

MAINTENANCE SERVICE MANUAL FT-107M



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SECTION 1-GENERAL

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YAESU ALL SOLID STATE HF SSB TRANSCEIVER FT-107M



GENERAL DESCRIPTION

The FT-107M is a precision-engineered, high-performance HF transceiver of advanced design, featuring all band coverage (160–10 meters) on SSB, CW, AM, and FSK. This transceiver operates at an input power of 240 watts on SSB/CW, and 80 watts on AM/FSK.

The all-solid-state design allows instant band changes, without so much as a preselector adjustment. Digital plus analog frequency display is used in this transceiver, with an advanced LSI frequency counter providing accurate frequency readout without calibration when switching modes. VOX, an RF speech processor, and a built-in SWR meter are included for maximum versatility.

Yaesu's exciting memory circuitry is available as an option, providing up to twelve channels of frequency memory, with clarifier adjustment allowing offset from memory channels. And Yaesu's new Digital Memory Shift (DMS) allows up to 500 kHz offset from any memory channel, in 100 Hz steps programmed by a photo-interrupter control. When the memory option is installed, an optional scanning microphone may be used to provide up/down scanning with fingertip ease, using pushbuttons on the microphone.

The FT-107M receiver section features a Schottky diode ring mixer, plus individually-tuned input bandpass filter networks, for excellent intercept characteristics. An audio peak/notch filter is also included, in addition to Yaesu's variable IF bandwidth feature, which uses two 8-pole filters to provide continuously variable width of the IF passband from 300 Hz to 2.4 kHz.

Designed for operation from a 13.5 VDC supply, the FT-107M may be used with either the FP-107 internal AC power supply or the FP-107E external AC power supply/speaker console. Either supply will provide excellent regulation, for many years of satisfying operation.

We recommend that you read the following pages carefully, so as to derive maximum enjoyment from the feature-packed FT-107M.

SPECIFICATIONS

GENERAL

Frequency coverage:

160 m	1.8 – 2.0 MHz
80 m	3.5 – 4.0 MHz
40 m	7.0 – 7.5 MHz
30 m	10.0 – 10.5 MHz
20 m	14.0 – 14.5 MHz
17 m	18.0 – 18.5 MHz
15 m	21.0 – 21.5 MHz
12 m	24.5 – 25.0 MHz
10 m	28.0 – 29.9 MHz

Power requirements:

DC 13.5 volts \pm 10 %

Power consumption:

DC 1.5 amps receive
20 amps transmit

Size:

334 (W) x 129 (H) x 400 (D) mm
including heat sink

Weight:

Approx. 12.5 kg.

TRANSMITTER

Emission type:

LSB, USB(A3J), CW(A1), AM(A3), FSK(F1)

Power input:

240 watts DC (SSB, CW)
80 watts DC (AM, FSK)

Carrier suppression:

Better than 40 dB at 14 MHz

Unwanted sideband suppression:

Better than 50 dB (14 MHz, 1 kHz)

Spurious radiation:

Better than 50 dB down

Transmitter frequency response:

350–2700 Hz (-6 dB)

Third order distortion products:

Better than 31 dB down

Negative feedback:

6 dB at 14 MHz

Transmitter frequency stability:

\pm 300 Hz after 10 minute warmup; less than
100 Hz after 300 minute warmup

Modulation type:

A3J : balanced modulator

A3 : amplitude modulation of a low power
stage

FSK shift: 170 Hz

Antenna output impedance:

50 ohms, unbalanced

Microphone input impedance:

500–600 ohms (low impedance)

RECEIVER

Sensitivity:

0.25 μ V for S/N 10 dB (SSB, CW, FSK)

1.0 μ V for S/N 10 dB (AM)

Image rejection:

Better than 60 dB (160-12 m)

Better than 50 dB (10 m)

IF rejection:

Better than 70 dB

Selectivity:

SSB 2.4 kHz at 6 dB down, 4.0 kHz at 60 dB
down

CW (with optional 600 Hz CW filter)

600 Hz at 6 dB down, 1.2 kHz at 60 dB down

AM (with optional 6 kHz AM filter)

6 kHz at 6 dB down, 12 kHz at 60 dB down

RF attenuator:

20 dB \pm 3 dB

APF, Notch frequency response:

300 Hz to 1.4 kHz

Bandwidth control:

Continuous from 2.4 kHz to 300 Hz

Audio output impedance:

4–16 ohms

Audio output:

3 watts at 10 % THD, 4 ohm load

SEMICONDUCTORS

Transistor

2SA564A	2	2SC1674L	1
2SA733	5	2SC1815GR	10
2SA952L	13	2SC1815Y	12
2SC372Y	2	2SC1959Y	4
2SC380Y	25	2SC2290	2
(2SC380TM-Y)		2SC2331	1
2SC535A	1	2SC2395	2
2SC735Y	1	2SD235Y	1
2SC1000GR	3	MPS-A13	1
2SC1583	2	2N4427	2
2SC1589	1		

Germanium Diode

1N270(GB)	18	1S1007(GB)	34
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Silicon Diode

10D1	2	1S1555	148
10D10	4		

Schottky Barrier Diode

1SS16	10		
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Varactor Diode

FC63	1	1S2236	
1S2209	1		

Zener Diode

YZ-033	1	WZ090	1
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LED

LN224RP	7	GD4203SRD	3
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LED Display

5082-7623	6		
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FET

2SK19GR	17	3SK73	2
3SK51-03	7	J-310	1

IC

μ PA54H	1	MSM9520RS	1
μ PC324C	1	MC14011B	1
μ PC2002H	1	MC14016P	1
TA7060P	1	NJM78L05	1
TA7063P	1	μ PC14305	1
SN76514N	1	μ PC14308	3
34024P	1		

Specifications subject to change without notice

ACCESSORIES

The following accessories are included with your FT-107M

DC Power cord	1
Speaker plug	1
RCA plug	1
DC fuse (20A)	1
Extender legs (30 mm)	2
Pad for legs	2

FT-107 SERIES MODEL CHART

FEATURE	FT-107M
ALL BAND CRYSTALS	O
MEMORY UNIT/DMS	X
CW FILTER	X
AM FILTER	X
RF SPEECH PROCESSOR	O
MICROPHONE (STANDARD)	X
MICROPHONE (SCANNING)	X
AC POWER SUPPLY	X

O = Standard feature X = Available option

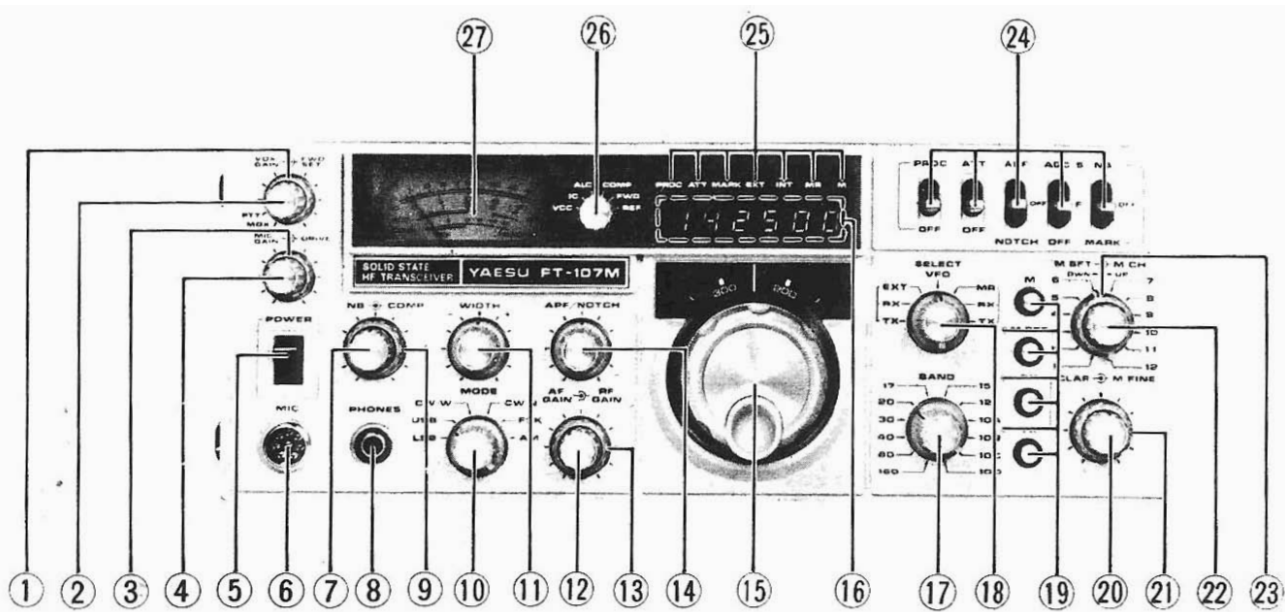
CAUTION

WHEN REPLACING FUSES IN THE DC CABLE, USE ONLY A 20 AMPERE FUSE. OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY USE OF AN IMPROPER FUSE. NEVER CONNECT AC POWER DIRECTLY TO THE REAR PANEL DC POWER CONNECTOR.

FRONT PANEL CONTROLS AND SWITCHES

This transceiver has been specifically designed for ease of operation. However, the operator may not be familiar with the function of some of the controls, and improper adjustment thereof may de-

grade transceiver performance. Therefore, be certain that you understand the function of every control and switch before operating the FT-107M.



(1) FWD SET

This switch sets the SWR meter sensitivity level.

(2) VOX-GAIN

This control selects MOX/PTT/VOX relay control, as well as adjustment of the VOX (voice-operated TX/RX switching) circuit. The PTT position provides push-to-talk operation from a microphone PTT switch or a footswitch. The MOX position provides manual transmit; this switch must be returned to the PTT position for receiver recovery.

(3) DRIVE

On CW, FSK, and AM, this control sets the carrier level. On SSB, with the RF processor ON, this control sets the drive level.

(4) MIC GAIN

This control sets the AM and SSB microphone amplifier gain level.

(5) POWER

This is the main power on/off switch for the transceiver.

(6) MIC

This eight-pin connector accepts the microphone audio input, as well as the push-to-talk (PTT) and scanning control lines.

(7) NB

This control varies the noise blanker threshold level.

(8) PHONES

This is a standard two-pin phone jack for output to your headphones. The impedance is 4 ohms, and the internal speaker will be cut off when a plug is inserted into this jack.

(9) COMP

This control sets the compression level for the RF speech processor.

(10) MODE

This switch selects the desired mode: LSB, USB, CW-W, CW-N, FSK, and AM. When the optional 600 Hz or 350 Hz CW filter is installed, the CW-W position will use the two 8-pole SSB filters, while the CW-N position will use the 6-pole CW filter and the 8-pole SSB filter used for the variable bandwidth feature.

(11) WIDTH

This control varies the IF bandwidth (except on AM) from 2.4 kHz down to 600 Hz.

(12) AF GAIN

This control varies the audio output level from the speaker or headphones. Clockwise rotation increases the audio output level.

(13) RF GAIN

This control varies the gain of the receiver RF and IF amplifiers. For proper S-meter operation, this meter should be set fully clockwise.

(14) APF/NOTCH

This control varies the frequency response of the audio peak/notch filter. The peak/notch filter may be varied over the range 300 Hz–1400 Hz.

(15) MAIN TUNING KNOB

This is the main frequency tuning dial for the transceiver.

(16) ANALOG AND DIGITAL DISPLAYS

The analog display is calibrated every 50 kHz, with 1 kHz marks providing finer resolution. The digital display provides resolution to 100 Hz.

(17) BAND

This switch selects the desired band

(18) SELECT SWITCH

This switch selects the means of frequency control for the transceiver. The details below apply to the fully equipped FT-107M (DMS unit installed).

TX EXT The transmit frequency is controlled by the FV-107 external VFO (option), while the receive frequency is controlled by the FT-107M internal VFO.

RX EXT The receive frequency is controlled by the FV-107 external VFO (option), while the transmit frequency is controlled by the FT-107M internal VFO.

EXT The transceive frequency is controlled by the FV-107 external VFO (option)

MR The transceive frequency is controlled by the memory unit and/or the DMS (Digital Memory Shift) control.

RX MR The receive frequency is controlled by the memory unit and/or DMS, while the transmit frequency is controlled by the internal VFO.

TX MR The transmit frequency is controlled by the memory unit and/or DMS, while the receive frequency is controlled by the internal VFO.

(19) PUSH SWITCHES (M, M SET, TX CLAR, RX CLAR)

M Push the M button to store a frequency in memory.

M SFT Push this switch to activate the DMS system.

TX CLAR, RX CLAR While using the internal VFO or memory, push the TX CLAR switch to provide offset from the TX frequency. Push the RX CLAR button to provide offset of the receive frequency, and push both buttons to provide offset of the transceive frequency from the dial frequency.

(20) CLARIFIER

The CLARIFIER allows offset from the VFO or memory frequency, according to the selection made by pushing the TX CLAR and/or RX CLAR buttons.

(21) M FINE

This control allows fine tuning during memory operation.

(22) M SET

This control activates the DMS system, allowing offset tuning from a memory channel in 100 Hz steps. The M FINE control may, in turn, be used to tune between the 100 Hz steps.

(23) M CH

This control selects the desired memory channel.

(24) LEVER SWITCHES

PROC This switch activates the RF speech processor.

ATT This switch activates a 20 dB attenuator in the incoming signal path.

GENERAL

- APF/NOTCH** This control selects either the Audio Peak Filter (APF) or the audio notch filter.
- AGC** This switch selects the AGC recovery time constant. Selection of slow, fast, and AGC OFF is possible.
- NB/MARK** This switch selects the noise blanker (NB) or the crystal calibrator. The latter feature is useful in receiver servicing, as it provides a signal at the antenna input which will serve as a reference.

(25) INDICATORS (PROC, ATT, MARK, EXT, INT, MR, M)

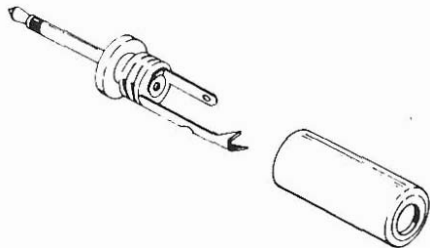
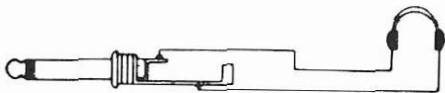
These indicators show the operating condition for the speech processor (PROC), the 20 dB attenuator (ATT), the crystal calibrator (MARK), external or internal VFO (EXT, INT), and the memory system (MR, M).

(26) METER SWITCH

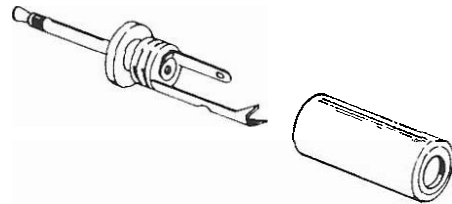
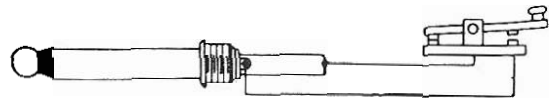
This switch selects meter indication of V_{cc} , I_c , ALC, compression (COMP), forward relative power (FWD), and reflected relative power (REF).

(27) METER

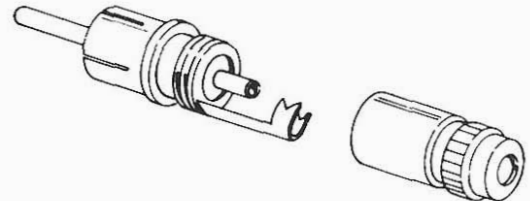
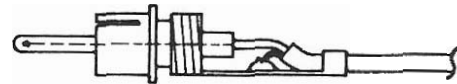
The meter will display transceiver operating conditions, according to the setting of the meter switch.



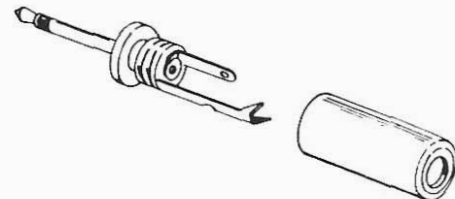
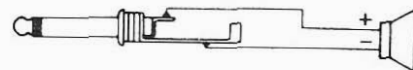
HEADPHONE CONNECTIONS



KEY PLUG CONNECTIONS

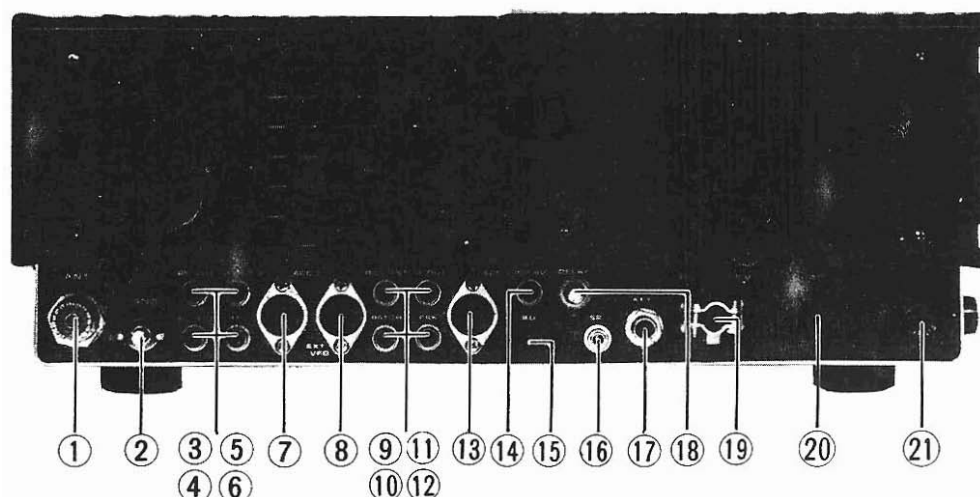


PHONO PLUG CONNECTIONS



EXTERNAL SPEAKER CONNECTIONS

REAR PANEL CONNECTIONS

**(1) ANT**

This is a standard UHF type female jack for connection to the antenna.

(2) GND

For best performance and safety, a good ground should be connected at this point.

(3) RF OUT

This jack provides 300 mV RMS at 50 ohms for connection to the FTV-107R transverter.

(4) AF OUT

This is an audio output jack, providing 200 mV of audio output for recording purposes. This jack is not disabled by insertion of a headphone or speaker plug into their respective jacks.

(5) IF OUT 2

This is wideband IF output for use with a band scope (such as the YO-901).

(6) PTT

This jack accepts push-to-talk control. When using a footswitch, it should be connected at this point.

(7) ACC 2

This is a 7 pin DIN jack for use with the FTV-107R transverter.

(8) EXT VFO

This is a 6 pin DIN jack for interconnection to the FV-107 external VFO.

(9) RCV ANT

This jack provides for connection of an external receiver to the main station antenna. This jack is switched to the antenna in the receive mode only.

(10) PATCH

This is an auxiliary microphone input for use with a phone patch, etc.

(11) IF OUT 1

This jack provides narrow-band IF output for use with a monitorscope (such as the YO-901).

(12) FSK

This jack provides input for the FSK keying lead from your FSK terminal. The standard shift of 170 Hz is used.

(13) ACC 1

This is a 5 pin DIN jack for connection to a linear amplifier or other station equipment. Included are make and break relay connections, as well as the external ALC line.

GENERAL

(14) +8 V

This is a +8 volt DC line for connection to the FC-107 antenna tuner meter lamp.

(15) BU (BACKUP)

This jack is for connection to an external +3 VDC power source, in order to hold the FT-107M memory circuits when the transceiver is turned off.

(16) SP

This is a miniature phone jack for connection to an external speaker. Insertion of a plug into this jack automatically cuts off the internal speaker.

(17) KEY

Your key plug may be inserted at this point. Key-up voltage is 7 volts, while key down current is 1.5 mA.

(18) DELAY

This control varies the receiver recovery time constant for the VOX circuitry.

(19) DC 13.5 V

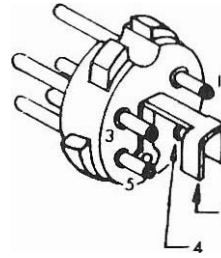
The DC cable should be connected at this point. **Never** connect AC power to the DC cable. Failure to observe this simple precaution will void the warranty. During AC operation with the FP-107, insert the DC dummy plug (supplied with the AC power supply) into this jack.

(20) AC

When using the internal FP-107 AC power supply option, the AC cord is connected at this point. Be certain to observe the proper voltage when using the FP-107.

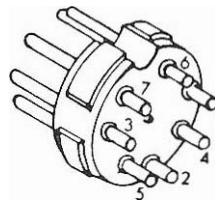
(21) FUSE

When using the FP-107 AC power supply, the AC line fuse is inserted at this point. For 100/110/117 VAC, use only a 10 amp fuse, and for 200/220/234 VAC, use only a 5 amp fuse.



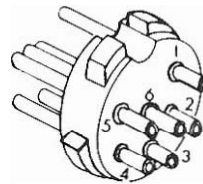
PIN No.	Function
1	-ALC IN
2	GND
3	TX GND
4	GND
5	RX GND

**ACC 1 PLUG CONNECTIONS
(FOR LINEAR AMPLIFIER)**



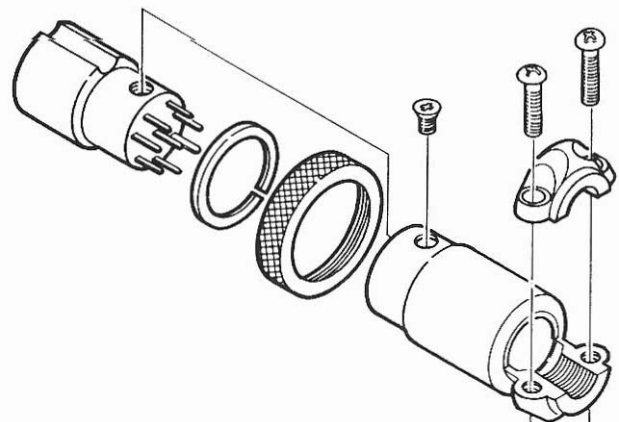
PIN No.	Function
1	CONTROL
2	13.5V
3	8V
4	CONTROL
5	13.5V
6	RX GND
7	TX GND

**ACC 2 PLUG CONNECTIONS
(FOR FTV-107R TRANSVERTER)**



PIN No.	Function
1	EXT VFO IN
2	GND
3	EXT 8V
4	AGC
5	13.5V
6	8V

**EXT VFO PLUG CONNECTIONS
(FOR FV-107 EXTERNAL VFO)**



MICROPHONE PLUG

RECOMMENDED ACCESSORIES

**FV-107 EXTERNAL VFO**

The FV-107 is a solid state remote VFO for the FT-107M series of HF transceivers. Featuring a precision analog dial coupled to a high quality gear mechanism, the FV-107 includes clarifiers for the transmit, receive, or transceive frequency, allowing offset of ± 2.5 kHz from the dial frequency.

As many as six crystal-controlled channels may be installed, for fixed channel operation (crystals optional). Selection of VFO or crystal operation is made by a convenient switch on the front panel of the FV-107. All power required by the FV-107 is provided by the FT-107M transceiver.

**FTV-107R VHF/UHF TRANSVERTER**

The FTV-107R is an all-new transverter for the FT-107M series, capable of operation on the 50, 144, and 430 MHz bands. The basic unit comes equipped with all control circuitry, and the 430 MHz and either the 50 MHz or 144 MHz unit may be installed as options (in the USA, the 144 MHz unit is built in). Power input is 20 watts DC on all bands.

For satellite operators, three satellite bands are provided, allowing full duplex operation through the transverter, using an external receiver in addition to the FT-107M. The operator may transmit on 145 MHz while listening on 29 MHz or 435 MHz, or transmit on 435 MHz while listening on 145 MHz.

The FTV-107R includes repeater split on all repeater bands within its operating range, for operation on the many SSB repeaters that are emerging. Fully solid state, the FTV-107R includes protection for the final amplifier transistors against damage caused by high SWR. Spurious radiation is at least 60 dB down.



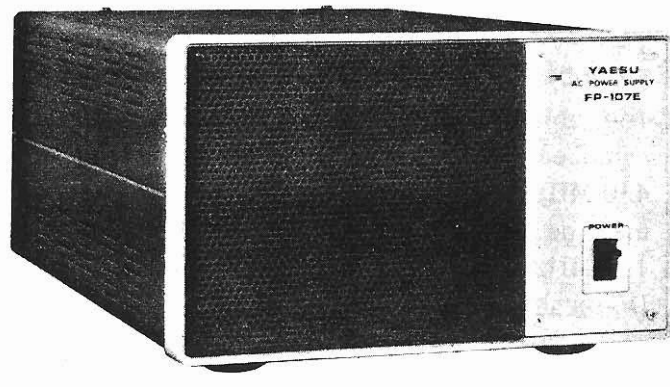
SP-107P PHONE PATCH/SPEAKER

The SP-107P featuring a shaped-response loudspeaker, and the hybrid phone patch allows easy, efficient operation during patches. Styling and size match the rest of the FT-107 series.



