UNIT COMPLEMENT

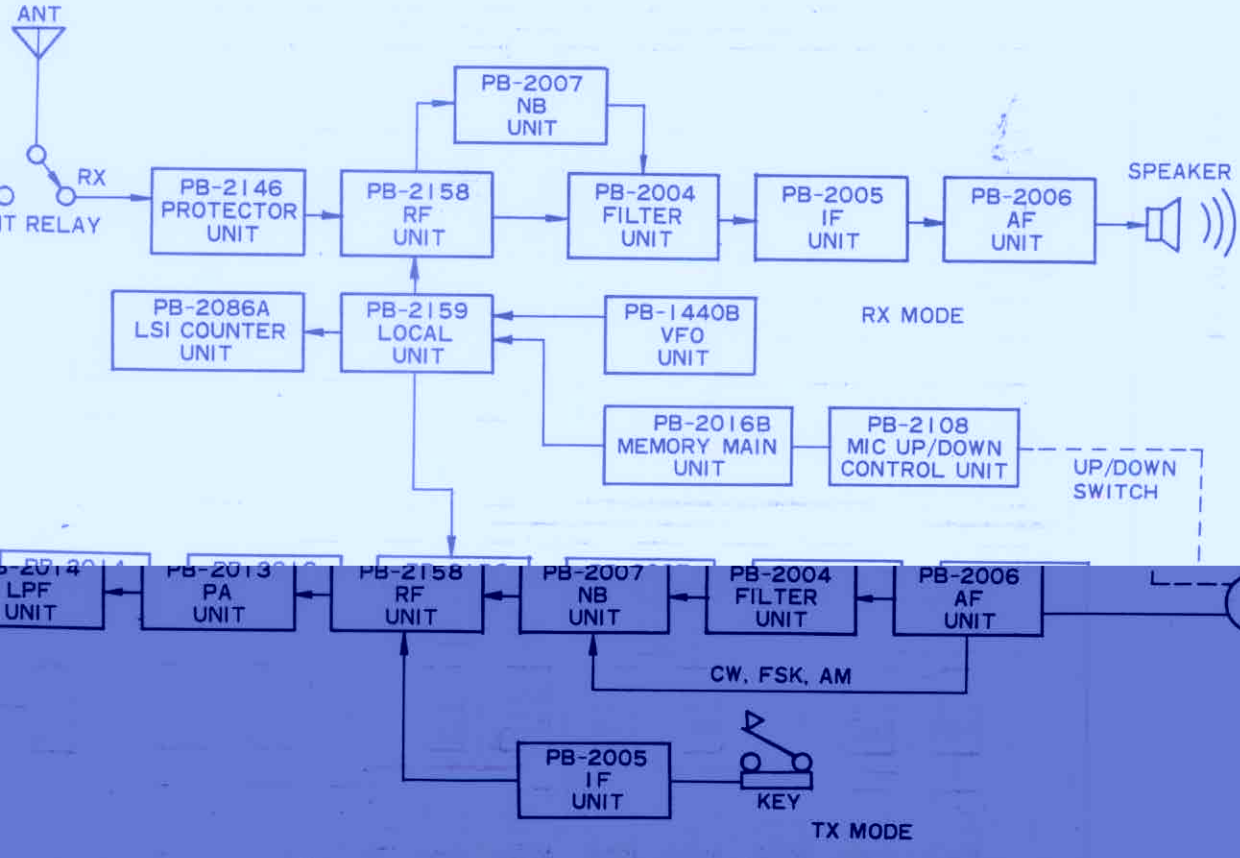
Unit	Product (serial number)					
	1 (01xxxx)	2 (02xxxx)	3 (03xxxx)	4 (04xxxx)	5 (05xxxx)	6 & up (06xxxx)
RF	PB-2002 ↔	PB-2002A	PB-2002A ↔	PB-2002B	PB-2002B X	PB-2158

SIGNAL TRACING IN THE FT-107M

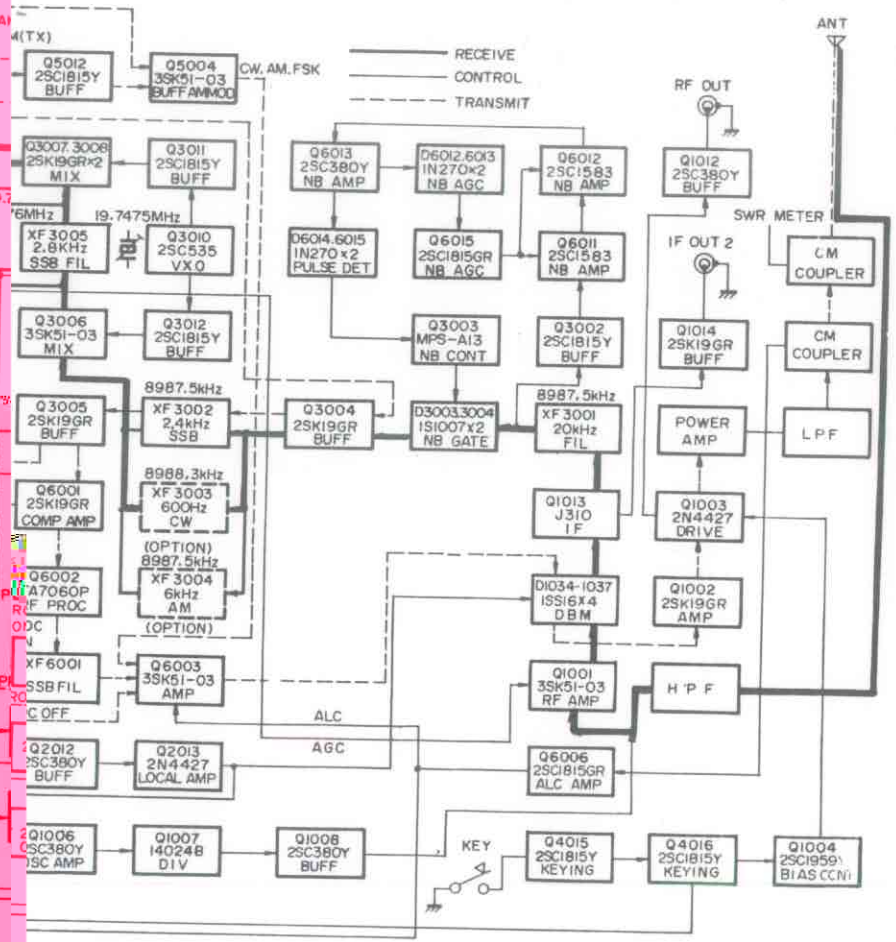
Because the signal path may change considerably when the mode is changed, we have included augmented block diagrams on page 2-4 through 2-8, in order to assist you in understanding the function of the FT-107M.

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

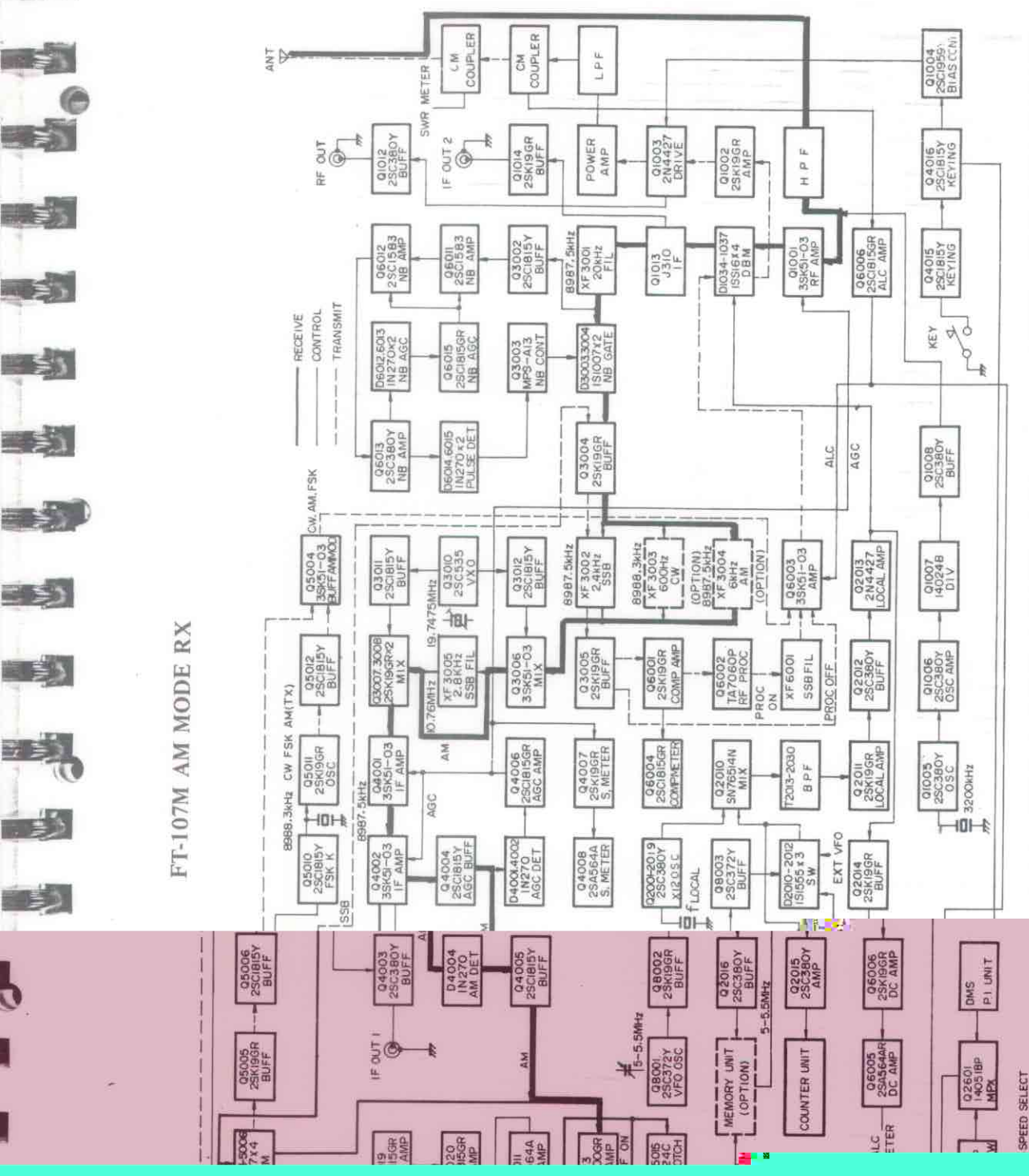
It should be noted that the internal calibrator (Marker) is an extremely useful signal for preliminary fault localization. In a properly functioning FT-107M, the S-meter should read approximately S9 + 20 dB. Minor variations from this number are not unusual, but a blown RF amplifier FET will cause this [illegible] 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.

