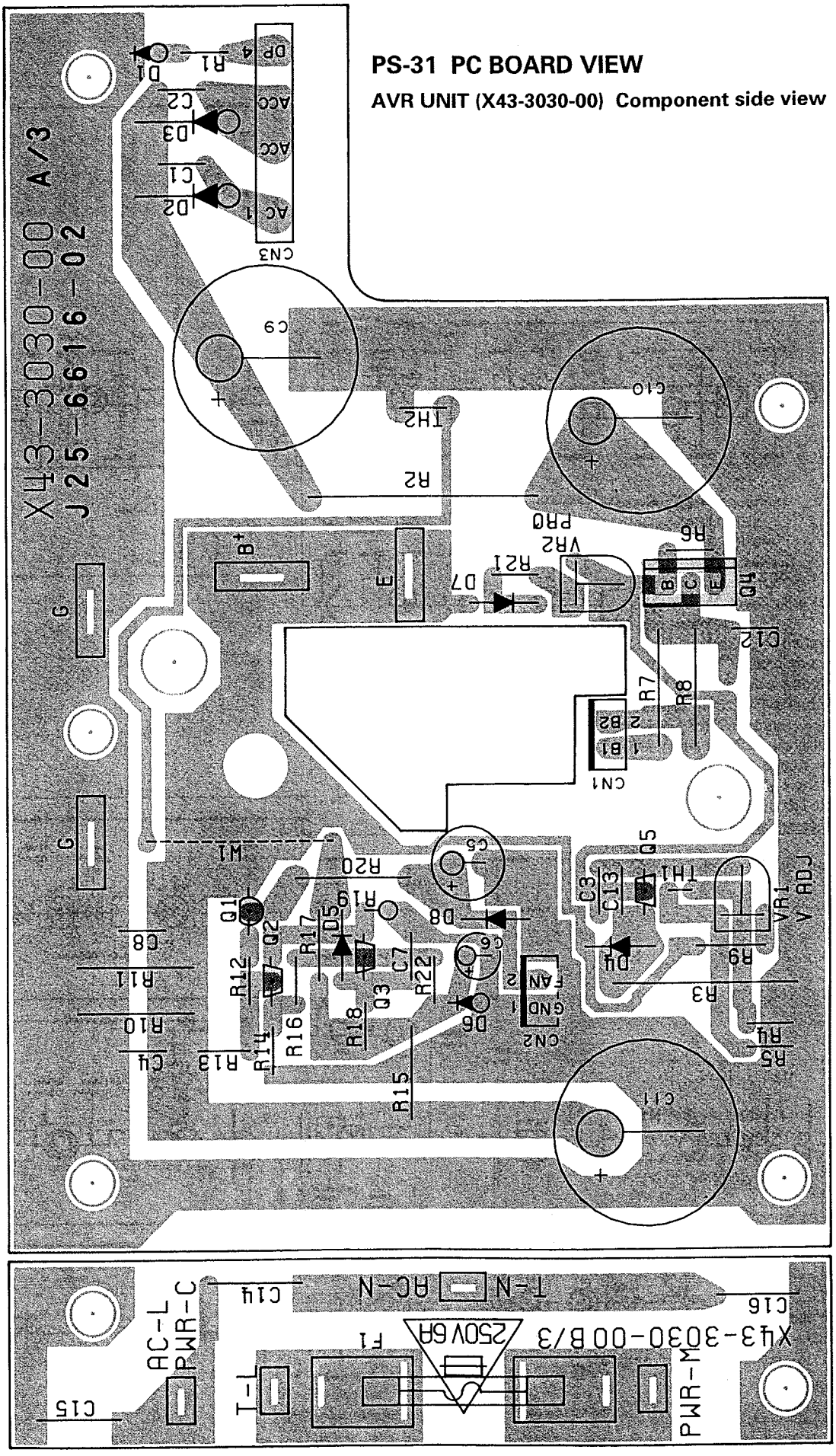


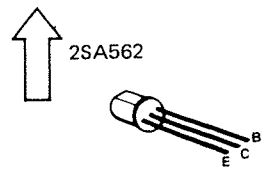
TS-790A/E

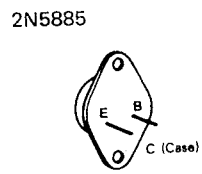
PS-31 (DC POWER SUPPLY)

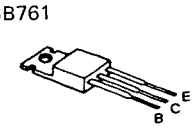
PS-31 PC BOARD VIEW

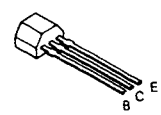
AVR UNIT (X43-3030-00) Component side view





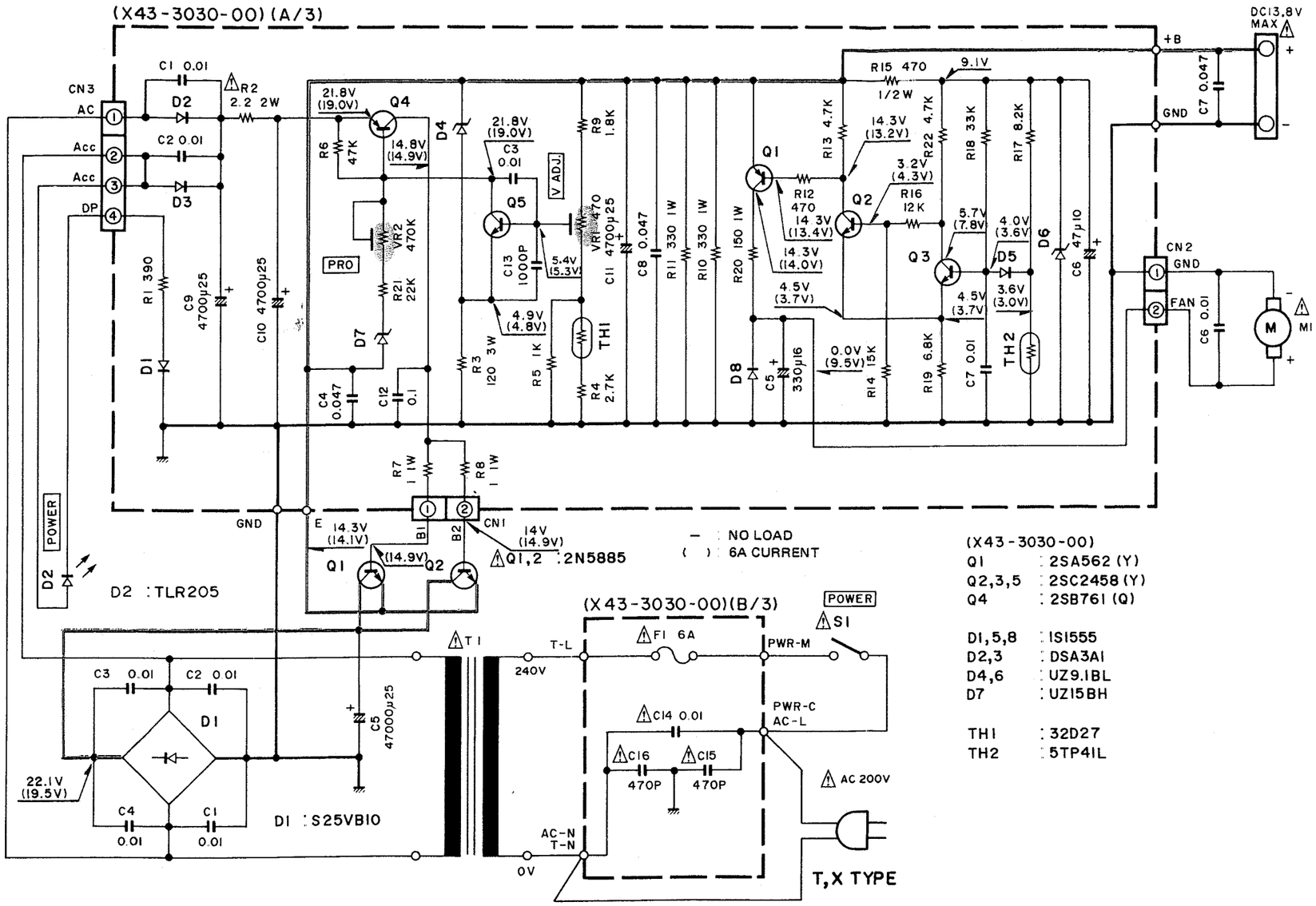


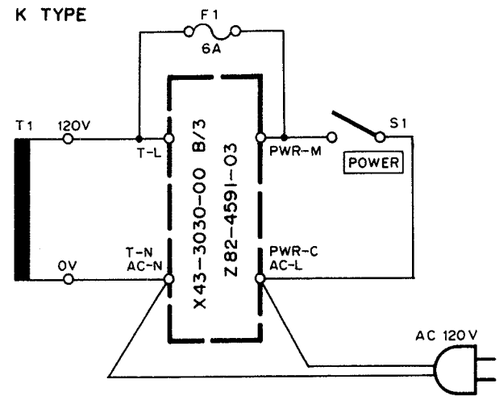


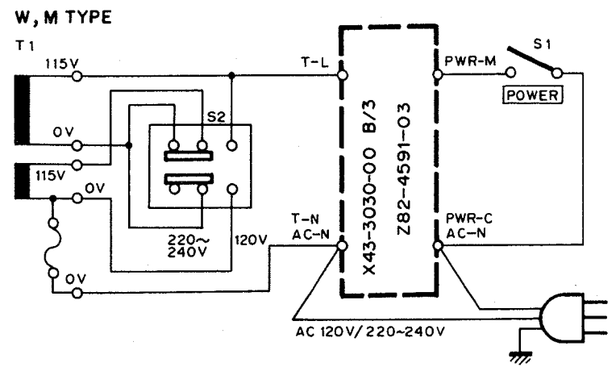


PS-31 (DC POWER SUPPLY)