FC-107 ANTENNA COUPLER

Present a 50 ohm load for your FT-107M transceiver all across the band with FC-107 antenna coupler. You may select three coax-fed and 1 random wire antenna. Included are an SWR bridge and power output meter. Maximum power handling capability is 250 watts.



FP-107E EXTERNAL POWER SUPPLY

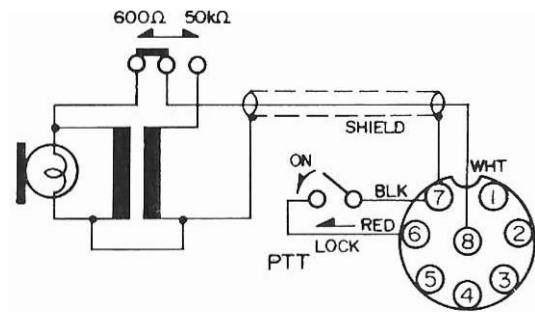
The FP-107E is an external power supply allowing operation from AC supply voltages of 100/110/117/200/220/234 volts, 50/60 Hz.

Excellent regulation and conservative design assure the owner of many years of trouble free operation.

MICROPHONE CONNECTIONS



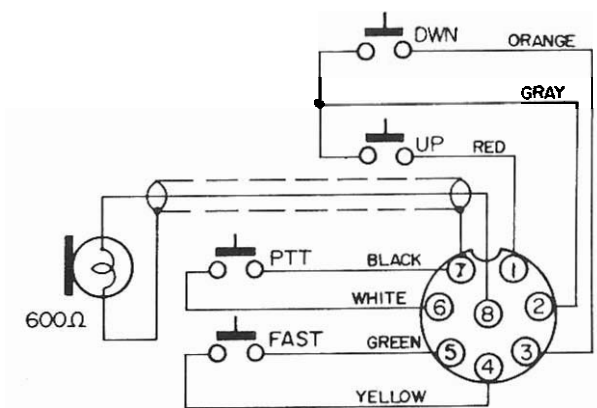
YM-34



YM-34 MICROPHONE CONNECTIONS



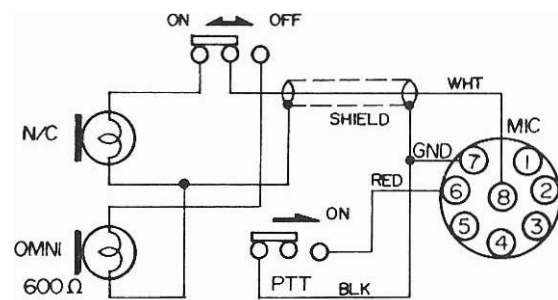
YM-35



YM-35 MICROPHONE CONNECTIONS



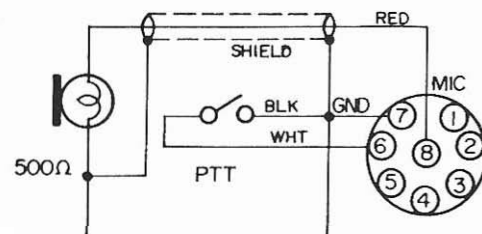
YM-36



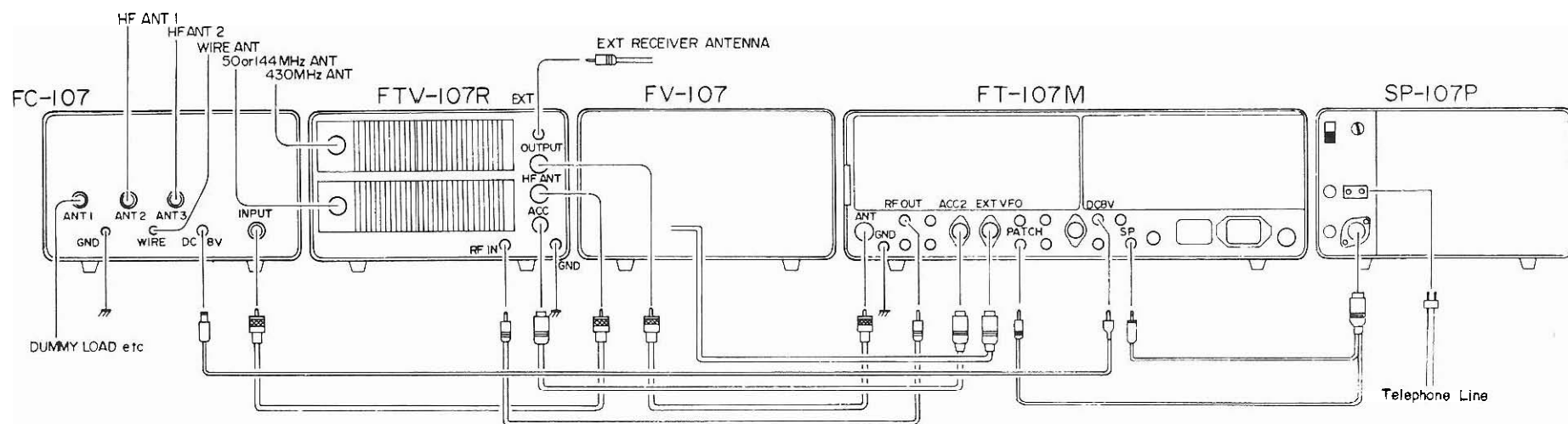
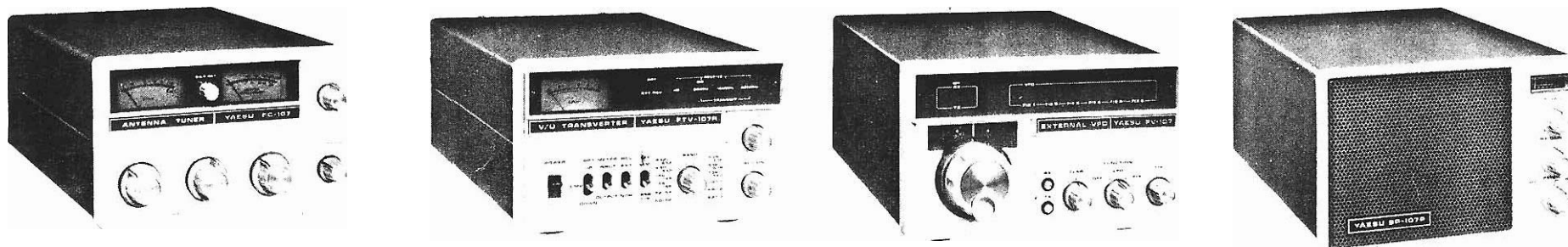
YM-36 MICROPHONE CONNECTIONS



YM-37



YM-37 MICROPHONE CONNECTIONS



INTERCONNECTIONS

INSTALLATION: FT-107M

The FT-107M is designed to be a single-unit transceiver for top-performance base station or mobile operation. For operation from AC mains, the optional FP-107 internal power supply or FP-107E external power supply/speaker are available from your Yaesu dealer. Please read the following sections carefully, so as to understand the important steps required for a successful installation.

PRELIMINARY INSPECTION

Upon opening the packing carton, immediately give the transceiver a thorough visual inspection. Check to see that the controls and switches are all working freely, and inspect the cabinet for any signs of damage. If any damage has been sustained, contact the shipping company immediately, and document the damage completely. Save the packing carton and foam packing material for possible use at a later date.

BASE STATION INSTALLATION

The FT-107M requires a power supply of 13.5 VDC at 20 amps for proper operation. The FP-107 internal power supply and FP-107E external power

supply/speaker console provide this voltage with excellent regulation. These options are available from your Yaesu dealer.

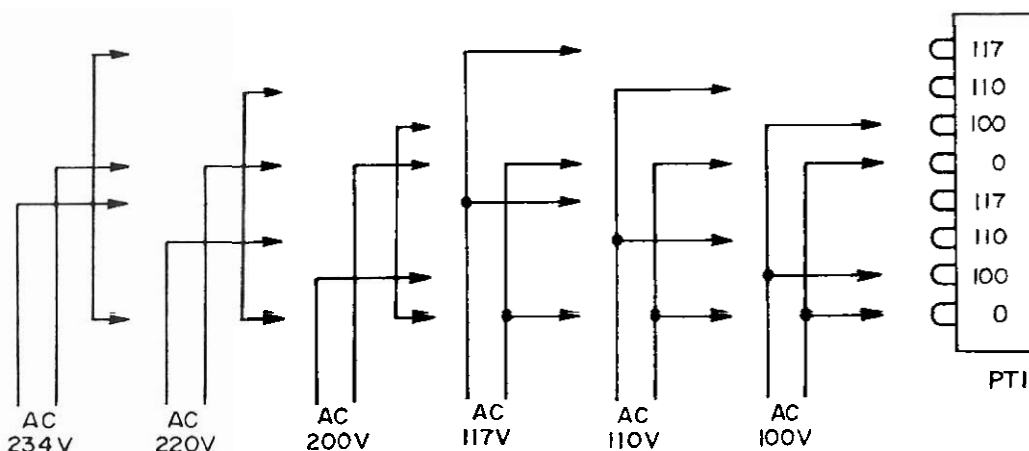
Before attempting operation of the FP-107 or FP-107E from AC mains, check to see that the voltage specification on the rear of the supply matches your local supply voltage. This inspection must be made before applying power to the equipment.

WARNING

Operation of the FT-107M directly from AC mains, from improper DC voltages, or with an improper fuse shall void the warranty on this equipment. Likewise, operation of the FP-107 or FP-107E from improper voltages or use of an improper fuse shall void the warranty.

Please refer to the power transformer primary connection chart when changing supply voltages.

The transceiver should be connected to a good earth ground. The ground lead should be made of a heavy, braided wire, and should be connected to the GND terminal on the rear apron of the transceiver. The ground wire connection to the station ground bus should not be longer than 10 feet.



FP-107/ FP-107E POWER TRANSFORMER PRIMARY CONNECTIONS

* (Refer to FP-107E/FP-107 Installation on page 3-8 for details.)

GENERAL

MOBILE INSTALLATION

The FT-107M is designed for operation from 13.5 volts DC, at 20 amps maximum current on voice peaks. As such, it provides exceptional performance as a mobile station. The DC cable is a standard accessory for the FT-107M.

For under-dash mounting, a special mobile mounting bracket is available from your Yaesu dealer. The FT-107M should be located away from heater ducts, and a minimum of two inches of air space on all sides is recommended, in order to allow proper air flow around the cabinet. Especially critical is the area around the heat sink fan exhaust port.

The DC cable comes equipped with a 20 amp fuse in the positive line. Use only a 20 amp fuse in this socket.

When making battery connections, be absolutely certain to observe the proper polarity of the supply voltage. Connect the RED cable lead to the POSITIVE battery terminal, and connect the BLACK lead to the NEGATIVE battery terminal. Reversed connections could cause permanent damage to the transceiver.

CAUTION

OUR WARRANTY DOES NOT COVER DAMAGE CAUSED BY IMPROPER SUPPLY CONNECTIONS NOR DAMAGE CAUSED BY USE OF AN IMPROPER FUSE.

It is recommended that the power connections be made directly to the battery, instead of to the ignition switch, etc. The battery provides considerable filtering action against ignition noise, while connection to the ignition switch can place the power line in a noisy circuit. Keep the power cable as short as possible, and keep the lead away from ignition cables.

WARNING

Permanent damage will occur if reversed supply polarity voltage is applied to this transceiver. Our warranty does not cover damage caused by reversed supply polarity.

Before connecting the DC power cable to the transceiver, check the battery voltage with the engine running (battery charging). If the voltage exceeds 15 volts DC, the vehicle voltage regulator should be adjusted, so as to limit the maximum charging voltage to less than 15 VDC. As well, do not operate the transceiver if the DC supply falls below 12 volts. The transceiver should always be turned off when the car is started, to prevent voltage transients from possibly causing damage to the transistor circuits of the radio.

ANTENNA CONSIDERATIONS

The FT-107M is designed for use into a 50 ohm resistive load. While minor deviations from the 50 ohm figure are of no consequence, the automatic final protection (AFP) circuitry will reduce the power output if high SWR conditions are encountered.

However, your FT-107M AFP circuitry and final amplifier components are tolerant of the minor SWR conditions present in many amateur installations. At an SWR of 3:1, for example, 75% of full rated output power will be obtained.

The Yaesu RSL series of mobile antennas is available from your Yaesu dealer, for mobile installations.

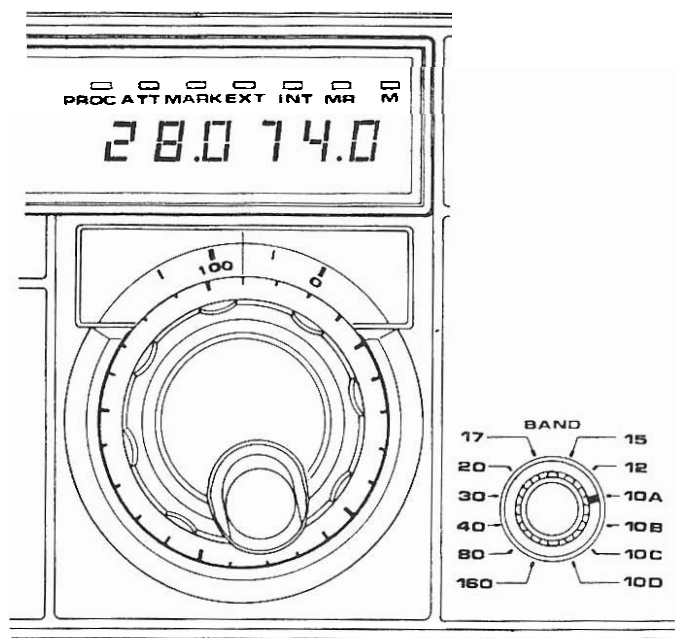
DIAL CALIBRATION

The FT-107M digital display is a true frequency counter, so no calibration is required. When changing sidebands, the digital display will also change 3 kHz.

Analog Dial Calibration

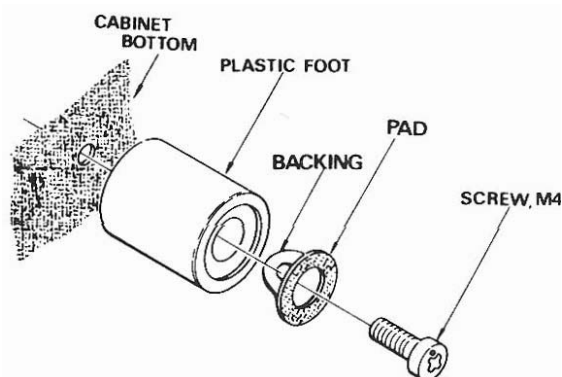
SSB

- (1) Set the MODE switch to the desired mode, USB or LSB.
- (2) Set the NB/MARK switch to MARK.
- (3) Rotate the VFO dial to the nearest 25 kHz point, as indicated on the digital display. Now align the analog dial skirt so that the bold calibration marking on the skirt is aligned with the vertical calibration point on the subdial window.



BOTTOM PANEL FEET

The feet on the bottom panel may be changed, if it is desired to change the viewing angle for the VFO. In the accessory kit for your FT-107M, there are two extender feet with mounting pads. These may be installed either in front or in back, according to the requirements of your station. Refer to the drawing for mounting details.



OPERATION

The tuning procedure for this transceiver is not complicated. However, care must be exercised when operating this equipment so that peak performance is obtained. The following paragraphs describe the procedure for operating the FT-107M.

INITIAL CHECK

Before connecting the transceiver to the DC power source, be certain that a fuse of the proper rating is in use. When using the FP-107 or FP-107E AC Power Supply, be certain that the voltage specification for the power supply matches your local AC supply voltage.

FREQUENCY SELECTION

Frequency selection on the FT-107M is by means of a digital as well as an analog display. The digital display reads the true frequency, with accounting for the carrier frequency. Therefore, no recalibration of the display is necessary when changing modes. The calibrator is chiefly useful for making receiver adjustments.

The digital display allows resolution to 100 Hz, while the analog skirt on the main dial allows 1 kHz. One revolution of the main tuning dial corresponds to a frequency change of 25 kHz. The marker signal may be used to set the 5 kHz marking of the analog dial skirt.

A further coarse frequency determination may be made through the main dial window, which contains a sub-dial calibrated every 50 kHz.

RECEIVE OPERATION

- (1) Connect a 50 ohm antenna to the rear panel ANT jack. Preset the controls and switches as follows:

POWER OFF
 VOX GAIN PTT
 NB Fully counterclockwise
 MODE Desired mode
 WIDTH 12 o'clock position
 AF GAIN . Adjust later for comfortable level
 RF GAIN Fully clockwise
 APF/NOTCH knob ... 12 o'clock position

BAND Desired band
 RX CLAR OFF
 CLARIFIER 12 o'clock position
 M FINE 12 o'clock position
 ATT OFF
 APF/NOTCH switch OFF
 AGC F
 NB/MARK switch OFF
 METER VCC

- (2) Turn the POWER switch ON. The meter lamp and digital display will become illuminated. The meter needle should deflect to within the VCC range at the right side of the meter scale.
- (3) Adjust the AF GAIN control for a comfortable listening level. There is no "preselector" or other peaking required for this receiver, because the preselector networks are all preset.
- (4) When pulse-type noise is encountered, turn the NB switch ON. Now, rotate the control clockwise until the noise pulses are eliminated. The best setting of the blanker for overall receiver performance is one that just eliminates the noise pulses, without being advanced too far. No noise blanker will eliminate all types of noise, but the FT-107M blanker is a state of the art design that provides significantly improved blanking capability over earlier designs.
- (5) For varying the width of the IF passband, rotate the width control. In the IF, two 8-pole crystal filters are used. One filter is fixed, and presents a boundary for the bandwidth. The center frequency of the IF is then varied across the passband of the second filter, using a mixing technique that results in no change of pitch on the received signal.

The result is continuously variable bandwidth, from 2.4 kHz down to approximately 300 Hz. This system is highly effective in eliminating high-pitched "buckshot" on SSB, as well as interfering CW signals.

The WIDTH system is defeated during AM operation, and the received signal bypasses the second IF filter.

- (6) Under conditions of very heavy QRM, while operating CW, the APF (Audio Peak Filter) may be activated. Switch the APF/NOTCH lever to APF, and tune the APF/NOTCH control for maximum enhancement of the desired signal. The operator will observe that the background noise will be reduced dramatically, resulting in excellent signal to noise ratio.
- (7) For elimination of an interfering carrier within the AF passband, set the APF/NOTCH switch to NOTCH. Then rotate the APF/NOTCH control carefully for the best nulling of the offending carrier. The notch is extremely sharp, so tuning is critical, but the excellent notch depth is extremely effective in eliminating interference.
The S-meter still indicates the interfering carrier strength regardless of notching, because the notching action is done in the audio stage.
- (8) The RX CLARIFIER may be used if the incoming signal is drifting. Press the RX CLAR button, and rotate the CLARIFIER control, to activate the receiver offset tuning. The TX button may be pushed to allow offset of the transmit frequency, and both the TX and RX buttons may be pushed together to allow offsetting of the transceive frequency from the dial frequency.
- (9) AGC time constant setting may be accomplished by setting the AGC switch for the desired recovery time, slow or fast. The AGC system may also be defeated by setting this switch to OFF.
- (10) For extremely strong signals, a 20 dB attenuator may be switched into the incoming receive line. Set the ATT switch to ON for this purpose.

TRANSMITTER OPERATION

The FT-107M transmitter is extremely easy to use, requiring only presetting of the controls and switches. No tuning procedure, other than an initial setting of the mic gain and RF processor level, is required.

When transmitting, it is important that you always have a dummy load or matched antenna connected to the antenna jack. The automatic final protection unit will reduce power if an improper load is connected.

When transmitting, **never** change the position of the MODE, BAND, nor the SELECT switch. It is possible for the final amplifier transistors to be damaged by transients generated by this kind of abuse. Please follow this simple precaution without fail.

The FT-107M contains a heat-sensing protection circuit for the final amplifier. Do not transmit at full power (e.g. key-down CW) for more than 30 seconds. If you have keyed down for a 30 second period, we recommend two minutes of standby operation to allow the final transistors to recover to normal operating temperature.

The following paragraphs describe transmitter operation. If our guidelines are followed, the FT-107M will provide many years of trouble-free operation.

PRELIMINARY CHECKS

- (1) Preset the controls and switches as follows:
 VOX GAIN PTT position
 FWD SET 12 o'clock position
 MIC GAIN Fully counterclockwise
 DRIVE Fully counterclockwise
 COMP Fully counterclockwise
 MODE FSK
 DIAL Desired frequency
 BAND Desired band
 SELECT VFO
 TX CLAR OFF
 PROC OFF
 METER switch IC
- (2) Connect a matched antenna to the antenna jack.
- (3) Set the VOX GAIN control to MOX.

GENERAL

- (4) Advance the DRIVE control so that the IC reading on the meter reaches exactly 10 amperes.
- (5) Set the METER switch to FWD, and adjust the FWD SET control so that the meter needle is aligned with the FWD SET position on the meter scale.
- (6) Set the METER switch to REF. The meter needle should be within the REF scale area for full power operation. The REF area covers SWR readings of up to 2 : 1, the area which will result in essentially no reduction in power output. If the needle rests above the REF area, remedial work on your antenna system may be in order. Alternatively, the FC-107 Antenna Coupler may be used to provide a 50 ohm load for your transceiver.
- (7) For the above test procedure, please be sure to check the frequency before transmitting. Also, use the minimum power necessary to obtain a full scale reading on the FWD SET step. If less than 10 amps of IC will provide this reading, by all means use the lower power level.

SSB OPERATION

- (1) Connect your microphone to the front panel MIC jack.
- (2) Preset the controls and switches as follows:
MODE Desired mode, LSB or USB
METER switch ALC
MIC GAIN 10 o'clock position
DRIVE Set for full output
- (3) Close the microphone PTT switch, and speak into the microphone in a normal voice. Adjust the MIC GAIN control so that the ALC meter needle does not go beyond the ALC range of the meter. With the meter switch set to IC, the reading on voice peaks will be roughly 5 amps, or about 1/3 to 1/2 of the full power single-tone meter reading.
- (4) To adjust the RF speech processor, place the PROC switch ON. Speak into the microphone in a normal voice, and do not change the MIC GAIN setting performed in step (3). Advance

the COMP control to the 10 o'clock position, and adjust the DRIVE control so that the ALC meter needle does not go beyond the ALC range of the meter. Now adjust the COMP control with the meter switch set to COMP; the meter should indicate between 5 and 10 on the COMP scale during voice peak conditions.

While some initial adjustment of the MIC GAIN, COMP, and DRIVE control may be required, be careful not to overdrive the transmitter, for best spectral purity. When speaking into the microphone in a long syllable (such as the word "four"), do not advance the DRIVE control beyond the point where the IC or forward power reading ceases to increase

- (5) To set the VOX circuitry, advance the VOX GAIN control on the front panel so that your voice activates the transmitter. The rear panel DELAY control will allow the operator to set the VOX time constant for the desired hang time after you have finished speaking. The ANTITRIP control, VR₄₀₀₃, is located on the IF Unit, and it may be adjusted as necessary to prevent the speaker output from activating the VOX. Do not use more VOX GAIN nor ANTITRIP than necessary.

CW OPERATION

- (1) Insert your key plug into the rear panel KEY jack. Key up voltage is 7 VDC, and key-down current is 1.5 mA, so most all electronic keyers will work without modification with the FT-107M.
- (2) If you use a footswitch, connect its plug to the rear apron PTT jack.
- (3) Set the MODE switch to CW-W or CW-N, and set the VOX GAIN control to PTT.
- (4) Activate the transmitter (close the footswitch or set the VOX GAIN control to MOX), and go key down. Adjust the DRIVE control for the desired power input, up to a maximum reading of about 18A on the IC meter.

- (5) For semi-break-in operation, advance the VOX GAIN control to the point where the VOX relay is activated by the sidetone audio signal. The DELAY control, located on the rear panel, may be adjusted to control the VOX relay hang time.
- (6) For QRP operation, reduce the level set by the DRIVE control. The power output may be reduced to 0 watts, if desired.

FSK OPERATION

The FT-107M is designed for 170 Hz FSK operation.

- (1) Connect the lead from your terminal unit to the rear panel FSK jack.
- (2) Set the MODE switch to FSK, and set the VOX GAIN control to MOX. Advance the DRIVE control for a reading of 5 amps on the IC meter. Do not operate the FT-107M on FSK at the same power levels as stipulated in the sections regarding SSB and CW operation.
- (3) The keying signal from your terminal will now activate the FT-107M transmitter. When using the optional CW filter, the CW filter will automatically be selected during FSK operation.

AM OPERATION

- (1) Set the MODE switch to AM, the METER switch to IC, and rotate the MIC GAIN and DRIVE controls fully counterclockwise.
- (2) Close the microphone PTT switch, and advance the DRIVE control until the reading on the IC meter reaches 5 amps.
- (3) Speak into the microphone in a normal voice, and advance the MIC GAIN control until a slight downward deflection of the IC meter is noted on voice peaks. Do not advance the MIC GAIN control too far, as any excess energy above that required for full modulation will be wasted in spurious emissions.
- (4) In the AM mode, the RF speech processor and variable IF bandwidth control are not usable.

