CP400
SERVICE MANUAL

COMMUNICATIONS POWER, INC.

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I. CPI RECOMMENDED TEST EQUIPMENT LIST

1. <u>OSCILLOSCOPE</u> - TEKTRONIX T932 35MHz portable -$1200-
   TEKTRONIX INC
   P.O. Box 500
   Beaverton, Oregon 97077

   Reliable, good CB 27MHz waveform resolution and triggering.

2. <u>RF GENERATOR</u> - CLEMENS Model SG-83C -$345-
   CLEMENS MFG. CO.
   630 S. Berry Road
   St. Louis, MO 63122 (314) 961-7228

   Excellent value solid state generator with calibrated micro-volt output and super reliability.

3. <u>FREQUENCY COUNTER</u> - CPI Model FC-70 -$170-

4. <u>AUDIO GENERATOR</u> - HEATH MODEL IG-18 -(approx. $100)-

II CP-400 Detailed Circuit Description

1. <u>Method of Frequency Selection</u>

The front panel switches SW806 and SW807 provide binary coded decimal (BCD) outputs corresponding to each digit of the channel number selected. BCD coding is as follows for each decimal number:

Number	C8*	C4	C2	C1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

*C1, C2, etc., correspond to the 1's, 2's, etc., place in the binary equivalent of each <u>digit</u> of the channel number. Note that <u>each</u> decimal <u>digit</u> is binary coded, <u>not</u> the entire number. C_11, C_12, etc., are the "bits" of C_1, the first digit in the channel number. C_21, C_22, etc., are the "bits" of C_2, the second digit of the channel number. For example:

Channel 23 is

$C = C_1C_2$

where $C = 23$
$C_1 = 2$
$C_2 = 3$

$$\overbrace{\underset{C_18}{\overset{0}{\uparrow}}\ \underset{C_14}{\overset{0}{\uparrow}}\ \underset{C_12}{\overset{1}{\uparrow}}\ \underset{C_11}{\overset{0}{\uparrow}}}^{2}\qquad\overbrace{\underset{C_28}{\overset{0}{\uparrow}}\ \underset{C_24}{\overset{0}{\uparrow}}\ \underset{C_22}{\overset{1}{\uparrow}}\ \underset{C_21}{\overset{1}{\uparrow}}}^{3}$$

Also note that TTL <u>negative</u> logic is used for the channel switches.
0 = 2.5 to 5 vdc and 1 = 0 to 0.6 vdc.

The radio operating frequency is determined as follows:

$$f_0 = 27.500 \text{ MHz} = N \text{ (5 kHz)}$$

where: f_0 = operating frequency
N = synthesizer divide ratio
$= N_1N_2N_3$

N is a three-digit BCD number ($N_1N_2N_3$) determined by feeding the channel switch outputs into U600N (for N_2 and N_3) and N1 control circuit (for N_1). U600N requires negative voltage for proper operation. This is done by feeding a 50 kHz pulse from the synthesizer into the circuitry of U600M, Q616, Q617 and Q618. The BCD number N is a nine's complement BCD number. This is coded as follows:

Number	N8	N4	N2	N1
0	1	0	0	1
1	1	0	0	0
2	0	1	1	1
3	0	1	1	0
4	0	1	0	1
5	0	1	0	0
6	0	0	1	1
7	0	0	1	0
8	0	0	0	1
9	0	0	0	0

Note that <u>positive</u> TTL logic levels are used for N. Thus, 0 = 0 to 0.6 vdc and 1 = 2.5 to 5.0 vdc.

2. PTT Control Circuit

Since transmitting on channels 41 to 99 is illegal, the transmit push-to-talk (PTT) function is inhibited for these channels by the PTT control circuit.

3. BFO Inhibit Control

Logic gate U600L, together with Q604 and Q605, turn off the BFO during AM receive operation.

4. Crystal Oscillators

All crystal oscillators are of the Colpitts type. Some oscillators operate only in certain modes:

Oscillator	ON Modes
12.803 MHz (Q614)	USB
12.800 MHz (Q610)	All modes
10.200 MHz (Q606)	AM, LSB
10.197 MHz (Q602)	USB

The front panel clarifier control (R814) adjusts the dc bias on D608 (12.800 MHz oscillator) and on D605 (12.803 MHz oscillator) to adjust frequency during receive operation only.

5. General Theory of Digital Synthesizer

The voltage controlled oscillator (VCO) is a free-running oscillator whose frequency can be shifted by changing the dc control voltage applied. Increasing control voltage causes higher frequency of operation. The output of the VCO is mixed with a fixed crystal oscillator to produce a lower frequency for digital division. The output of the digital divider is compared with a fixed reference frequency. A difference in frequency will cause the phase comparator to shift the VCO dc tuning voltage until the VCO is on frequency (locked).

An example will best illustrate this operation. If radio operation on 27.00 MHz is desired, the synthesizer output must be 16.8 MHz (since the radio IF frequency is 10.200 MHz). The 16.800 MHz is mixed with the 12.800 MHz fixed frequency to produce a 4.000 MHz frequency out of the synthesizer mixer. This 4.000 MHz is applied to the programmable divider and divided by 800 to produce 5 kHz. This 5 kHz is compared with 5 kHz produced by dividing the reference oscillator by 2560. Thus, synthesizer output frequency is as follows: f_{out} = 12.800 MHz + N (5 kHz). It can be seen that a change of N by one will produce a 5 kHz shift in operating frequency.

6. Detailed Synthesizer Operation

The VCO (Q608) is automatically tuned by varactor D604 and manually set by L603. Its output is low-pass filtered by C615, L604, C616, and applied to output buffer Q609 and loop buffer Q612. The output of Q612 is applied to loop mixer Q611. The other input to Q611 is the output of the 12.803 MHz (Q614) oscillator for USB. During USB operation, the output of the 12.800 MHz oscillator (Q610) is kept from the loop mixer by switch U600F. For LSB and AM, Q614 is turned off, and U600F switches Q610 output into the loop mixer. Both oscillator outputs are low-pass filtered by C641, L606, C642. Q611 output is low-pass filtered by C623, L605, C624 and converted to TTL level pulses by Q615. Q615 output is applied to the programmable divider which consists of U600G (N_3), U600H (N_2) and U600J (N_1). The programmable divider output is applied to the phase comparator (U600A and U600B) which compares the pulses with 5 kHz output of the reference dividers U600E (÷16), and U600C (÷10). The output of the phase comparator is level shifted to 10-volt pulses by Q613. Note that the phase comparator output, when the loop is locked, consists of 5 kHz "square" wave, the duty cycle of which is proportional to the VCO dc tuning voltage required for operation at the given frequency. If the phase comparator output is at 0 or 1 logic levels and does not have a pulse output, the loop is not phase locked. The pulse output of Q613 is filtered by C603-C607, L601 and L602 to produce a smooth dc tuning voltage for the VCO. R607, R609 and C608 form a gain compensation network to assure loop stability.

7. BFO

Two crystal oscillators are used for the BFO. The 10.200 MHz (Q606) is used for AM and LSB. The 10.197 MHz oscillator (Q202) is used for USB only. Both oscillator outputs are low-pass filtered by C664, L607, C665 and amplified by Q607. The output of Q607 is fed to the double balanced mixer module (D610-D613) which is the product detector for SSB receive operation and the balanced modulator for AM operation. R699 and D614 form a network reinsertion during AM transmit operation.