PS-31 SCHEMATIC DIAGRAM







PS-31 (DC POWER SUPPLY)

PS-31 PARTS LIST

Ref. No.	New Parts	Parts No	Description
		PS-31	
	*	A01-1053-02	Case (Upper)
	*	A01-1054-02	Case (Lower) **K,T,X**
	*	A01-1055-02	Case (Lower) **M,W**
	*	A20-2658-03	Panel
	*	A23-1505-03	Rear panel **T,W**
	*	A23-1506-03	Rear panel **M,X**
	*	A23-1510-03	Rear panel **K**
	*	B40-3814-04	Model name plate (120V) **K**
	*	B40-3815-04	Model name plate (120/220V–240V) **M,W**
	*	B40-3843-04	Model name plate (240V) **T,X**
		B41-0660-04	Caution plate (LA) **K**
		B42-3301-04	Spec. plate (LA) **K**
		B42-3343-04	Serial plate
	*	B42-3345-04	Spec. plate (Voltage sel.) **M,W**
	*	B42-3346-04	Spec. plate (Fuse) **K**
	*	B42-3354-04	Spec. plate (Fuse) **M,W**
	*	B42-3355-04	Spec. plate (Earth) **T,W,X**
		B46-0411-00	Warranty card **K**
		B46-0419-00	Warranty card **W**
	*	B50-8230-00	Instruction manual
C1-4		CK45F1H103Z	Ceramic 0.01µF Z
C5	*	C90-2085-05	Electro 4700µF 25WV
C6		CK45F1H103Z	Ceramic 0.01µF Z
C7		CK45F1H473Z	Ceramic 0.047µF Z
		E20-0284-05	Terminal board (2P)
		E30-0185-05	AC cord **X**
		E30-0585-05	AC cord **W**
		E30-0602-05	AC cord **T**
		E30-2120-05	AC cord **K,M**
		E31-3373-15	Lead with terminal
		E31-3374-05	Lead with terminal
		E31-3375-05	Lead with terminal
		E31-3377-05	Lead with connector
		E31-3378-05	Lead with connector
		E31-3379-05	Lead with connector
	*	E31-3454-05	Lead with terminal
		F01-0962-13	Heat sink
F1		F05-4024-05	Fuse (4A) **M,T,W,X**
F1		F05-6021-05	Fuse (6A) **K,M,W**
		F09-0410-04	Fan
		F29-0436-05	Insulating bush (Q1, 2)
		G02-0549-04	Leaf spring (Fan)

Ref. No.	New Parts	Parts No	Description
	*	H01-8184-04	Item carton box
	*	H10-2652-02	Polystyrene foamed fix (F)
	*	H10-2653-02	Polystyrene foamed fix (R)
	*	H12-0413-04	Buffer
	*	H20-1433-03	Protection cover
		H25-0029-04	Protection bag (Fuse)
		H25-0105-04	Protection bag (AC cord)
		J02-0049-14	Foot (Rear)
		J02-0423-04	Foot (Front outside)
		J02-0424-04	Foot (Front inside)
		J13-0033-15	Fuse holder **K**
		J19-0306-05	Cord holder (Panel)
		J21-4153-14	Mounting hardware (Motor)
		J21-4179-04)	Mounting hardware (Electro)
	*	J21-4237-03	Mounting hardware (Fan)
		J42-0024-15	Cord bushing **K,M,X**
		J42-0085-05	Cord bushing **T,W**
		J61-0307-05	Wire band
		K29-0758-14	Push knob (POWER)
	*	L01-8331-05	Power transformer (120V) **K**
	*	L01-8332-05	Power transformer (240V) **T,X**
	*	L01-8335-05	Power transformer (120/220V–240V) **M,W**
		N09-0372-04	Screw (Pulley)
		N09-0658-04	Round head screw (Leaf spring)
		N09-2033-04	Bind head screw (Transistor)
	*	N09-2050-05	Round head screw (Earth) **T,W,X**
		N14-0535-04	Hex. nut (Transistor)
		N16-0040-46	Spring washer (Diode)
		N19-0642-04	Flat washer (Transistor)
		N30-2604-46	Round head screw (Motor mounting hardware)
		N30-4018-46	Round head screw (Diode)
		N33-3008-41	Flat head screw
		N33-4008-41	Flat head screw (Trans)
		N50-3008-41	Bind head taptite screw (Voltage selector) **M,W**
		N87-3006-46	Brazier head taptite screw
		N87-3014-46	Brazier head taptite screw (AVR)
		N87-4008-45	Brazier head taptite screw (Terminal board)
		N87-4010-46	Brazier head taptite screw (Foot)
		N88-3008-46	Flat head taptite screw (POWER SW)

PS-31 (DC POWER SUPPLY)

Ref. No.	New Parts	Parts No.	Description
S1		S40-1416-05	Push switch (POWER)
S2		S31-2126-05	Slide switch (Voltage sel.) M,W
M1		T42-0302-05	Fan motor
D1		S25BV10	Diode
D2		TLR205	LED
Q1, 2		2N5885	Transistor
		X43-3030-00	AVR unit
AVR UNIT (X43-3030-00)			
C1~3		CK45F1H103Z	Ceramic 0.01μF Z
C4*		CK45F1H473Z	Ceramic 0.047μF Z
C5		CE04EW1C331M	Electro 330μF 16WV
C6		CE04EW1A470M	Electro 47μF 10WV
C7		CK45F1H103Z	Ceramic 0.01μF Z
C8		CK45F1H473Z	Ceramic 0.047μF Z
C9~11		C90-0814-05	Electro 4700μF 25WV
C12		CQ92M1H104K	Myler 0.1μF K
C13		CK45B1H102K	Ceramic 1000pF K
C14		C91-0647-05	Ceramic 0.01μF P
C15,16		C91-1075-05	Ceramic 470pF K
		E23-0022-04	Terminal
		E23-0462-05	Tab terminal
CN1,2		E40-3237-05	Mini-connector (2P)
CN3		E40-0470-05	Pin ass'y (4P)
W1		E31-0302-05	Jumper wire
		F29-0072-05	Condenser cover
		J13-0055-05	Fuse holder
		J31-0502-14	Collar (PC board)
		J42-0428-05	Bushing (PC board)
R1		RD14BB2C391J	RD R 390 J 1/6W
R2		R92-1202-05	Fuse R 2.2 J 2W
R3		RS14KB3F121J	RS R 120 J 3W
R4		RD14BB2C272J	RD R 2.7k J 1/6W
R5		RD14BB2C102J	RD R 1.0k J 1/6W
R6		RD14BB2C473J	RD R 47k J 1/6W
R7,8		RS14KB3A010J	RS R 1.0 J 1W
R9		RD14BB2C182J	RD R 1.8k J 1/6W
R10,11		RS14KB3A331J	RS R 330 J 1/6W
R12		RD14BB2C471J	RD R 470 J 1/6W
R13		RD14BB2C472J	RD R 4.7k J 1/6W
R14		RD14BB2C153J	RD R 15k J 1/6W
R15		RS14KB2H471J	RS R 470 J 1/2W
R16		RD14BB2C123J	RD R 12k J 1/6W
R17		RD14BB2C822J	RD R 8.2k J 1/6W

Ref. No.	New Parts	Parts No	Description
R18		RD14BB2C333J	RD R 33k J 1/6W
R19		RD14BB2C682J	RD R 6.8k J 1/6W
R20		RS14KB3A151J	RS R 150 J 1/6W
R21		RD14BB2C223J	RD R 22k J 1/6W
R22		RD14BB2C472J	RD R 4.7k J 1/6W
VR1		R12-0094-05	Trimming pot. 470
VR2		R12-6012-05	Trimming pot. 470k
D1		1S1555	Diode
D2,3		DSA3A1	Diode
D4		UZ9.1BL	Zener diode (9.1V)
D5		1S1555	Diode
D6		UZ9.1BL	Zener diode (9.1V)
D7		UZ15BH	Zener diode (15V)
D8		1S1555	Diode
Q1		2SA562(Y)	Transistor
Q2,3		2SC2458(Y)	Transistor
Q4		2SB761(Q)	Transistor
Q5		2SC2458(Y)	Transistor
TH1		32D27	Thermister
TH2		5TP41L	Thermister