SELECT SWITCHES/MEMORY OPERATION

(Note: The memory unit is an available option for the FT-107M)

Frequency control on the FT-107M is by means of the internal VFO, the memory and DMS circuitry, an external VFO (such as the FV-107), or various combinations of the three. The SELECT switch will determine the circuitry in control of each mode, and the selection procedure is described below:

VFO	This position selects TX/RX operation on the FT-107M internal VFO.
MR	This position selects TX/RX operation on the FT-107M memory system.
RX MR	This position selects RX operation on the memory, with TX operation on the FT-107M internal VFO.
TX MR	This operation selects TX operation on the memory, with RX operation on the FT-107M internal VFO.
EXT	This position selects TX/RX operation on the FV-107 external VFO.
RX EXT	This position selects RX operation on the FV-107, with TX operation on the FT-107M internal VFO.
TX EXT	This position selects TX operation on the FV-107, with RX operation on the FT-107M internal VFO.

In addition, changing of and offset from memory channels is controlled from the front panel. The controls of interest are as follows:

M	This button is used to store a frequency in memory.
M SFT	This button activates the DMS circuit.
RX CLAR	This button selects offset tuning of the receive frequency during VFO or memory operation.
TX CLAR	This button selects offset tuning of the transmit frequency during VFO or memory operation.
T/R CLAR	When both buttons are pushed, offset tuning of the transceive frequency is provided.

GENERAL

M FINE	The memory fine tuning control provides a very fine tuning adjustment for memory channels. The available offset range is approximately ± 500 Hz, making this control ideal for tuning between the 100 Hz DMS steps.
M SFT (knob)	The Digital Memory Shift (DMS) circuitry is controlled by the M SFT knob. When a memory channel is programmed, and the M SFT button is pushed, the memory frequency can be shifted up or down in 100 Hz steps, up to and slightly beyond the 500 kHz limits of the normal VFO range.
M CH	The memory channel selector chooses the desired memory channel.

TYPICAL MEMORY OPERATION

Operation of the memory system and DMS circuitry is perhaps best described by the use of several examples. Following the examples, some advanced programming techniques will be discussed.

- (1) You are operating on a net on 3970 kHz and must QSY down 10 kHz to handle a piece of traffic. With the SELECT switch set to VFO, set the main tuning dial to 3970 kHz. Press M to memorize 3970 kHz in the desired memory channel. Now move the main dial down to 3960 kHz to handle the message. When finished, set the SELECT switch to MR for instant return to 3970 kHz, the net frequency. For return to 3960 kHz, again select VFO.
- (2) You are operating split frequency on 40 meter phone, and you hear DX1DX on 7090 kHz, listening for calls on 7205 kHz. With the SELECT switch on VFO, tune to 7090 kHz, and press M to store that frequency in channel 1. Now turn the main dial to 7205 kHz, and set the SELECT switch to RX MR; you will now be listening on 7090 kHz, while transmitting on 7205 kHz. To listen to the pile-up of stations on 7205 kHz calling DX1DX, set the SELECT switch to VFO; you will now be listening on 7205 kHz.

If DX1DX starts to drift, press the RX CLAR button, and use the clarifier. Alternatively, for slight drifting, use the M FINE control. If DX1DX decides to QSY 10 kHz, press the M SFT button, and rotate the M SFT control to the new frequency (e.g. 7080 kHz). The M SFT control will not affect the transmit frequency, because the SELECT switch is set to RX MR, and control of the transmit frequency is by the VFO.

- (3) You find DX1DX on 21270 kHz, working stations by order of call area. You also find DX0AA on 14145 kHz, listening on 14205 kHz, also by call area. The memory and no tune-up capability make this situation easy to cover.

First, tune to 21270 kHz on the VFO, set the M CH switch to 1, and press M. Now, set the bandswitch to 14 MHz, and the dial to 14145 kHz. Set the M CH switch to 2, and press M. Now move the main dial to 14205 kHz.

To check DX0AA's frequency (14145 kHz), set the SELECT switch to RX MR. To check DX1DX's frequency, set the bandswitch to 21 MHz and the M CH switch to 1. If DX1DX is acknowledging your call area, set the SELECT switch to MR and call him. To recheck DX0AA, set the bandswitch to 14 MHz, and the M CH switch to 2. If DX0AA is listening for your call area, switch to RX MR for RX on 14145 Hz and TX on 14205 kHz.

Because there is no "preselector tuning" control, nor any transmitter peaking whatsoever, it may be seen that several stations on different bands may be checked in a matter of seconds, without touching a VFO dial.

NOTES ON DMS OPERATION

The DMS control will allow offsetting of the memory frequency in 100 Hz steps. Every several steps, however, a slight momentary “chirp” in the memory frequency may be observed. This is caused by a relocking of the memory circuitry during shift operation, and it is entirely normal. The “chirp” lasts only a small fraction of a second, and no frequency stability whatsoever will result on that “step”. The design technique that produces the brief “chirp” also ensures clean local oscillator operation, important for good dynamic range of the receiver.

When you turn on the M SFT button, perform a shift using the M SFT knob, then turn the M SFT button OFF, the memory will return to the original memory frequency. However, when you push the M SFT button on again, you will **not** return to the previous shift frequency; you will start on the original memory frequency, and a new shift must be programmed. An alternative solution is shown in the “Advanced Programming of Memory Channels” section, below.

When using the M SFT control, it will frequently be useful to use the M FINE control for tuning between the 100 Hz steps, especially on CW. The M FINE control should, otherwise, be set to the 12 o'clock position. When a frequency is stored in memory, then recalled, the M FINE control shifts the memory frequency based on the position of the M FINE control at the time of frequency entry. Therefore, one can see that the offset capability of the M FINE control will be reduced if it is not preset to the 12 o'clock position.

ADVANCED PROGRAMMING OF MEMORY CHANNELS

The parallel storage system used in the FT-107M memory allows a degree of flexibility not found in other memory systems: the ability to program a new memory frequency having shifted an earlier memory frequency. An example will show how this technique can be used to good advantage.

Let us say that DXØAA is transmitting on 14195 kHz, tuning between 14225 and 14250 kHz; watching DXØAA's operating practice, you notice that he listens for stations at 5 kHz intervals within the above range. Here's how to proceed:

Tune the main dial to 14195 kHz, set the M CH switch to 1, and push M. Now set the SELECT switch to RX MR, and press the M SFT button. Rotate the M SFT knob until you find the station DXØAA is working on 14225 kHz (check the transmit frequency of DXØAA instantly by switching the SELECT switch to VFO to follow the calling sequence). Now set the M CH switch to 2, and press M. If the next QSO is with a station on 14230 kHz, rotate the M SFT knob again to that frequency, set the M CH switch to 3, and press M. Follow this sequence until you have DXØAA's favored listening frequencies in memory. Now you can switch to TX MR, turn M SFT OFF, and select the memory channel corresponding to the most likely listening frequency for DXØAA, because 14225 kHz, 14230 kHz, 14235 kHz, etc. will all have been stored in successive memory channels. Use the transmit clarifier, if desired, to make a minor change in a frequency.

You may continue to shift off of any memory channel, and use it to program a new memory channel, up to the limit of 12 total memory channels. This technique can also be used to advantage when operating on a net, if you want to store and check several frequencies without leaving the net frequency (on the VFO).

SCANNING OPERATION WITH YM-35 MICROPHONE (OPTION)

The YM-35 scanning microphone (option) can be used to provide up/down scanning, as well as scanning speed control, for convenient operation. The YM-35 can only be used with a memory-equipped FT-107M, because it depends on the memory system for its scanning capability.

First, program any memory frequency as a starting point. Now set the M SET button to ON, and press the UP or DN scanning button on the YM-35. For as long as you hold the UP or DN switch down, scanning will occur. Release the scanning switch to stop the scan.

To activate the fast scanning feature, press both the UP or DN switch and the FAST switch. Release both switches for stopping of the scan.

UNIT COMPLEMENT

Unit	Prod. Lot (Serial Number)					
	1 (01xxxx)	2 (02xxxx)	3 (03xxxx)	4 (04xxxx)	5 (05xxxx)	6 & up (06xxxx)
RF	PB-2002 ↔ PB-2002A	PB-2002A ↔ PB-2002B	PB-2002B X PB-2158			
Local	PB-2003 ↔ PB-2003A	PB-2003A ↔ PB-2003B	PB-2003B X PB-2159			
Filter	PB-2004 ↔ PB-2004A	PB-2004A ↔ PB-2004B	PB-2004B			
IF	PB-2005 ↔ PB-2005A	PB-2005A ↔ PB-2005B	PB-2005B ↔ PB-2005C			
AF	PB-2006 ↔ PB-2006A	PB-2006A ↔ PB-2006B	PB-2006B			
NB	PB-2007 ↔ PB-2007A	PB-2007A ↔ PB-2007B	PB-2007B ↔ PB-2007C			
Lever SW	PB-2008 ↔ PB-2008A	PB-2008A	PB-2008A			
VFO	PB-1440B	PB-1440B	PB-1440B	PB-1440B	PB-1440B	PB-1440B
RF Mother Board	PB-2009 ↔ PB-2009A	PB-2009A	PB-2009A	PB-2009A	PB-2009A X PB-2009B	
CLAR SW	PB-2010A	PB-2010A	PB-2010A	PB-2010A	PB-2010A	PB-2010A
LED	PB-2011 ↔ PB-2011A	PB-2011A	PB-2011A	PB-2011A	PB-2011A	PB-2011A
IF Mother Board	PB-2012 ← PB-2012A	PB-2012A ↔ PB-2012B	PB-2012B ↔ PB-2012C	PB-2012C ↔ PB-2012D		
100W PA	PB-2013 ↔ PB-2013A	PB-2013A	PB-2013A	PB-2013A	PB-2013A	PB-2013A
LPF	PB-2014	PB-2014	PB-2014	PB-2014	PB-2014	PB-2014
PROTECTOR	PB-2015 ↔ PB-2015A	PB-2015A	PB-2015A	PB-2015A	PB-2015A X PB-2146	
MEMORY MAIN	PB-2016B	PB-2016B	PB-2016B	PB-2016B	PB-2016B ← PB-2016C	
MEMORY VCO	PB-2045	PB-2045	PB-2045	PB-2045	PB-2045	PB-2045
VXCO	PB-2046 ↔ PB-2046A	PB-2046A ↔ PB-2046B	PB-2046B	PB-2046B	PB-2046B	PB-2046B
DIVIDER	PB-2084	PB-2084	PB-2084	PB-2084	PB-2084 ← PB-2084A	
DISPLAY	PB-2087	PB-2087	PB-2087	PB-2087	PB-2087	PB-2087
LSI COUNTER	PB-2086A	PB-2086A	PB-2086A	PB-2086A	PB-2086A	PB-2086A
COUPLER	PB-2056A	PB-2056A	PB-2056A	PB-2056A	PB-2056A	PB-2056A
AF BUFFER	PB-2064	-	-	-	-	-
MIC UP/DOWN CONTROL	-	-	PB-2108 ↔ PB-2108A	PB-2108A	PB-2108A	PB-2108A
CONTROL	PB-2083A	PB-2083A	PB-2083A	PB-2083A	PB-2083A	PB-2083A

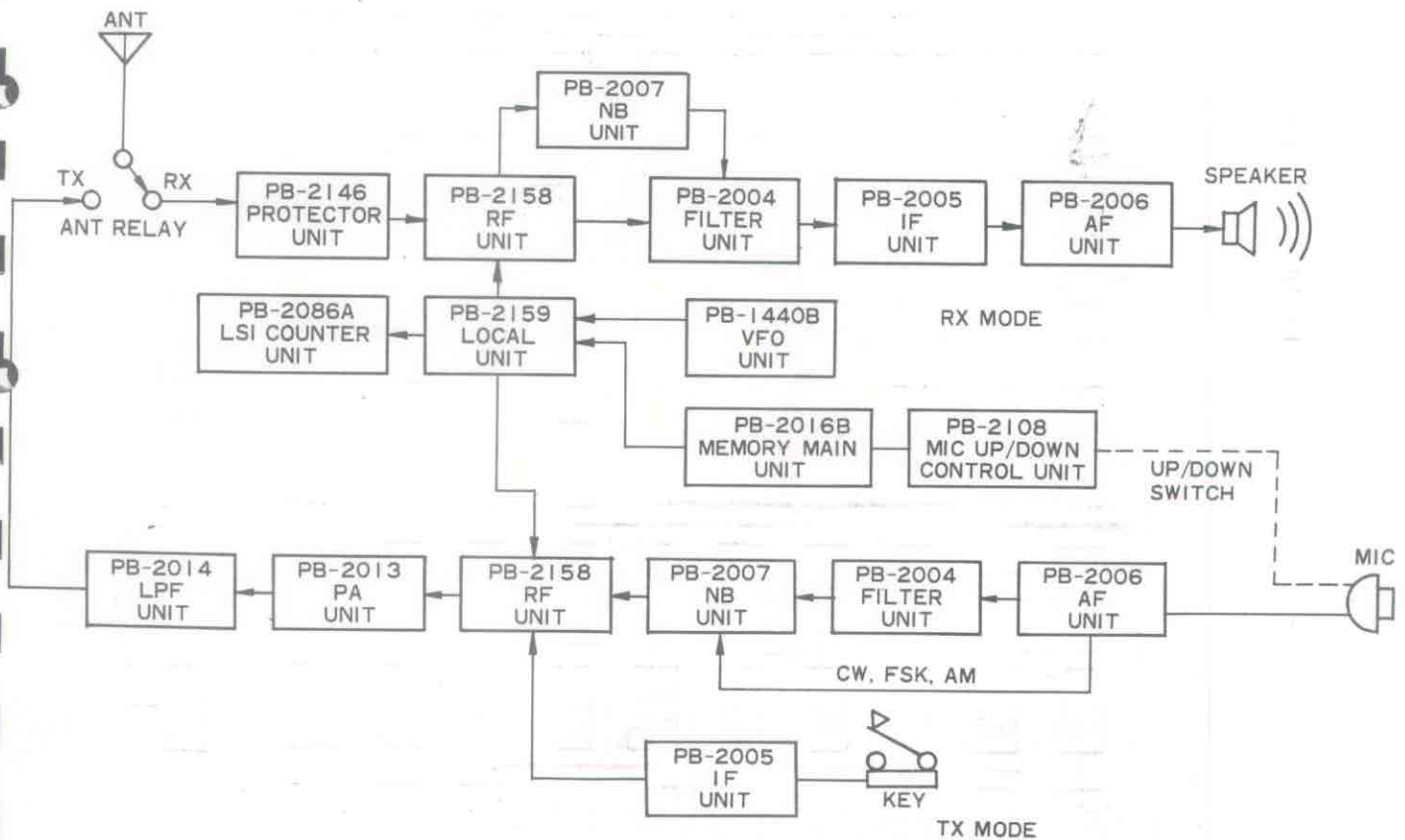
- ↔ Interchangeable
- X Not interchangeable
- ← Interchangeable in this direction

SIGNAL TRACING IN THE FT-107M

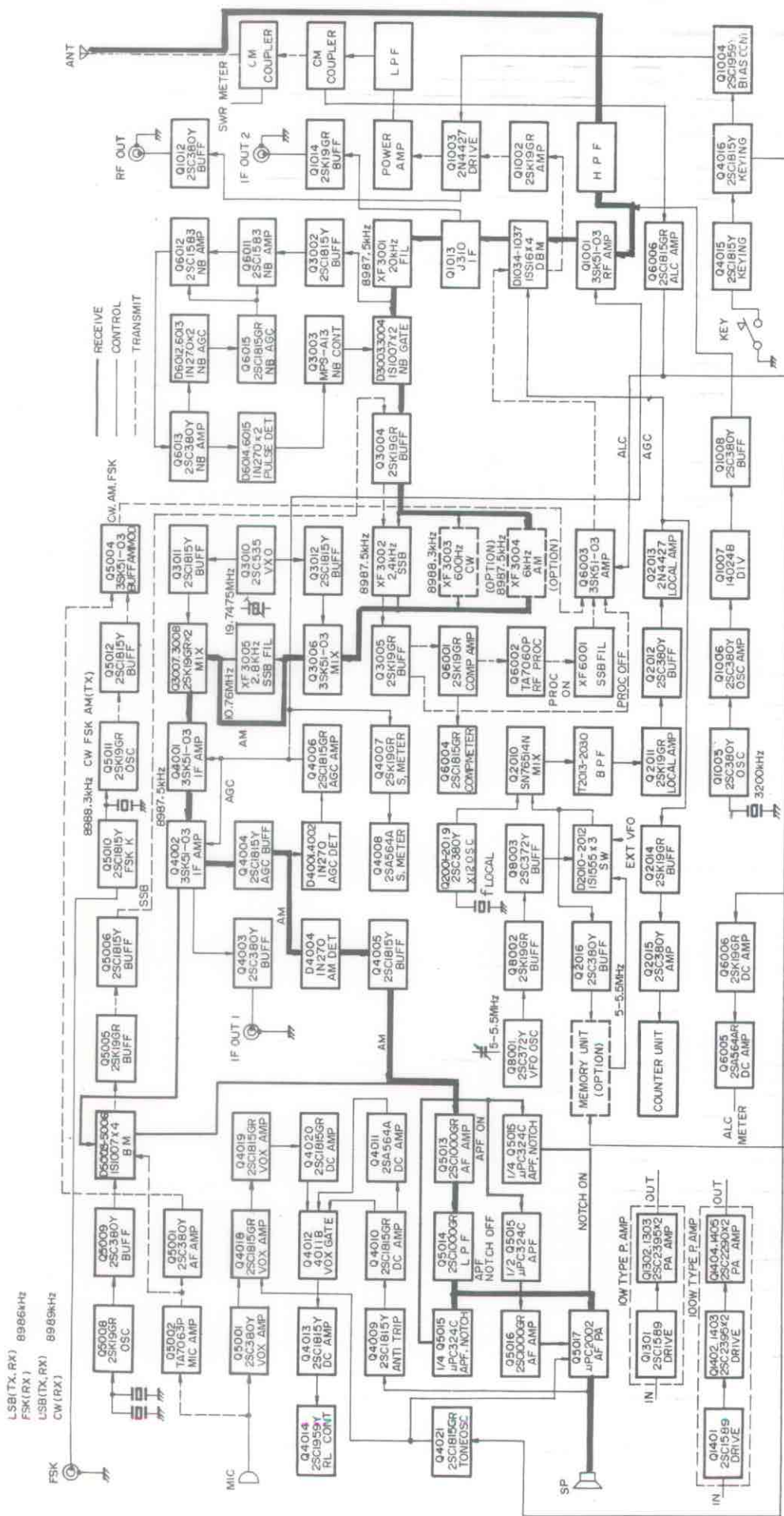
Because the signal path may change considerably when the mode is changed, we have included augmented block diagrams on page 2-4 through 2-8, in order to assist you in understanding the function of the FT-107M.

Below you will find a board-to-board block diagram, showing the TX and RX signal paths through the transceiver.

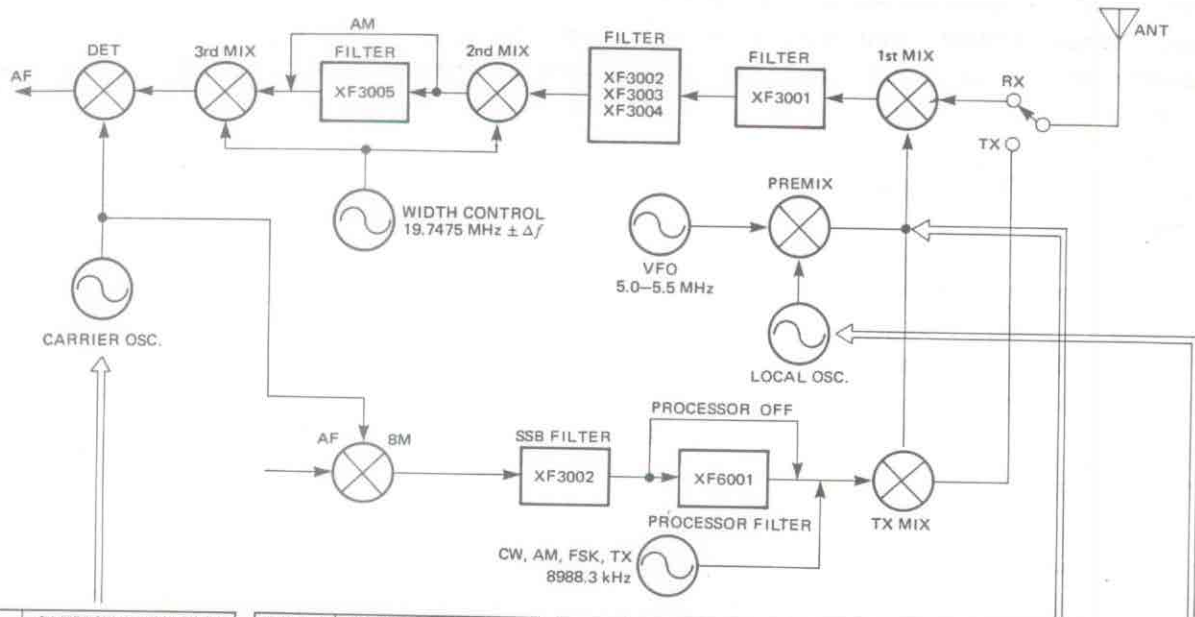
It should be noted that the internal calibrator (Marker) is an extremely useful signal for preliminary fault localization. In a properly functioning FT-107M, the S-meter should read approximately $S9 + 20$ dB. Minor variations from this number are not unusual, but a blown RF amplifier FET will cause this indication to be practically nil. By using the internal calibrator, an experienced technician can peak practically all circuits on the receiver side, without the use of an external signal generator.