8. Reference Oscillators

A crystal oscillator (Q610) operating at 12.800 MHz is used as the primary reference for PLL circuitry. Additionally, the 12.800 MHz is used as a L.O. signal to mix with the 16.800 MHz VCO which yields a difference frequency of 4.0 MHz. The 4.0 MHz is applied to the programmable divider chain whose output is 5 kHz. To maintain a constant 27 MHz output frequency on USB a 12.803 MHz crystal oscillator (Q614) is used as the above mentioned L.O.. Furthermore, a voltage variable capacitor is incorporated in each oscillator circuit to allow ±1500 Hz fine tuning of the receiver with the front panel CLARIFIER control R814.

During transmit the front panel CLARIFIER control does not function. Each side of the control R814 is connected through its respective switching transistor Q804 and Q805. In the transmit mode both Q804 and Q805 are turned off which effectively floats the arm of R814. This prevents the user from warping either oscillator during transmit.

9. Basic Theory of R/T Operation

The radio is basically a single-conversion superheterodyne type unit with filter type SSB generation. Some commonality is used on key components for both transmit and receive. One key unique feature of the unit bears some explanation for thorough understanding of radio operation. A single crystal filter unit is used for all modes of operation (AM, LSB and USB) on both receive and transmit. The filter is a dual mode type with an AM mode centered at 10.200 MHz and an LSB mode with the carrier at 10.200 MHz. For USB operation it is necessary to shift BFO operation down 3 kHz to the other side of the filter (10.197 MHz) so that the filter will pass the upper sideband. If the BFO has been shifted down 3 kHz for USB, it is necessary to shift the SMO LO input 3 kHz to maintain a constant channel frequency. This is why two oscillators (12.800 MHz and 12.803 MHz) are used in the synthesized master oscillator (SMO).

10. Detailed Receiver Operation

C113, L103, C114, L104, C115, L105 and C116 provide a low-pass filter from the rf input connector which is shared with the transmitter. From the low-pass filter, the receive rf input is coupled by C112 to D105. D105 is a PIN type diode which acts as a shunt attenuator for rf AGC on receive and as a shunt shorting switch for transmit operation. C250, C251, C252 and L209 provide the required impedance transformation for the grounded gate preamplifier Q223. L210, C255 resonate at 27 MHz on the output of Q223. This output is fed into the gate of JFET mixer Q201. The source of Q201 is fed with local oscillator signal by Q206.

The 10.200 MHz output of Q201 is fed through diode switch D203 to crystal filter FL-201. For SSB operation, +10vdc is applied through R245 to FL201 to change the filter to the SSB mode. The output of FL201 passes through diode switch D205 and is amplified by U200A and U200B (about 100db of IF gain). For SSB operation the output of Q213 is switched by D211 into the product detector (BFO). Q214 is the AM and AGC detector. Q216 is connected as a temperature tracking diode to bias Q214.

The output of Q214 is low-pass filtered by R309, and C288 to provide dc voltage for AGC operation. This ac and dc component is applied to comparator U200E. R306 sets the comparison voltage for U200E. The output of U200E drives follower Q212 to provide fast attack of C277, R297 and R298 set the AGC decay. In the AM mode R298 is shorted by Q217 which shortens the decay characteristics of the AGC. R283 and R281 apply AGC to the IF amplifiers. U200C compares the IF AGC level set by R292 to begin rf AGC. R289 and D208 assure full receive rf AGC shutdown during transmit. Q208 is the PIN diode (D105) driver.

U200E senses a dc IF AGC level set by the front panel squelch control (R809) to open the audio squelch gate Q215. Q219 is a FET switch to select either AM or SSB audio for amplifier U200F. R314 is to balance AM/SSB audio levels into U200F. The output of U200F goes through squelch gate (Q215) to the output amplifier.

11. Detailed Transmitter Operation

Microphone audio is amplified by Q501 and is followed by U500A which is a high gain low distortion amplfier. When overdriven the output of U500A symetrically limits the audio level applied to the compressor which prevents overmodulation. C505 and C508 determines the amount of audio pre-emphasis introduced by the amplifier. The output of U500A drives logarithmic amplifier U500B. This amplfier introduces a non-linear transfer characteristic and produces compressed full wave audio at its output. The output of U500B drives AGC amplifier U200D which feeds emitter-follower Q221 to provide a low impedence audio source to the balanced modulator.

The output of the balanced modulator (10.200 MHz) is fed to diode switch D211. Note that R699 and D614 on the balanced modulator (BFO module) form the key elements for switched, variable carrier insertion during AM transmit operation. The output of switch D211 is buffered by Q222, passed by switch D206, and filtered by dual mode filter FL201 (see previous sections for details of FL201 operation).

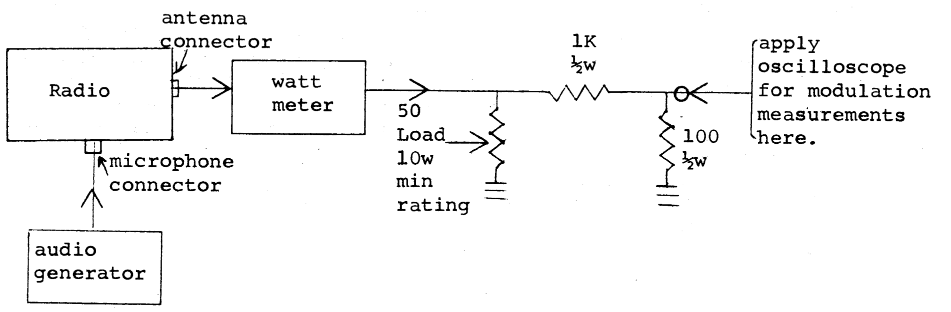
The output of FL201 passes through switch diode D204 and is buffered by Q205. The output of buffer Q205 is amplified by AGC driver Q207 and detected by D201 and D202. The dc level output of D201-D202 is compared to a fixed +2 volts by U200C. The transmit IF signal level is set by R274 before buffer Q222. The output of U200C drives emitter-follower Q209 for a fast attack of C222 and R229 which set the transmit AGC attack and decay time. Q209 is an emitter-follower AGC driver to the transmit audio AGC amplifier U200D. Thus, adjustment of the audio gain through U200D adjusts the rf level through the transmit IF chain, to prevent over-modulation and level the varying audio input levels from the microphone. The output of Q205 also is passed through buffer Q203 to the gate of the transmit rf mixer, JFET Q204. The source ofQ204 gets LO injection (16.3 MHz) from amplifier Q206. The output of Q204 (27 MHz) is bandpass filtered by C205-C209 and L202-L204. Q202 is the exciter output amplifier, filtered by L201 and C294, matched by C201 to R205. R205 sets the rf drive level to (and therefore the rf output of) linear transmit power amplifiers Q101 and Q102. Q202 and Q101 are operated class A, with LC and transformer interstage matching respectively. Q102, the final rf amplifier, is operated class B with quiescent dc bias set by R108 and temperature tracking diode D104. Q102 also uses transformer type input and output matching. The output of Q102 passes through a seven section low pass filter which insures complete removal of undesired harmonic energy. The rf output of Q102 is detected by diodes D101 and D102 and the resultant dc level is applied to the meter driver circuitry.

12. <u>Detailed Noise Blanker Operation</u>

The CP400 uses a tuned RF receiver operated at 23.5 MHz as a detector for noise pulses free of 27 MHz signal interference. L501 and C527 provide the front end selectivity of NB receiver, amplified by Q512 and Q510. Q508 is the noise detector which is class B biased by Q511 connected as a diode. The output of the detector drives one shot Q509 which provide 5-10 micro second pulses to the NB switch,Q224, on the R/T board (7H016). L214, C296, C292, L211, C258, and C259 on the R/T board provide selectivity and time delay in the main receiver 10.2 MHz IF after mixer Q201. The time delay of the main receiver path is necessary for proper blanking by the NB receiver.