SP-31 (EXTERNAL SPEAKER)

SP-31 SPECIFICATIONS

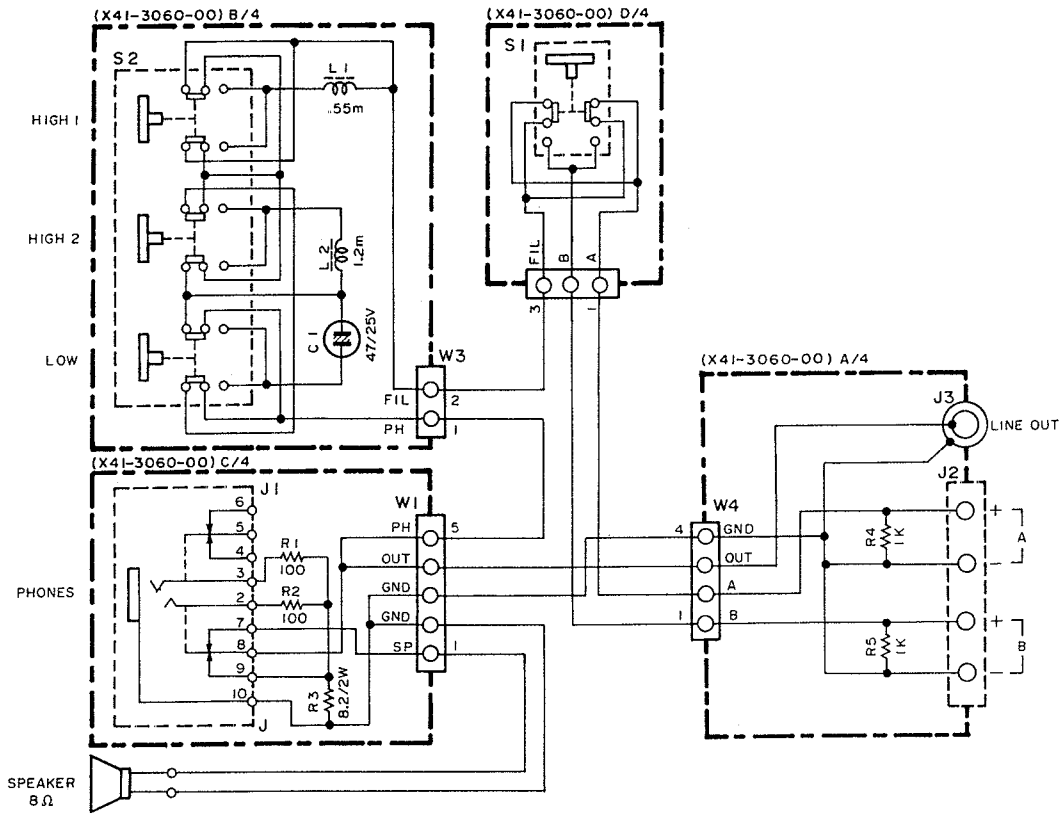
Speaker used:	10 cm dia.
Rated Input:	2 Watts
Impedance:	8 Ω
Frequency response:	160 Hz to 7 kHz
Filter cut-off frequency:	
LOW:	400 Hz, −3 dB
HIGH 1:	3.0 kHz, −3 dB
HIGH 2:	1.2 kHz, −2 dB
HIGH 1+HIGH 2:	900 Hz, −3 dB
Filter attenuation:	−6 dB/oct.
Dimensions:	W. 180 mm (7-1/16″)
	H. 120 mm (4-23/32″)
	D 310 mm (12-7/32″)
Net weight:	2.0 kg (4.4 lbs)

SP-31 PARTS LIST

Ref. No.	New Parts	Parts No	Description
		SP-31	
	*	A01-1051-02	Case (upper)
	*	A01-1052-02	Case (lower)
	*	A20-2656-03	Panel
	*	A23-2504-03	Rear panel
	*	B40-3812-04	Model name plate
	*	B50-8228-00	Instruction manual
		E14-0101-05	Pin plug (Accessory)
		E30-1711-15	Speaker cord (Accessory)
		G10-0662-04	Felt
	*	H01-8182-04	Item coarton box
	*	H10-2644-02	Polystyrene foamed fixture
	*	H10-2645-02	Polystyrene foamed fixture
		H20-1433-03	Protection cover
		H25-0705-04	Portection bag
		J02-0049-14	Foot (rear)
		J02-0423-04	Foot (front outside)
		J02-0424-04	Foot (front inside)
		J19-1325-04	Mounting hardware (panel)
		J21-2788-04	Mounting hardware (speaker)
		J61-0307-05	Wire band
		K29-0758-14	Knob
		N33-3006-41	Round flat screw (case)
		N87-3006-41	Brazier head taptite screw
		N87-4008-41	Brazier head taptite screw
		T07-0225-15	Speaker
	*	X41-3060-00	Switch unit
		SWITCH UNIT (X41-3060-00)	
C1		CE04BW1E470M	Electro 47μF 25WV
J1	*	E11-0432-05	Phone jack (PHONES)
J2	*	E20-0459-05	Speaker terminal board (4P)
J3	*	E13-0167-05	Pin jack (LINE OUT)
W1	*	E31-3426-05	Lead with connector
L1	*	L33-0706-05	Choke coil 0.55mH
L2	*	L33-0705-05	Choke coil 1.2mH
	*	N09-2048-05	Bind head screw
		N14-0404-04	Flange nut
R1, 2		RD14BB2E101J	RD resistor 100 J 1/4W
R3		RS14KB3D8R2J	RS resistor 8.2 J 2W
R4, 5		RD14BB2E102J	RD resistor 1k J 1/4W
S1		S40-2436-05	Push switch
S2		S42-3405-05	Push switch

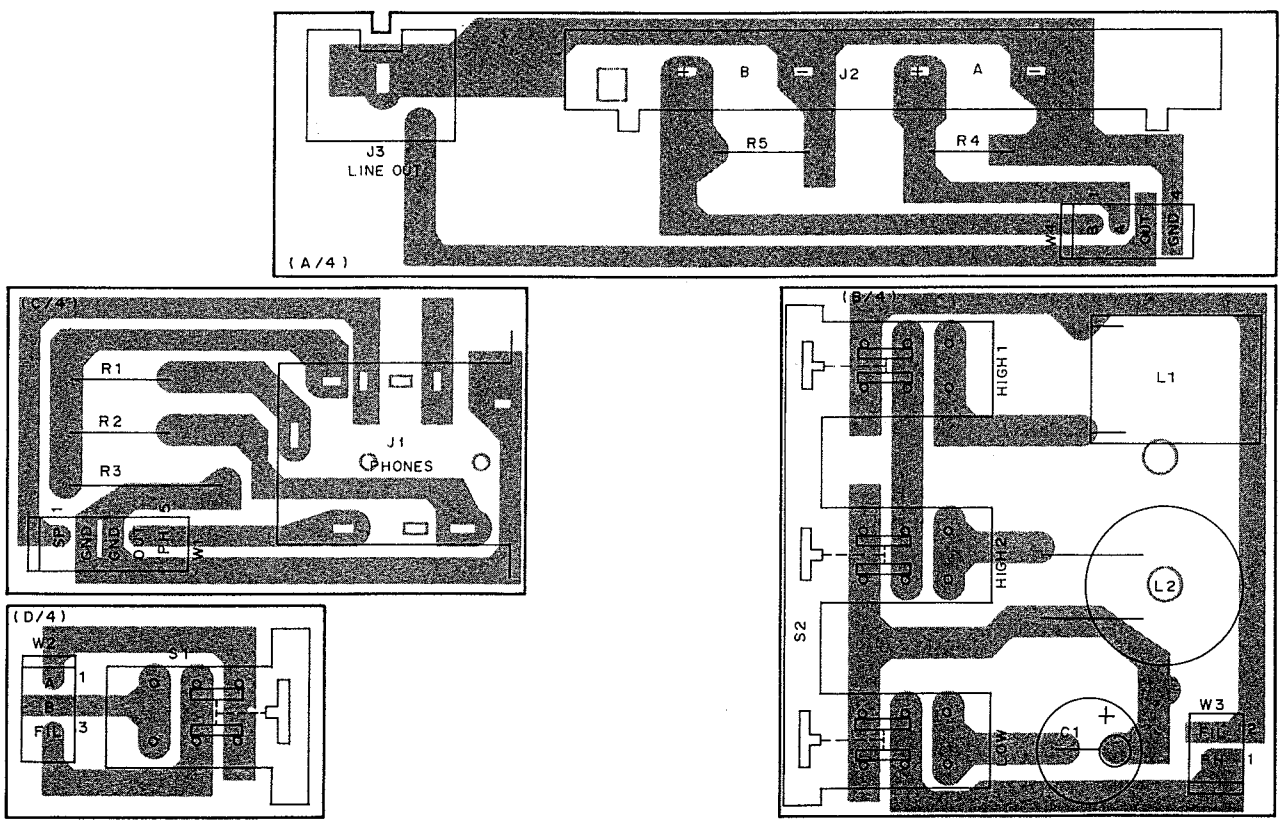
SP-31 (EXTERNAL SPEAKER)