FT-107M AM MODE RX



FREQUENCY RELATIONSHIPS



MODE	CARRIER FREQUENCY	
	RX kHz	TX kHz
LSB	8986	8986
USB	8989	8989
CW	8989	-
FSK	8986	-

FILTER	CENTER FREQUENCY
XF3001	8987.5 kHz
XF3002	8987.5 kHz
XF3003	8988.3 kHz
XF3004	8987.5 kHz
XF3005	10.7 MHz
XF6001	8987.5 kHz

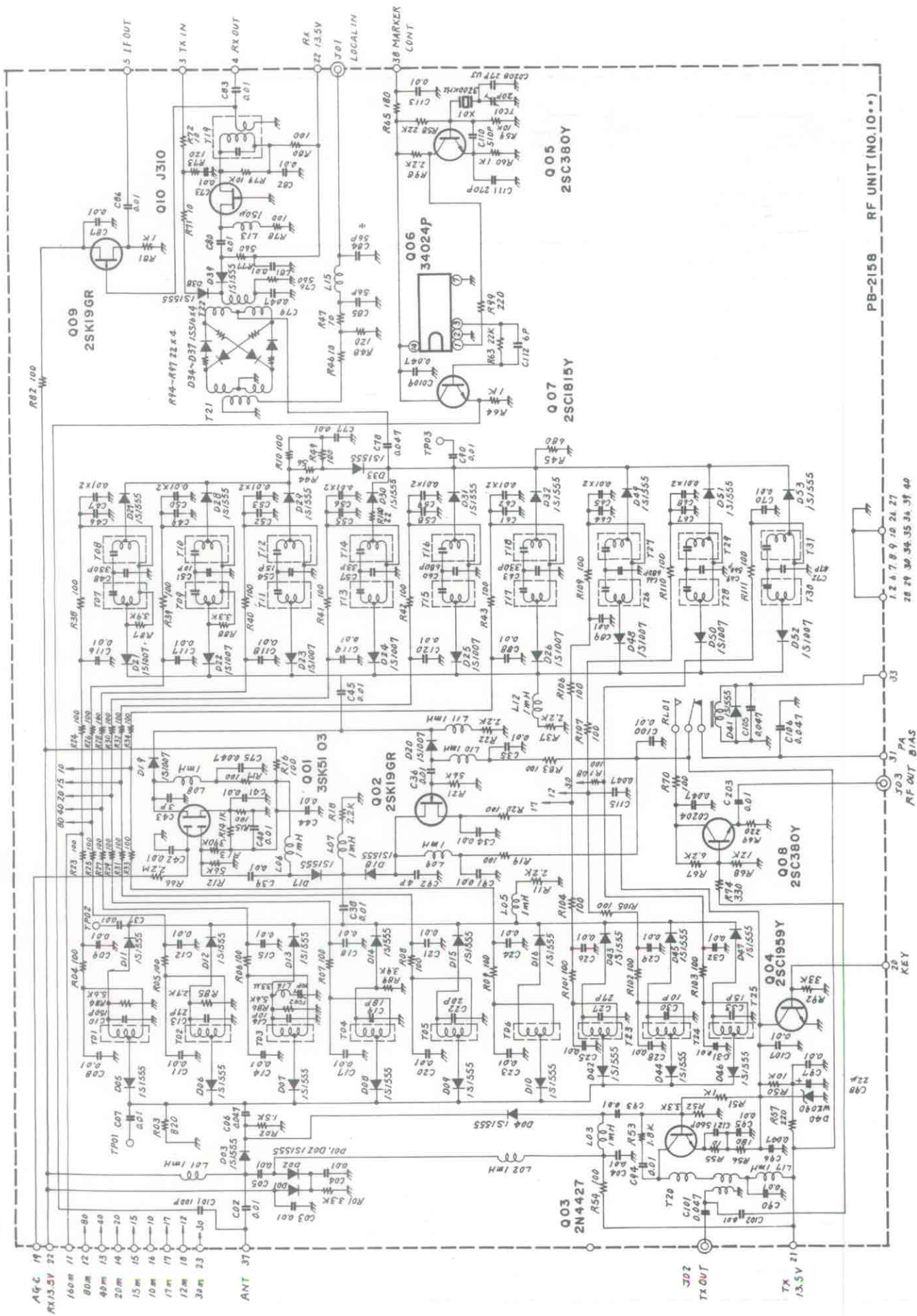
BAND	PREMIX OUT FREQUENCY MHz	LOCAL OSC. FREQUENCY MHz	BAND	PREMIX OUT FREQUENCY MHz	LOCAL OSC. FREQUENCY MHz
160 m	10.4875-10.9875	15.9845	15 m	29.9875-30.4875	35.4875
80 m	12.4875-12.9875	17.9845	*12 m	33.4875-33.9875	38.9875
40 m	15.9875-16.4875	21.4845	10 m A	36.9875-37.4875	42.4875
*30 m	18.9875-19.4875	24.4875	10 m B	37.4875-37.9875	42.9875
20 m	22.9875-23.4875	28.4875	10 m C	37.9875-38.4875	43.4875
*17 m	26.9875-27.4875	32.4875	10 m D	38.4875-38.9875	43.9875

* After Proc. 6

CRYSTAL DATA FT-107M

UNIT	FUNCTION	HOLDER	FREQUENCY (kHz)	MODE	LOAD C (pF)	EFFECTIVE RESISTANCE (ohms)	DRIVE LEVEL (mw)
LOCAL	160m	HC-18/U	15984.5	3rd overtone	20	80	2
	80m	"	17984.5	"	"	60	"
	40m	"	21484.5	"	"	45	"
	30m	"	24487.5	"	"	40	"
	20m	"	28487.5	"	"	40	"
	17m	"	32487.5	"	"	40	"
	15m	"	35487.5	"	"	40	"
	12m	"	38987.5	"	"	40	"
	10m(A)	"	42487.5	"	"	40	"
	10m(B)	"	42987.5	"	"	40	"
	10m(C)	"	43487.5	"	"	40	"
	10m(D)	"	43987.5	"	"	40	"
	WWV	"	19487.5	"	"	50	"
	AF	LSB	"	8986.0	Fundamental	30	35
USB		"	8989.0	"	"	"	"
CW, AM, FSK		"	8988.3	"	"	"	"
FILTER	Width	"	*19747.5	Fundamental	35	15	2
DMS	Local	"	20480.0	Fundamental	18.5	20	2
RF	Marker	HC-6/W	3200.0	Fundamental	23	50	5
LSI COUNTER	Clock	HC-18/U	6553.6	Fundamental	30	30	2

* XCO FREQUENCY: 19743-19753kHz
Determined by circuit

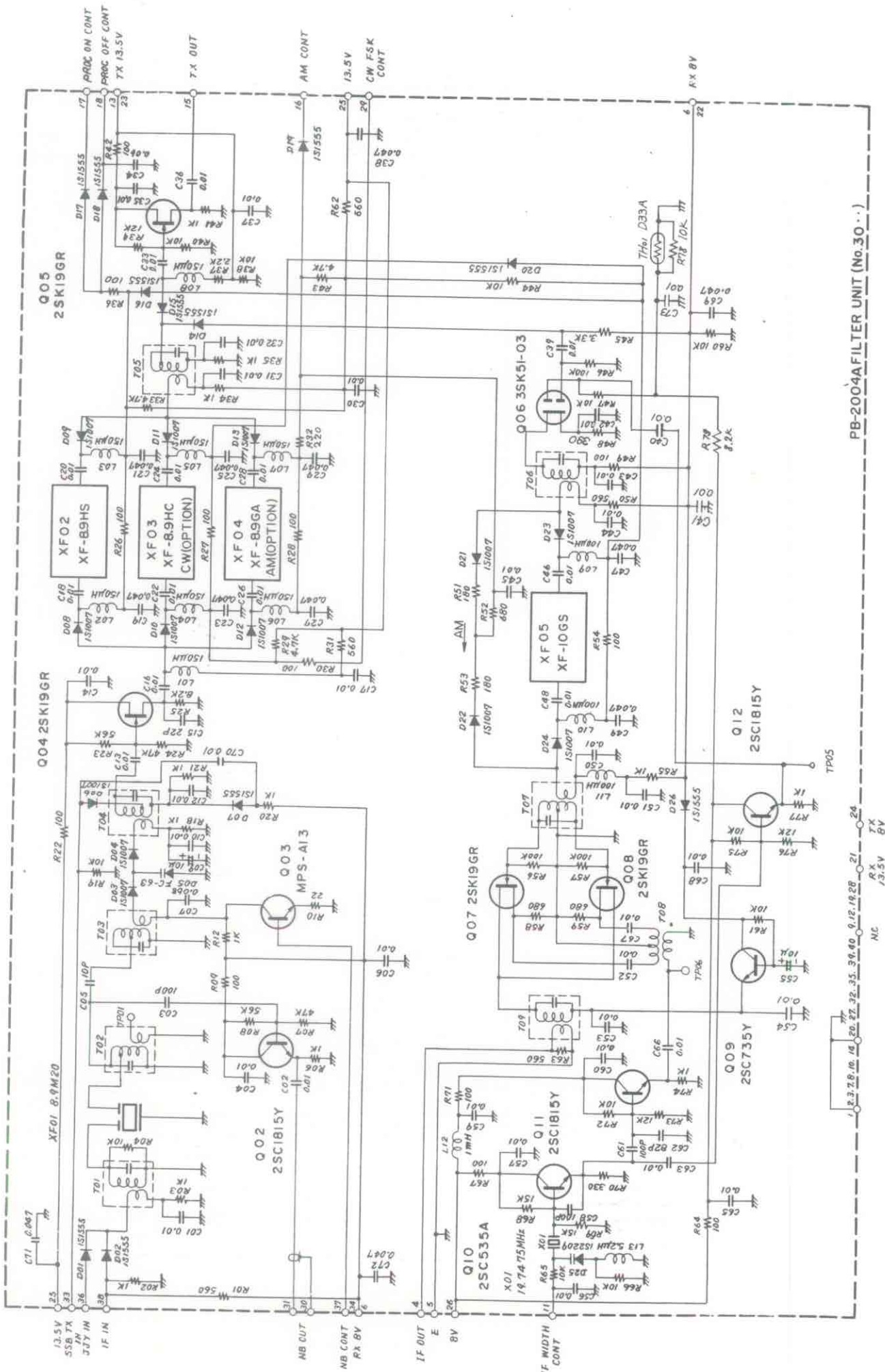


PB-2158 RF UNIT (NO.10**)

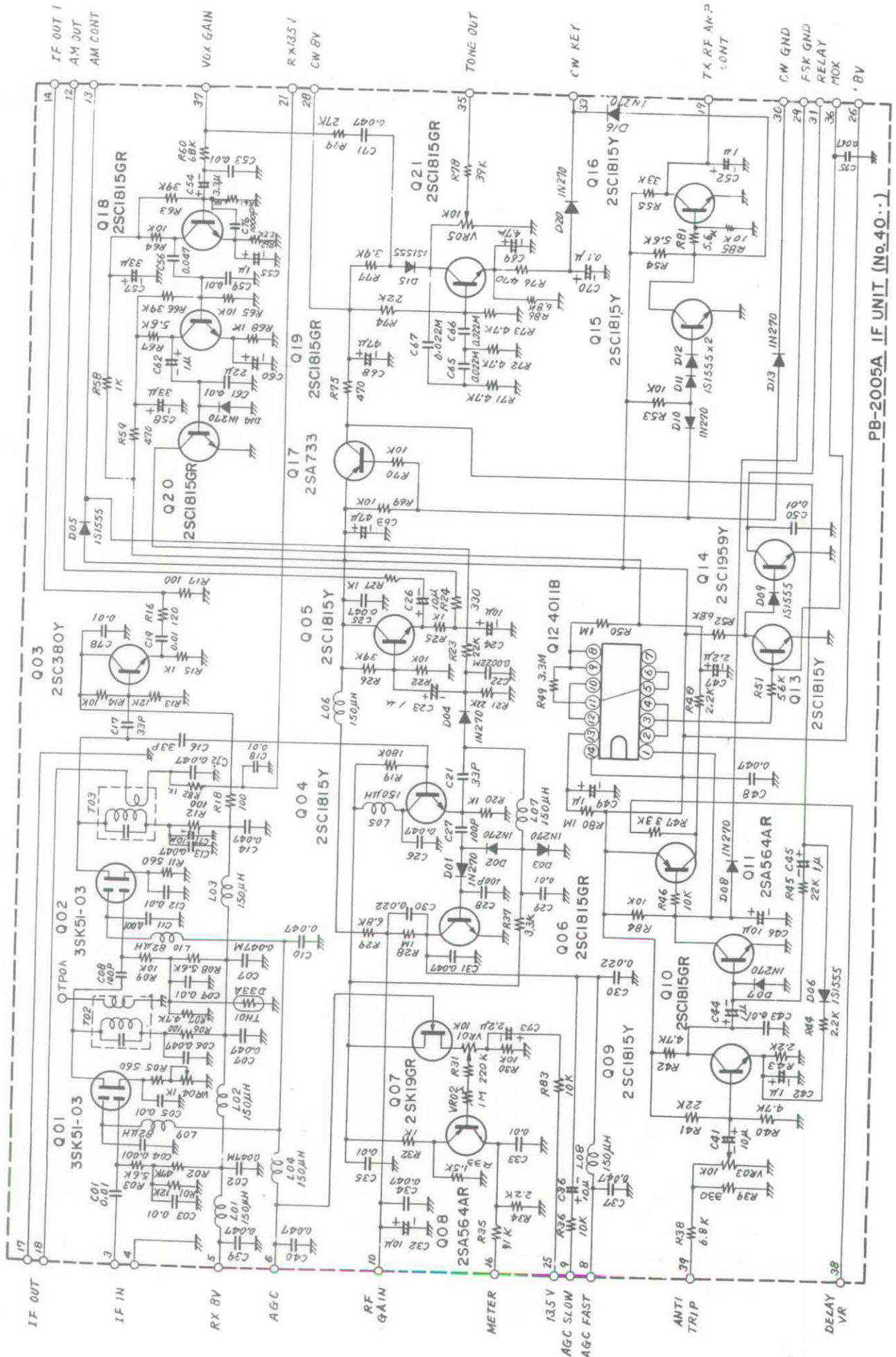
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

RF OUT BIAS

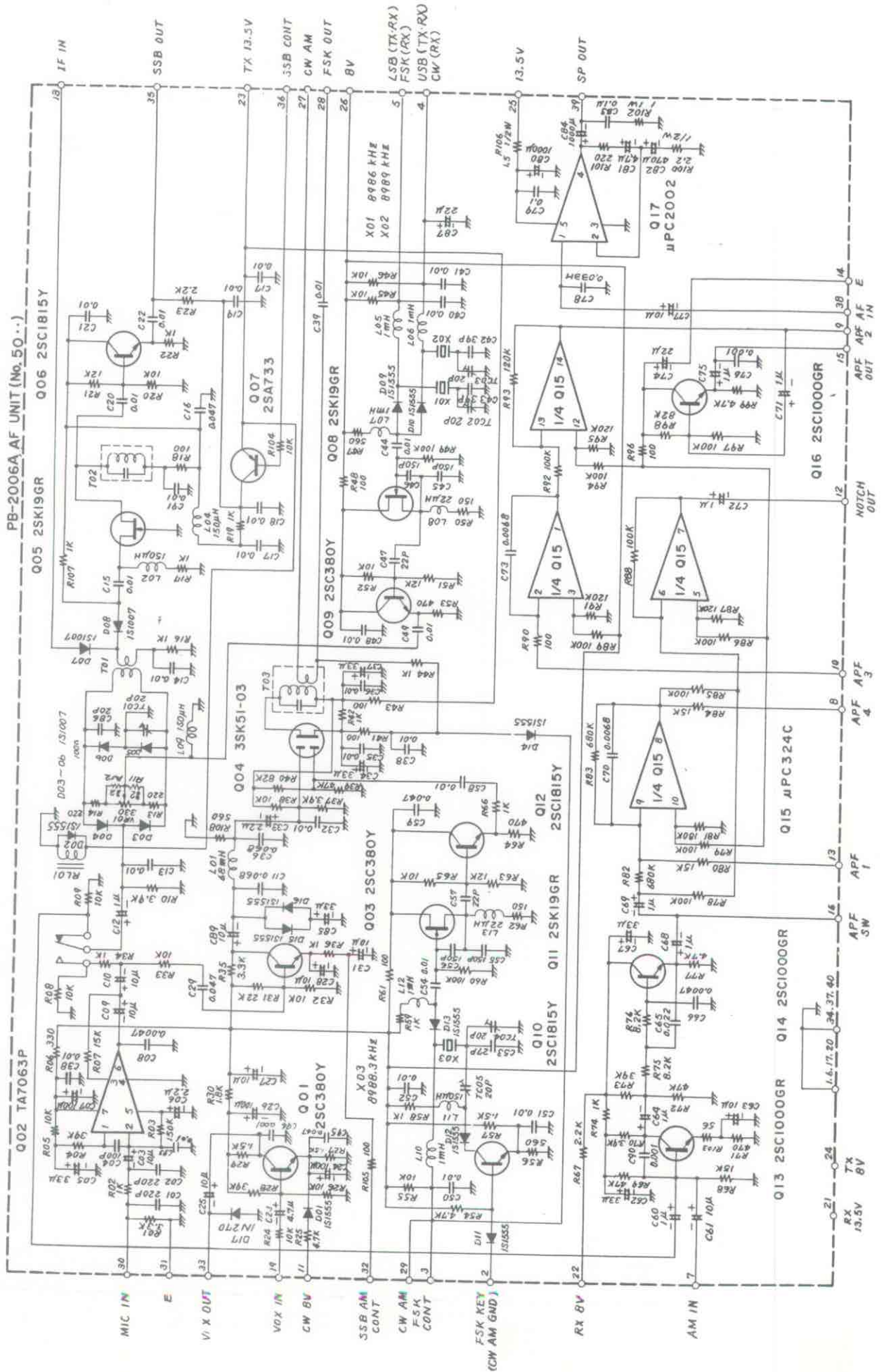
KEY



PB-2004 FILTER UNIT (No. 30...)



PB-2005A IF UNIT (No.40..)



AF UNIT (PB-2006)

The incoming SSB/CW/FSK IF signal is fed through diode switch D_{5007} (1S1007), and delivered to the ring demodulator, consisting of D_{5003} – D_{5006} (1S1007), which demodulates the IF signal into audio using the carrier signal delivered from Q_{5009} (2SC380Y).

The carrier oscillator, Q_{5008} (2SK19GR), oscillates at 8986 kHz for LSB and FSK, and at 8989 kHz for USB and CW. Diode D_{5009} (1S1555) conducts to activate X_{5001} for LSB/FSK, while D_{5010} (1S1555) conducts to activate X_{5002} for USB/CW. The carrier signal from Q_{5008} is amplified by Q_{5009} for delivery to the ring demodulator.

The audio output from the ring is amplified by Q_{5016} and Q_{5017} (2SC1000GR), and delivered through the APF/NOTCH switch and AF GAIN control VR_{2a} to the audio output amplifier, Q_{5017} (μ PC 2002H), which delivers 3 watts of audio output to the speaker. The audio spectrum is shaped at Q_{5014} by a low-pass filter of $f_0 = 2.7$ kHz, -12 dB/octave.

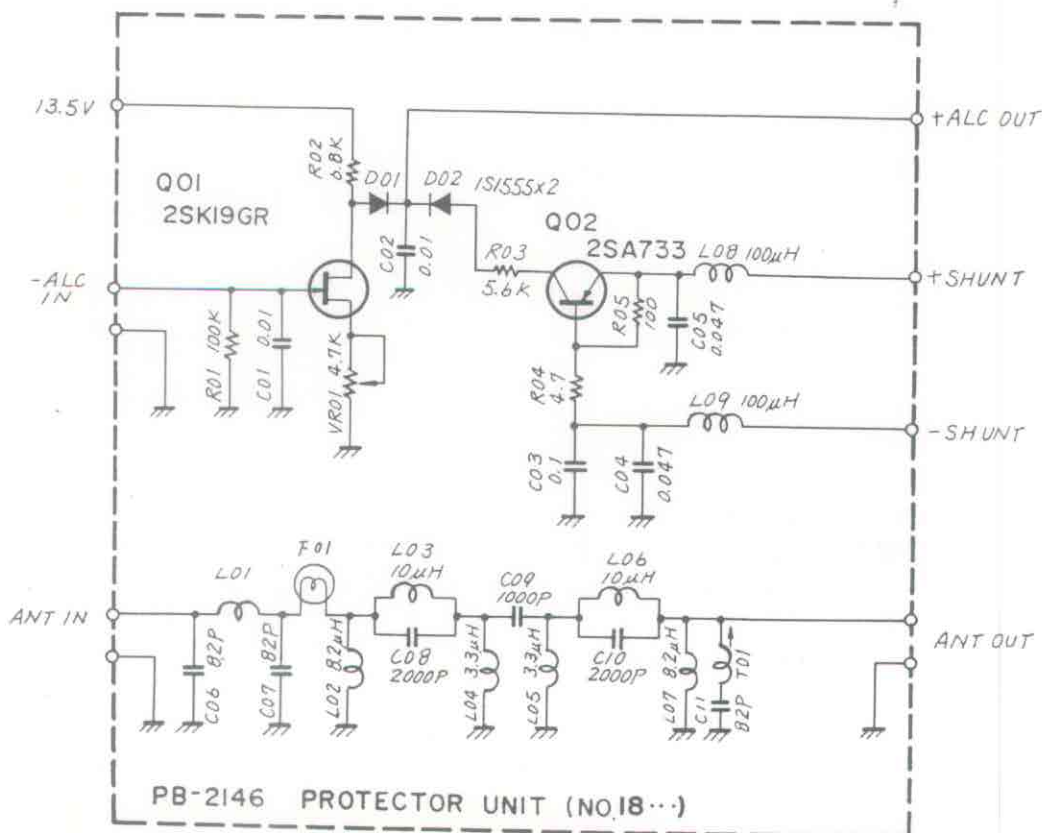
Operational amplifier Q_{5015} (μ PC324C) is placed in the audio circuit by the APF/NOTCH switch on the front panel. For APF operation, a selective active filter is formed by two sections of Q_{5015} , and the output is amplified by Q_{5016} (2SC1000GR) prior to delivery to Q_{5017} . Two sections of Q_{5015} are also used for the high-Q notch filter. VR_3 provides for adjustment of the center frequency of the audio peak and notch filters.

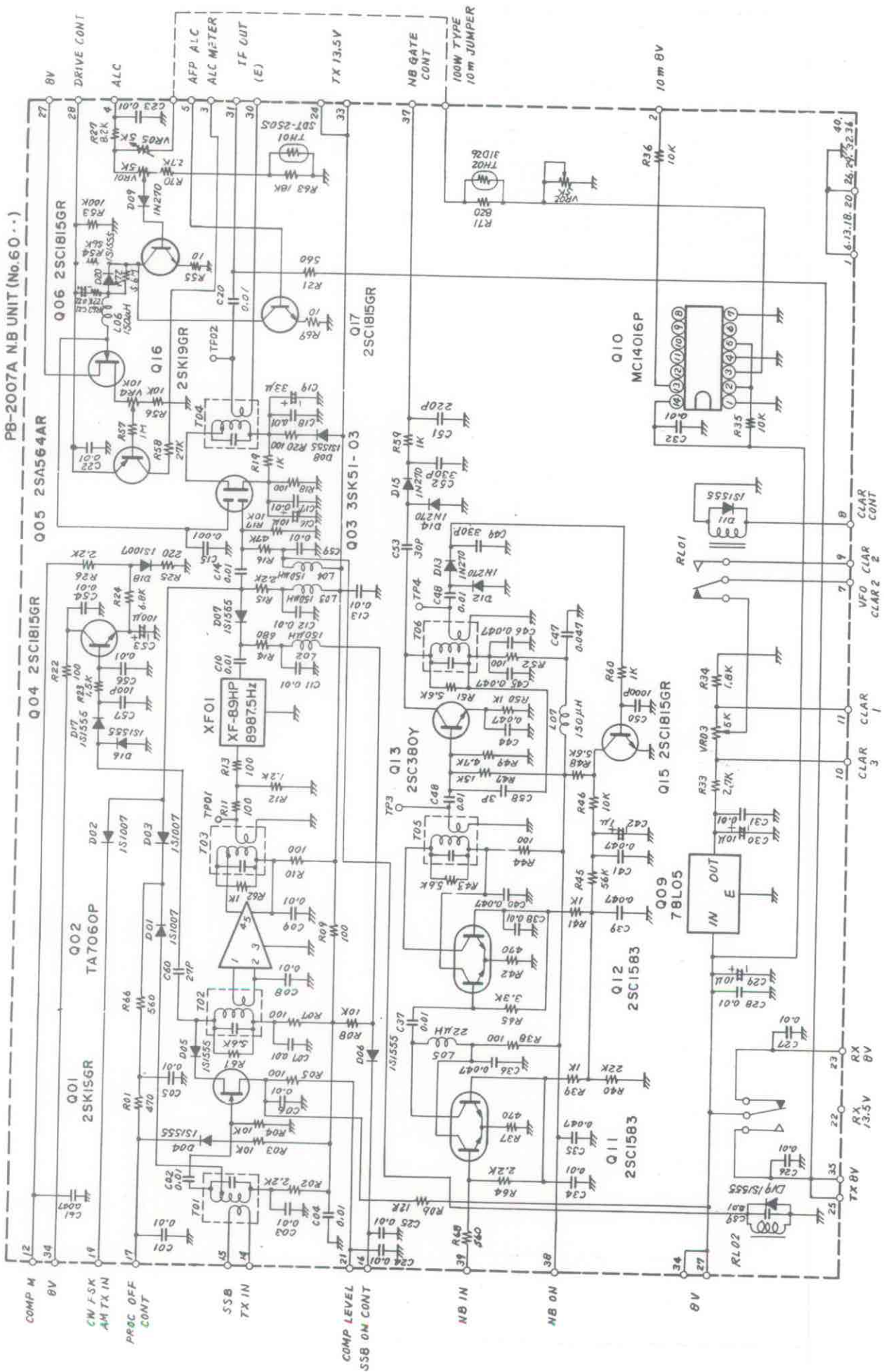
In the AM mode, the output from buffer Q_{4005} is fed to the base of Q_{5013} for amplification, in the same way as the signals on the other modes.