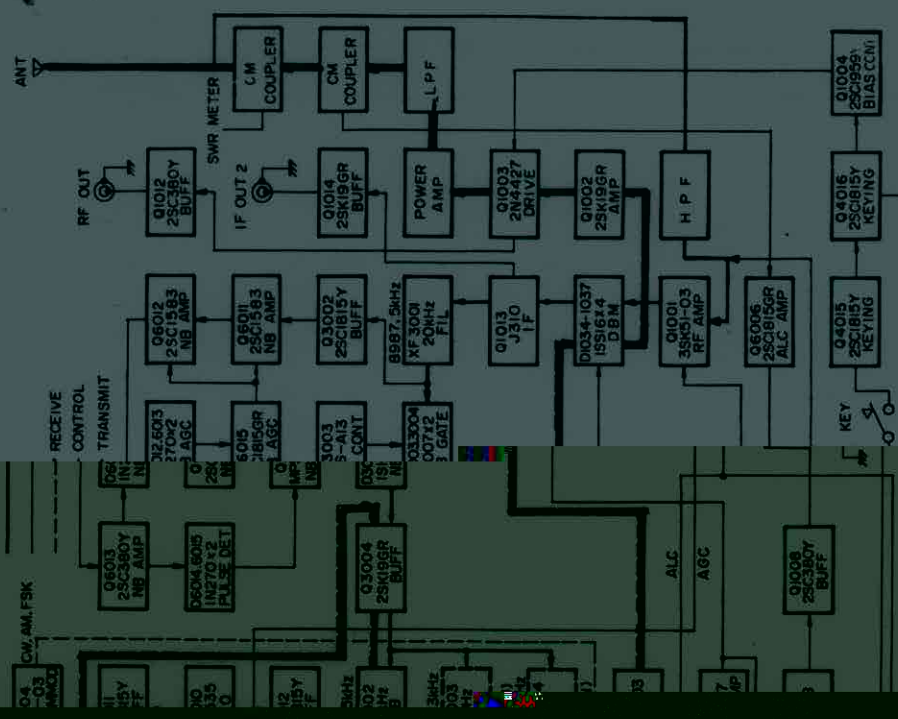


MODE RX

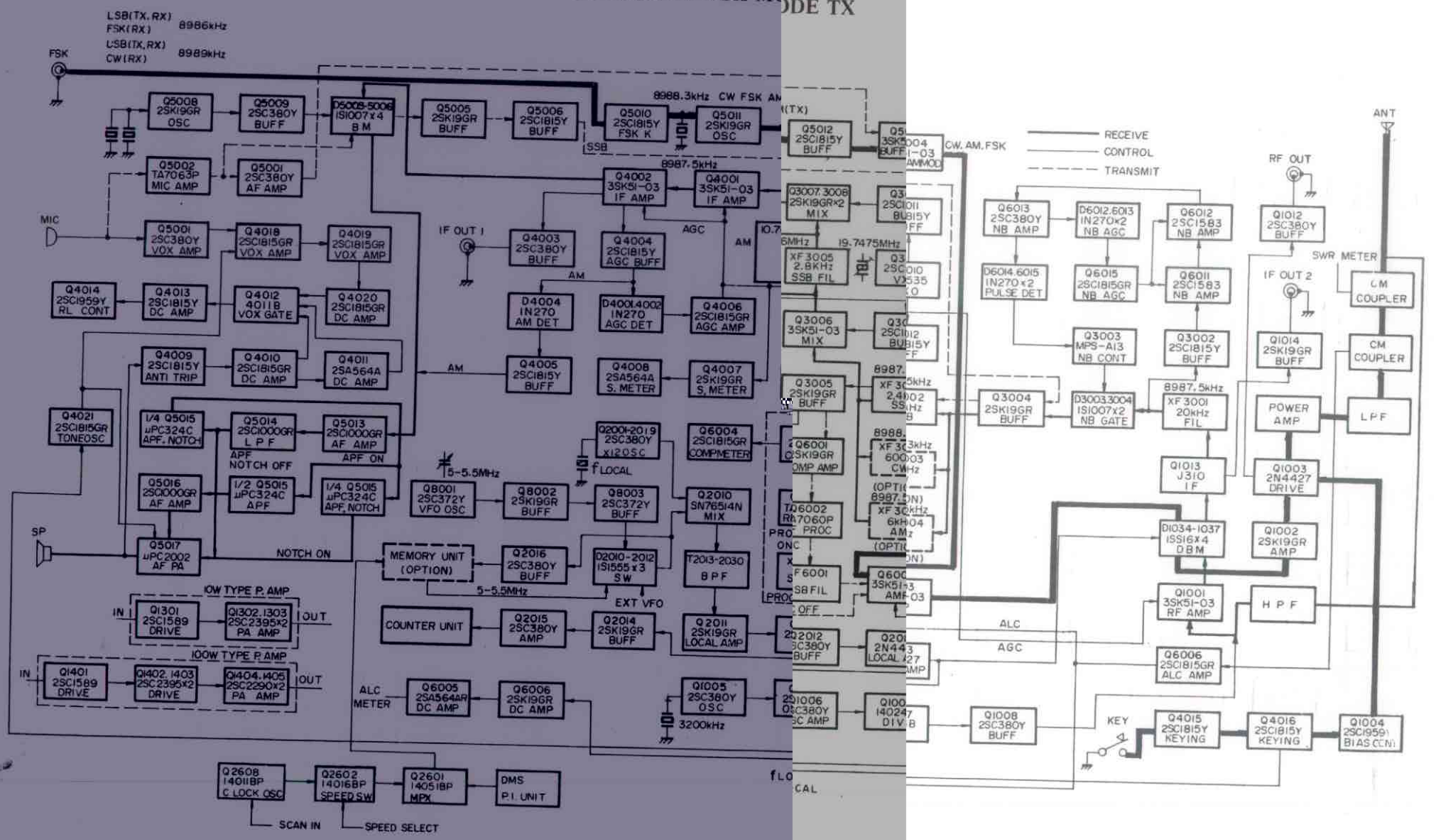

RECEIVE
CONTROL
TRANSMIT
ANT
RF OUT
IF OUT 2
SWR METER
CW. AM. FSK
Q5012 2SC1815Y BUFF
Q5004 3SK51-03 BUFF AMMOD
Q3007. 3008 2SK19GR×2 MIX
Q3011 2SC1815Y BUFF
19.7475MHz
XF 3005 2.8KHz SSB FIL
Q3010 2SC535 VXO
Q3006 3SK51-03 MIX
Q3012 2SC1815Y BUFF
8987.5kHz
XF 3002 2.4KHz SSB
8988.3kHz
XF 3003 600Hz CW
(OPTION) 8987.5kHz
XF 3004 6kHz AM
(OPTION)
Q3005 2SK19GR BUFF
Q6001 2SK19GR COMP AMP
Q6002 TA7060P RF PROC
XF 6001 SSB FIL
Q6003 3SK51-03 AMP
Q2012 2SC380Y BUFF
Q2013 2N4427 LOCAL AMP
Q1006 2SC380Y OSC AMP
Q1007 140248 DIV
Q1008 2SC380Y BUFF
Q3004 2SK19GR BUFF
Q6013 2SC380Y NB AMP
D6012.6013 IN270×2 NB AGC
Q6012 2SC1583 NB AMP
D6014.6015 IN270×2 PULSE DET
Q6015 2SC1815GR NB AGC
Q6011 2SC1583 NB AMP
Q3003 MPS-A13 NB CONT
Q3002 2SC1815Y BUFF
D3003.3004 1SI007×2 NB GATE
8987.5kHz
XF 3001 20kHz FIL
Q1013 J310 IF
D1034-1037 1SS16×4 DBM
Q1001 3SK51-03 RF AMP
Q6006 2SC1815GR ALC AMP
ALC
AGC
KEY
Q4015 2SC1815Y KEYING
Q4016 2SC1815Y KEYING
Q1004 2SC1959 BIAS CONT
Q1012 2SC380Y BUFF
Q1014 2SK19GR BUFF
Q1003 2N4427 DRIVE
Q1002 2SK19GR AMP
H.P.F
CM COUPLER
CM COUPLER
POWER AMP
L.P.F