SP-31 SCHEMATIC DIAGRAM



SP-31 PC BOARD VIEW

SWITCH UNIT (X41-3060-00) Component side view



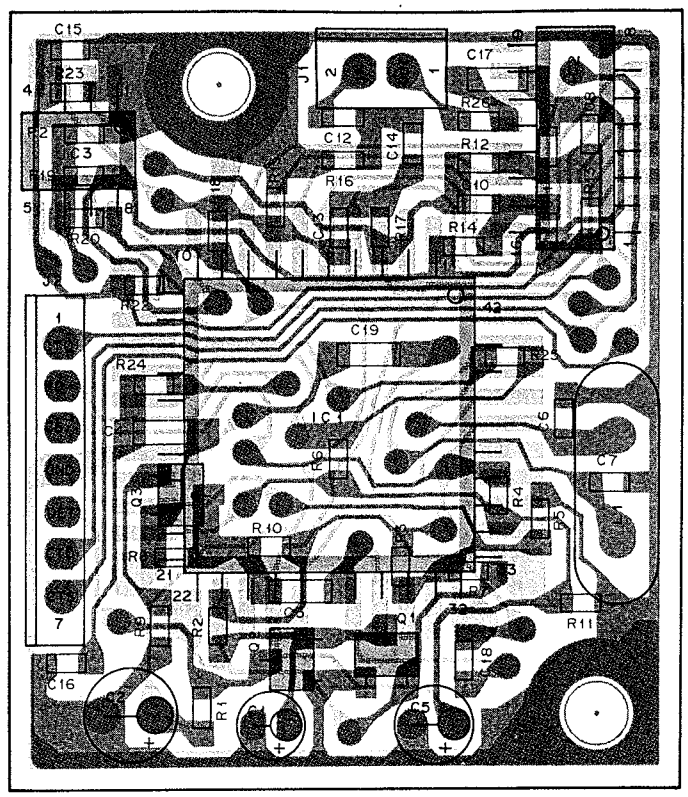
TSU-5 (CTCSS UNIT)

TSU-5 PARTS LIST

Ref. No.	New Parts	Parts No.	Description
		TSU-5	
		E31-3248-05	Lead with connector
		N87-2606-46	Brazier head taptite screw
		X52-3060-00	CTCSS unit
		CTCSS UNIT (X52-3060-00)	
C6,7		CC41FCH1H150J	Chip C 15pF J
C15		CC73FSL1H681J	Chip C 680pF J
C1		CE04CW1A100M	Electro 10µF 10WV
C2		CE04CW1A101M	Electro 100µF 10WV
C5		CE04CW0G101M	Electro 100µF 4WV
C3, 4		CK73EF1C104Z	Chip C 0.1µF Z
C17,19		CK73EF1C105Z	Chip C 1µF Z
C16		CK73FB1H103K	Chip C 0.01µF K
C13,14		CK73FB1H222K	Chip C 2200pF K
C12		CK73FB1H272K	Chip C 2700pF K
C18		C91-0431-05	Laminated C 0.1µF
C8~11		C93-0501-05	Chip C 680pF
		E31-3248-05	Lead with connector
J1		E40-5016-05	Pin ass'y (2P)
J2		E40-5021-05	Pin ass'y (7P)
L1		L77-1333-05	Crystal 4.194394MHz
R4,10,11		RD41FB2B103J	Chip R 10k J 1/8W
R1		RD41FB2B104J	Chip R 100k J 1/8W
R8,22,23		RD14FB2B105J	Chip R 1M J 1/8W
R26		RD41FB2B122J	Chip R 1.2k J 1/8W
R16		RD41FB2B124J	Chip R 120k J 1/8W
R5		RD41FB2B153J	Chip R 15k J 1/8W
R25		RD41FB2B154J	Chip R 150k J 1/8W
R3		RD41FB2B183J	Chip R 18k J 1/8W
R6		RD41FB2B222J	Chip R 2.2k J 1/8W
R19		RD41FB2B273J	Chip R 27k J 1/8W
R9		RD41FB2B392J	Chip R 3.9k J 1/8W
R2,20,21,24		RD41FB2B473J	Chip R 47k J 1/8W
R17		RD41FB2B683J	Chip R 68k J 1/8W
R7		RD41FB2B823J	Chip R 82k J 1/8W
R15,18		RD41FB2B824J	Chip R 820k J 1/8W
R14		R92-0688-05	Chip R 470k
R12,13		R92-0689-05	Chip R 910k
IC1		MN6520	IC
IC2		MN4094BS	IC
IC3		NJM4558M	IC
Q1,2		DTC114YK	Digital transistor
Q3		2SC2712(GR)	Chip transistor

TSU-5 PC BOARD VIEW

CTCSS UNIT (X52-3060-00)
Component side view

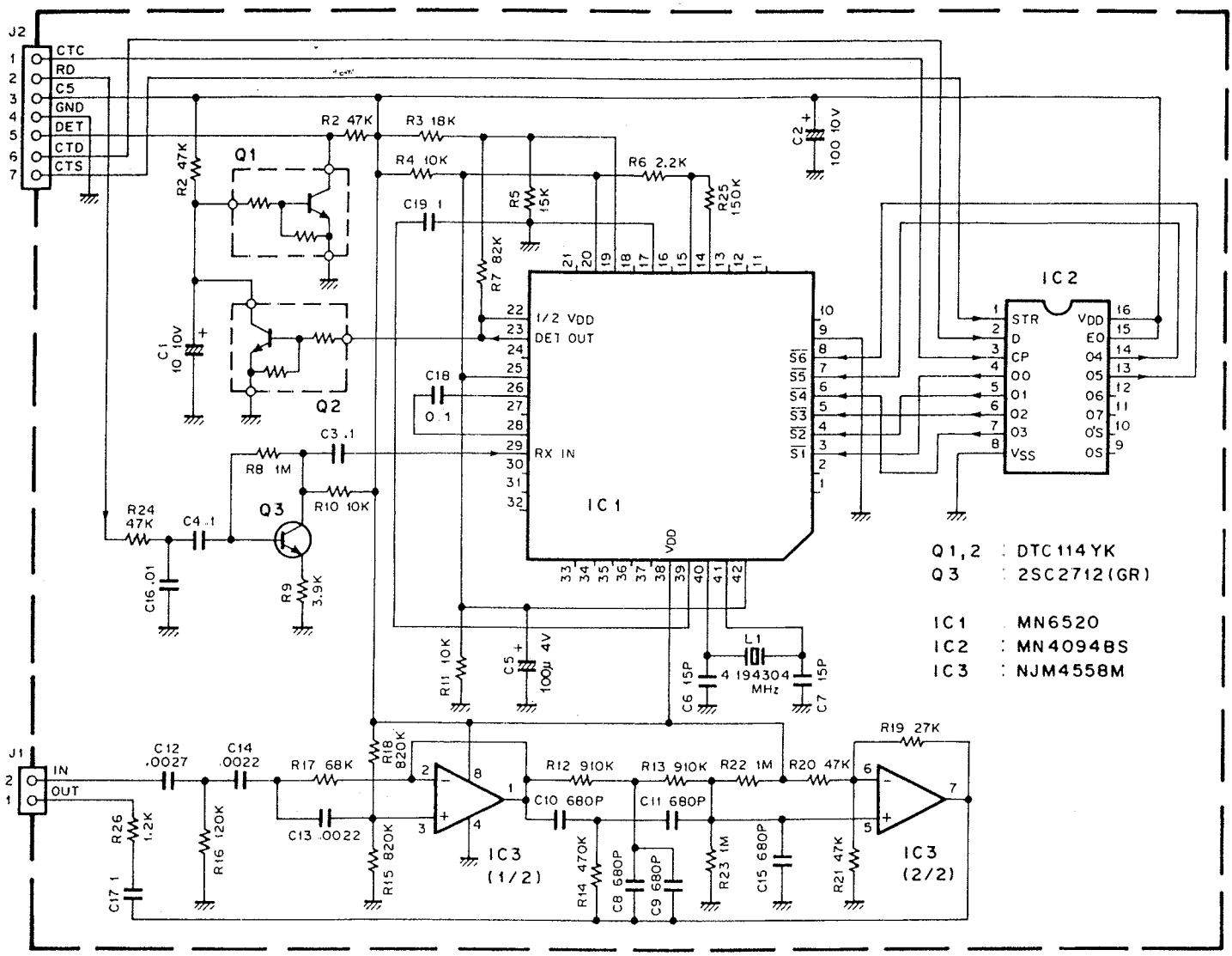


2SC2712

DTC114YK

TSU-5 (CTCSS UNIT)