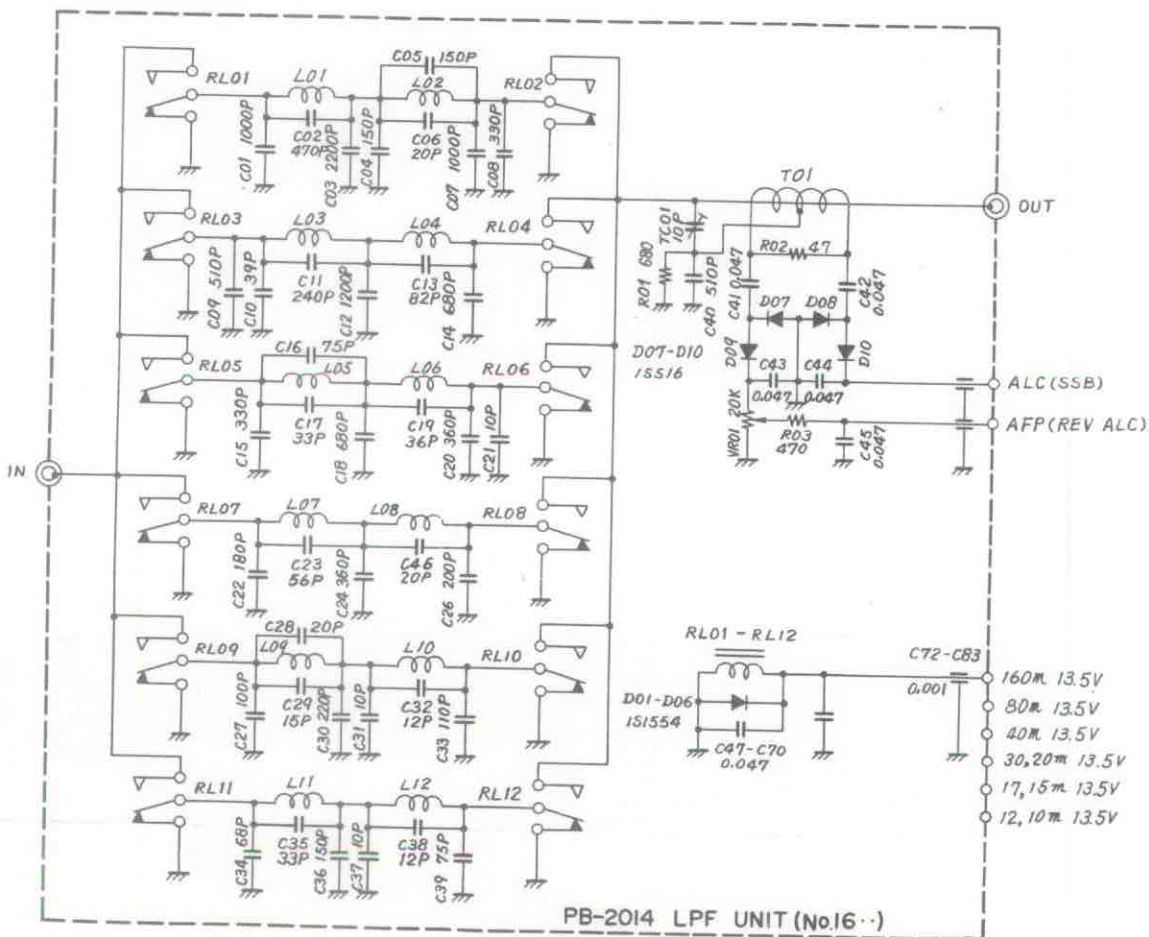
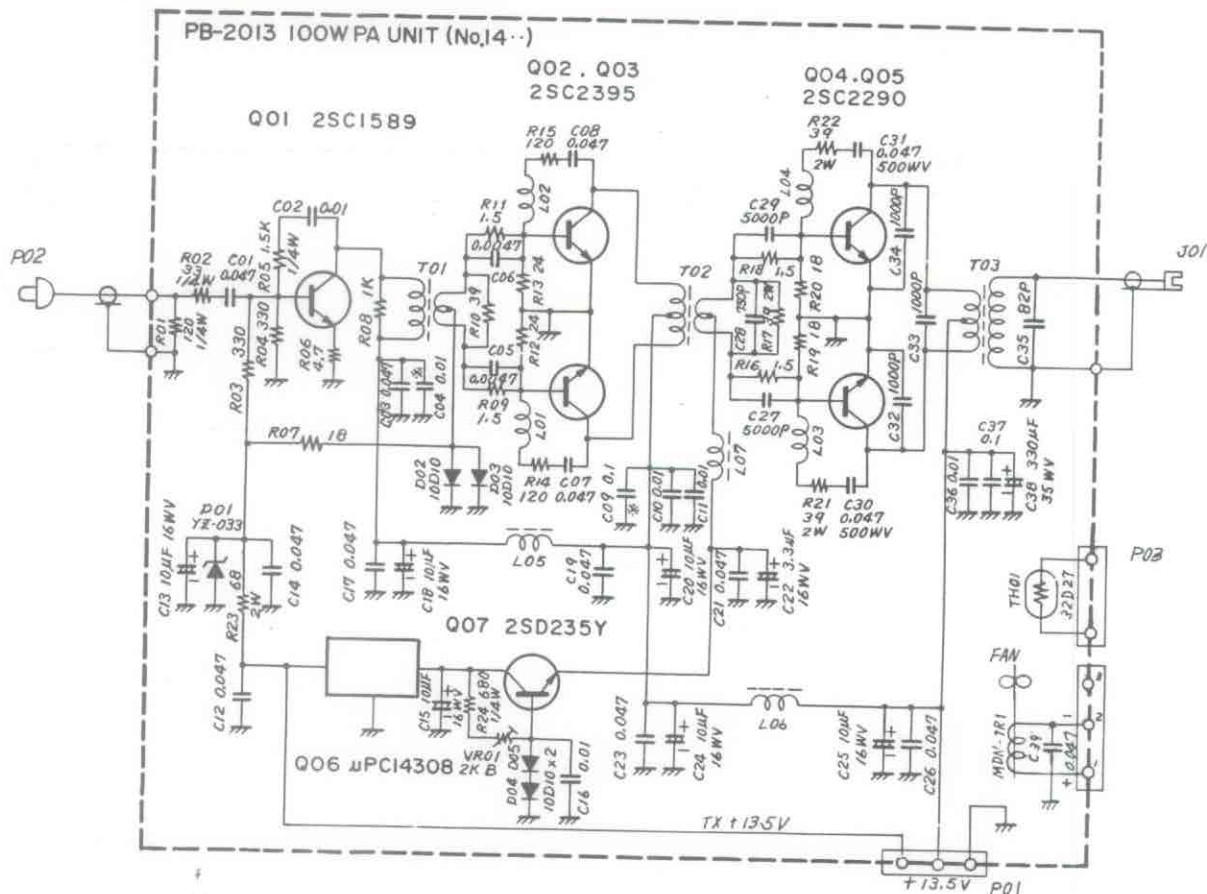
PROTECTOR UNIT (PB-2146)

The incoming RF signal is fed to a 1.7 MHz high-pass filter through a lamp fuse which protects the RF amplifier and mixer against extremely strong signals. This signal is then fed to the RF Unit.

If an excessive current flows through the Power Amp Unit, Q_{1802} (2SA733) will act to reduce the drive level and to protect the Power Amp Unit.

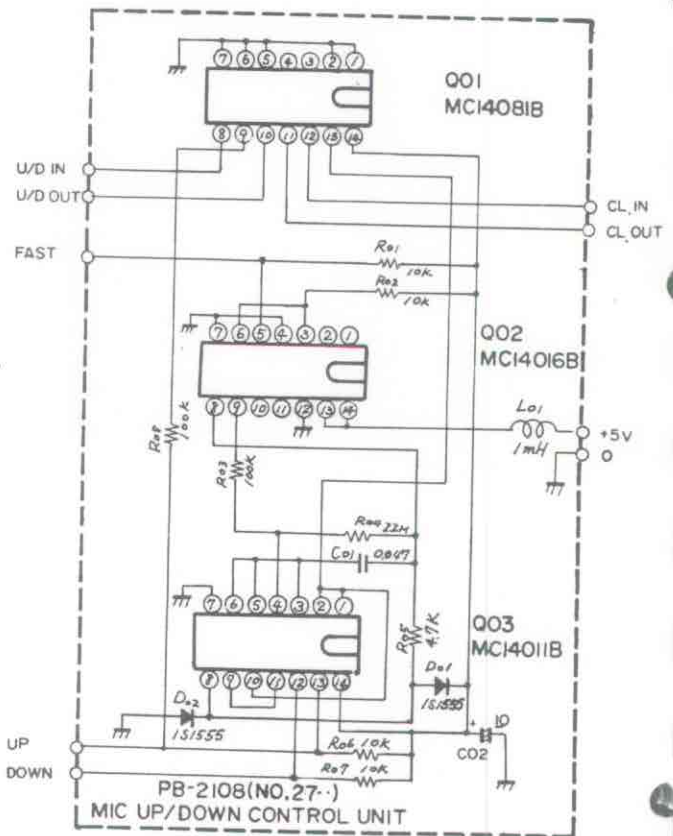
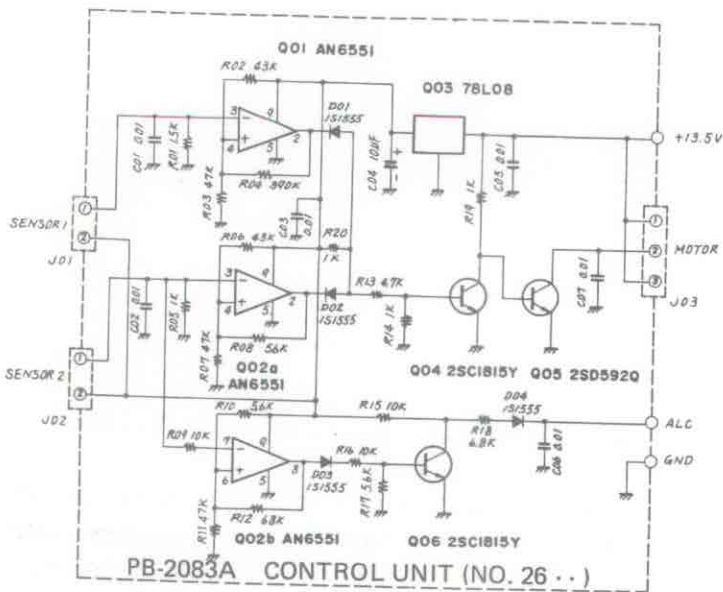
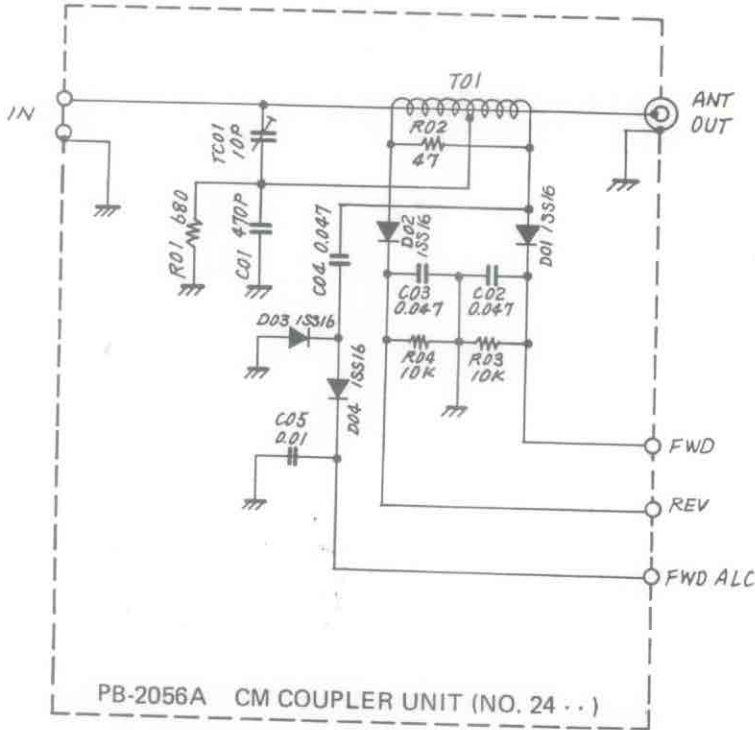


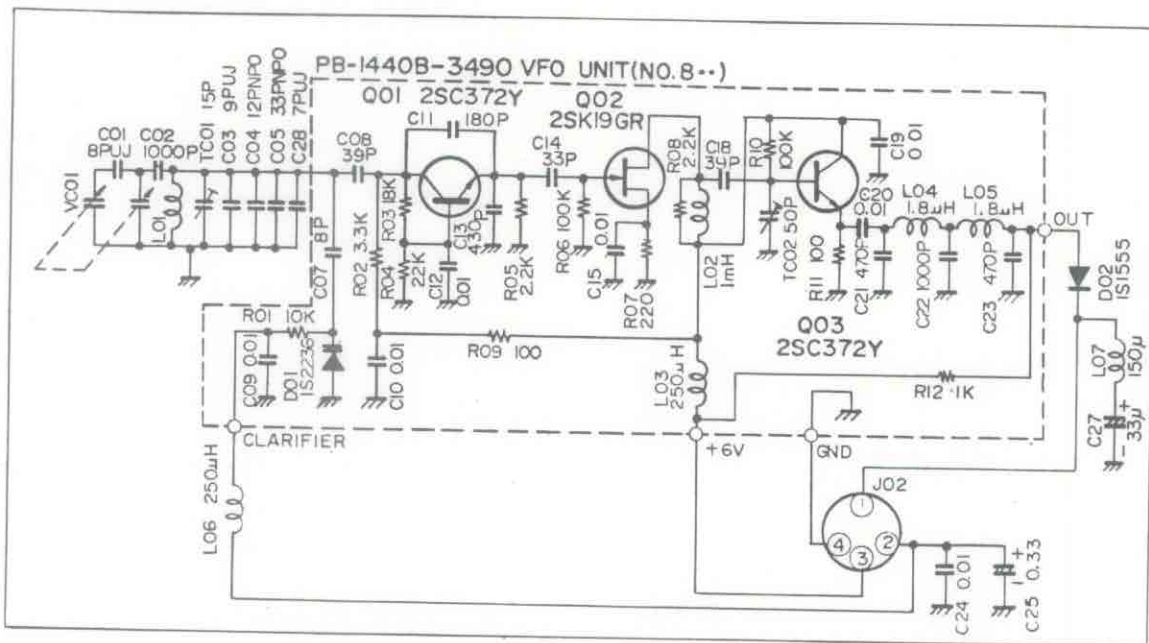




CM COUPLER UNIT (PB-2056)

The output from the LPF Unit is fed to the CM COUPLER Unit, where a directional coupler provides for relative forward and reverse power indication on the front panel meter.



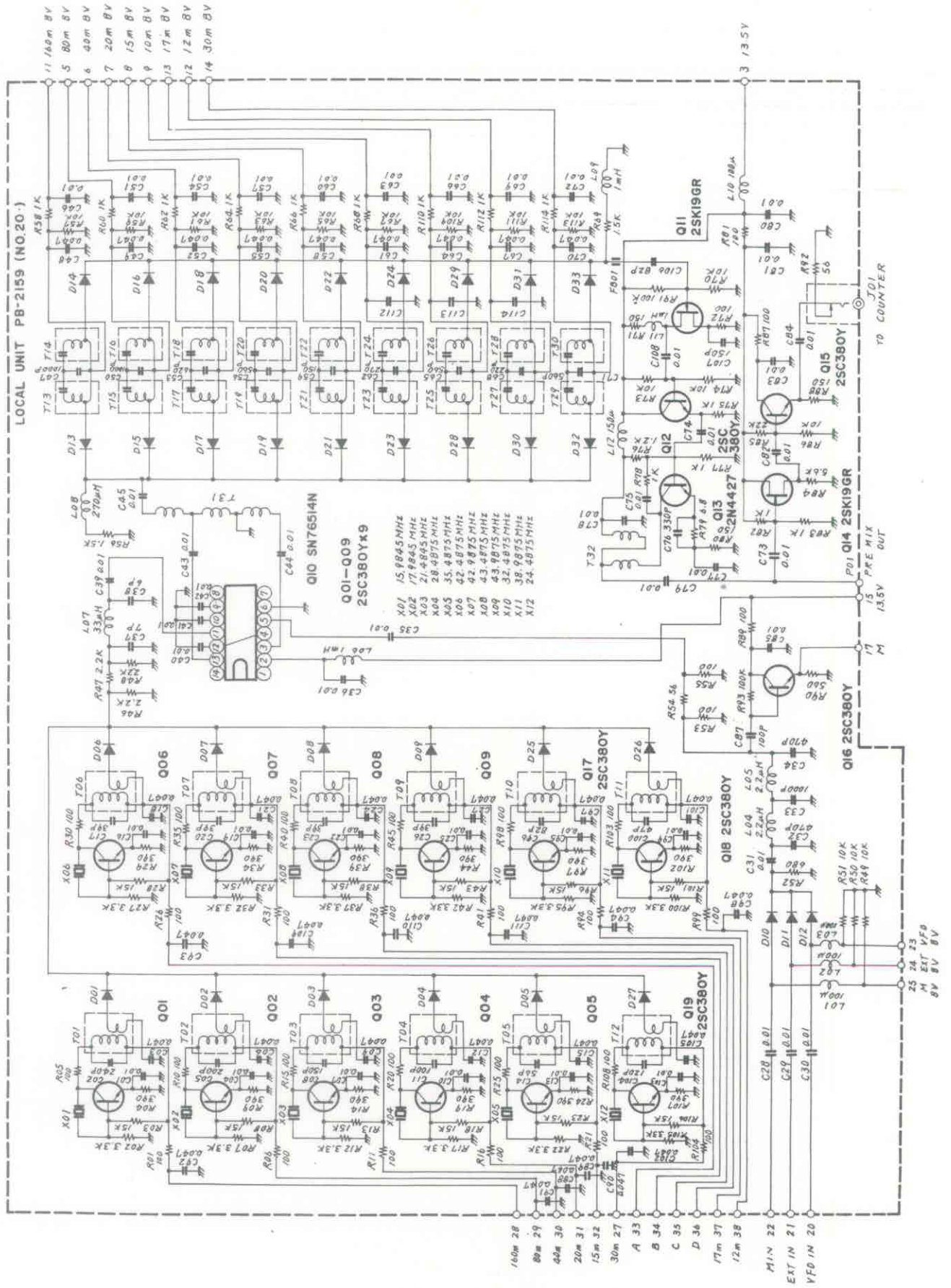


BAND	CRYSTAL	XCO Frequency	PREMIX OUT Frequency
160m	X ₂₀₀₁	15.9845MHz	10.4875~10.9875MHz
80m	X ₂₀₀₂	17.9845MHz	12.4875~12.9875MHz
40m	X ₂₀₀₃	21.4845MHz	15.9875~16.4875MHz
30m	X ₂₀₁₂	24.4875MHz	18.9875~19.4875MHz
20m	X ₂₀₀₄	28.4875MHz	22.9875~23.4875MHz
17m	X ₂₀₁₀	32.4875MHz	26.9875~27.4875MHz
15m	X ₂₀₀₅	35.4875MHz	29.9875~30.4875MHz
12m	X ₂₀₁₁	38.9875MHz	33.4875~33.9875MHz
10m A	X ₂₀₀₆	42.4875MHz	36.9875~37.4875MHz
10m B	X ₂₀₀₇	42.9875MHz	37.4875~37.9875MHz
10m C	X ₂₀₀₈	43.4875MHz	37.9875~38.4875MHz
10m D	X ₂₀₀₉	43.9875MHz	38.4875~38.9875MHz

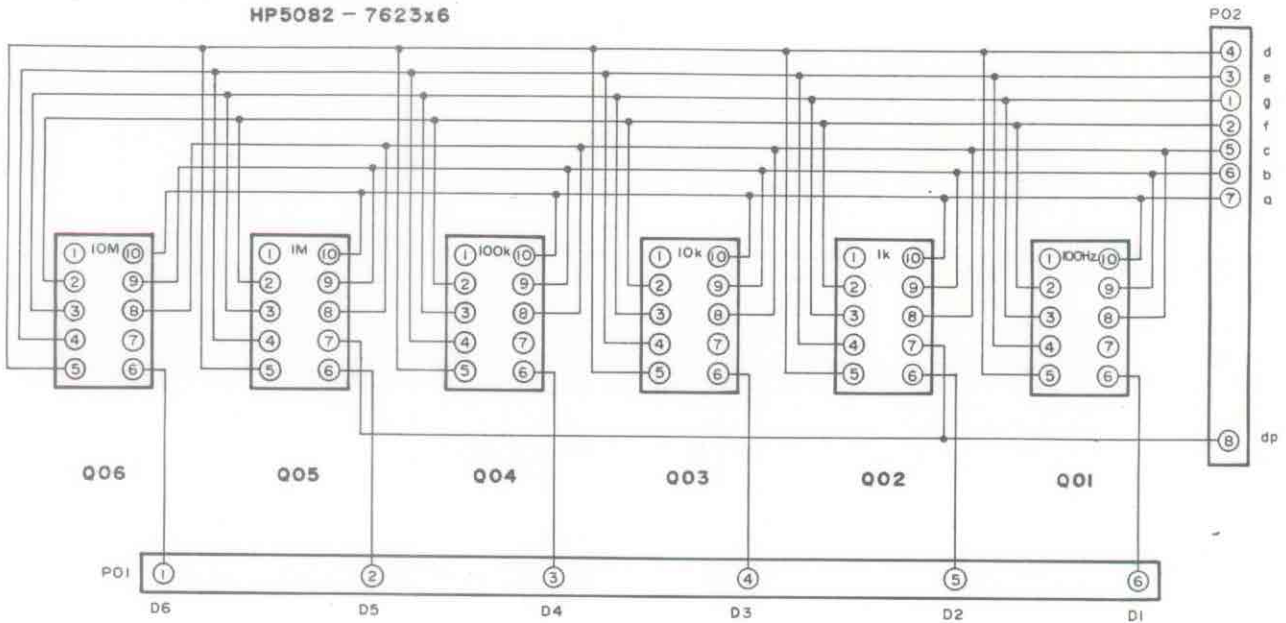
Table 1

BAND	Nominal Premix Local Frequency	L S B	U S B	CW, AM
160m	10.4875-10.9875(MHz)	10.486-10.986(MHz)	10.489-10.989(MHz)	10.4883-10.9883(MHz)
80m	12.4875-12.9875	12.486-12.986	12.489-12.989	12.4883-12.9883
40m	15.9875-16.4875	15.986-16.486	15.989-16.489	15.9883-16.4883
30m	18.9875-19.4875	18.986-19.486	18.989-19.489	18.9883-19.4883
20m	22.9875-23.4875	22.986-23.486	22.989-23.489	22.9883-23.4883
17m	26.9875-27.4875	26.986-27.486	26.989-27.489	26.9883-27.4883
15m	29.9875-30.4875	29.986-30.486	29.989-30.489	29.9883-30.4883
12m	33.4875-33.9875	33.486-33.986	33.489-33.989	33.4883-33.9883
10m A	36.9875-37.4875	36.986-37.486	36.989-37.489	36.9883-37.4883
10m B	37.4875-37.9875	37.486-37.986	37.489-37.989	37.4883-37.9883
10m C	37.9875-38.4875	37.986-38.486	37.989-38.489	37.9883-38.4883
10m D	38.4875-38.9875	38.486-38.986	38.489-38.989	38.4883-38.9883

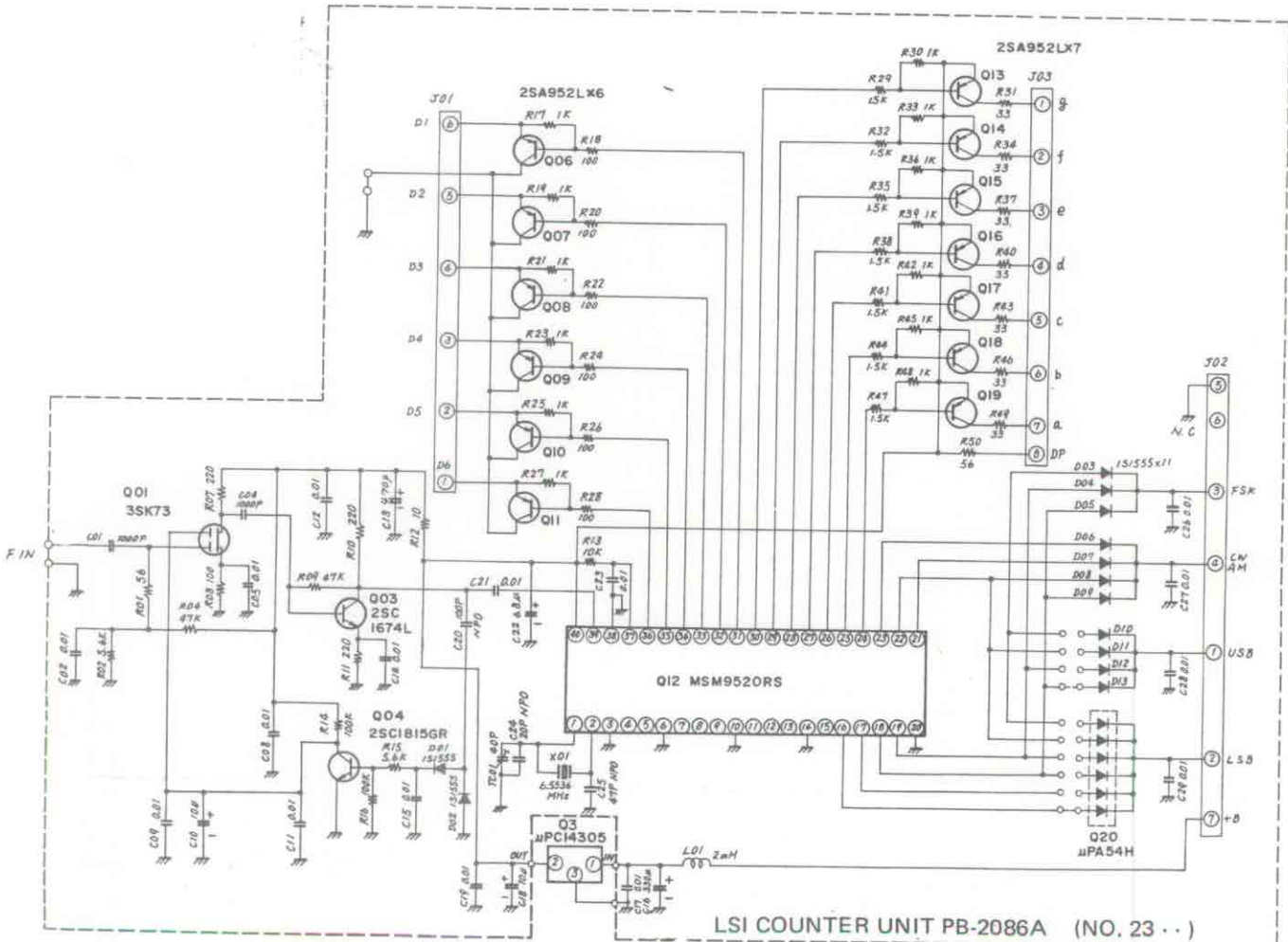
Table 2



HP5082 - 7623x6



DISPLAY UNIT PB-2087 (NO.22..)