FT-107M AM MODE RX

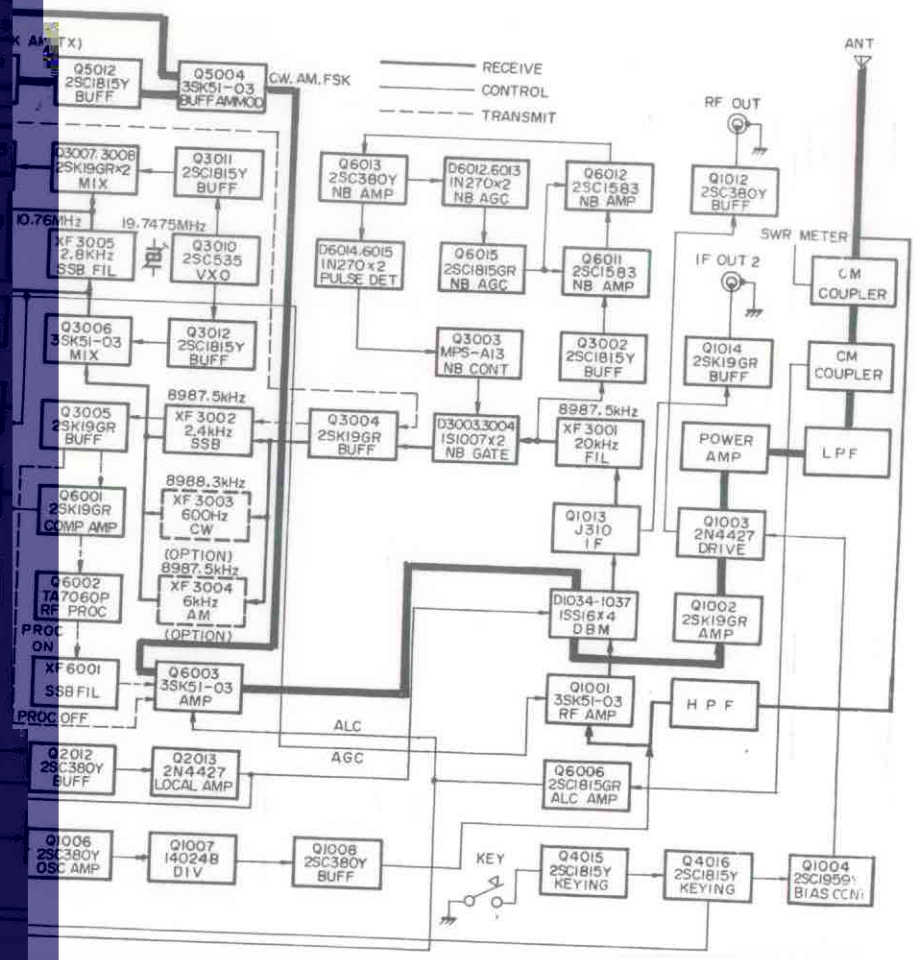



ANT
C.M. COUPLER
C.M. COUPLER
L.P.F.
SWR METER
Q1004 2SC959 BIAS CCNT
RF OUT
Q1012 2SC380Y BUFF
IF OUT 2
Q1014 2SK19GR BUFF
POWER AMP
Q1003 2N4427 DRIVE
Q1002 2SK19GR AMP
H P F
Q4016 2SC815Y KEYING
Q6012 2SC1583 NB AMP
Q6011 2SC1583 NB AMP
Q3002 2SC815Y BUFF
8987.5KHz XF-3001 20KHz FIL
Q1013 J310 I.F.
D1034-1037 1SS1644 D.B.M.
Q1001 3SK51-03 RF AMP
Q6006 2SC815GR ALC AMP
Q4015 2SC815Y KEYING
KEY
RECEIVE CONTROL TRANSMIT
Q6013 2SC380Y NB AMP
D604.6015 1N270×2 PULSE DET
Q3004 2SK19GR BUFF
ALC
AGC
Q4008 2SC380Y BUFF
CW.AM.FSK

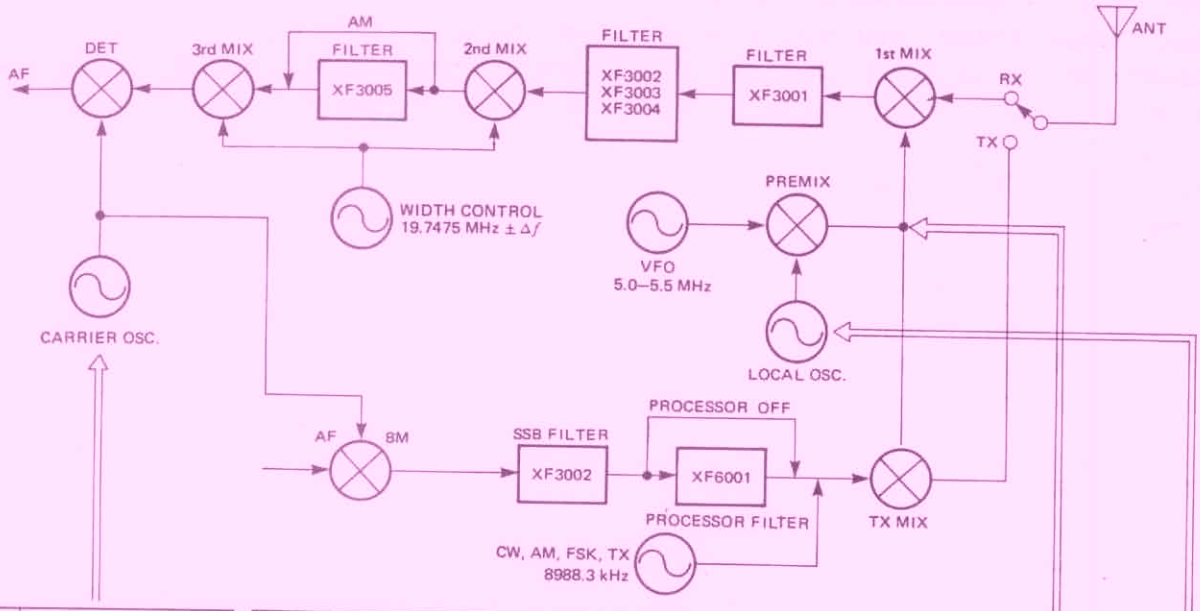
FT-107M CW FSK MODE TX



FT-107M AM MODE TX



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

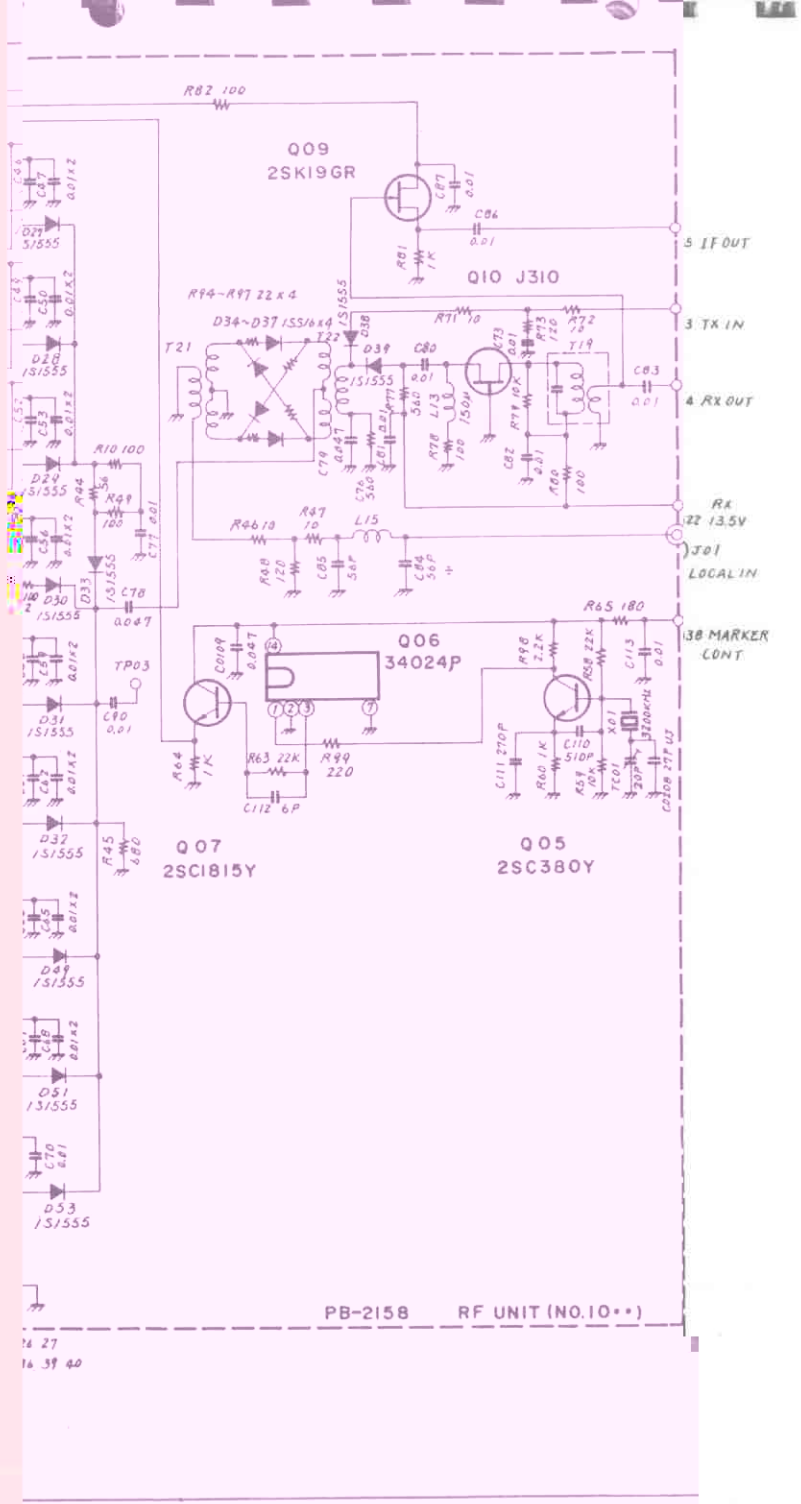
BAND	PREMIX OUT FREQUENCY MHz	LOCAL OSC. FREQUENCY MHz	BAND	PREMIX OUT FREQUENCY MHz	LOCAL OSC. FREQUENCY MHz
160 m	10.4875–10.9875	15.9845	15 m	29.9875–30.4875	35.4875
80 m	12.4875–12.9875	17.9845	*12 m	33.4875–33.9875	38.9875
40 m	15.9875–16.4875	21.4845	10 m A	36.9875–37.4875	42.4875
*30 m	18.9875–19.4875	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