TSU-5 SCHEMATIC DIAGRAM

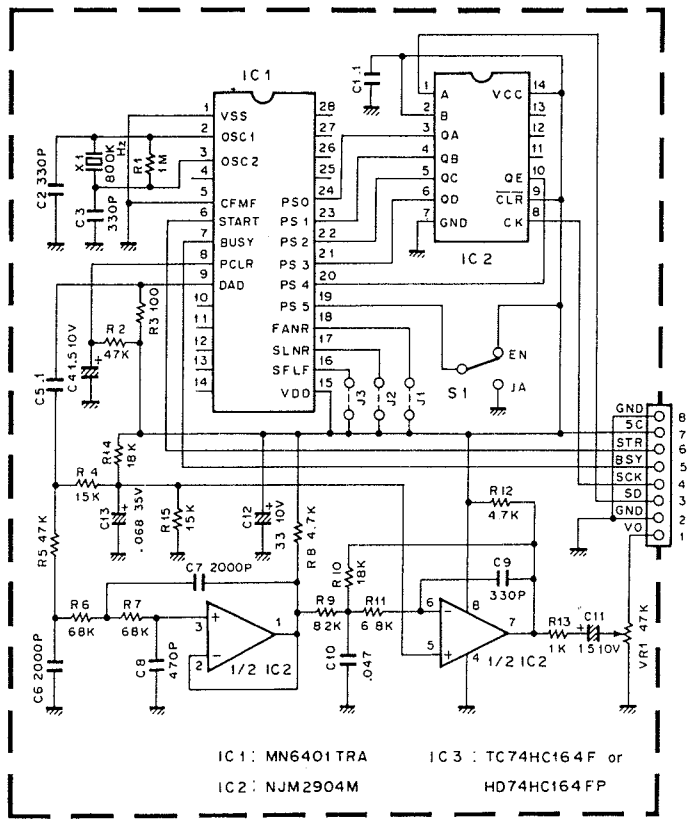


VS-2 (VOICE SYNTHESIZER)

VS-2 PARTS LIST

Ref. No.	New Parts	Parts No	Description
		VS-2	
		B50-8095-00	Instruction manual
		G13-0645-04	Cushion Accessary
		H01-8025-03	Item carton box
		H25-0029-04	Protection bag
		N32-2004-41	Flat head screw
		N35-2604-41	Bind head screw
		X42-3000-00	Accessary unit
		ACCESSARY UNIT (X42-3000-00)	
C6,7		CC73ECH1H202J	Chip C 2000pF J
C2,3,9		CC73FCH1H331J	Chip C 330pF J
C8		CC73FCH1H471J	Chip C 470pF J
C12		CE04CW1A330M	Electro 33µF 10WV
C1,5		CK73EB1E104K	Chip C 0.1µF K
C10		CK73EB1H473K	Chip C 0.047µF K
C13		C90-0503-05	Chip tan 0.068µF 35WV
C4,11		C92-0501-05	Chip tan 1.5µF 10WV
CN1		E40-5022-05	Pin ass'y (8P)
		J21-4146-04	Mounting hardware
X1		L78-0006-05	Ceramic oscillator
R3		RK73FB2A101J	Chip R 100 J 1/10W
R13		RK73FB2A102J	Chip R 1k J 1/10W
R1		RK73FB2A105J	Chip R 1M J 1/10W
R4,15		RK73FB2A153J	Chip R 15k J 1/10W
R10,14		RK73FB2A183J	Chip R 18k J 1/10W
R8,12		RK73FB2A472J	Chip R 4.7k J 1/10W
R2,5		RK73FB2A473J	Chip R 47k J 1/10W
R11		RK73FB2A682J	Chip R 6.8k J 1/10W
R6,7		RK73FB2A683J	Chip R 68k J 1/10W
R9		RK73FB2A822J	Chip R 8.2k J 1/10W
VR1		R12-3457-05	Trimming pot 47k
S1		S31-1418-05	Slide switch
IC1		MN6401TRA	IC
IC2		NJM2904M	IC
IC3		TC74HC164FP	IC
IC3		HD74HC164FP	IC

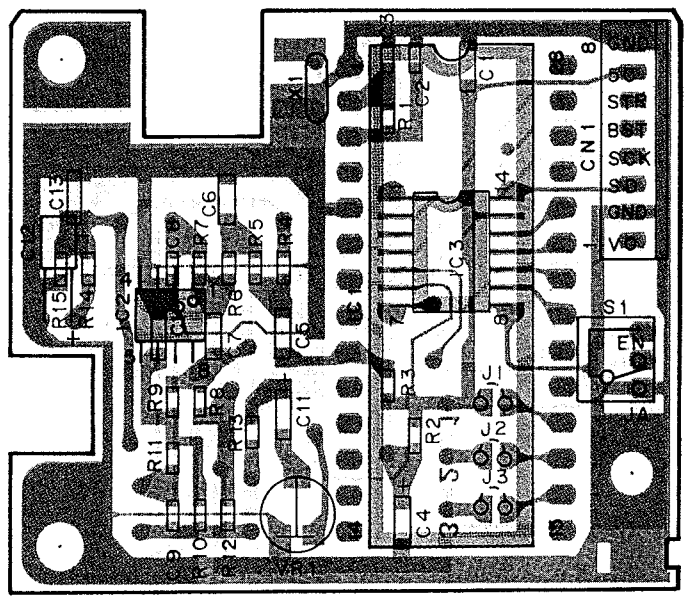
VS-2 SCHEMATIC DIAGRAM



VS-2 PC BOARD VIEW

ACCESSARY UNIT (X42-3000-00)

Component side view



TS-790A/E

SPECIFICATIONS

	Specifications \ Model			TS-790A	TS-790E
General	Frequency range		2 m band	144 ~ 148 MHz	144 ~ 146 MHz
			70 cm band	430 ~ 450 MHz*1	430 ~ 440 MHz
			23 cm band	1240 ~ 1300 MHz (Option)	
	Mode			J3E (LSB, USB), A1A (CW), F3E (FM)	
	Antenna impedance			50 ohms	
	Power requirement			13.8 VDC ± 15%	
	Grounding			Negative	
	Current drain	Receive mode with no input signal		2.5 A	
		Transmit mode	2 m band	12 A	
			70 cm band	15 A	
			23 cm band	8 A	
	Operating temperature			− 10 to + 50°C (+ 14 to + 122°F)	
	Frequency stability (Except FM mode)			Less than ± 3 PPM	
	Dimensions (W × H × D) (Projections included)			342 × 134 × 369 mm (13-15/32" × 5-9/32" × 14-17/32")	
	Weight			9.2 kg (20.2 lbs)	
Transmitter	Output power	2 m band	LSB·USB	35 W	
			FM·CW	45 W	
		70 cm band	LSB·USB	30 W	
			FM·CW	40 W	
		23 cm band	LSB, USB, CW, FM	10 W	
	Modulation		LSB, USB	Balanced modulation	
			FM	Reactance modulation	
	Spurious radiation		2 m/70 cm band	Less than − 60 dB	
			23 cm band	Less than − 50 dB	
	Carrier suppression			More than 40 dB (with 1.5 kHz reference)	
	Unwanted sideband suppression			More than 40 dB (with 1.5 kHz reference)	
	Maximum frequency deviation (FM)			± 5 kHz	
	Frequency response (− 6 dB) (SSB mode only)			400 to 2600 Hz	
	Microphone impedance			600 ohms	
Receiver	Circuitry	2 m band	LSB·USB·CW	Single conversion superheterodyne	
			FM	Double conversion superheterodyne	
		70 cm band	LSB·USB·CW	Double conversion superheterodyne	
			FM	Triple conversion superheterodyne	
		23 cm band	LSB·USB·CW	Triple conversion superheterodyne	
			FM	Quadruple conversion superheterodyne	

Intermediate frequency

MAIN

	1st IF	2nd IF	3rd IF	4th IF
2 m band	10.695 MHz	* 455 kHz	—	—
70 cm band	75.925 MHz	10.695 MHz	* 455 kHz	—
23 cm band	287.175 MHz	41.415 MHz	10.695 MHz	* 455 kHz

SUB RX

	1st IF	2nd IF	3rd IF	4th IF
2 m band	10.595 MHz	* 455 kHz	—	—
70 cm band	75.925 MHz	10.595 MHz	* 455 kHz	—
23 cm band	287.075 MHz	41.315 MHz	10.595 MHz	* 455 kHz

* : FM only

SPECIFICATIONS

Receiver	Sensitivity	LSB, USB, CW (at 10 dB S+N/N)	2 m band	Less than 0.16 μV
			70 cm band	Less than 0.16 μV
			23 cm band	Less than 0.16 μV
		FM (at 12 dB SINAD)	2 m band	Less than 0.22 μV
			70 cm band	Less than 0.22 μV
			23 cm band	Less than 0.22 μV
	Selectivity		LSB, USB	−6 dB:2.1 kHz, −60 dB: 4.8 kHz
			FM	−6 dB:12 kHz , −60 dB: 24 kHz
			CW	−6 dB:500 Hz , −50 dB: 2 kHz
	Image ratio		2 m band	More than 65 dB
			70 cm band	More than 60 dB
			23 cm band	More than 55 dB
	IF SHIFT variable range			More than ±0.9 kHz
	RIT variable range		LSB, USB, CW	±1.9 kHz
			FM	±9.9 kHz
	Squelch sensitivity		LSB, USB, CW	Less than 0.20 μV
			FM	Less than 0.16 μV
	Output			1.5 W across 8 ohms load (10% distortion)
	Output load impedance			8 ohms

Notes:

1. *1: Frequency range for M2 type is 430~440 MHz.
2. Circuit and ratings are subject to change without notice due to advancements in technology.