LSI COUNTER UNIT PB-2086A (NO. 23..)

COUNTER UNIT (PB-2086A/PB-2087)

The local oscillator signal is applied to Large-Scale Integrated Circuit (LSI) chip for display on the front panel digital display.

The premix signal from the LOCAL Unit is applied to the F IN terminal and amplified by Q₂₃₀₁ (3SK73). The amplified signal is further amplified by Q₂₃₀₃ (2SC1674) and delivered to the LSI counter chip, Q₂₃₂₁ (MSM9520RS). A portion of the output from Q₂₃₀₃ is amplified by Q₂₃₀₄ (2SC1815Y) and fed to gate 2 of Q₂₃₀₁ and Q₂₃₀₂, controlling the gain of those amplifiers.

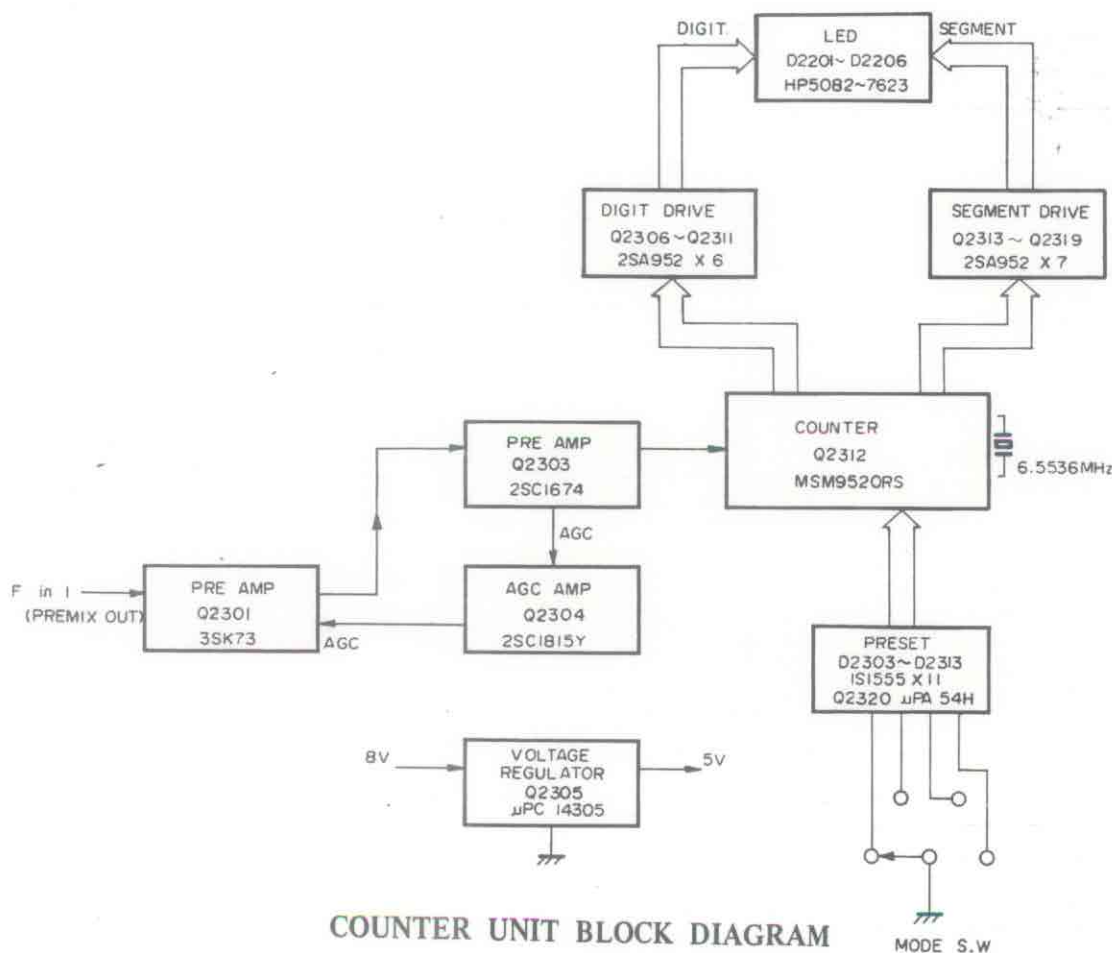
The output from the LSI is fed to the display. The output from pins 24 through 30 is delivered to segment drivers Q₂₃₁₃–Q₂₃₁₉ (2SA952L) and digit drivers Q₂₃₀₆–Q₂₃₁₁ (2SA952L) through a dynamic drive configuration. Display is performed by D₂₂₀₁–D₂₂₀₆ (HP5082-7623), seven-segment light-emitting diodes.

POWER SUPPLY

When the optional FP-107 AC Power Supply is installed, it will provide the required 13.5 VDC at 20 amps for the FT-107M. AC input voltages of 100/110/117/200/220/234 volts at 50/60 Hz may be used.

The output from the power transformer is rectified by a full-wave bridge rectifier. The rectified voltage is stabilized by a voltage regulator, consisting of Q₁ (2N5685) and Q₂₀₂ (2SA1012), while current limiting is provided by Q₂₀₁ (2SK19BL). The comparator function of the voltage regulator is performed by Q₂₀₃ (2SA950).

The input 13.5 VDC line from the FP-107 (or the external DC power line) is used for the PA Unit, the meter lamp, and for relay switching. RL₁ provides relay switching for the TX 13.5V and RX 13.5 V lines.

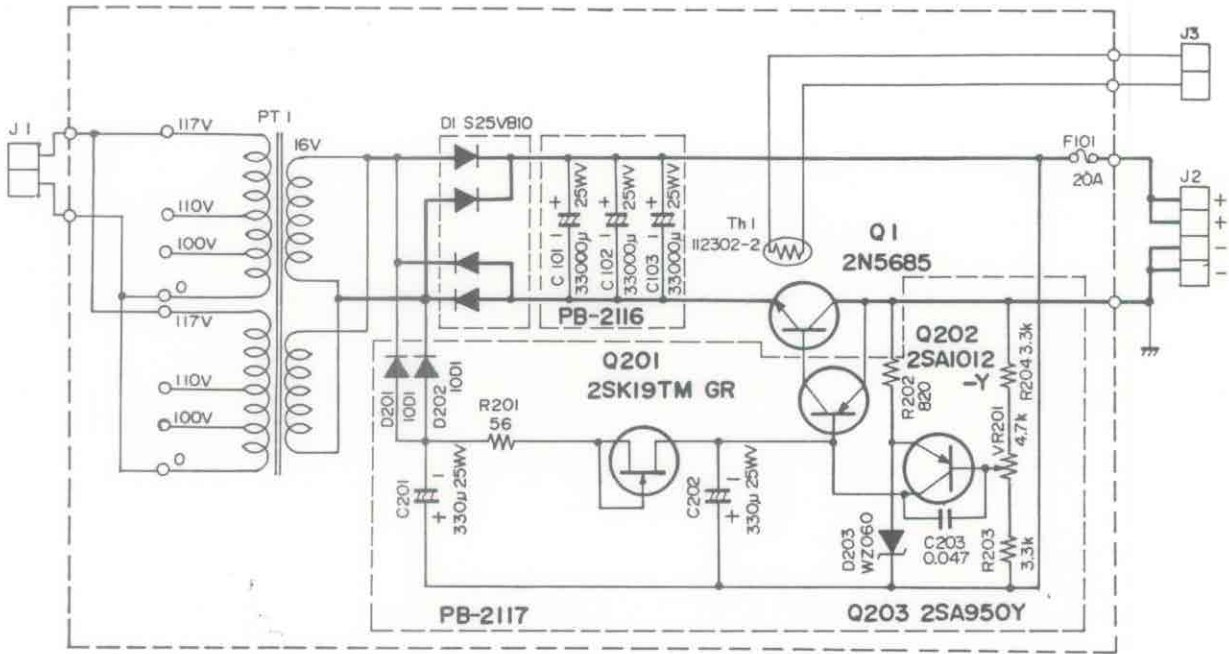


COUNTER UNIT BLOCK DIAGRAM

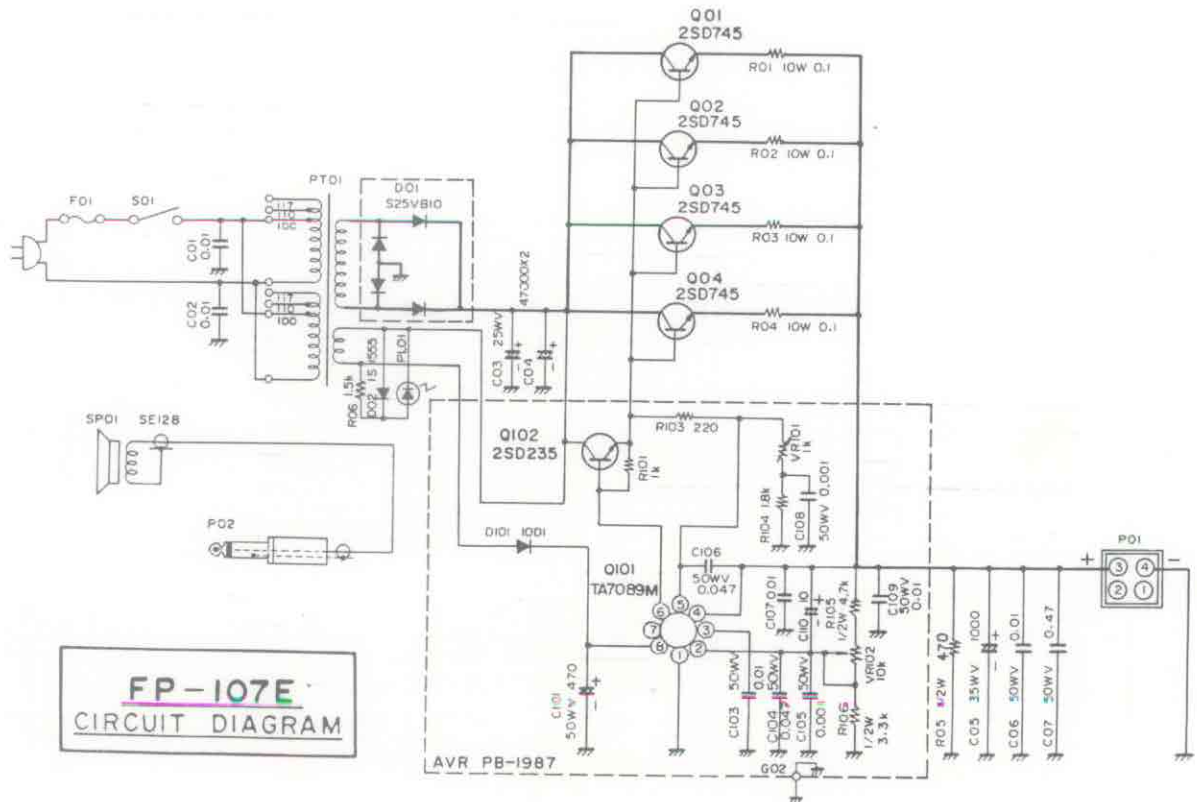
TECHNICAL NOTES

The 13.5 volt line is stabilized at 8 volts by Q₁ (μ PC14308), for use in the transistor circuits. The 8 volt line is further stabilized by Q₂ (μ PC-14308) for the VFO circuitry, which requires a highly stable power source.

Transistor switches Q₆₀₀₇/Q₆₀₀₈ (2SC1959Y), located on the NB Unit, provide switched 8 volts for the transmit and receive circuits.



**FP 107
CIRCUIT DIAGRAM**



**FP-107E
CIRCUIT DIAGRAM**

DMS UNIT

While a complete description of the Digital Memory Shift and memory circuitry is beyond the scope of this manual, reference to the block diagram of the DMS, along with the following description, should provide the owner with a better understanding of this design technique.

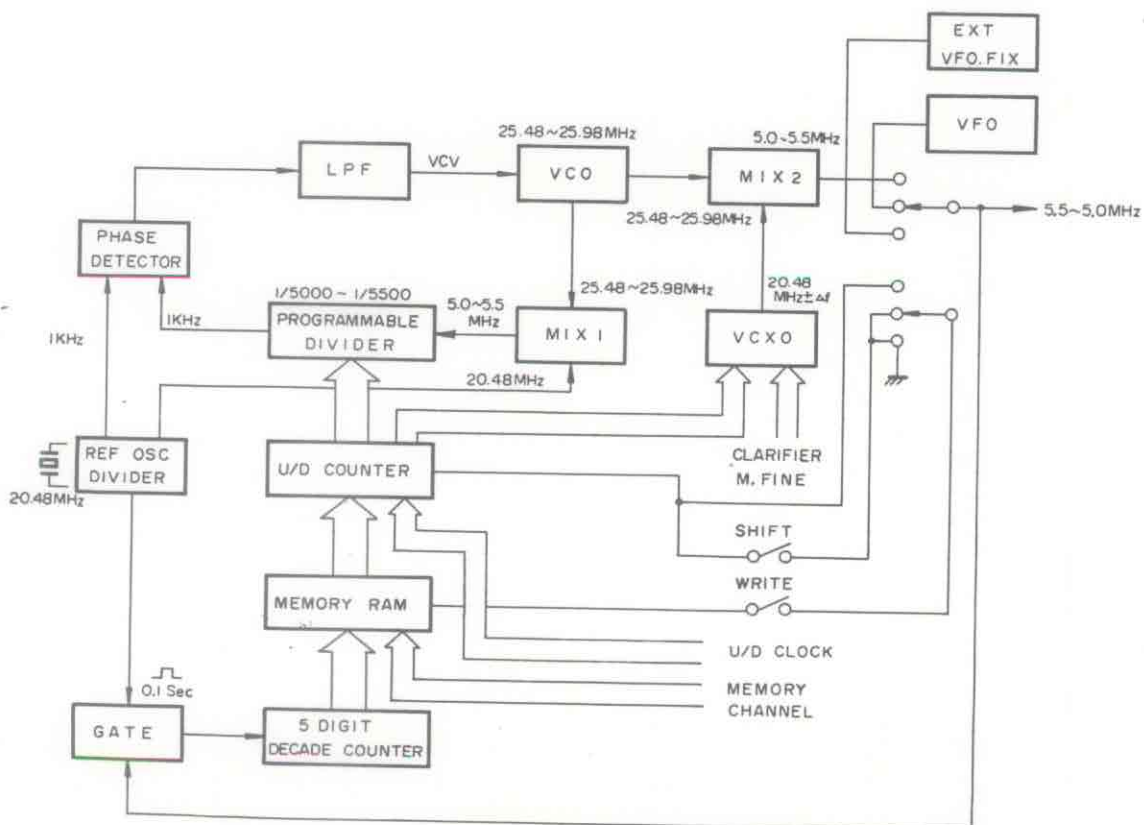
The 5.0–5.5 MHz VFO signal is fed to a counter gate, driven by a crystal controlled clock signal. The pulses which pass through the counter gate are fed to a five digit decade counter, which counts the VFO frequency. The digitally encoded output from the decade counter is delivered to the memory RAM for storage.

The output from the RAM is fed through an UP/DOWN counter to preset the programmable divider. On the DMS Unit, a 25.48–25.98 MHz signal is produced from the Voltage Controlled Oscillator (VCO). This signal is fed to a mixer, where the VCO signal is mixed with a 20.48 MHz reference signal, producing a 5.0–5.5 MHz signal, which is fed to the programmable divider.

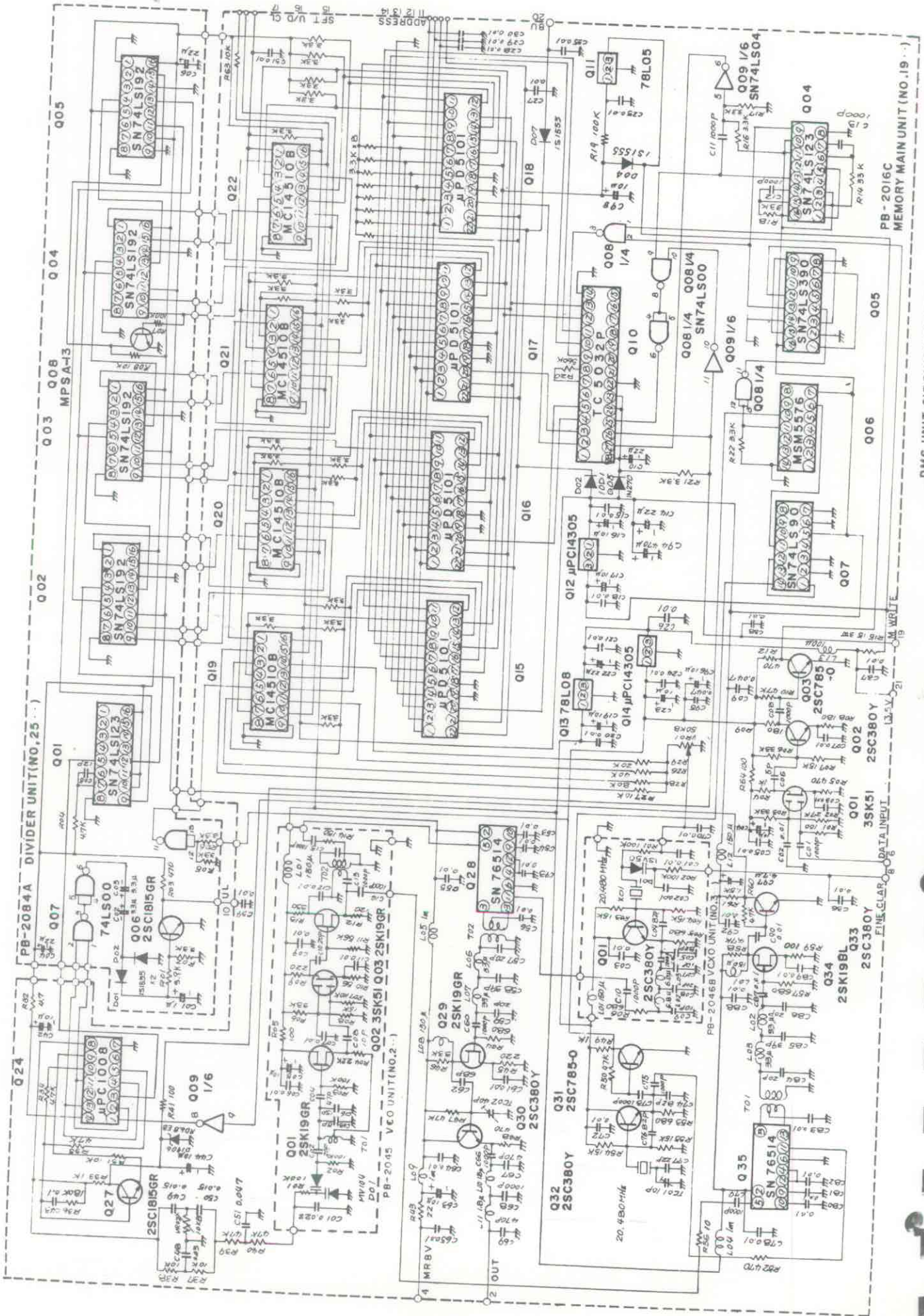
The output from the programmable divider (at approximately 1 kHz) is fed to a phase detector, where the phase of the signal is compared to that of a 1 kHz reference signal, producing an error voltage. The error voltage is fed through a low-pass filter, which removes any ripple on the signal. The error voltage is then used to control varactor diodes in the VCO, locking it on the desired frequency.

When the memory frequency is recalled, the VCO output is fed to another mixer, where the 25.48–25.98 MHz signal is mixed with a 20.48 MHz signal, resulting in a 5.0–5.5 MHz signal which is fed to the PLL (instead of the VFO signal). During memory fine tuning or clarifier operation (using the memory), the frequency of the 20.48 MHz voltage controlled crystal oscillator (VCXO) is varied, changing the 5.0–5.5 MHz output signal slightly in frequency.

During memory shift operation, the output pulses from the photo-interrupter circuitry are applied to the UP/DOWN so as to preset the programmable divider, thereby shifting the output from the memory RAM so as to provide the desired shifting the memory channel frequency.

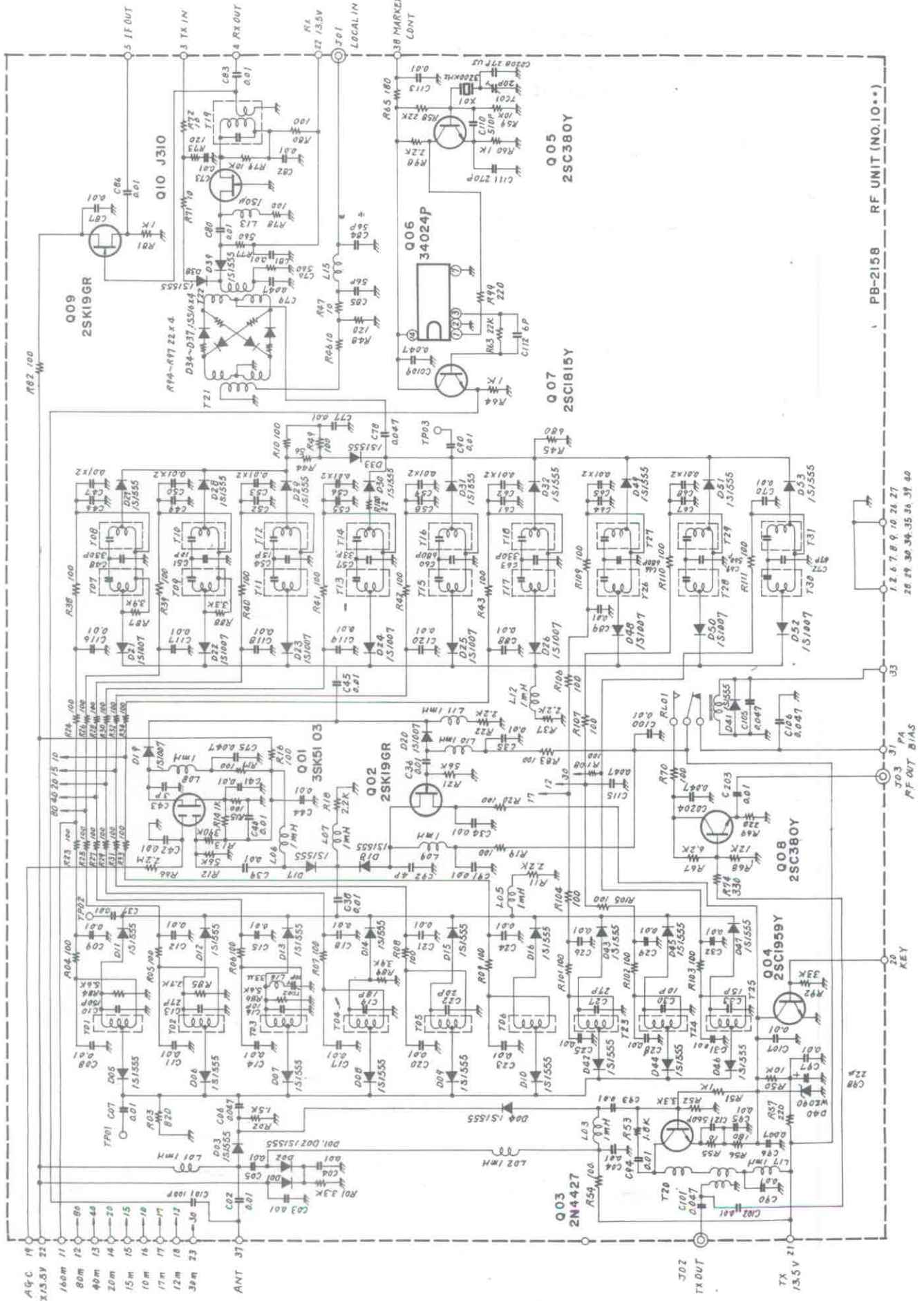


DMS UNIT BLOCK DIAGRAM



DMS UNIT CIRCUIT DIAGRAM

RF UNIT PB-2158 After Prod.6

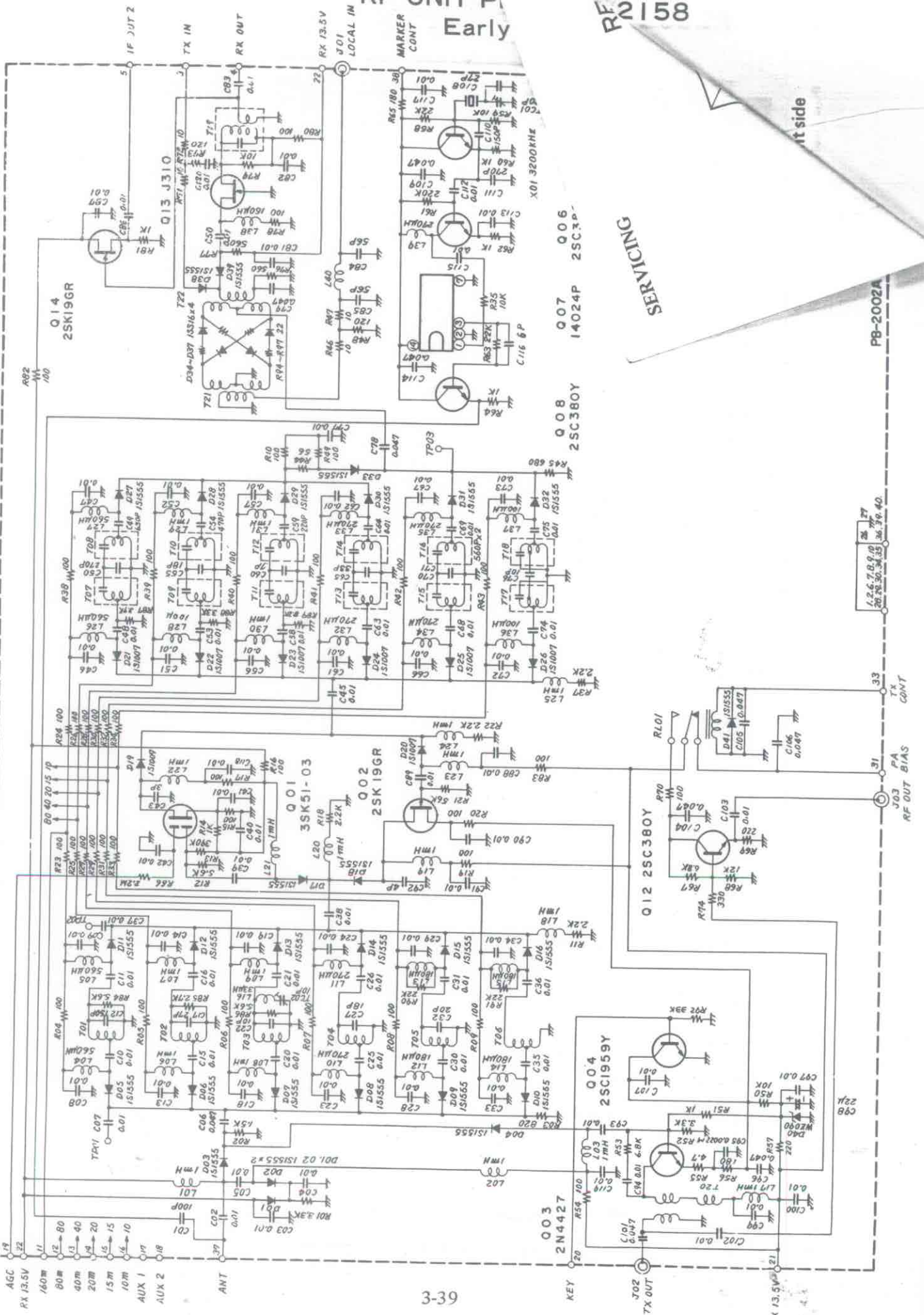


PB-2158 RF UNIT (NO.10..)