III. <u>CP-400 TUNING PROCEDURE (General)</u>

1. <u>Be sure to tune the radio in the sequence given</u>. It is imperative that the +10 VDC regulator and the xmt audio processor be adjusted before the rest of the radio is tuned.
2. Remember that a second class or better FCC radio telephone license is required to make frequency or transmit adjustments on the CP-400.
3. On the CP-400 microphone connector:
   a) audio hot is on pin 1
   b) audio ground (shield) is on pin 2
   c) pins 3 and 4 are shorted together for transmit
4. All receive rf generator inputs are applied to the radio antenna connector.
5. All transmit measurments are done with a 50 load connected to the radio antenna connector through a good quality wattmeter.



IV. CP-400 AUDIO PROCESSOR TUNE UP (7H020 Board)

1. Set +10 VDC at TP 7 (+side of C525) using R551 (<u>V ADJ</u>).
2. Set R570 (MIC) at full CCW (counter-clockwise) rotation.
3. Check that audio output (TP5) clips at about 2.6v p-p for 100mv p-p, IKC audio in.

V. CP-400 SMO TUNE UP (7H015 Board)

1. Set R699 at ½ rotation.
2. CHECK for -8VDC at TP 8.
3. Set xtal oscillators on frequency. Be sure to use a high impedance probe with frequency counter.

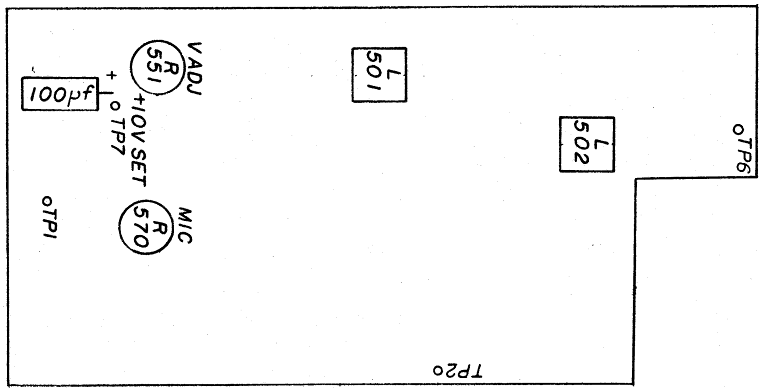
   a. XL 1 = 12.802850 MHz at TP 6 (USB xmt) with C640.
   b. XL 2 = 12.800 MHz at TP 6 (LSB xmt) with C648.
   c. XL 3 = 10.197150 MHz at TP 7 (USB) with C667.
   d. XL 4 = 10.200 MHz at TP 7 (LSB) with C652.

4. Check for no signal on AM-RCV at TP 7 with an oscilloscope.
5. On channel 01, adjust L603 for 2.4 VDC at TP 3.

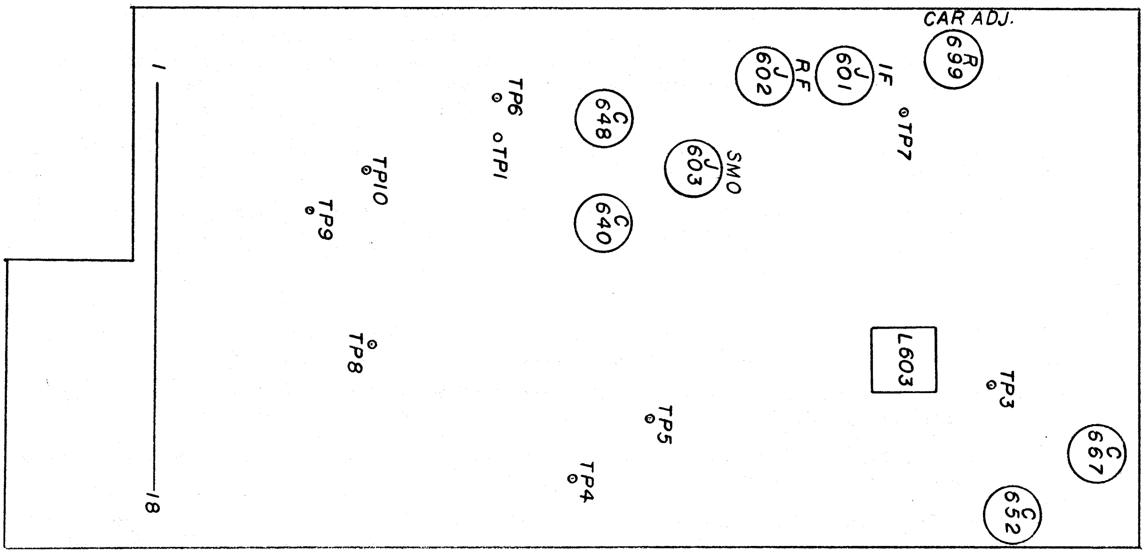
VI. CP-400 R/T TUNE UP (7H016 Board)

1. All receive tuning is done with a signal generator connected to the radio antenna connector.
2. On channel 20, peak L206 and L207 at TP 4 for maximum 16.8 MHz voltage. At least 8v p-p should be present.
3. On channel 20, tune L208, L209, L214, L211,L212, and L213 on LSB for peak S-meter reading. Adjust generator frequency to keep audio out-put at 1KC. Use R286 (SM) to keep the S-meter at S-9 and R306 (IF AGC) to keep the 1 KC audio on TP 8 at 3.0v p-p. Be sure audio is unsquelched. Keep reducing the rf generator input level as the receiver is tuned, to just barely keep the level in full AGC. Full AGC is usually at signal levels above 10 UV. Check clarifier operation by its rotation causing a change in receive audio frequency. For -60dbm (220 UV) signal level, set 3.0 p-p at TP8 with R306 (IF AGC).
4. Check USB receive and clarifier operation for proper sensitivity and operation. Do not retune the receiver on USB.
5. In the AM rcv mode, set 2.0v p-p at TP 8 using R314 (AM). RF generator should be at 1KC, 50% modulation AM with a -60dbm (220 UV) signal level.
6. Check squelch operation at TP 8. Rotation of the front panel squelch control should cause the audio at TP 8 to be cut off.
7. Set RF-AGC (R292) at TP 5 for 1.5 VDC with -50 dbm (700 uv) on LSB receive 1KC audio out. Check proper RF AGC operation.
8. Check R/T switching at TP 5. It should be +8 VDC on xmt and 0 VDC on receive (with no rcv signal).
9. Set S-meter to S-9 with a 50 uv signal generator level on LSB receive, with 1KC audio out using R286 (SM).
10. On the audio processor board, peak L501 and L502 for at least 1 VDC downward deflection at TP 6 with a -50dbm (700UV), 23.5 MHz CW RF input to the radio.
11. Disconnect the signal generator and connect a wattmeter and 50 ohm dummy load to the radio antenna connector. See step 5 of general tuning procedure.
12. With a 20 mv p-p 1KC audio input at the radio mic connector, set R274 (RFL) for .5v p-p audio at TP 1 on LSB xmit. Vary audio input level to verify proper ALC operation (limiting). At a point below 20 mv input, the audio level at TP 1 will start to drop, above that point the audio should limit at .5v p-p.
13. Set 90%, 1KC AM modulation at TP 2 on R/T Board with R699 (CAR ADJ) on SMO board. Be sure audio is in ALC limiting when R699 is adjusted. Always use an oscilloscope to adjust modulation, not a meter.
14. Peak L204, L202,L203,L205, and L201 in that order for maximum power output on CH 20, AM. Adjust R205 to maintain 4 watt carrier output. Check output power balance on Ch 1, 20, and 40. If this power varies more than 0.5 watt from Ch 1 to 40 complete the following. Slightly adjust L204 for maximum power on Ch 1 and L205 on Ch 40. Check power balance. Recheck 4 watt level and adjust R205 if required.
15. Set front panel meter at 4w carrier with no mod on AM, CH 20,using R412 (TX MTR CAL) on Audio Power Amp board.
16. Remove audio generator, and using microphone check whistle and speech mod waveforms on AM, LSB, and USB. Be sure AM carrier level is 4w and adjust R699 (CAR ADJ) for 90% whistle mod on AM, if necessary. Check whistle up power on LSB and USB (10w min). Also check proper meter operation on all modes. The meter should always go upward with modulation.
17. Check xmit inhibit on channels 41 and 99.
18. Recheck 4w carrier level on AM, adjust R205 (RFD) if necessary.