2-2. ACCESSORIES

Unpack your TS-790A/790E carefully and confirm that it is supplied with the following accessories.

Dynamic microphone	T91-0352-15	1 ea.
DIN plug (7-pin)	E07-0751-05	1 ea.
DIN plug (13-pin)	E07-1351-05	1 ea.
DC power cable assembly	E30-2065-05	1 ea.
Fuse (15A)	F05-1531-05	1 ea.
Connector cable for the Tone unit (Except U.K. and Europe version)	E31-3453-05	1 ea.
Control location sticker	B42-3314-04	1 ea.
External control Instruction Manual	B50-8262-XX	1 copy
Instruction Manual	B50-8254-XX	1 copy
Warranty card (U.S.A. and Europe version only)		1 ea.

After unpacking
Shipping container:
Save the boxes and packing in the event your unit needs to be transported for remote operation, maintenance, or service.

TS-790A/E

KENWOOD CORPORATION

Shionogi Shibuya Building 17-5 2-chome Shibuya Shibuya-ku Tokyo 150 Japan

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KENWOOD ELECTRONICS BENELUX N.V.
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5, Boulevard Ney, 75018 Paris, France

KENWOOD ELECTRONICS AUSTRALIA PTY. LTD.
(INCORPORATED IN N.S.W.)
4E. Woodcock Place, Lane Cove, N.S.W. 2066, Australia

KENWOOD & LEE ELECTRONICS, LTD.
Wang Kee Building 4th Floor 34-37 Connaught Road Central Hong Kong

SERVICE TECHNICAL REPORT

KENWOOD
KENWOOD CORPORATION

STR No. E51-93-053 1/1

■ : A M A

REFERENCE.

MODEL :TS-790	DATE. AUG. 30. 1993

SUBJECT :Change of relay parts number (Ref number K1 of 1.2GHz Final unit).

With the production discontinuation of relay (S51-1434-05).

Unit name:1.2GHz Final unit (X45-3150-00)

Ref No: K1

Old		New
S51-1434-05	⇨	S51-1438-05

Parts included ☑ No ☐ Yes ☐ Mail	Service code
Parts stock ☐ Yes ☐ No Delivery M D ☐ Charge ☐ Free of charge	A(S) : B :
Prod. change Lot:25508 S/No.:50800081～	C(P) : D(C) :
Application ☐ All repair parts ☒ Defectives only ☐	MANAGER J. Ando
Distribution ■サービス部 技術教育S □国内サービス及び代行店 (無線) □ショールーム ■K-U. S. A ■TK-F. ■K-LEE ■BLO (北京事務所) ■K-CANADA ■TK-U. K ■K-E. L. A. ■K-General Market ■K-GmBH ■K-ITALIA ■K-SPAIN ■K-N. V ■K-AUST. ■K-SINGAPORE □国内営業部 ■山形K 工場長室 ■IMD 通信営業課 ■品保S	WRITER S.TOGASHI

21. SEPT 93

TCS-1011A 1992. 1

SERVICE TECHNICAL REPORT

KENWOOD
KENWOOD CORPORATION

STR No. B510-94-025E 1/1

■ : AMA

REFERENCE.

MODEL : TS-790A/E	DATE. May 12 '94

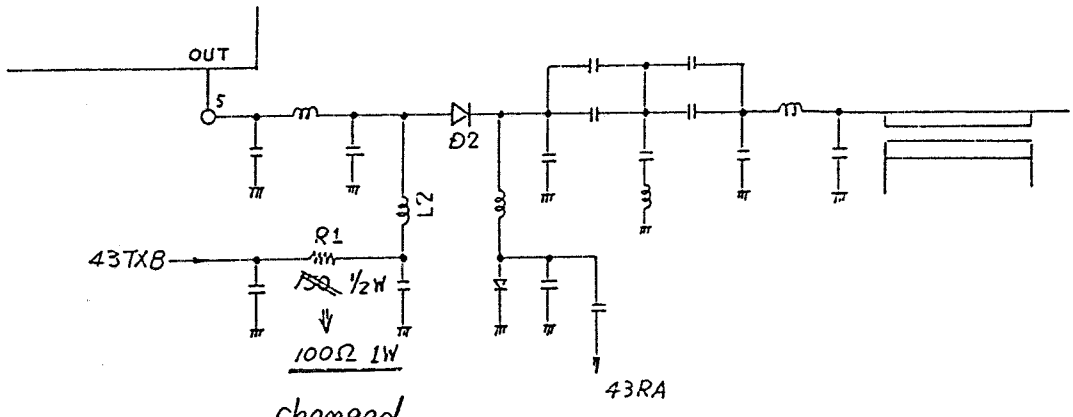
SUBJECT : Countermeasure against defective soldering of pin diode D2:UM9401 in 430MHz FINAL UNIT.

Phenomenon: In the market was found defective soldering of pin diode D2:UM9401. This diode may be found defectively soldered again six months after it is replaced.

Cause: Impedance at the end of 50 Ω ANT terminal is too low against the pin diode, which makes loss power consumption at the diode higher than the specification (1.5W). This caused excessive heat at the diode, which damaged the soldered point.

Counter-measure: Reduce the serial resistance during power ON by raising the current to diode to hold the loss under the specifications.
Change the constanc of R1 in 430MHz FINAL UNIT (X45-3170-XX).
Resistor R1: 150Ω, 1/2W (RS14DB2H151J) to be replaced with 100Ω, 1W (RS14DB3A101J).

Circuit diagram: 430MHz FINAL UNIT (X45-3170-XX)



Service code	A(S): 12 B: X45-3170 C(P): R1 D(C): 91	
Parts included	☒ No ☐ Yes ☐ Mail	Index code
Parts stock	☐ Yes ☐ No Delivery M D ☐ Charge ☐ Free of charge	Information 1: 1 2:
Prod. change	Lot 36016 S/No. 603XXXXX~	Symptom 1: 12 2: 01
Application	☐ All repair units ☒ Defectives only ☐ Refurbish	MANAGER
Distribution	■CS推進部 ■お客様相談室 ■㈱K・サービス ■㈱K・パーツセンター ■IMD □ショールーム ■KSC-USA ■K-DEUTSCHLAND ■K-ITALIA □K-MALAYSIA ■K-CANADA ■K-BENELUX ■K-ESPANA ■K&LEE ■K-PANAMA ■TK-FRANCE ■K-AUSTRALIA ■K-BLO □K-EUROPE ■TK-U.K ■K-SINGAPORE ■General Market	WRITER H. Shimizu

Information: 1. Rework, 2. Parts, 3. S/W, 4. Noise(CAR only), 5. Repair, 6. Genuine(CAR), 7. s-con/software, 8. I/M, 9. etc.
Symptom: Symptom code of Repair Code List

SERVICE TECHNICAL REPORT

KENWOOD
KENWOOD CORPORATION

STR No. B510-94-063E 1/2

■ : AMA

REFERENCE.

MODEL : TS-790S	DATE. Aug. 25 '94

SUBJECT : Countermeasure against amp I at 430MHz band.

Phenomenon: There was a claim in the market that mumbling soud is heard from the internal speaker when transmitting in the SSB mode at 430MHz band. This is due to "amp I", or a trouble caused by the RF signal penetrating into the audio circuit without demodulated.

Cause: 1) RF feed back penetrated in the AF circuit.
2) Radiation from the power module IC was transmitted to the chassis to flow into the AF circuit.