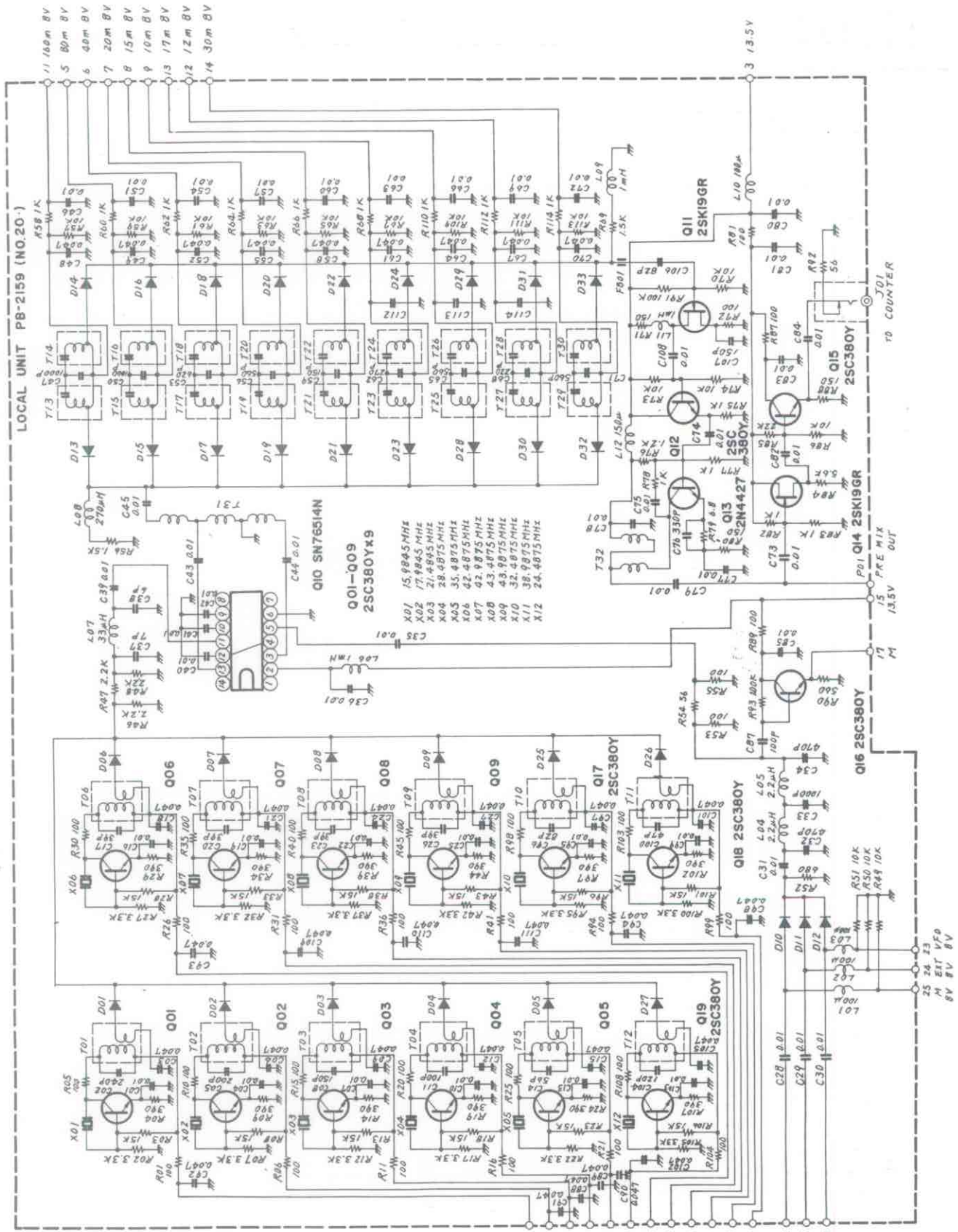
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 26. 27. 28. 29. 30. 36. 35. 36. 37. 40.

RF UNIT PA Early

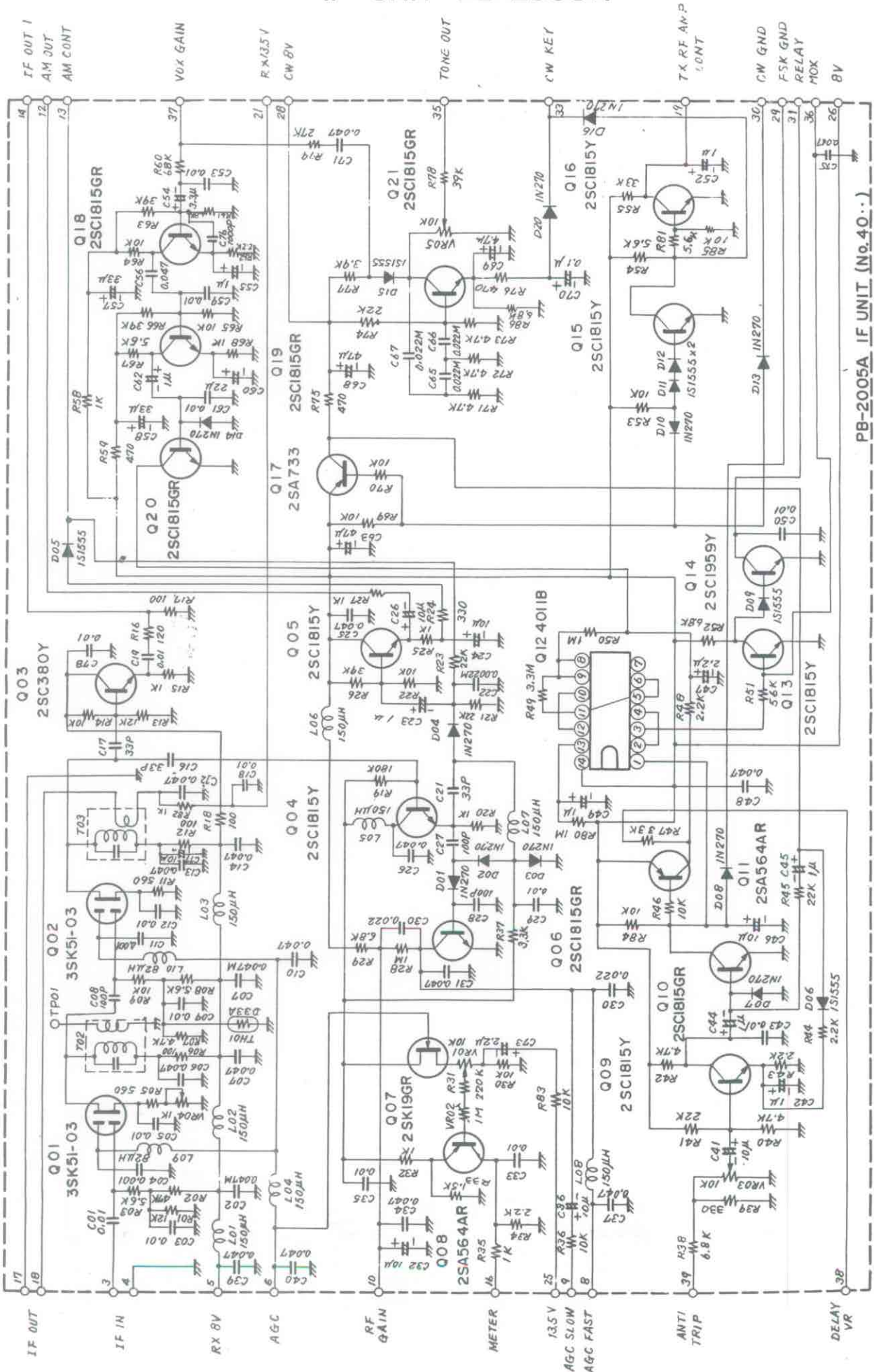
RF 2158



LOCAL UNIT PB-2159 After Prod.6

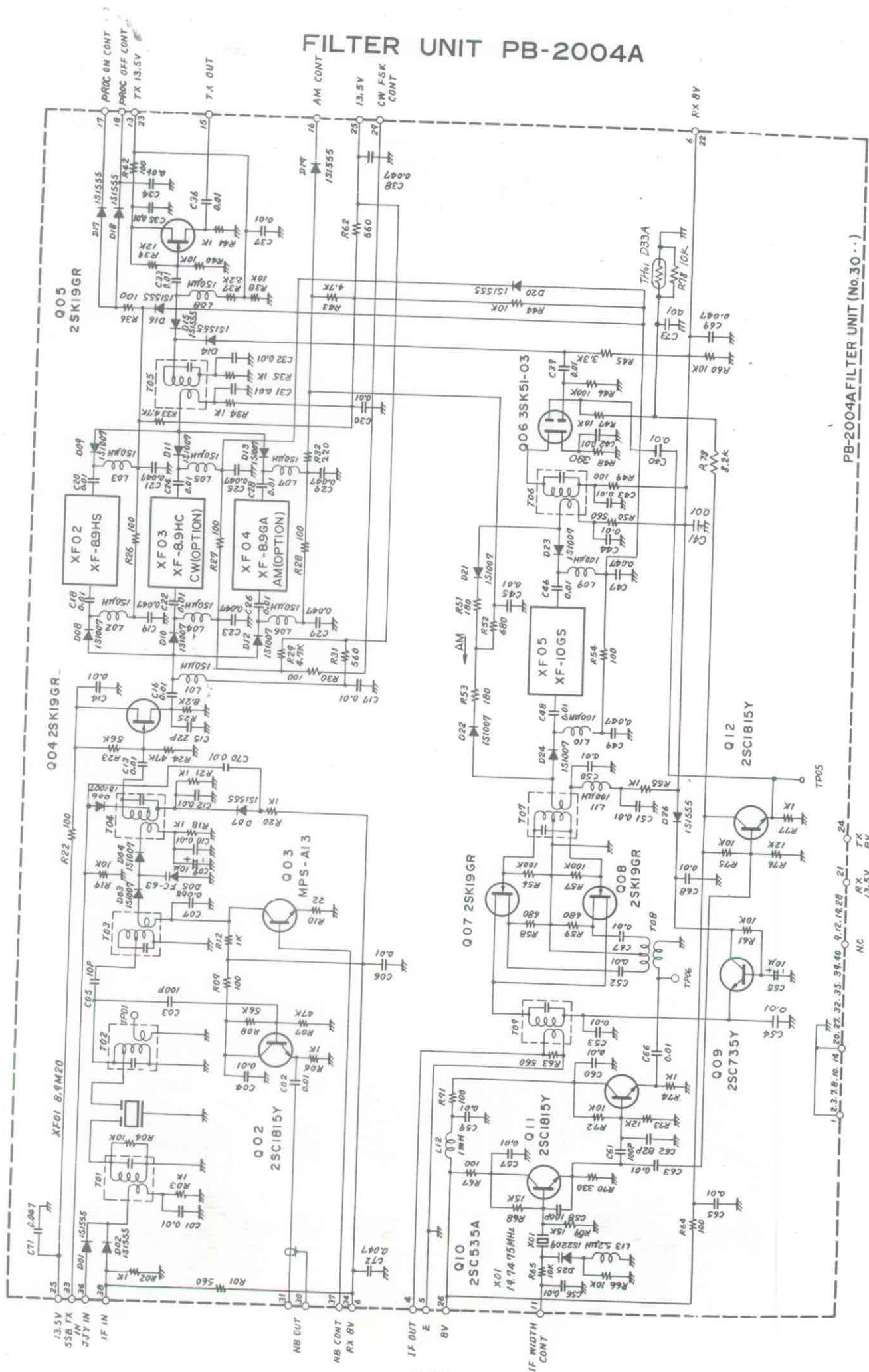


IF UNIT PB-2005A



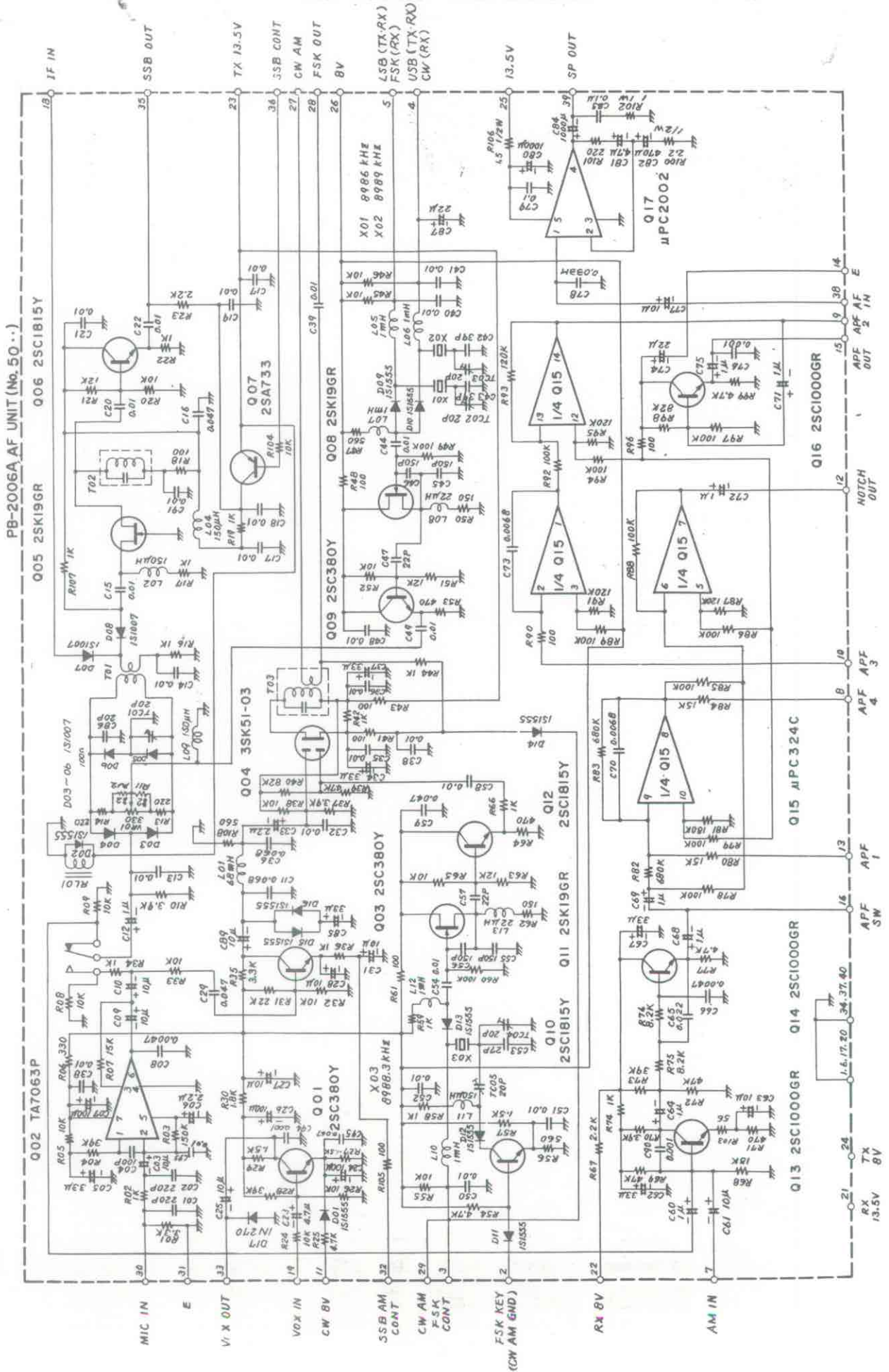
PB-2005A IF UNIT (No. 40..)

FILTER UNIT PB-2004A

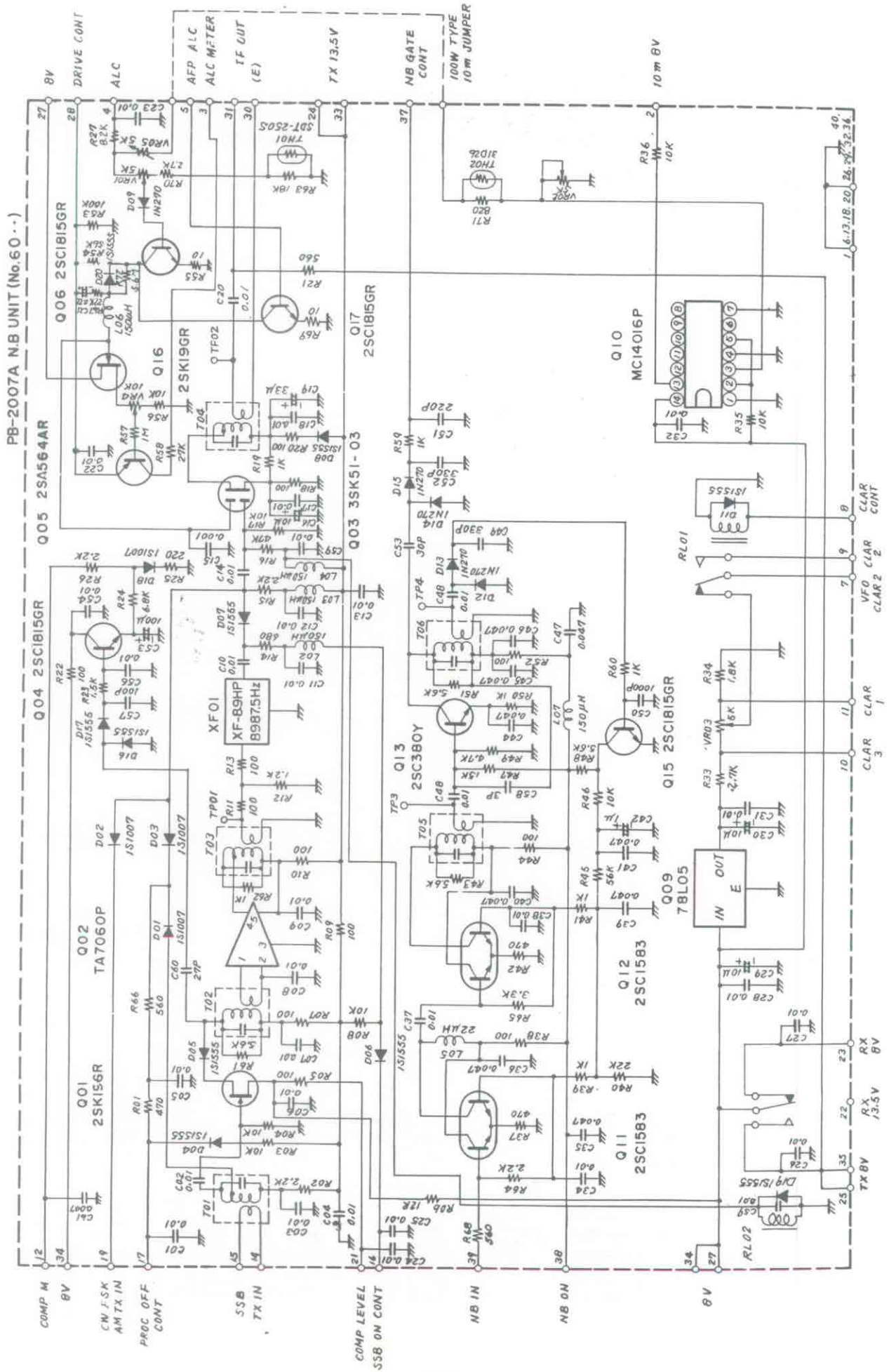


PB-2004A FILTER UNIT (No. 30...)