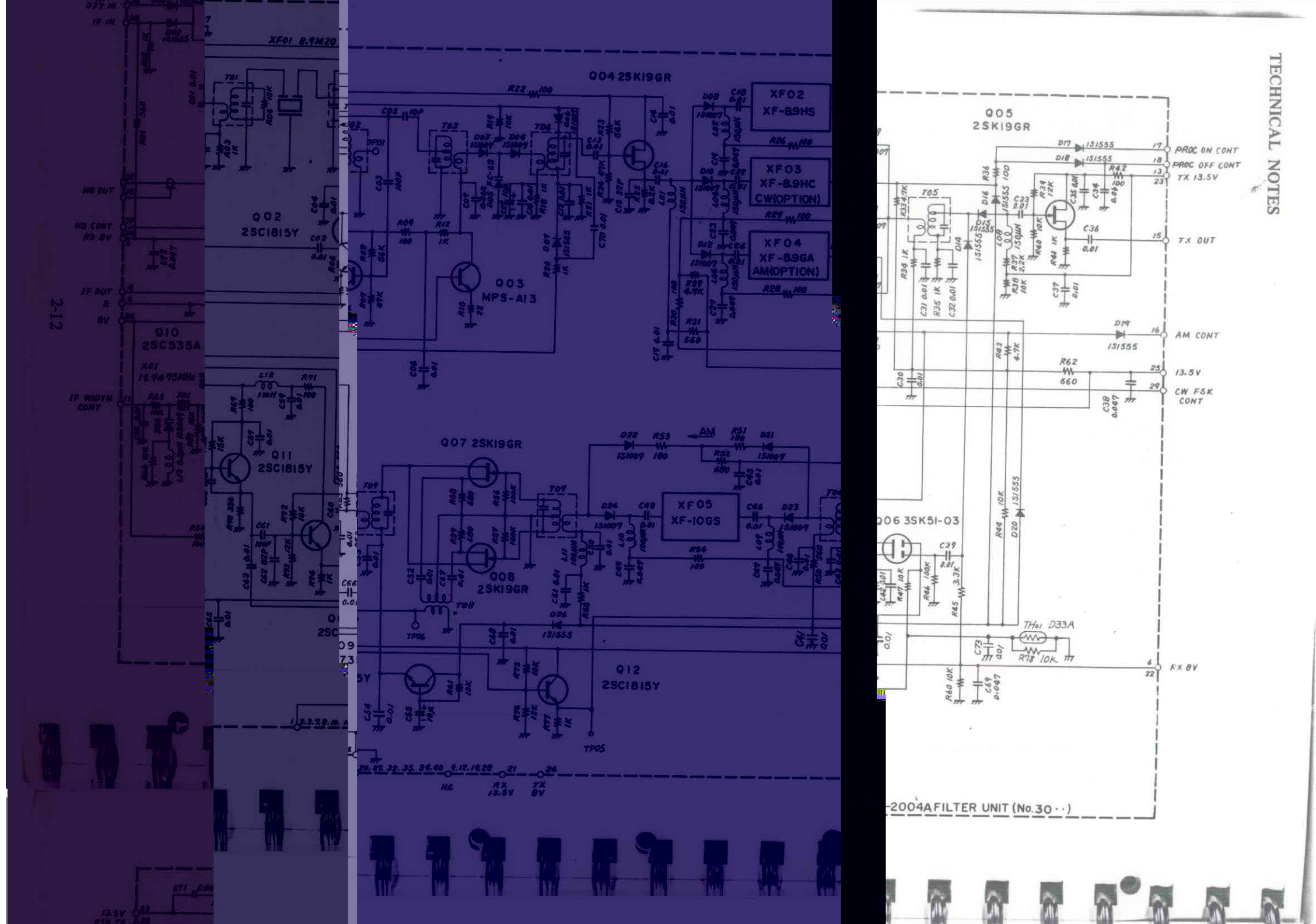
* After Proc. 6

CRYSTAL DATA FT-107M

UNIT	FUNCTION	HOLDER	FREQUENCY (kHz)	MODE	LOAD C (pF)	EFFECTIVE RESISTANCE (ohms)	DRIVE LEVEL (mw)
LOCAL	160m	HC-18/U	15364.5	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	10
	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[illegible]	Fundamental	30	30	2

※ XCO FREQUENCY: 19743–19753kHz
Determined by circuit


R82 100
Q09
2SK19GR
C87 0.01
C86 0.01
R81 1K
5 IF OUT
Q10 J310
R94~R97 22 x 4
D34~D37 1S1555x4
R71 10
R72 75
R73 120
T19
3 TX IN
T21
D38
D39
C80 0.01
C73 0.01
C83 0.01
4 RX OUT
L13 560
L14 150n
R78 100
R79 10K
C82 0.01
R100 100
C79 0.047
C81 0.01
C76 560
R10 100
R94 5K
R99 100
C77 0.01
D33 1S1555
D29 1S1555
D30 1S1555
C78 0.047
R46 10
R97 10
L15
RX
22 13.5V
J01
LOCAL IN
R48 120
C85 56P
C84 56P
R65 180
38 MARKER
CONT
C0109 0.047
Q06
34024P
TP03
C90 0.01
R64 1K
R63 22K
C112 6P
R99 220
R98 2.2K
R58 22K
C113 0.01
X01
3200KHz
C110 5108
C111 270P
R60 1K
R59 10K
C108 27P
Q07
2SC1815Y
Q05
2SC380Y
D31 1S1555
D32 1S1555
R45 680
D49 1S1555
D51 1S1555
C70 0.01
D53 1S1555
PB-2158 RF UNIT (NO.10**)


XF01 8.9M20
Q04 2SK19GR
XF02 XF-89HS
XF03 XF-89HC CW(OPTION)
XF04 XF-89GA AM(OPTION)
Q02 2SC1815Y
Q03 MPS-A13
Q10 2SC535A
Q11 2SC1815Y
Q07 2SK19GR
XF05 XF-10GS
Q08 2SK19GR
Q12 2SC1815Y
Q05 2SK19GR
Q06 3SK51-03
TH01 D33A
PROC ON CONT
PROC OFF CONT
TX 13.5V
TX OUT
AM CONT
13.5V
CW FSK CONT
RX 8V
NB OUT
NB CONT RX 8V
IF OUT
IF IN
IF WIDTH CONT
NC
RX 13.5V
TX 8V
-2004A FILTER UNIT (No.30··)


IF OUT 1
AM OUT
AM CONT
VOX GAIN
RX 8.5 V
CW 8V
TONE OUT
CW KEY
TX RF AMP CONT
CW GND
FSK GND
RELAY
MOX
8V
14
12
13
37
21
28
35
33
19
30
29
31
36
26
R60 68K
C53 0.01
C71 0.047
R19 27K
2SC1815GR
2SC1815Y
1N270
D16
0.047

PB-2006A AF UNIT (No.50··)
IF IN
SSB OUT
TX 13.5V
SSB CONT
CW AM
FSK OUT
8V
LSB (TX·RX) FSK (RX)
USB (TX·RX) CW (RX)
13.5V
SP OUT
Q05 2SK19GR
Q06 2SC1815Y
Q07 2SA733
Q08 2SK19GR
Q09 2SC380Y
Q16 2SC1000GR
Q17 μPC2003
Q15 μPC324C
Q04 3SK51-03
Q03 2SC380Y
Q12 2SC1815Y
2SK19GR
APF OUT
APF AF 2 IN
NOTCH OUT
APF 1
APF 2
APF 3
APF 4

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 VR2a to the audio output amplifier, Q_{5017} (μPC 2002H), which delivers 3 watts of audio output to the speaker. The audio output

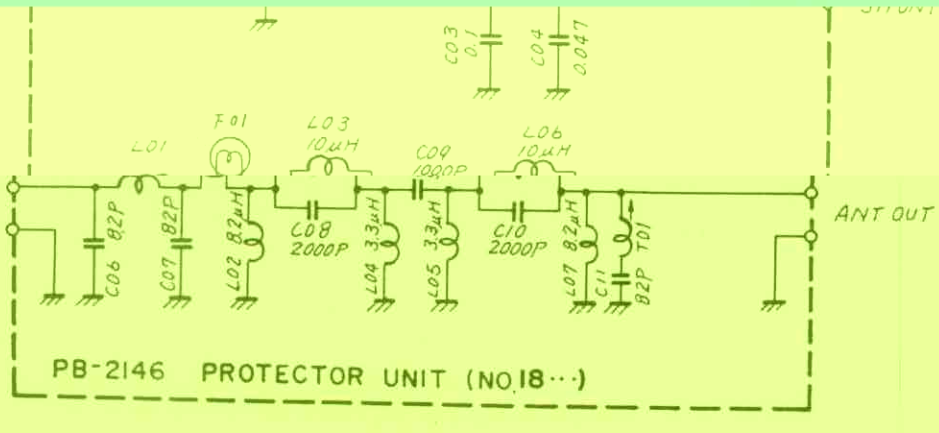
Operational amplifier Q_{5015} (μPC324C) is placed in the audio circuit by the APF/NOTCH switch on the front panel. For APF operation, a selective active filter is formed by two sections of Q_{5015}, and the output is amplified by Q_{5016} (2SC1000GR) prior to delivery to Q_{5017}. Two sections of Q_{5015} are also used for the high-Q notch filter. VR3 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.