Counter-measure:
1) Remove the chip resistor R122 (47kΩ) in the IF unit (X48-3050-XX). Insert a 4.7kΩ lead resistor (RD14BB2C472J) to the different GND pattern (as shown in the foil side).
2) Remove the electro-capacitor C130:22uF/25V in the IF unit (X48-3050-XX).
3) Insert a shield plate (F11-1133-14) to the 10W power module (M57716) in the 430 FINAL unit (X45-3170-XX).
4) Insert a shield plate (F10-2167-04) to the HIGH power module (M57728) in the 430 FINAL unit (X45-3170-XX).
5) Insert a shield plate (F10-2167-04) to the HIGH power module (M57727) in the 144 FINAL unit (X45-3160-XX).
Note: The shield plate (F10-2167-04) is a new part.
6) As the shield plates are inserted, all of the screws fixing the power modules 3)-5) shall be also changed.
Round head screw and washer assembly: B (N66-4012-46) → W (N67-4012-46)

Service code	A(S): 54	B: X48-3050	C(P): R122	D(C): 91

Parts included	☒ No ☐ Yes ☐ Mail	Index code
Parts stock	☐ Yes ☐ No Delivery M D ☐ Charge ☐ Free of charge	Information 1: 5 2:
Prod. change	Lot #16503 / No. 607XXXXX~	Symptom 1: 54 2:
Application	☐ All repair units ☒ Defectives only ☐ Refurbish	MANAGER: H. Kondo
Distribution	■ CS推進部 ■ お客様相談室 ■ ㈱K・サービス ☐ ㈱K・パーツセンター ■ IMD ☐ ショールーム ■ KSC-USA ■ K-DEUTSCHLAND ■ K-ITALIA ☐ K-MALAYSIA ■ K-CANADA ■ K-BENELUX ■ K-ESPANA ■ K&LEE ■ K-PANAMA ■ TK-FRANCE ■ K-AUSTRALIA ■ K-BLO ☐ K-EUROPE ■ TK-U.K ■ K-SINGAPORE ■ General Market	WRITER: H. Shimizu

Information: 1. Rework, 2. Parts, 3. S/M, 4. Noise(CAR only), 5. Repair, 6. Genuine(CAR), 7. s-com/software, 8. I/M, 9. etc.
Symptom: Symptom code of Repair Code List

SERVICE TECHNICAL REPORT

KENWOOD
KENWOOD CORPORATION

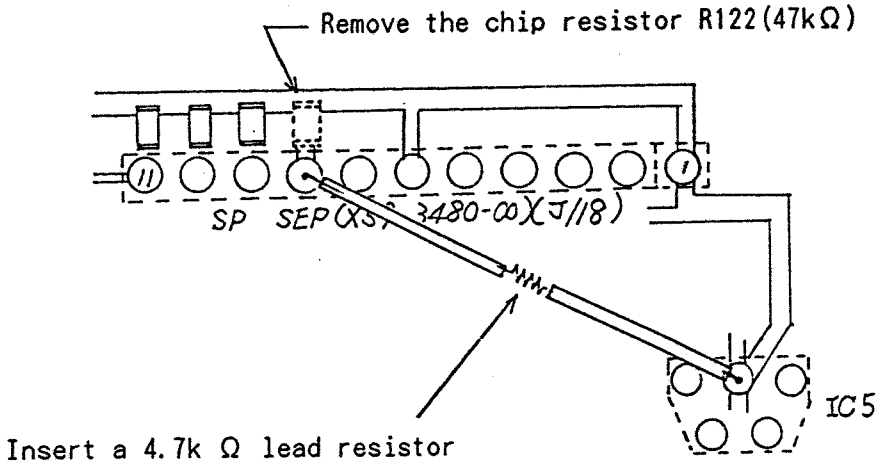
STR No. B510-94-063E 2/2

■ : AMA

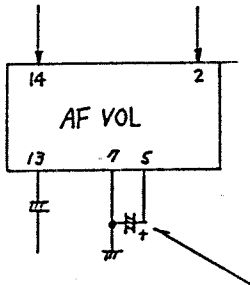
REFERENCE.

MODEL : TS-790S	DATE. Aug. 25 '94
SUBJECT : Countermeasure against amp I at 430MHz band.	

PC Board:IF unit(X48-3050-XX) (Foil side view)



Schematic diagram:IF unit(X48-3050-XX)



Remove the electro-capacitor C130:22uF/25V

Service code	A(S): 54 B: X48-3050 C(P): R122 D(C): 91	
Parts included	☒ No ☐ Yes ☐ Mail	Index code
Parts stock	☐ Yes ☐ No Delivery M D ☐ Charge ☐ Free of charge	Information 1: 5 2:
Prod. change	Lot #16503 / No. 607XXXXX~	Symptom 1: 54 2:
Application	☐ All repair units ☒ Defectives only ☐ Refurbish	MANAGER: H. Konatsu
Distribution	■ CS推進部 ■ お客様相談室 ■ ㈱K・サービス ■ ㈱K・パーツセンター ■ IMD ☐ ショールーム ■ KSC-USA ■ K-DEUTSCHLAND ■ K-ITALIA ☐ K-MALAYSIA ■ K-CANADA ■ K-BENELUX ■ K-ESPANA ■ K&LEE ■ K-PANAMA ■ TK-FRANCE ■ K-AUSTRALIA ■ K-BLO ☐ K-EUROPE ■ TK-U.K ■ K-SINGAPORE ■ General Market	WRITER: H. Shimizu ✓

Information : 1. Rework, 2. Parts, 3. S/M, 4. Noise(CAR only), 5. Repair, 6. Genuine(CAR), 7. s-com/software, 8. I/M, 9. etc.
Symptom : Symptom code of Repair Code List

EXT COVERAGE : Rx ONLY - CUT D29 control wire
Rx & Tx - " D29 & D30

COPY TO: ALAN JOHN MARK

TS-790 Modification Method

(1) Modification for operations at other frequencies than specified.

a) Frequency ranges (when not adjusted)

	Display	PLL lock range (approx.)
144 MHz band	135~ 174 MHz	140~168 MHz
430 MHz band	300~ 950 MHz	340~373, 425~458, 840~905 MHz
1.2 GHz band	1200~1306 MHz	1230~1305 MHz

b) Modification procedure

1) Cut the destination diode on the Control Unit (X53-3120) according to the frequency requirement.

2) Reset the unit (microprocessor) as follows.

Hold down A = B, and turn the POWER switch ON.

3) When the 800 MHz band is to be received, additionally connect an exolusive BNC connector (the attaching hole is provided on the rear panel).

Connect the BNC connector (GND to TP202), and lead the lines to TP201 and TP202 on the RF Unit (X44-3060/430 MHz) with a coaxial cable.

*Caution: Use a coaxial cable, otherwise the receiving sensitivity will be very poor.

4) Adjustment (These adjustments have already been made. Perform the following only when you need it.)

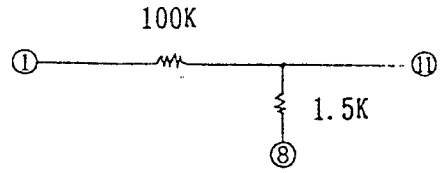
- 370 M ··· L228, L229, L234 S meter peak
  TC204 ····· F adjustment
- 800 M ··· L230, L231, L232, S meter peak
  L218, L219, L220 S meter peak (CN211 for RF voltage peak)

(2) Modification of cross-band repeater

a) Modification procedure

1) Cut D32 on the Control Unit (X53-3120).

2) Connect resistors to the ACC2 plug as shown below.



b) Operation procedure

1) Press F key + Min key. The cross-band operation will be activated and "*" appears on the display.

2) To deactivate, press F + Min again.

3) To vary the modulation depth, vary the resistor value of ACC2 or adjust VR36 on the internal IF Unit.

(T S − 7 9 0 Microprocessor data of the destination)

Destination		Basic Model	AUTO MODE TYPE	REV SW	CTCSS SW		430MHz RF Bandwidth	CW-N FILTER	Accessary M I C	
J	1	●	1	O	Used		10MHz	Option	Option	
	2		1	O	Used					
	3		1	O	Used					
K	1	●	2	O	Used		20MHz	Buildin	Buildin	
	2		2	O	Used					
	3		2	O	Used					
M	1	●	2	O	Used		20MHz	Buildin	Buildin	
	2		2	O	Used					
	3		2	O	Used					
V2	1	●	2	O	Used		10MHz	Buildin	Buildin	
	2		2	O	Used					
	3		2	O	Used					
W	1	●	3	M	Not used		10MHz	Buildin	Buildin	
	2		3	M	Not used					
	3		3	M	Not used					
X2	1		4	M	Not used					
	2		4	M	Not used					
	3		4	M	Not used					
X3	1		3	M	Not used					
	2		3	M	Not used					
	3		3	M	Not used					

O : Alternate

M : Momentary

(TS-790 Microprocessor data of the destination)