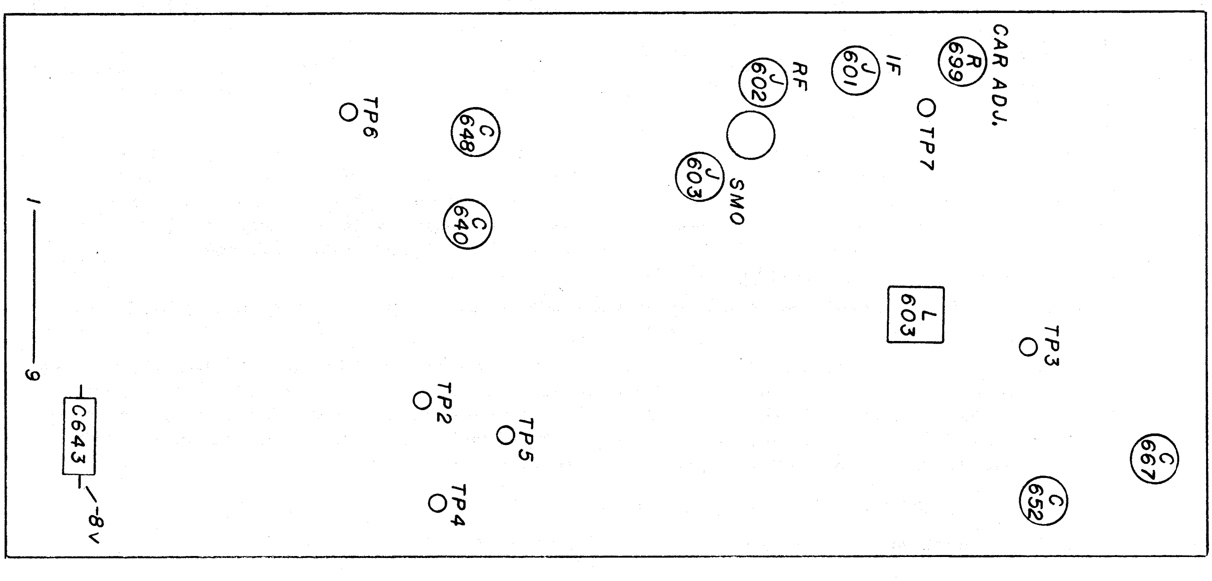
A. AUDIO PROCESSOR 7H020 BOARD - COMPONENT SIDE