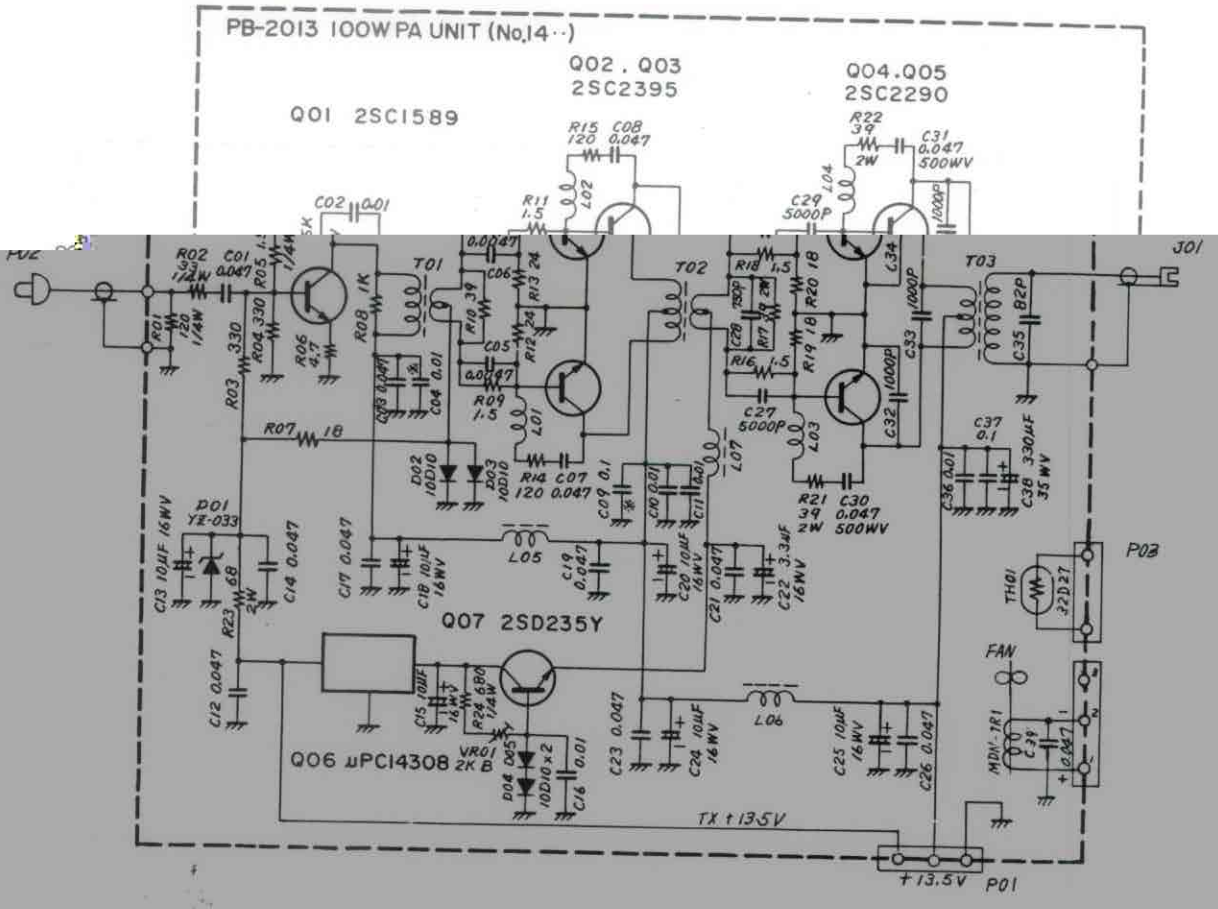
PROTECTOR UNIT (PB-2146)

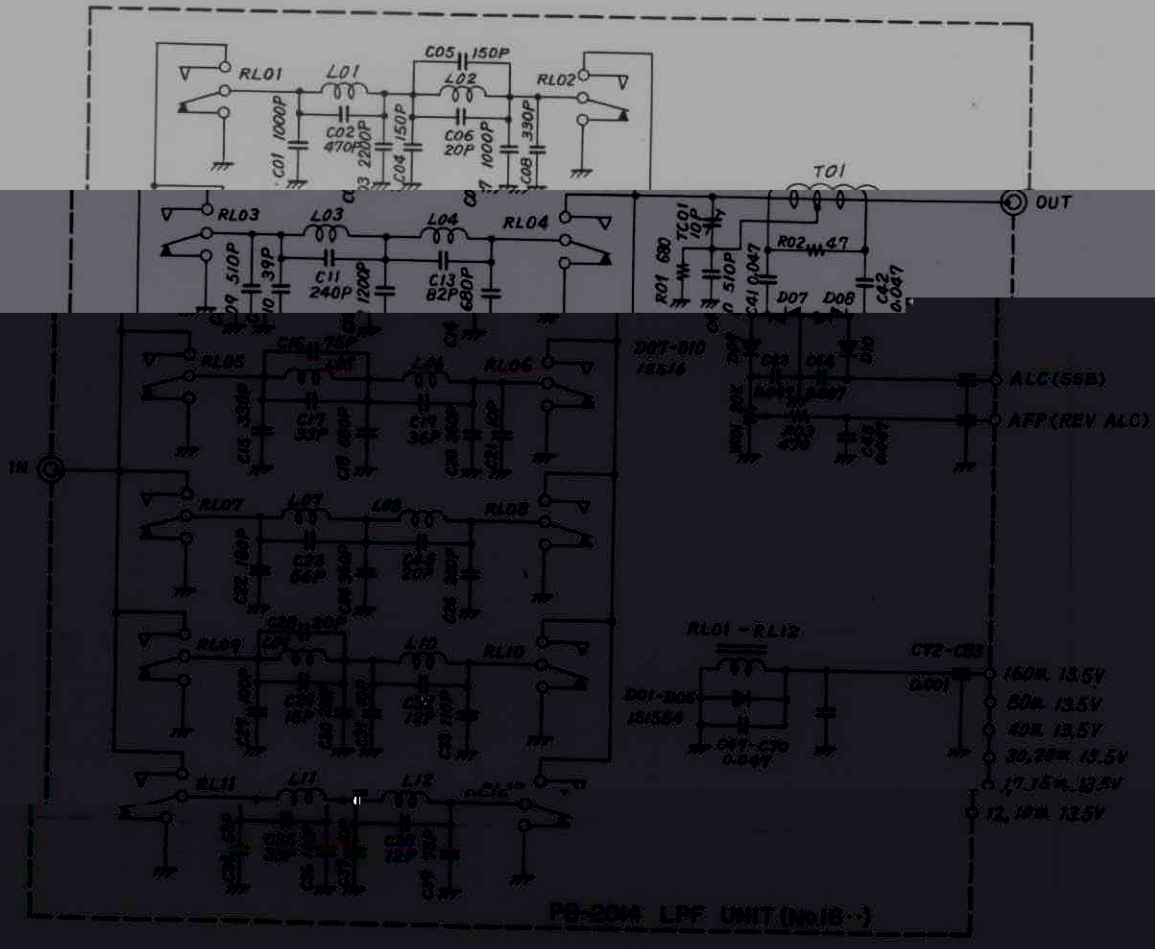
The incoming RF signal is fed to a 1.7 MHz high-pass filter through a lamp fuse which protects the RF amplifier and mixer against extremely strong signals. This signal is then fed to the RF Unit.

If an



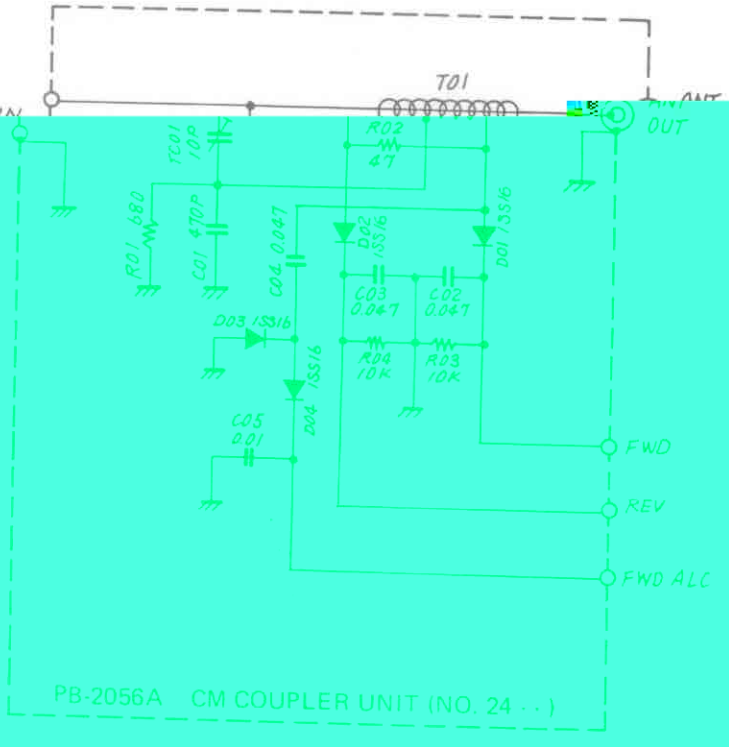
8V
DRIVE CONT
ALC
AFP ALC
ALC METER
IF OUT
(E)
TX 13.5V
NB GATE CONT
100W TYPE
10m JUMPER
10m 8V
N.B UNIT (No.60--)
Q06 2SC1815GR
Q17 2SC1815GR
Q10
2SA564AR
3SK51-03
IN270
ISS35
MC14016P


PB-2013 100W PA UNIT (No.14··)
Q02 . Q03
2SC2395
Q04.Q05
2SC2290
Q01 2SC1589
Q07 2SD235Y
Q06 μPC14308
TX +13.5V
+13.5V
P01
P02
J01
FAN