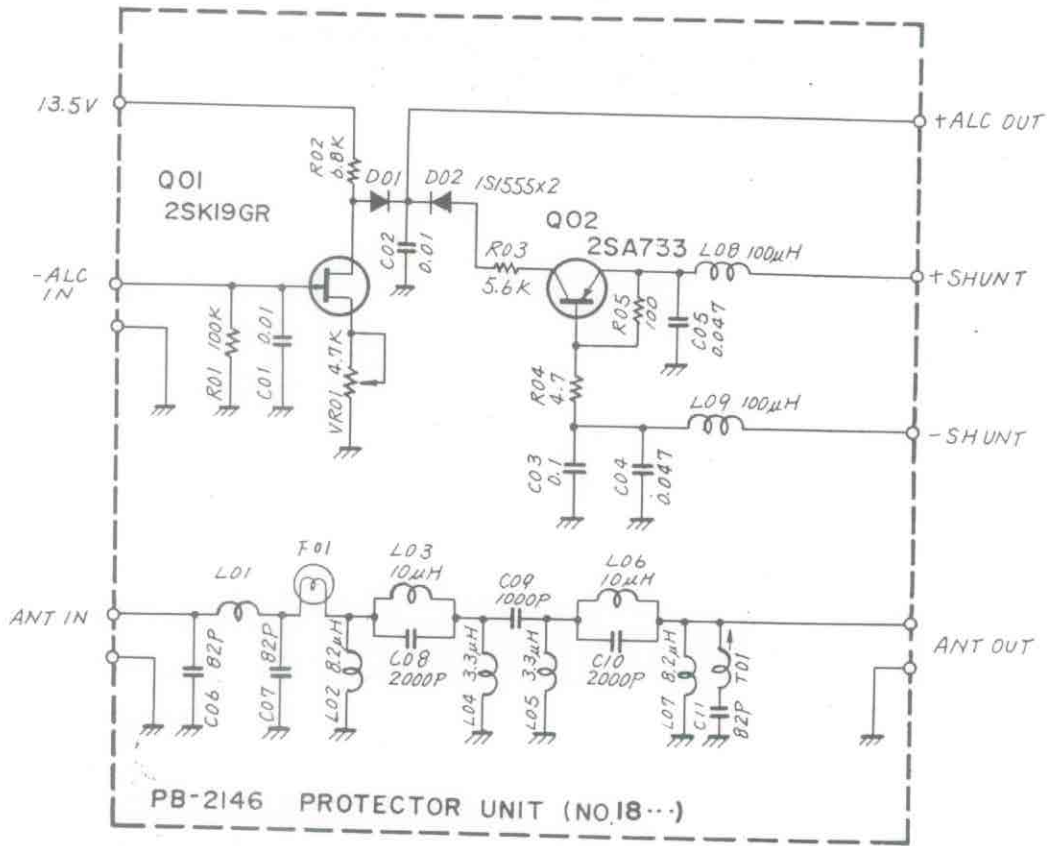
AF UNIT PB-2006A



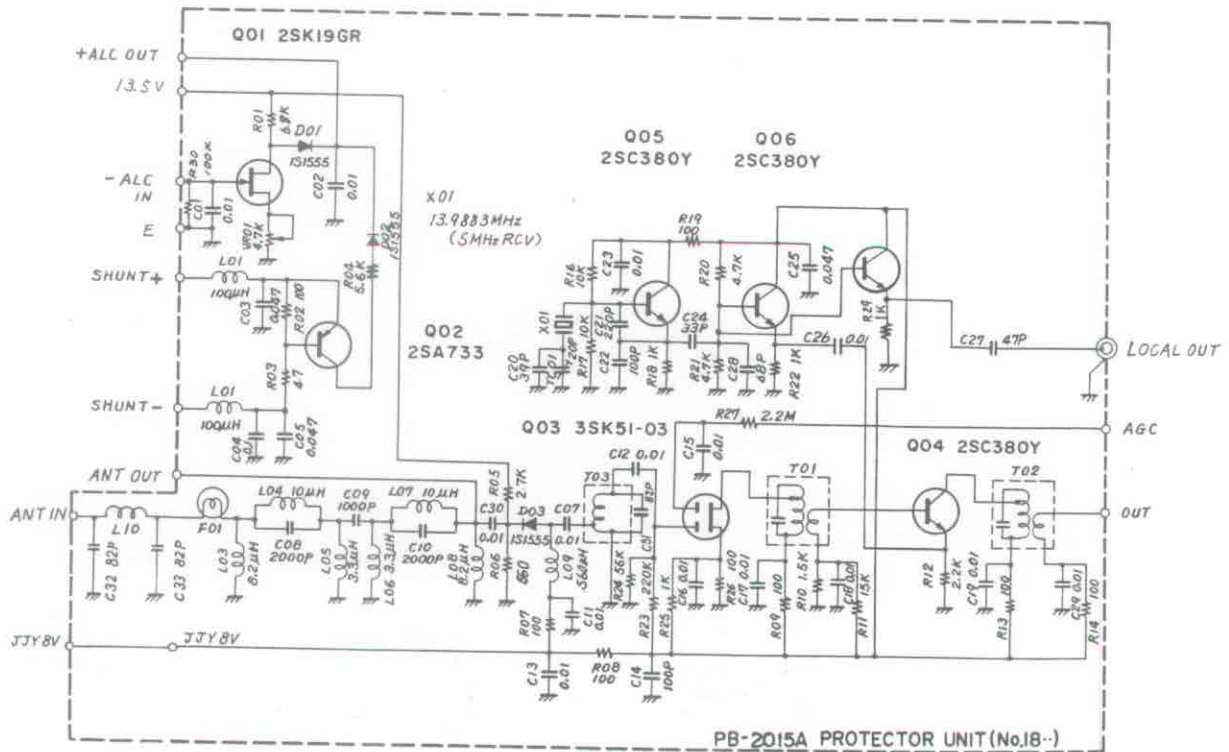
NB UNIT PB-2007A



PROTECTOR UNIT PB-2146
PB-2015A

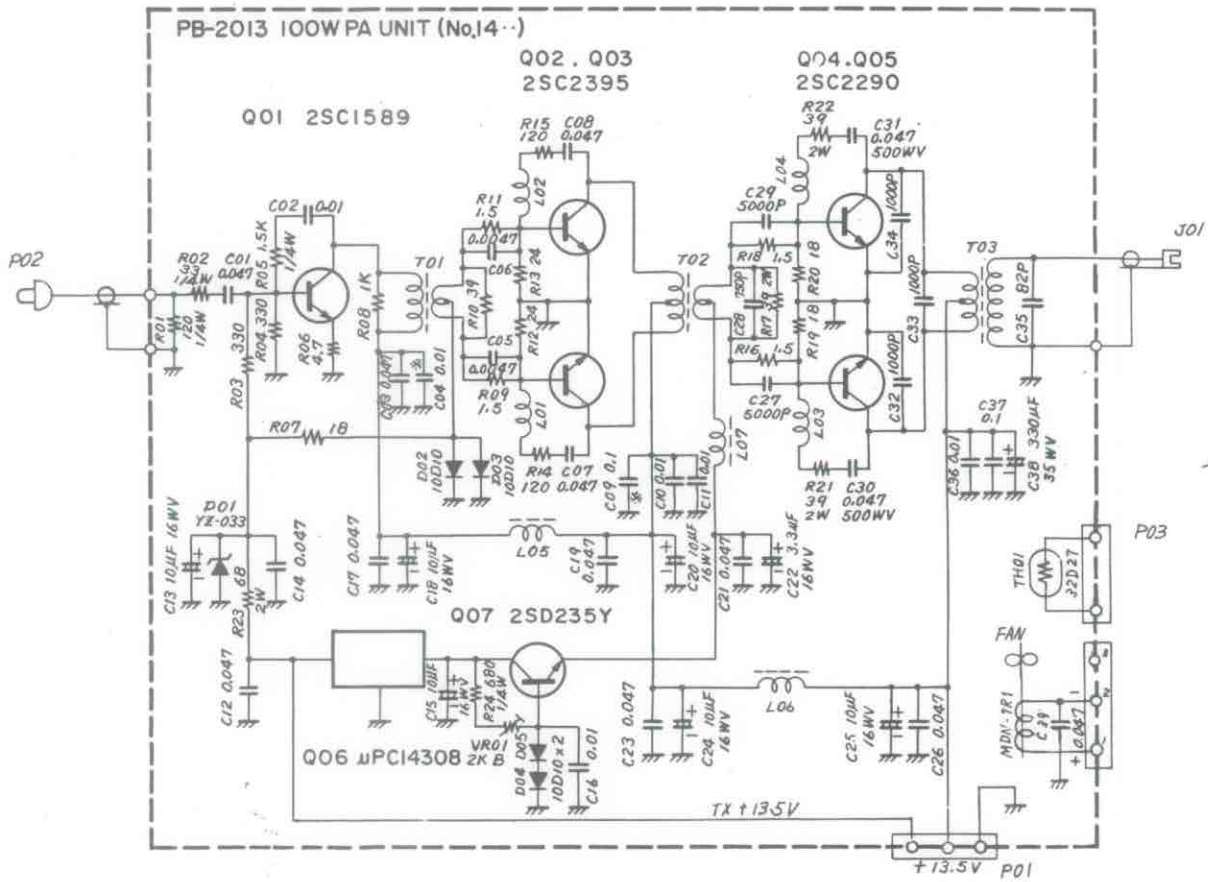


After Prod 6



Early Model

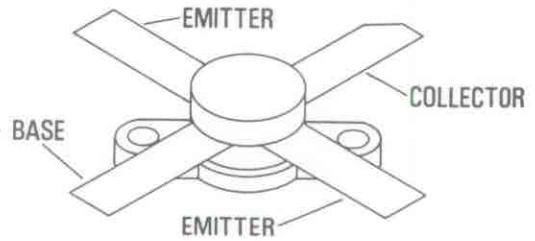
100W PA UNIT PB-2013



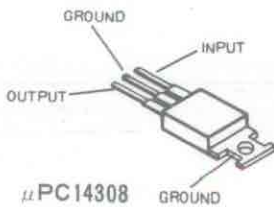
VOLTAGE CHART
(DC VOLTS)

| | E | C | B |
|-------------|-----|------|-----|
| Q1401 | 0.5 | 13.5 | 1.3 |
| Q1402, 1403 | 0 | 13.5 | 0.7 |
| Q1404, 1405 | 0 | 13.5 | 0.7 |
| Q1407 | 0.7 | 8.0 | 1.3 |

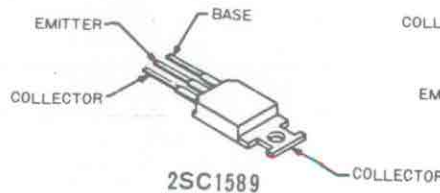
| | IN | COM | OUT |
|-------|------|-----|-----|
| Q1406 | 13.5 | 0 | 8.0 |



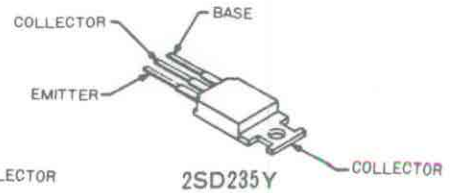
2SC2290
2SC2395



μPC14308

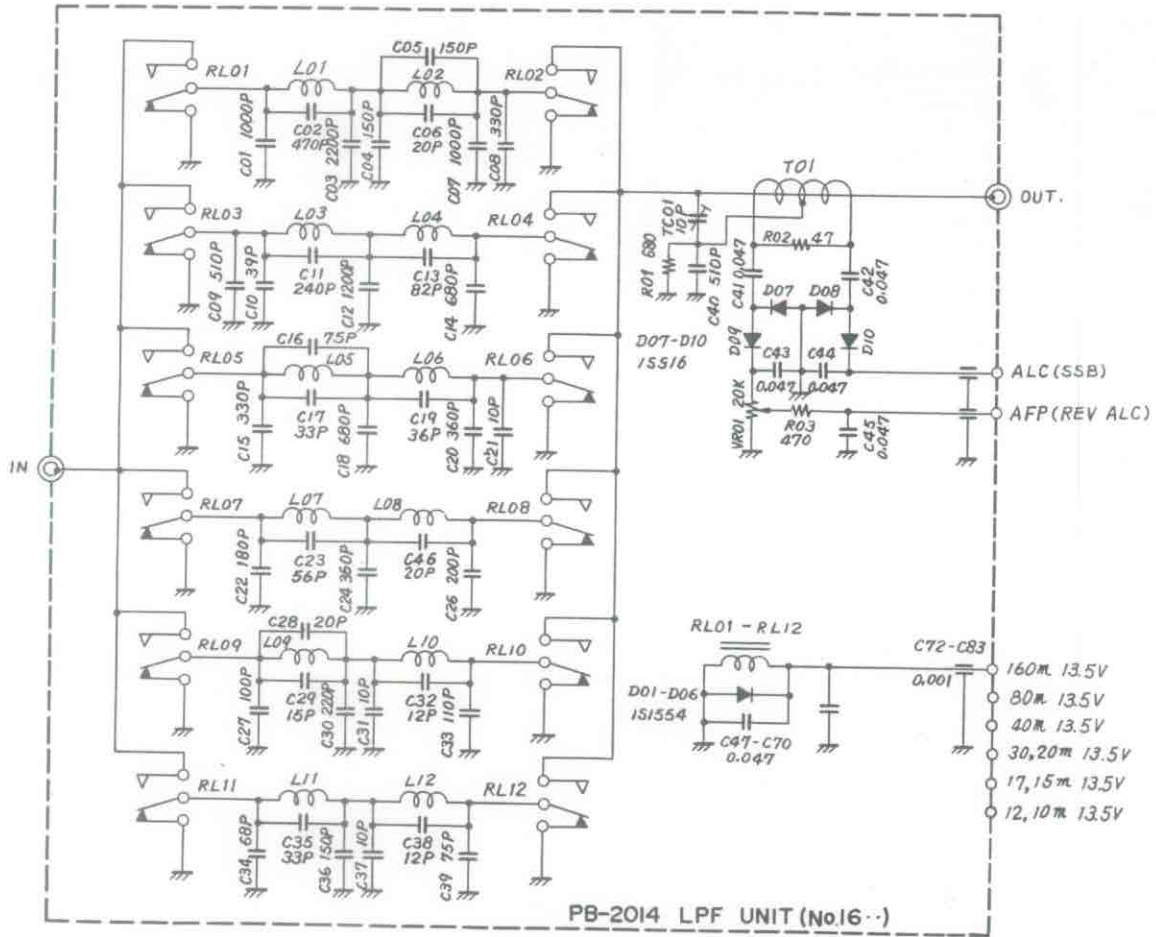


2SC1589

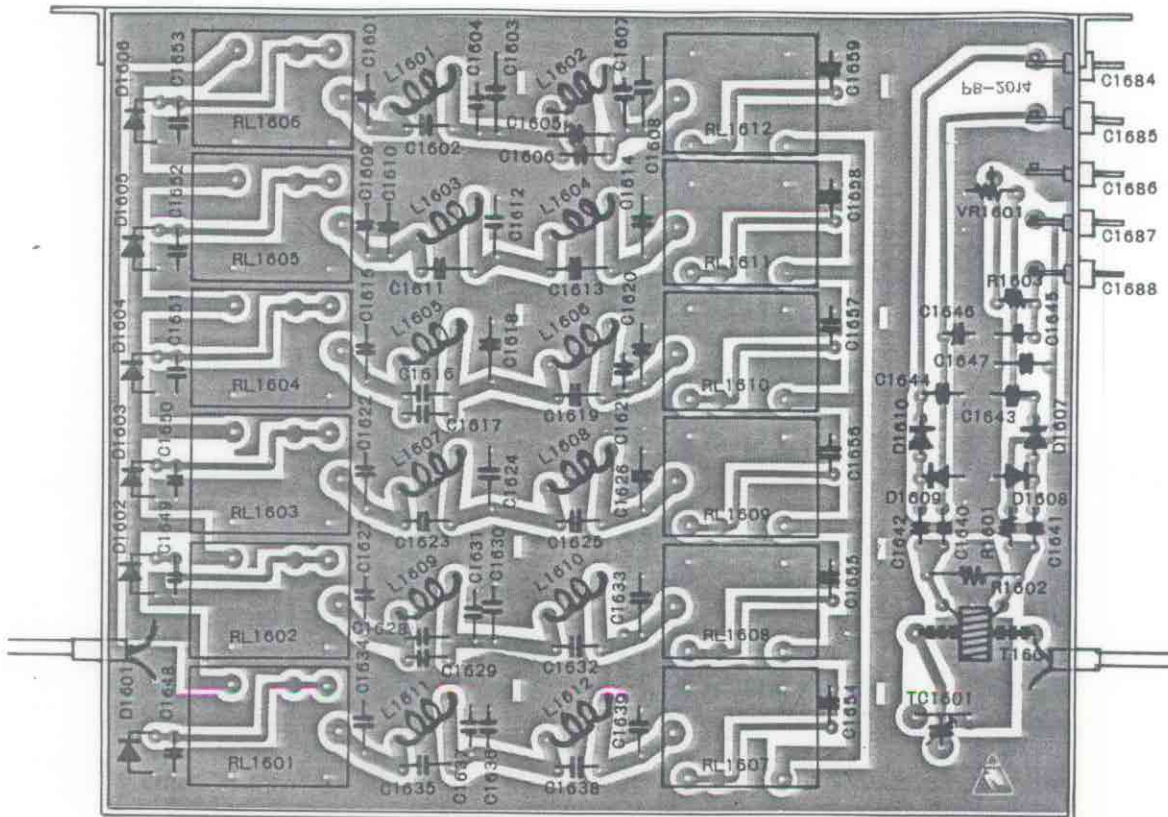


2SD235Y

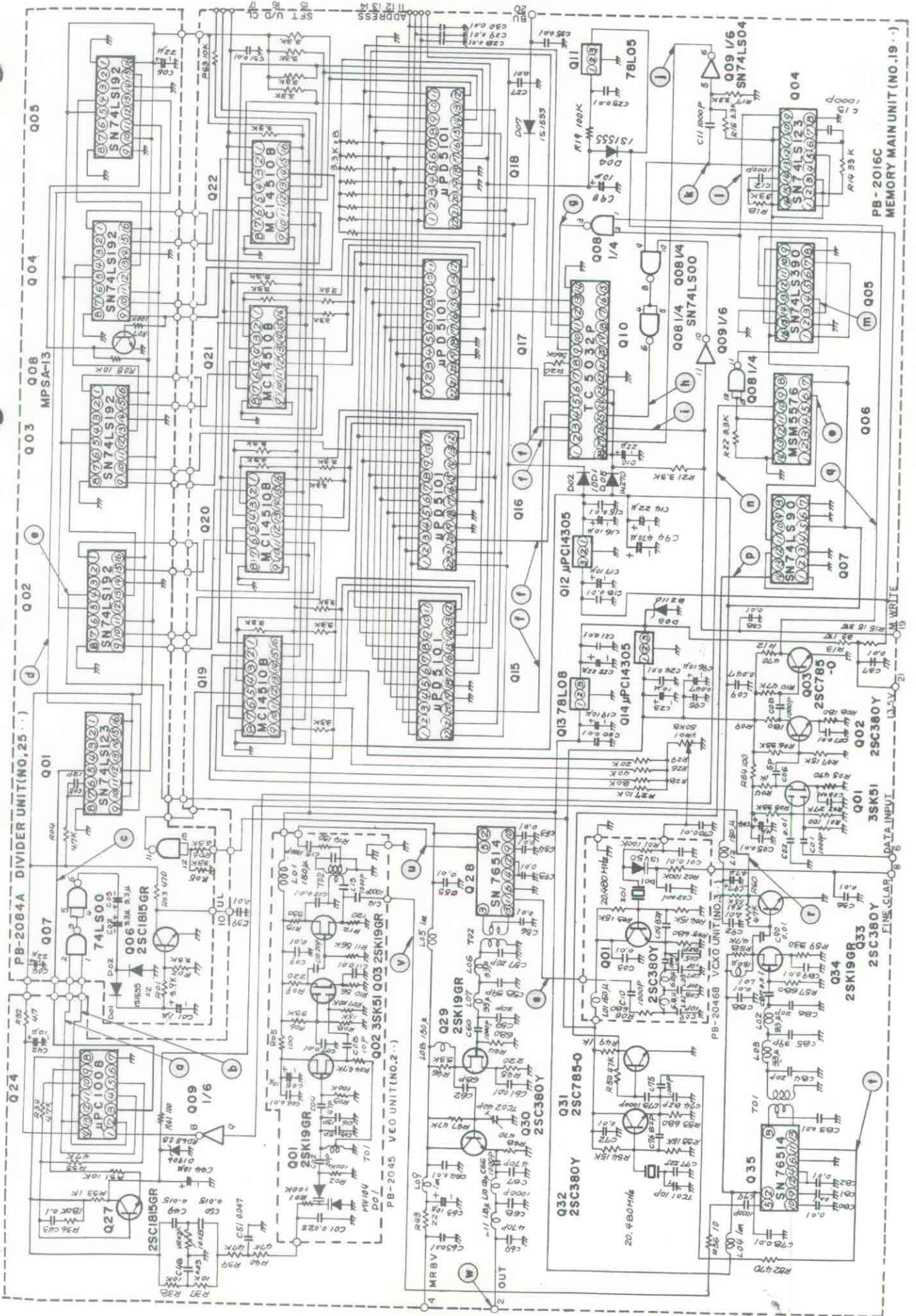
LPF UNIT PB-2014



LPF UNIT PARTS LAYOUT



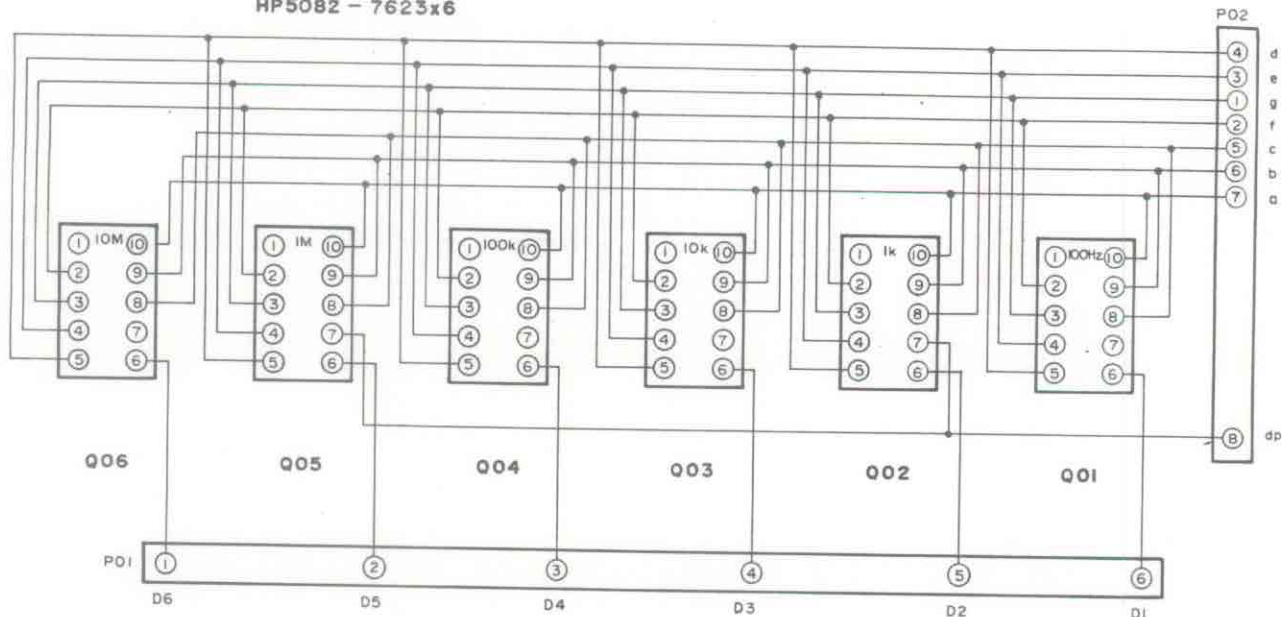
DMS UNIT PB-2016C



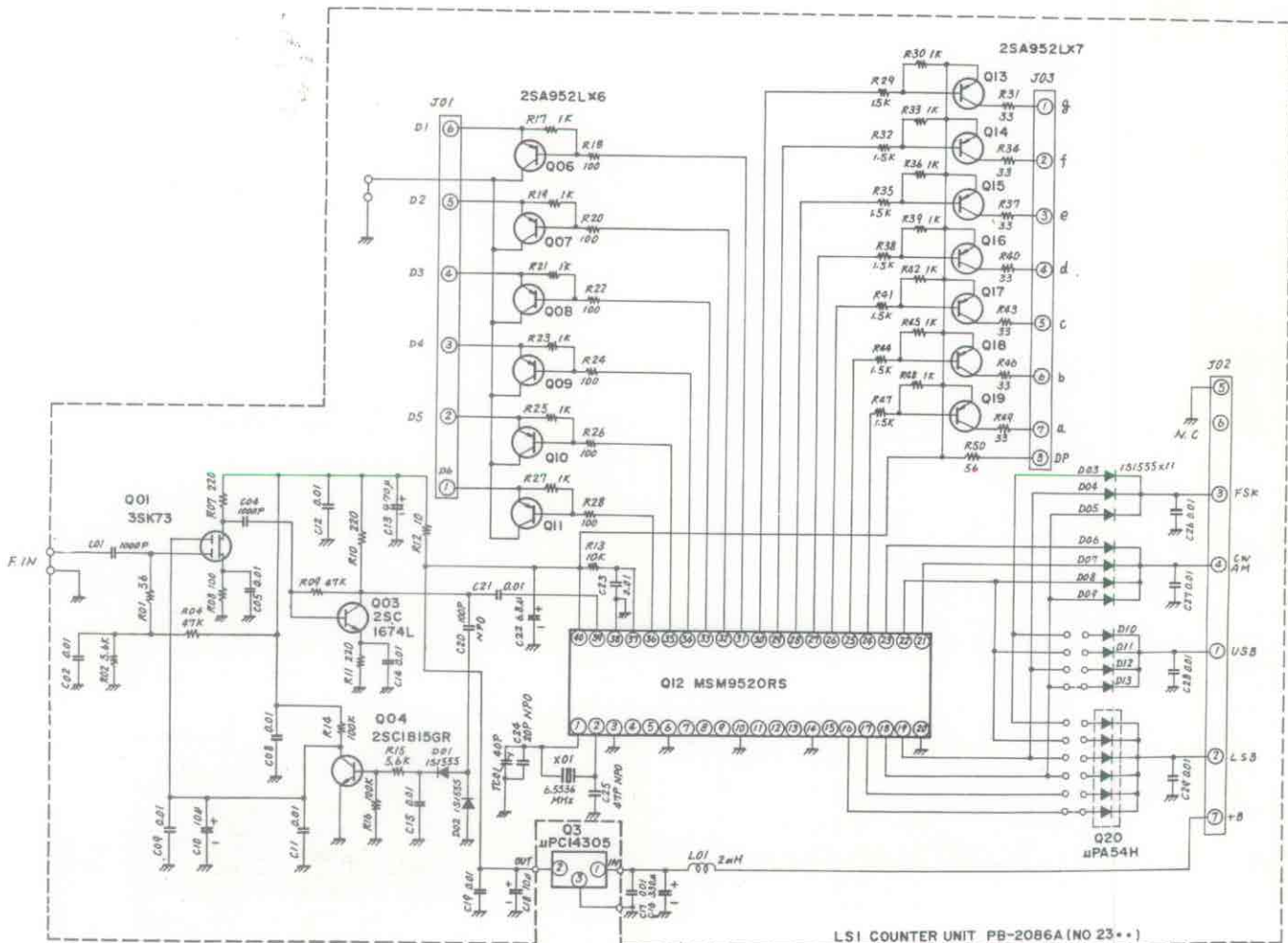
DMS UNIT CIRCUIT DIAGRAM

COUNTER UNIT LSI COUNTER UNIT PB-2086A DISPLAY UNIT PB-2087

HP5082 - 7623x6



DISPLAY UNIT PB-2087 (NO.22...)



LSI COUNTER UNIT PB-2086A (NO 23...)