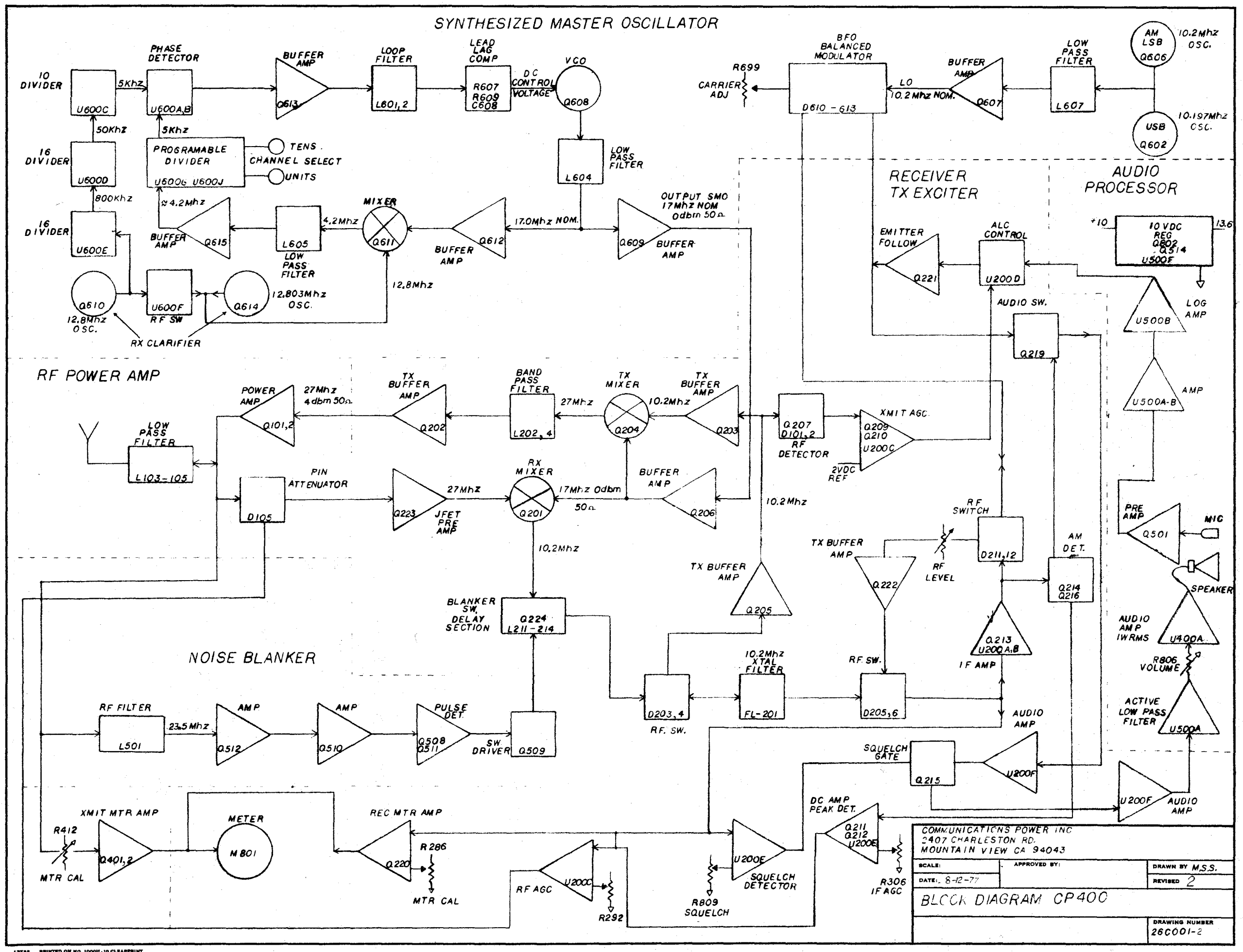


B. SMO 7H015 BOARD - COMPONENT SIDE



SMO 7H042 BRD-COMPONENT SIDE




SYNTHESIZED MASTER OSCILLATOR
10 DIVIDER U600C
PHASE DETECTOR U600A,B
5Khz
BUFFER AMP Q613
LOOP FILTER L601,2
LEAD LAG COMP R607 R609 C608
DC CONTROL VOLTAGE
VCO Q608
LOW PASS FILTER L604
16 DIVIDER U600D
50Khz
PROGRAMABLE DIVIDER U600G U600J
TENS CHANNEL SELECT UNITS
16 DIVIDER U600E
800Khz
≈4.2Mhz
BUFFER AMP Q615
L605 LOW PASS FILTER
4.2Mhz
MIXER Q611
BUFFER AMP Q612
17.0Mhz NOM.
OUTPUT SMO 17Mhz NOM 0dbm 50Ω
BUFFER AMP Q609
Q610 12.8Mhz OSC.
U600F RF SW
Q614 12.803Mhz OSC.
12.8Mhz
RX CLARIFIER
R699 CARRIER ADJ
BFO BALANCED MODULATOR D610 - 613
LO 10.2 Mhz NOM.
BUFFER AMP Q607
LOW PASS FILTER L607
AM LSB Q606 10.2Mhz OSC.
USB Q602 10.197Mhz OSC.
RECEIVER TX EXCITER
AUDIO PROCESSOR
EMITTER FOLLOW. Q221
ALC CONTROL U200D
+10 10 VDC REG Q802 Q514 U500F 13.6
LOG AMP U500B
AUDIO SW. Q219
AMP U500A-B
RF POWER AMP
LOW PASS FILTER L103-105
POWER AMP Q101,2
27Mhz 4dbm 50Ω
TX BUFFER AMP Q202
BAND PASS FILTER L202,4
27Mhz
TX MIXER Q204