Destination				Destination diodes on the CONTROL UNIT								Receive operation				Transmit operation		
		Basic Model		D 17	D 18	D 21	D 22	D 23	D 24	D 29	D 30		144MHz	430MHz	1200MHz	144MHz	430MHz	1200MHz
J	1	●	JAPAN	○	—	—	—	—	—	—	—		144-146	430-440		1260-1300	144-146	430-440	1260-1300
	2			—	—	—	—	—	—	—	—	※	140-168	340-373 425-458 840-905		1230-1305	144-146	430-440	1260-1300
	3			—	○	—	—	—	—	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305
K	1	●	U.S.A	—	—	—	○	—	—	○	○		140-165	430-450		1240-1300	144-148	430-450	1240-1300
	2		RX only	—	—	—	○	—	—	—	○	※	140-168	340-373 425-458 840-905		1230-1305	144-148	430-450	1240-1300
	3		RX/TX	—	—	—	○	—	—	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305
M	1	●	General market	—	—	—	○	○	○	○	○		144-148	430-450		1240-1300	144-148	430-450	1240-1300
	2		RX only	—	—	—	○	○	○	—	○	※	140-168	340-373 425-458 840-905		1230-1305	144-148	430-450	1240-1300
	3		RX/TX	—	—	—	○	○	○	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305
M2	1	●	General market	—	—	—	○	—	○	○	○		144-148	430-440		1240-1300	144-148	430-440	1240-1300
	2		RX only	—	—	—	○	—	○	—	○	※	140-168	340-373 425-458 840-905		1230-1305	144-148	430-440	1240-1300
	3		RX/TX	—	—	—	○	—	○	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305
W	1	●	European	—	—	○	—	○	○	○	○		144-146	430-440		1240-1300	144-146	430-440	1240-1300
	2		RX only	—	—	○	—	○	○	—	○	※	140-168	340-373 425-458 840-905		1230-1305	144-146	430-440	1240-1300
	3		RX/TX	—	—	○	—	○	○	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305
W2	1		Denmark	—	—	—	—	○	—	○	○		144-146	432-438		1240-1300	144-146	432-438	1240-1300
	2		RX only	—	—	—	—	○	—	—	○	※	140-168	340-373 425-458 840-905		1230-1305	144-146	432-438	1240-1300
	3			—	—	—	—	○	—	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305
W3	1			—	—	—	—	○	○	○	○		144-146	430-440		1240-1300	144-146	430-440	1240-1300
	2			—	—	—	—	○	○	—	○	※	140-168	340-373 425-458 840-905		1230-1305	144-146	430-440	1240-1300
	3			—	—	—	—	○	○	—	—	※	140-168	340-373 425-458 840-905		1230-1305	140-168	425-458	1240-1305

○ : Used

— : Not used

※ : Display frequency range 135-174MHz 300-950MHz 1200-1305MHz

(T S − 7 9 0 Microprocessor data of the destination)

Destination				Destination diodes on the CONTROL UNIT								Receive operation				Transmit operation		
		Basic Model		D 17	D 18	D 21	D 22	D 23	D 24	D 29	D 30		144MHz	430MHz	1200MHz	144MHz	430MHz	1200MHz
J	1	●	JAPAN	○	—	—	—	—	—	—	—		144-146	430-440		144-146	430-440	1260-1300
	2			—	—	—	—	—	—	—	—	※	140-168	340-373 425-458 840-905	1230-1305	144-146	430-440	1260-1300
	3			—	○	—	—	—	—	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305
K	1	●	U.S.A	—	—	—	○	—	—	○	○		140-165	430-450		144-148	430-450	1240-1300
	2		RX only	—	—	—	○	—	—	—	○	※	140-168	340-373 425-458 840-905	1230-1305	144-148	430-450	1240-1300
	3		RX/TX	—	—	—	○	—	—	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305
M	1	●	General market	—	—	—	○	○	○	○	○		144-148	430-450		144-148	430-450	1240-1300
	2		RX only	—	—	—	○	○	○	—	○	※	140-168	340-373 425-458 840-905	1230-1305	144-148	430-450	1240-1300
	3		RX/TX	—	—	—	○	○	○	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305
M2	1	●	General market	—	—	—	○	—	○	○	○		144-148	430-440		144-148	430-440	1240-1300
	2		RX only	—	—	—	○	—	○	—	○	※	140-168	340-373 425-458 840-905	1230-1305	144-148	430-440	1240-1300
	3		RX/TX	—	—	—	○	—	○	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305
W	1	●	European	—	—	○	—	○	○	○	○		144-146	430-440		144-146	430-440	1240-1300
	2		RX only	—	—	○	—	○	○	—	○	※	140-168	340-373 425-458 840-905	1230-1305	144-146	430-440	1240-1300
	3		RX/TX	—	—	○	—	○	○	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305
W2	1		Denmark	—	—	—	—	○	—	○	○		144-146	432-438		144-146	432-438	1240-1300
	2		RX only	—	—	—	—	○	—	—	○	※	140-168	340-373 425-458 840-905	1230-1305	144-146	432-438	1240-1300
	3			—	—	—	—	○	—	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305
W3	1			—	—	—	—	○	○	○	○		144-146	430-440		144-146	430-440	1240-1300
	2			—	—	—	—	○	○	—	○	※	140-168	340-373 425-458 840-905	1230-1305	144-146	430-440	1240-1300
	3			—	—	—	—	○	○	—	—	※	140-168	340-373 425-458 840-905	1230-1305	140-168	425-458	1240-1305

○ : Used

— : Not used

※ : Display frequency range 135-174MHz 300-950MHz 1200-1305MHz

(T S − 7 9 0 Microprocessor data of the destination)

Destination			VFO Initial state and reset of the microprocessor. (MHz)						OFFSET Initial state(MHz)			TONE Initial state (Hz)				Click stop(FM) ON/OFF Initial state (KHz)	
		Basic	144MHz		430MHz		1200MHz										
		Model	VFO A	VFO B	VFO A	VFO B	VFO A	VFO B	144	430	1200	144	430	1200	SW	144	430 1200
J	1	●	145.0 FM	144.0 CW	433.0 FM	430.0 CW	1295.0 FM	1260.0 LSB	0.6	5.0	20.0	88.5	88.5	88.5	A	20/10	20/10
	2		145.0 FM	144.0 CW	433.0 FM	430.0 CW	1295.0 FM	1260.0 LSB	0.6	5.0	20.0	88.5	88.5	88.5	A	20/10	20/10
	3		145.0 FM	144.0 CW	433.0 FM	430.0 CW	1295.0 FM	1260.0 LSB	0.6	5.0	20.0	88.5	88.5	88.5	A	20/10	20/10
K	1	●	144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
	2		144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
	3		144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
M	1	●	144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
	2		144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
	3		144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
X2	1	●	144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
	2		144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
	3		144.0 CW	144.0 CW	430.0 FM	430.0 FM	1240.0 FM	1240.0 FM	0.6	5.0	12.0	88.5	88.5	88.5	A	5/10	25/5
W	1	●	144.0 CW	144.0 CW	430.0 CW	430.0 CW	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	M	12.5/5	25/5
	2		144.0 CW	144.0 CW	430.0 CW	430.0 CW	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	M	12.5/5	25/5
	3		144.0 CW	144.0 CW	430.0 CW	430.0 CW	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	M	12.5/5	25/5
Y2	1		144.0 CW	144.0 CW	432.0 FM	432.0 FM	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	M	12.5/5	25/5
	2		144.0 CW	144.0 CW	432.0 FM	432.0 FM	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	M	12.5/5	25/5
	3		144.0 CW	144.0 CW	432.0 FM	432.0 FM	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	M	12.5/5	25/5
Y3	1		144.0 CW	144.0 CW	430.0 CW	430.0 CW	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	O+B	12.5/5	25/5
	2		144.0 CW	144.0 CW	430.0 CW	430.0 CW	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	O+B	12.5/5	25/5
	3		144.0 CW	144.0 CW	430.0 CW	430.0 CW	1240.0 FM	1240.0 FM	0.6	1.6	35.0	1750	1750	1750	O+B	12.5/5	25/5

FM mode: Click ON.

CW mode: Click OFF.

O: Alternate M: Momentary B: Burst

(TS-790 Microprocessor data of the destination)

Destination		Basic Model	AUTO MODE TYPE	REV SW	CTCSS SW		430MHz RF Bandwidth	CW-N FILTER	Accessary MIC	
J	1	●	1	O	Used		10MHz	Option	Option	
	2		1	O	Used					
	3		1	O	Used					
K	1	●	2	O	Used		20MHz	Buildin	Buildin	
	2		2	O	Used					
	3		2	O	Used					
M	1	●	2	O	Used		20MHz	Buildin	Buildin	
	2		2	O	Used.					
	3		2	O	Used					
M2	1	●	2	O	Used		10MHz	Buildin	Buildin	
	2		2	O	Used					
	3		2	O	Used					
W	1	●	3	M	Not used		10MHz	Buildin	Buildin	
	2		3	M	Not used					
	3		3	M	Not used					
W2	1		4	M	Not used					
	2		4	M	Not used					
	3		4	M	Not used					
W3	1		3	M	Not used					
	2		3	M	Not used					
	3		3	M	Not used					

O : Alternate

M : Momentary