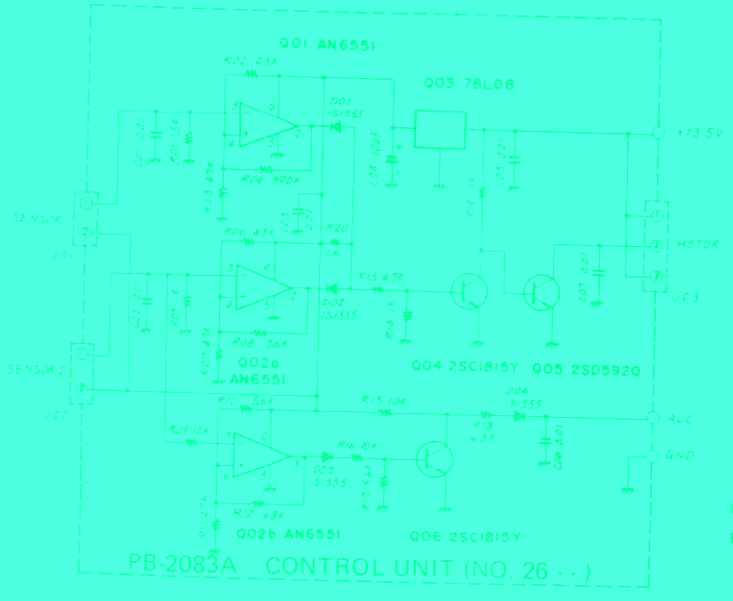

RL01
RL02
RL03
RL04
RL05
RL06
RL07
RL08
RL09
RL10
RL11
RL12
T01
OUT
IN
ALC(SSB)
AFP(REV ALC)
RL01 ~ RL12
160m 13.5V
80m 13.5V
40m 13.5V
30,20m 13.5V
17,15m 13.5V
12,10m 13.5V
PB-2014 LPF UNIT (No.18··)

CM COUPLER UNIT (PB-2056)

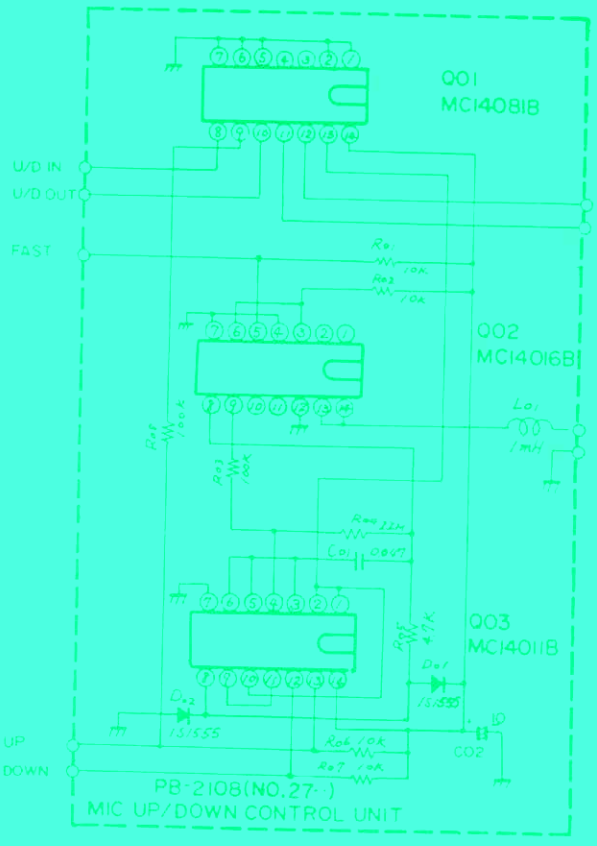
The output from the LPF Unit is fed to the CM COUPLER Unit, where a directional coupler provides for relative forward and reverse power indication on the front panel meter.



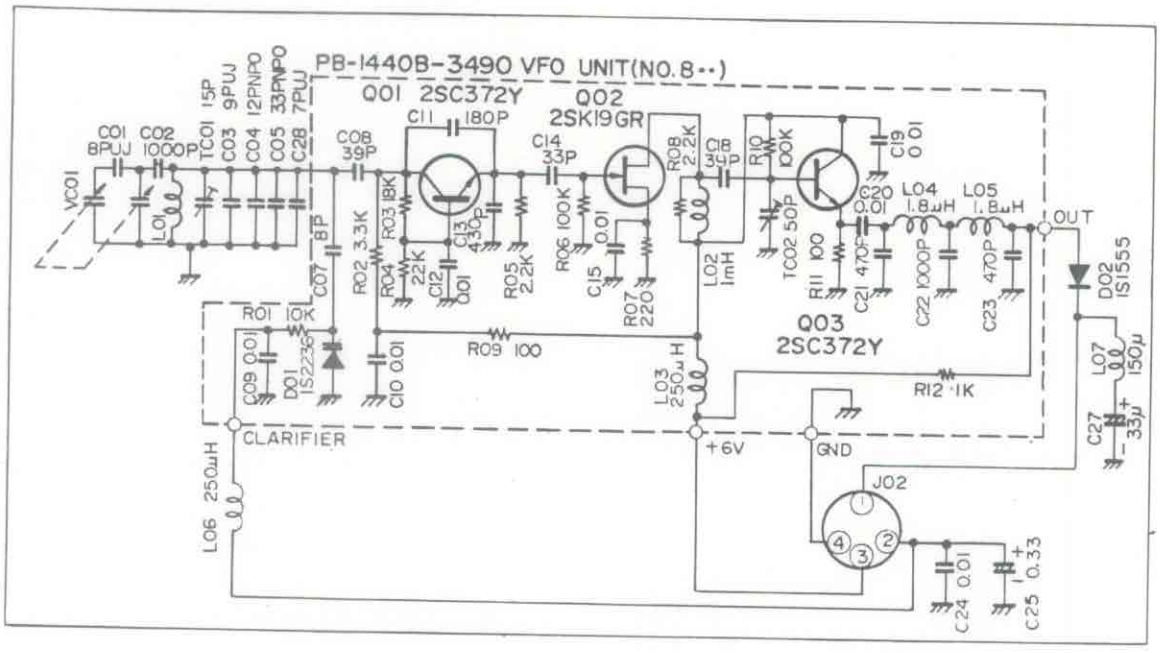
PB-2056A CM COUPLER UNIT (NO. 24 · ·)



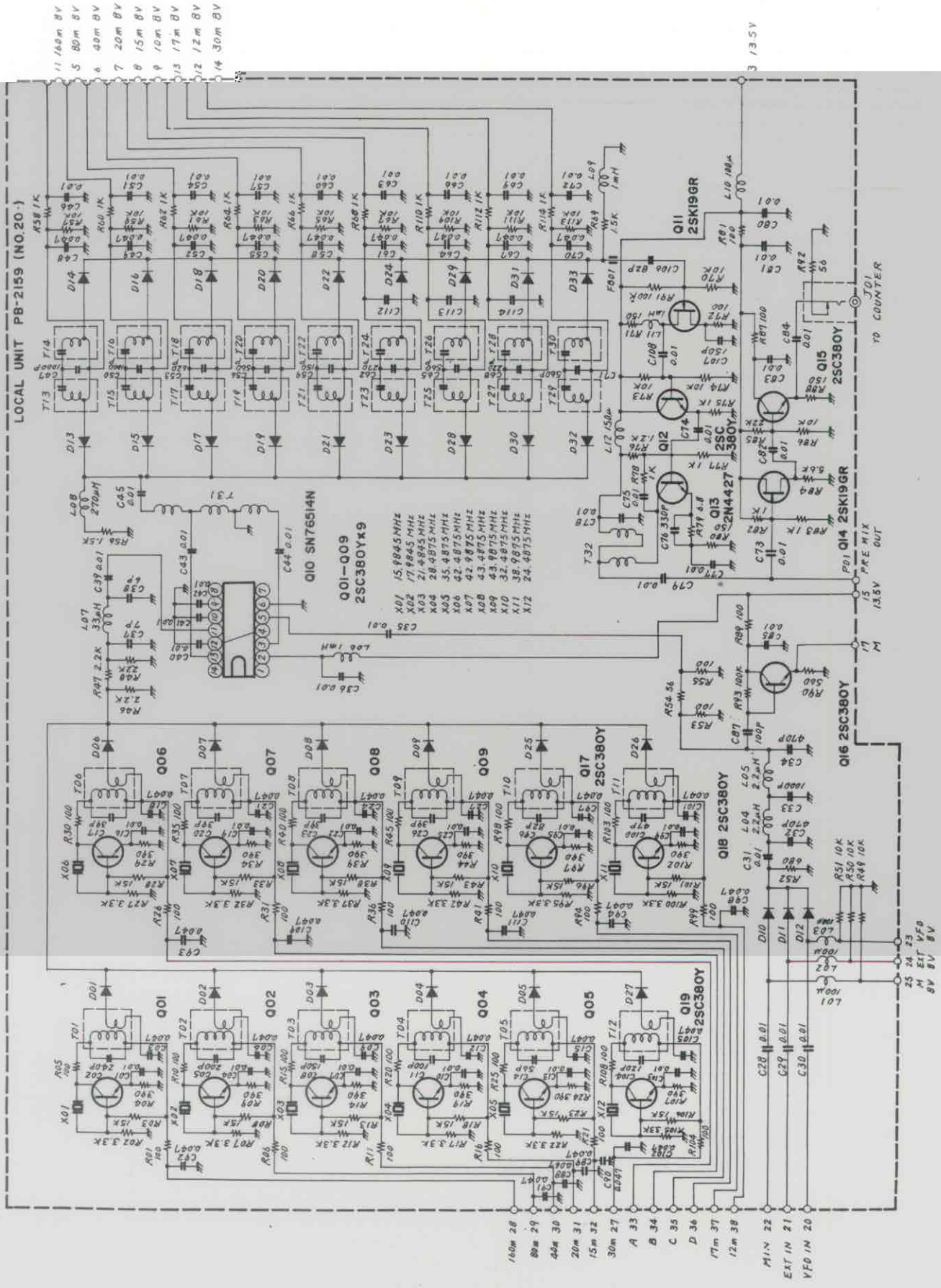
PB-2083A CONTROL UNIT (NO. 26 · ·)