10.2Mhz
TX BUFFER AMP Q203
Q207 D101,2 RF DETECTOR
XMIT AGC Q209 Q210 U200C
2VDC REF
PIN ATTENUATOR D105
JFET PRE AMP Q223
27Mhz
RX MIXER Q201
17Mhz 0dbm 50Ω
BUFFER AMP Q206
10.2Mhz
RF SWITCH D211,12
TX BUFFER AMP Q222
RF LEVEL
AM DET. Q214 Q216
PRE AMP Q501
MIC
SPEAKER
10.2Mhz
BLANKER SW. DELAY SECTION Q224 L211-214
TX BUFFER AMP Q205
Q213 U200A,B IF AMP
AUDIO AMP 1WRMS U400A
R806 VOLUME
NOISE BLANKER
10.2Mhz XTAL FILTER FL-201
RF SW. D205,6
D203,4 RF. SW.
ACTIVE LOW PASS FILTER U500A
RF FILTER L501
23.5Mhz
AMP Q512
AMP Q510
PULSE DET. Q508 Q511
SW DRIVER Q509
AUDIO AMP U200F
SQUELCH GATE Q215
U200F AUDIO AMP
XMIT MTR AMP Q401,2
R412 MTR CAL
METER M801
REC MTR AMP Q220
R286 MTR CAL
RF AGC U200C
R292
R809 SQUELCH
U200E SQUELCH DETECTOR
DC AMP PEAK DET. Q211 Q212 U200E
R306 IF AGC
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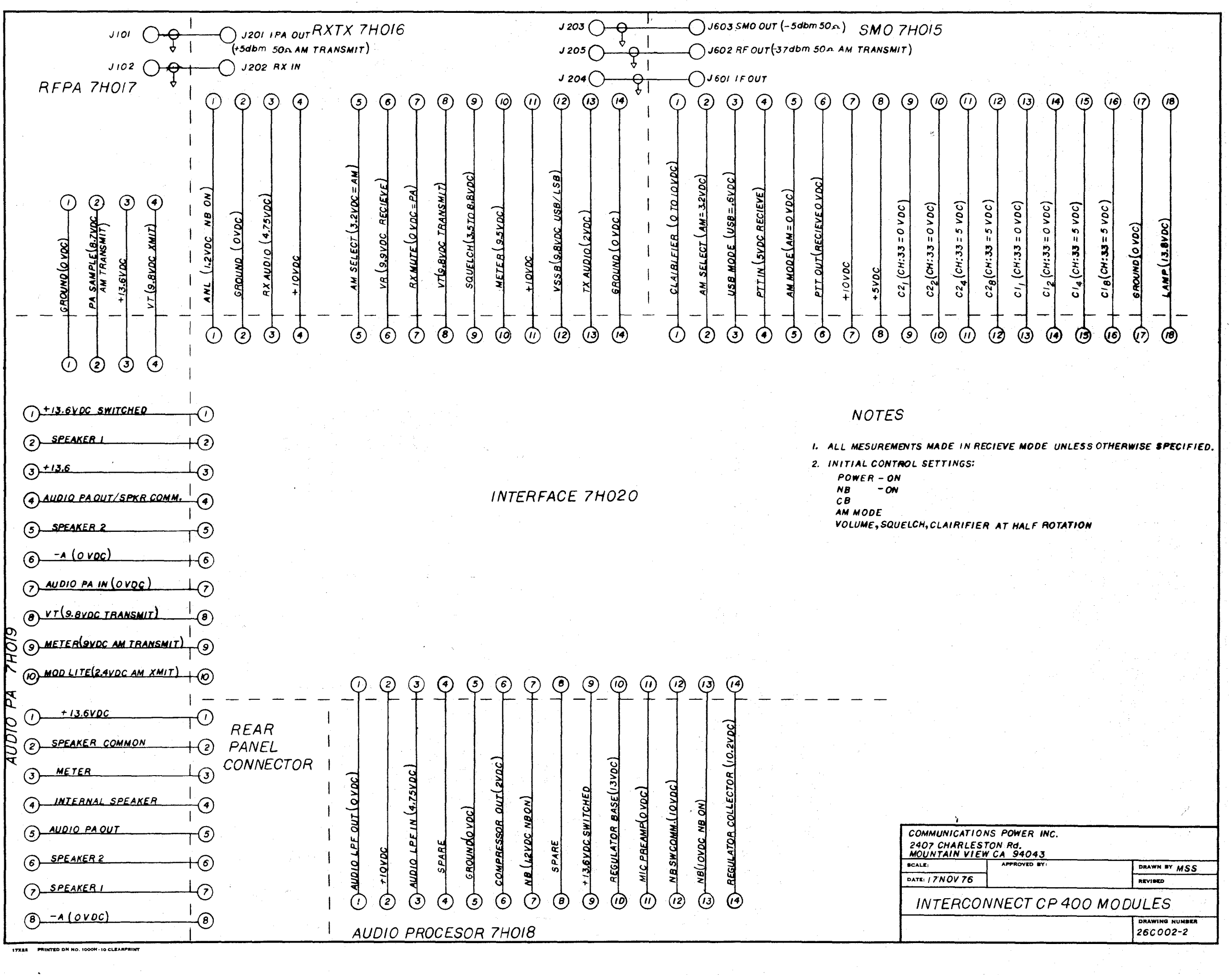
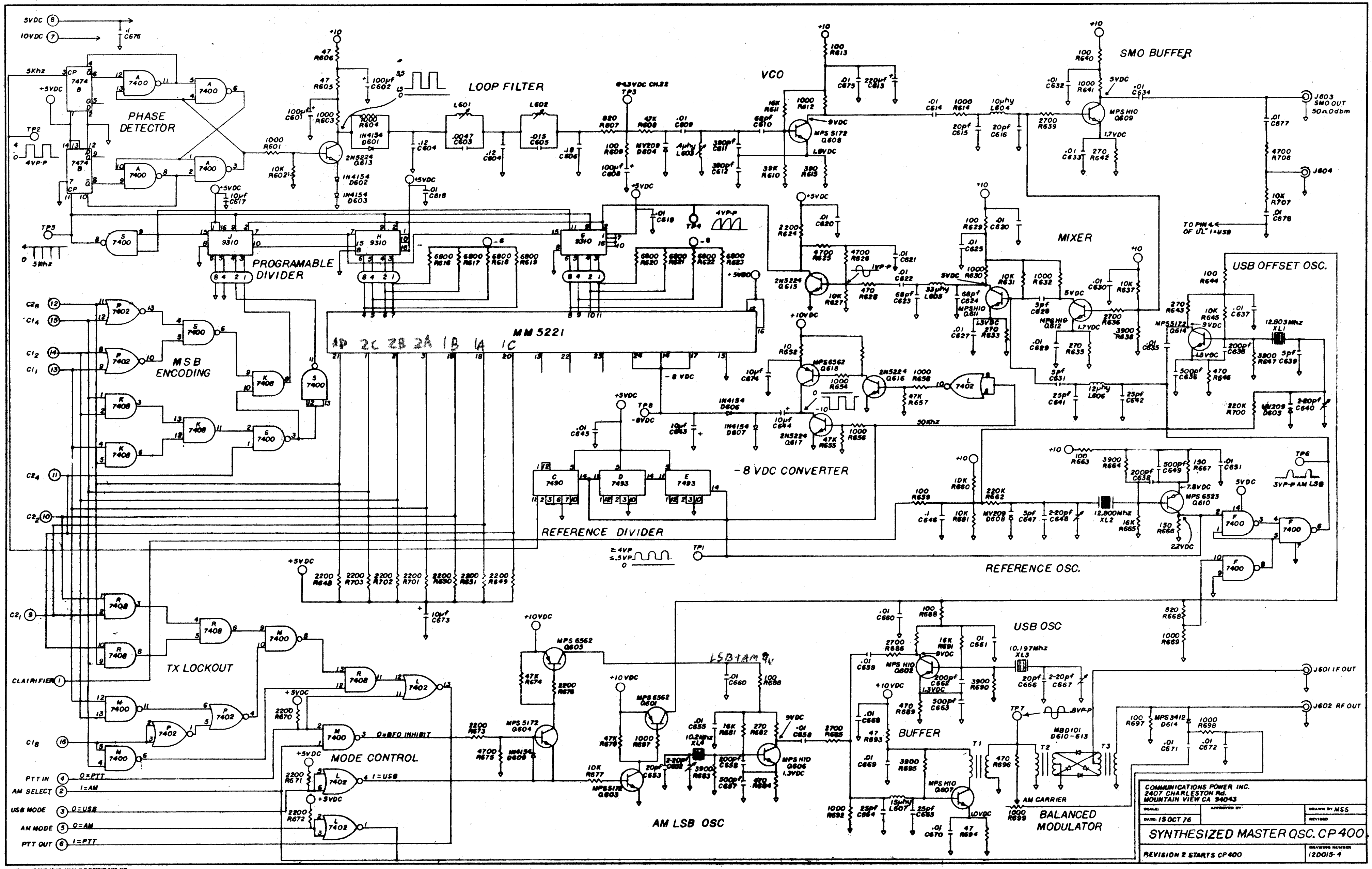
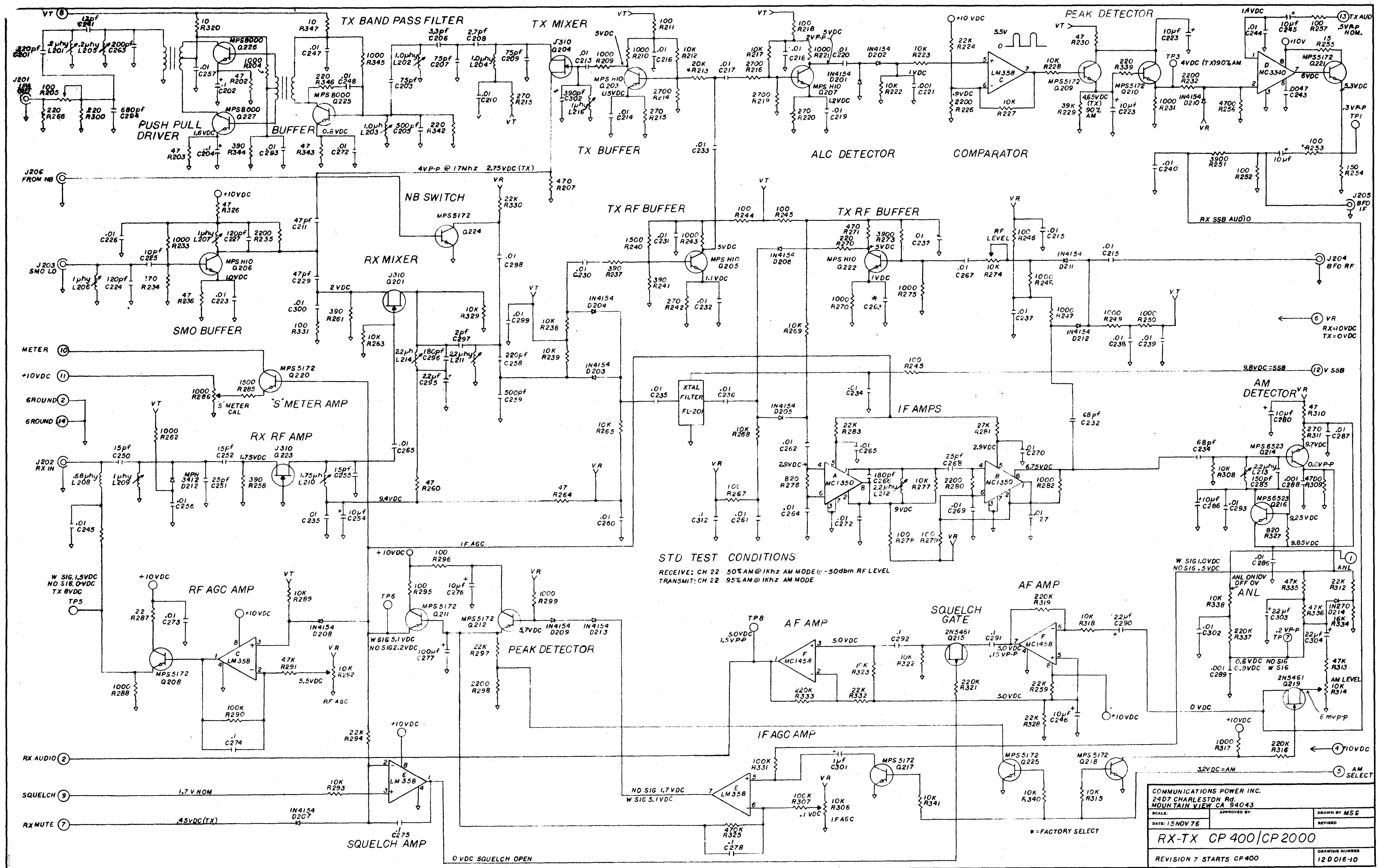
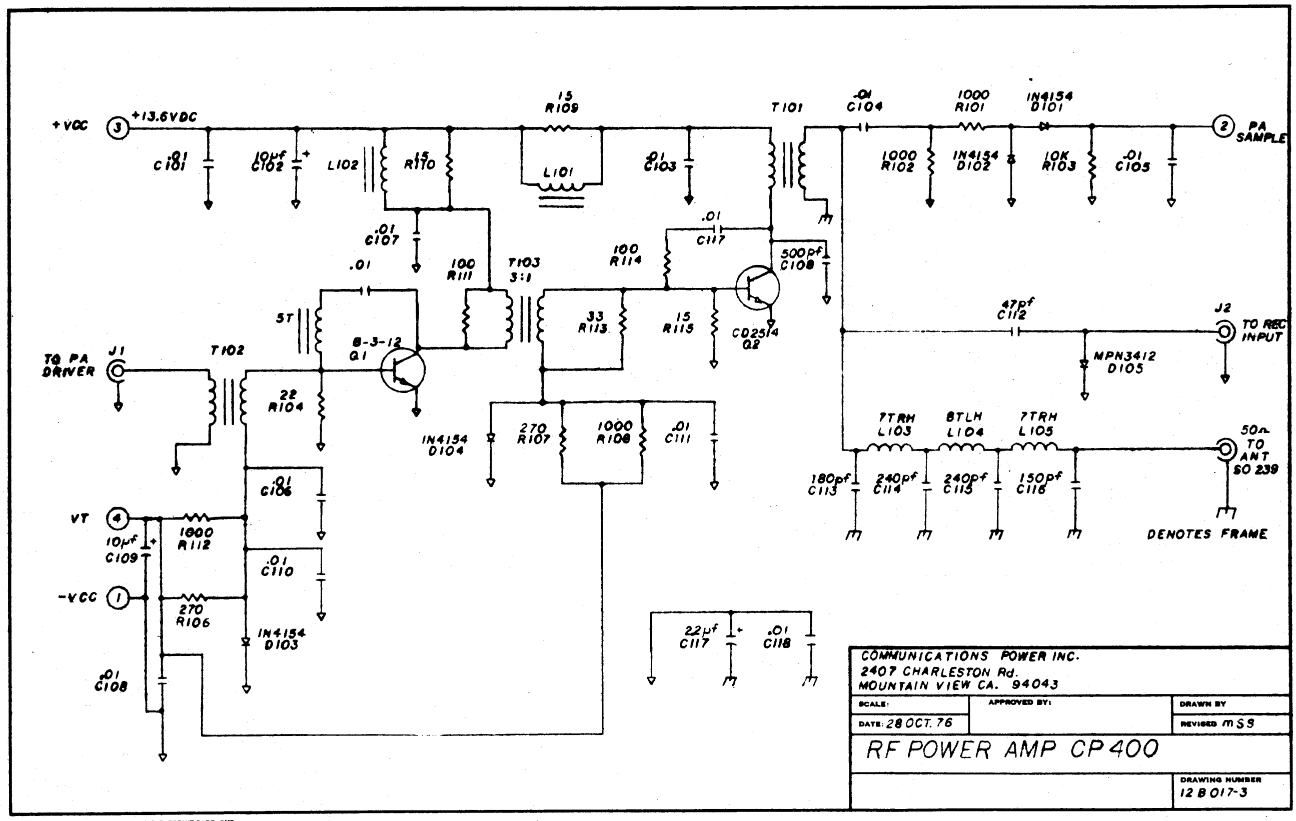
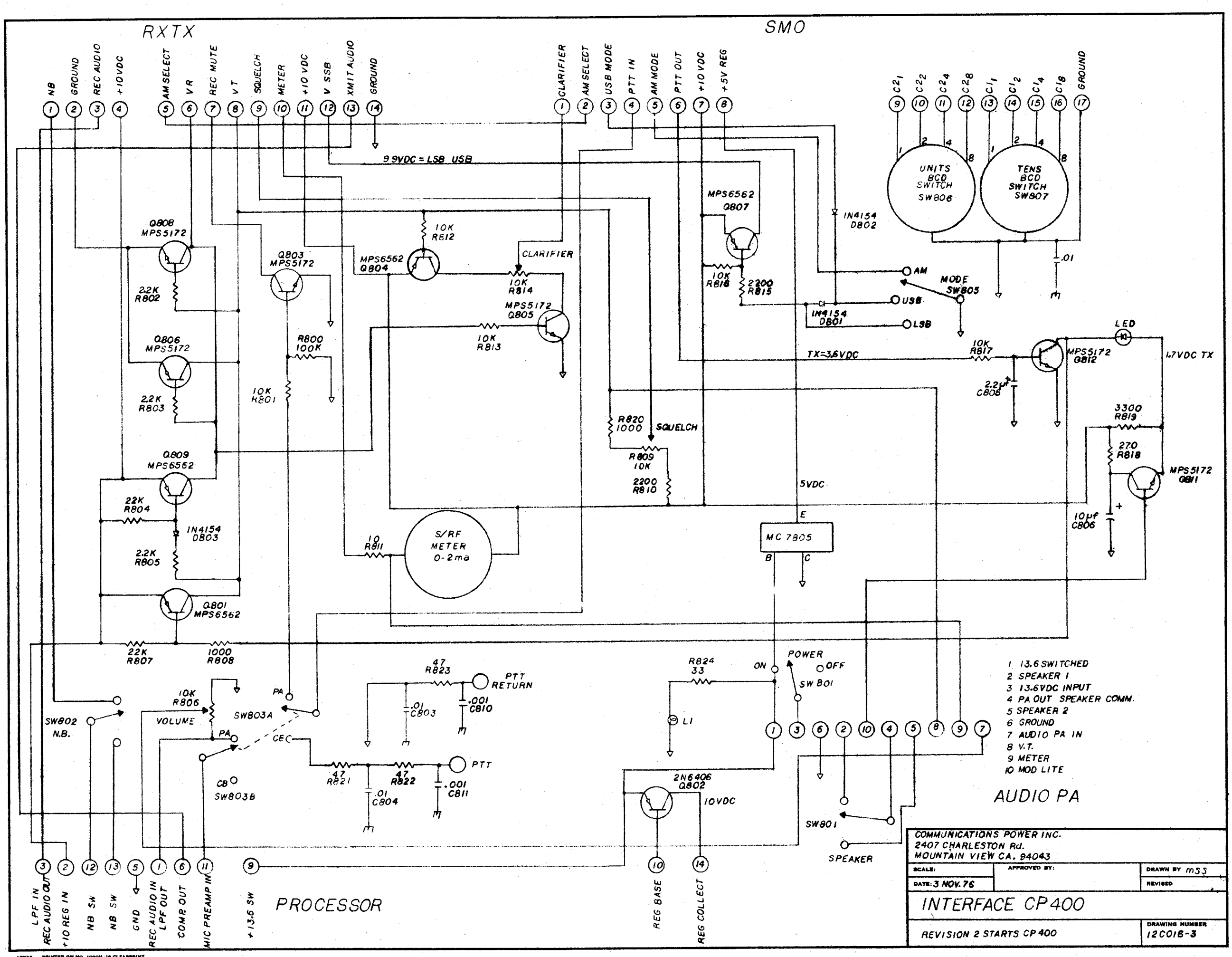