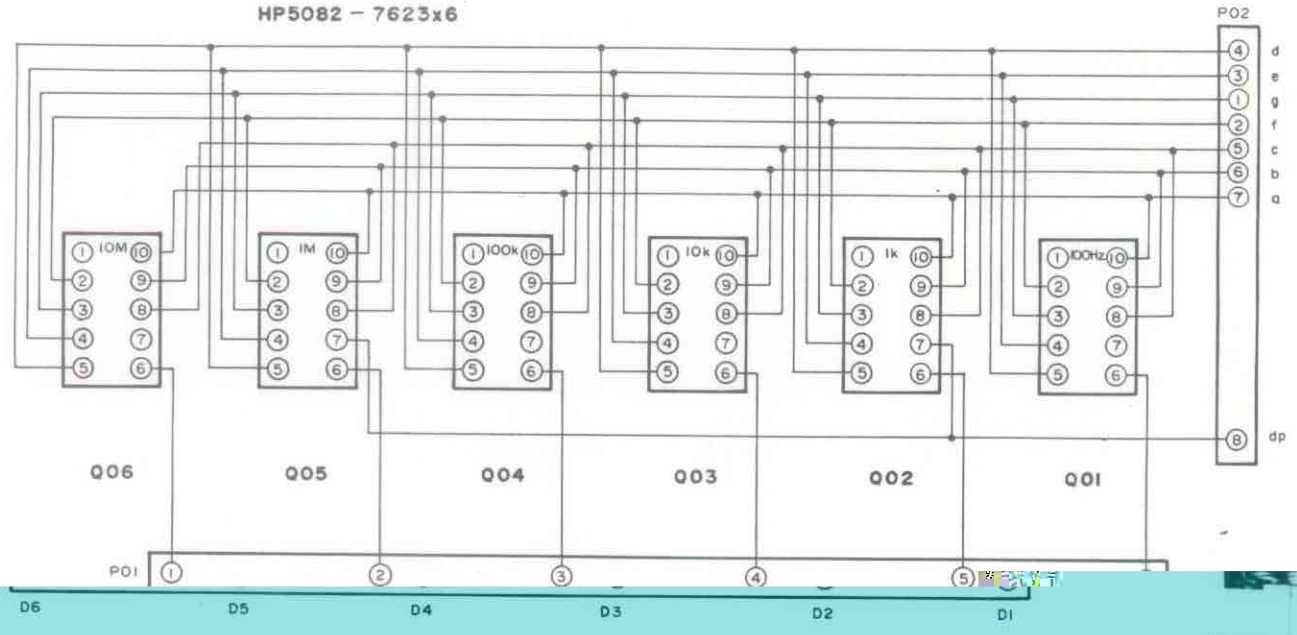


PB-2108(NO.27· ·)
MIC UP/DOWN CONTROL UNIT

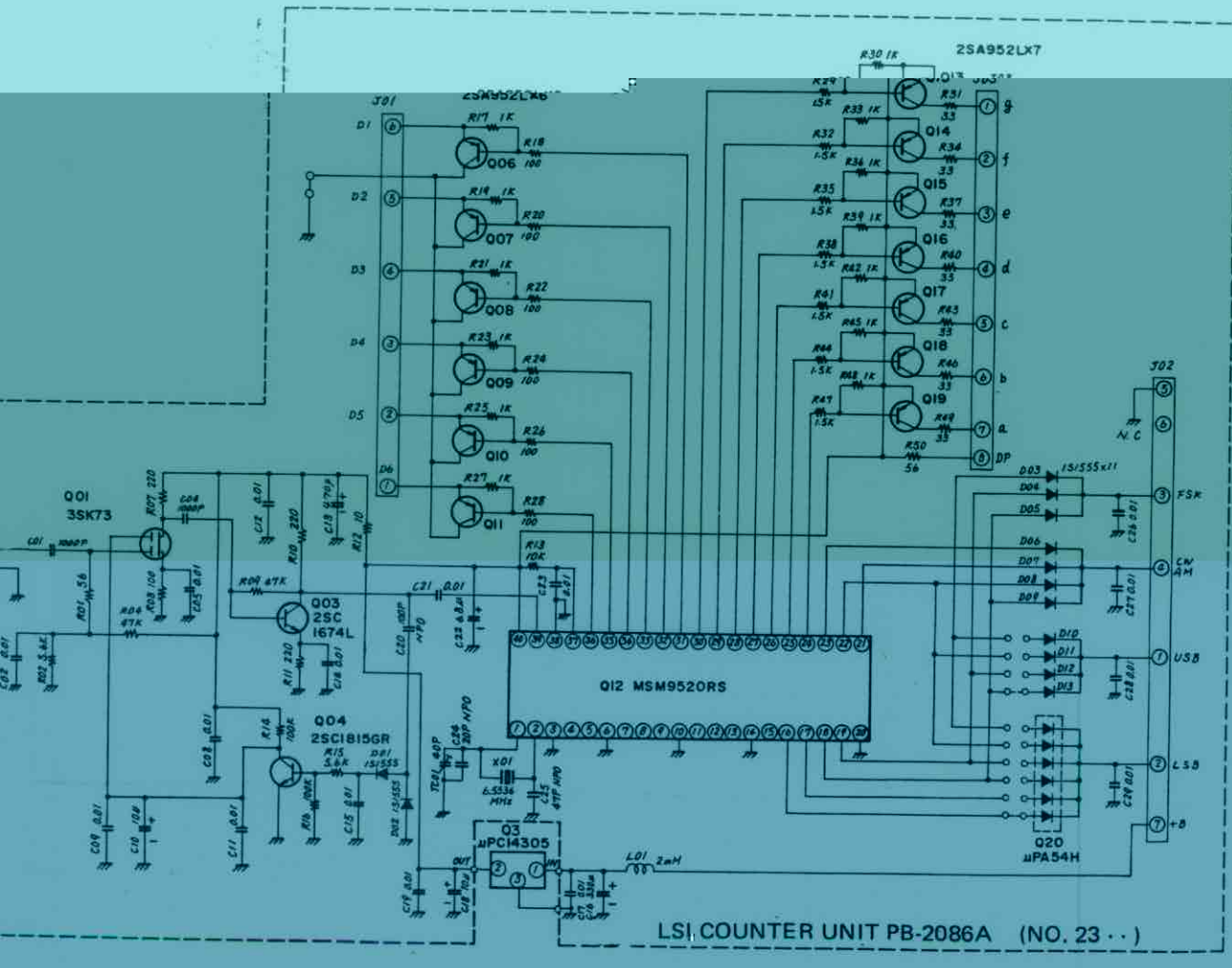


BAND	CRYSTAL	XCO Frequency	PREMIX OUT Frequency
160m	X_{2001}	15.9845MHz	10.4875～10.9875MHz
80m	X_{2002}	17.9845MHz	12.4875～12.9875MHz
40m	X_{2003}	21.4845MHz	15.9875～16.4875MHz
30m	X_{2012}	24.4875MHz	18.9875～19.4875MHz
20m	X_{2004}	28.4875MHz	22.9875


LOCAL UNIT PB-2159 (NO.20)
Q01–Q09 2SC380Y×9
Q10 SN76514N
Q11 2SK19GR
Q12 2SC 380Y
Q13 2SN4427
Q14 2SK19GR
Q15 2SC380Y
Q16 2SC380Y
Q17 2SC380Y
Q18 2SC380Y
Q19 2SC380Y
TO COUNTER
PRE MIX OUT
13.5V
VFO 8V
EXT 8V
MIX
EXT IN
VFO IN



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 Q_{2301} **(3SK73)** The amplified signal is further amplified by Q_{2303} **(2SC1674)** and delivered to the LSI counter chip, Q_{2321} **(MSM9520RS)**. A portion of the output from Q_{2303} is amplified by Q_{2304} **(2SC1815Y)** and fed to gate 2 of Q_{2301} and Q_{2302}, controlling the gain of those amplifiers.