J101
J102
J201 IPA OUT (+5dbm 50Ω AM TRANSMIT)
J202 RX IN
RXTX 7H016
RFPA 7H017
J203
J205
J204
J603 SMO OUT (-5dbm 50Ω)
J602 RF OUT (-37dbm 50Ω AM TRANSMIT)
J601 IF OUT
SMO 7H015
GROUND (0VDC)
PA SAMPLE (8.7VDC AM TRANSMIT)
+13.6VDC
VT (9.8VDC XMIT)
ANL (1.2VDC NB ON)
GROUND (0VDC)
RX AUDIO (4.75VDC)
+10VDC
AM SELECT (3.2VDC = AM)
VR (9.9VDC RECIEVE)
RX MUTE (0VDC = PA)
VT (9.8VDC TRANSMIT)
SQUELCH (3.5 TO 8.8VDC)
METER (9.5VDC)
+10VDC
VSSB (9.8VDC USB/LSB)
TX AUDIO (2VDC)
GROUND (0VDC)
CLAIRIFIER (0 TO 10VDC)
AM SELECT (AM = 3.2VDC)
USB MODE (USB = .6VDC)
PTT IN (5VDC RECIEVE)
AM MODE (AM = 0VDC)
PTT OUT (RECIEVE 0VDC)
+10VDC
+5VDC
C2₁ (CH:33 = 0VDC)
C2₂ (CH:33 = 0VDC)
C2₄ (CH:33 = 5VDC)
C2₈ (CH:33 = 5VDC)
C1₁ (CH:33 = 0VDC)
C1₂ (CH:33 = 0VDC)
C1₄ (CH:33 = 5VDC)
C1₈ (CH:33 = 5VDC)
GROUND (0VDC)
LAMP (13.8VDC)
+13.6VDC SWITCHED
SPEAKER 1
+13.6
AUDIO PA OUT/SPKR COMM.
SPEAKER 2
-A (0VDC)
AUDIO PA IN (0VDC)
VT (9.8VDC TRANSMIT)
METER (9VDC AM TRANSMIT)
MOD LITE (2.4VDC AM XMIT)
AUDIO PA 7H019
INTERFACE 7H020
NOTES
1. ALL MESUREMENTS MADE IN RECIEVE MODE UNLESS OTHERWISE SPECIFIED.
2. INITIAL CONTROL SETTINGS:
POWER - ON
NB - ON
CB
AM MODE
VOLUME, SQUELCH, CLAIRIFIER AT HALF ROTATION
+13.6VDC
SPEAKER COMMON
METER
INTERNAL SPEAKER
AUDIO PA OUT
SPEAKER 2
SPEAKER 1
-A (0VDC)
REAR PANEL CONNECTOR
AUDIO LPF OUT (0VDC)
+10VDC
AUDIO LPF IN (4.75VDC)
SPARE
GROUND (0VDC)
COMPRESSOR OUT (2VDC)
NB (12VDC NB ON)
SPARE
+13.6VDC SWITCHED
REGULATOR BASE (13VDC)
MIC PREAMP (0VDC)
NB SW COMM. (10VDC)
NB (0VDC NB ON)
REGULATOR COLLECTOR (10.2VDC)
AUDIO PROCESOR 7H018
COMMUNICATIONS POWER INC.
2407 CHARLESTON Rd.
MOUNTAIN VIEW CA 94043
SCALE:
APPROVED BY:
DRAWN BY MSS
DATE: 17NOV76
REVISED
INTERCONNECT CP400 MODULES
DRAWING NUMBER 26C002-2
PRINTED ON NO. 1000H-10 CLEARPRINT