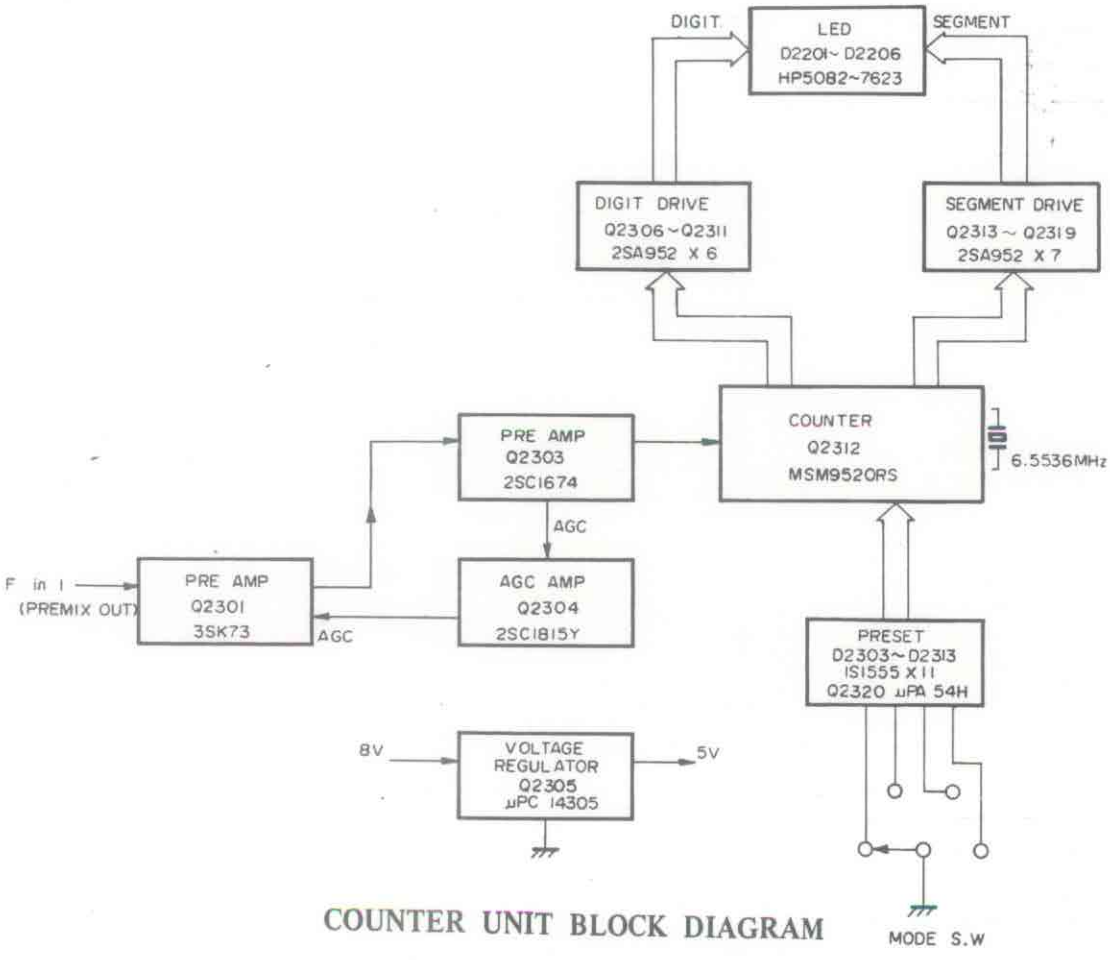
The output from the LSI is fed to the display. The output from pins 24 through 30 is delivered to segment drivers Q_{2313}–Q_{2319} **(2SA952L)** and digit drivers Q_{2306}–Q_{2311} **(2SA952L)** through a dynamic drive configuration. Display is performed by D_{2201}–D_{2206} **(HP5082-7623)**, seven-segment 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 Q_1 **(2N5685)** and Q_{202} **(2SA1012)**, while current limiting is provided by Q_{201} **(2SK19BL)**. The comparator function of the voltage regulator is performed by Q_{203} **(2SA950)**.

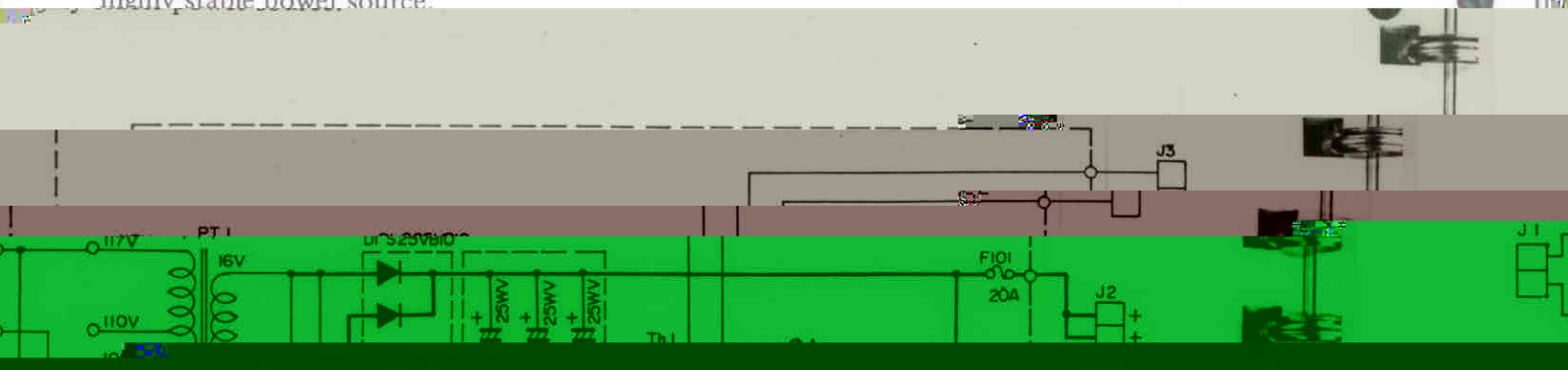
The input 13.5 VDC line from the FP-107 (or the external DC power line) is used for the PA Unit, the meter lamp, and for relay switching. RL_1 provides relay switching for the TX 13.5 V and RX 13.5 V lines.



COUNTER UNIT BLOCK DIAGRAM

The 13.5 volt line is stabilized at 8 volts by Q_1 (μPC14308), for use in the transistor circuits. The 8 volt line is further stabilized by Q_2 (μPC-14308) for the VFO circuitry, which requires a highly stable power source.

Transistor switches Q_{6007}/Q_{6008} (2SC1959Y), located on the NB Unit, provide switched 8 volts for the transmit and receive circuits.



DMS UNIT

The output from the programmable divider (at

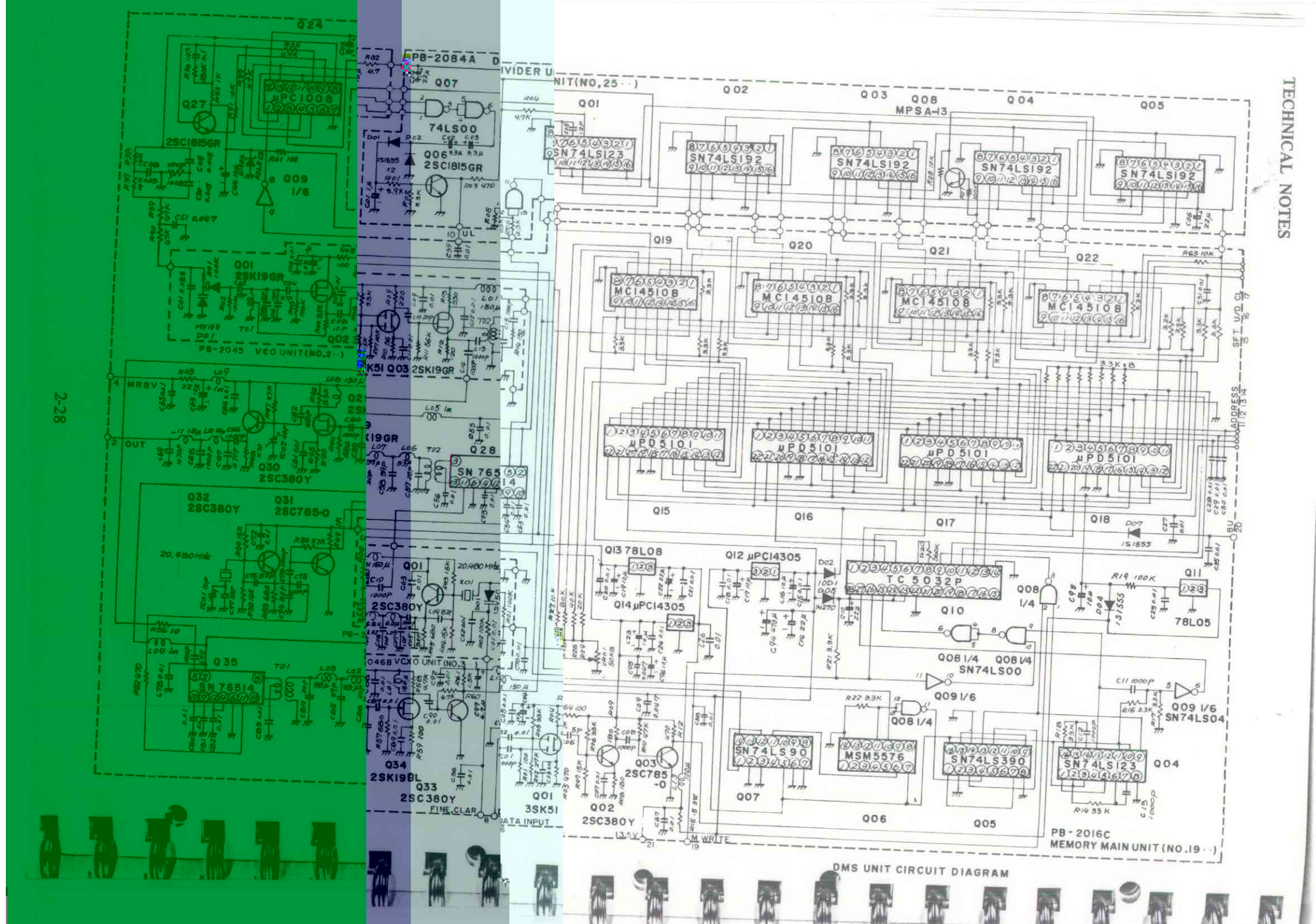
O frequency. The digitally encoded output from decade counter is delivered to the memory M for storage.

output from the R.A.M is fed through an UP/ N counter to preset the programmable divider. he DMS Unit, a 25.48–25.98 MHz signal is ced from the Voltage Controlled Oscillator). This signal is fed to a mixer, where the signal is mixed with a 20.48 MHz reference producing a 5.0–5.5 MHz signal, which is the programmable divider.

25.98 MHz signal is mixed with a 20.48 ± Δf 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


PB-2084A
Q07
74LS00
2SC1815GR
Q09 1/6
PB-2045 VCO UNIT(NO.2··)
2SK19GR
Q30 2SC380Y
Q32 2SC380Y
Q31 2SC785-O
20.480MHz
Q35
SN76514
Q34 2SK19BL
Q33 2SC380Y
FINE CLAR
DATA INPUT
Q01 3SK51
MPSA-13
SN74LS123
SN74LS192
MC14510B
μPD5101
TC5032P
78L08
μPC1430S
78L05
SN74LS00
SN74LS04
SN74LS90
MSM5576
SN74LS390
PB-2016C
MEMORY MAIN UNIT (NO.19··)
M WRITE
ADDRESS
DMS UNIT CIRCUIT DIAGRAM