PHASE DETECTOR
LOOP FILTER
VCO
SMO BUFFER
PROGRAMABLE DIVIDER
MM 5221
MIXER
USB OFFSET OSC.
MSB ENCODING
-8 VDC CONVERTER
REFERENCE DIVIDER
REFERENCE OSC.
TX LOCKOUT
MODE CONTROL
AM LSB OSC
USB OSC
BUFFER
BALANCED MODULATOR
J603 SMO OUT 50Ω 0dbm
J604
J601 IF OUT
J602 RF OUT
PTT IN
AM SELECT
USB MODE
AM MODE
PTT OUT
CLARIFIER
COMMUNICATIONS POWER INC.
2407 CHARLESTON Rd.
MOUNTAIN VIEW CA 94043
DRAWN BY MSS
DATE: 15 OCT 76
SYNTHESIZED MASTER OSC. CP 400
REVISION 2 STARTS CP400
120015-4

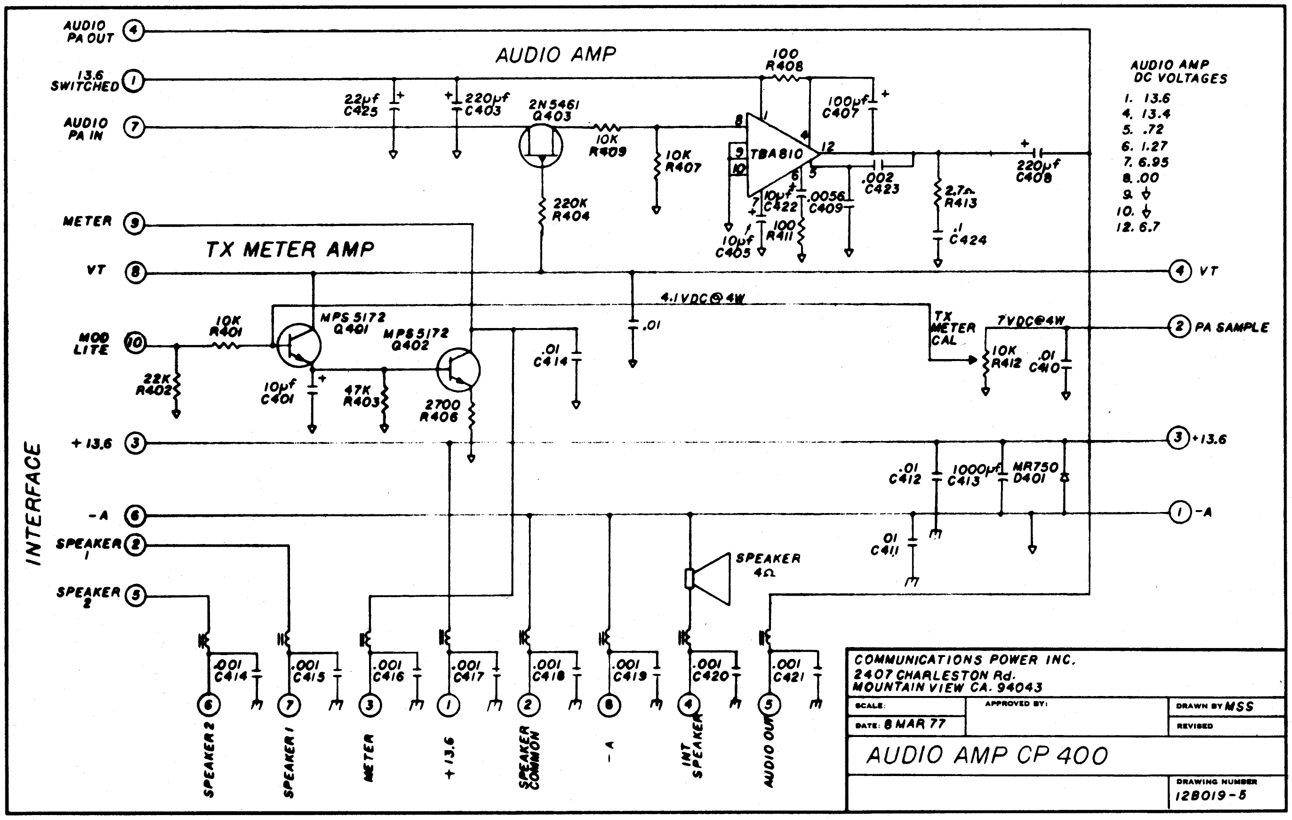

TX BAND PASS FILTER
TX MIXER
PUSH PULL DRIVER
BUFFER
TX BUFFER
ALC DETECTOR
COMPARATOR
PEAK DETECTOR
NB SWITCH
TX RF BUFFER
TX RF BUFFER
RX MIXER
SMO BUFFER
"S" METER AMP
RX RF AMP
IF AMPS
AM DETECTOR
ANL
RF AGC AMP
PEAK DETECTOR
AF AMP
SQUELCH GATE
AF AMP
IF AGC AMP
SQUELCH AMP
STD TEST CONDITIONS
RECEIVE: CH 22 50% AM@ 1Khz AM MODE @ -50dbm RF LEVEL
TRANSMIT: CH 22 95% AM @ 1Khz AM MODE
* = FACTORY SELECT
J201 ANT
J206 FROM NB
J203 SMO LO
J202 RX IN
J204 BFO RF
J205 BFO IF
METER
+10VDC
GROUND
RX AUDIO
SQUELCH
RX MUTE
TX AUD
VR
V SSB
AM SELECT
0 VDC SQUELCH OPEN
COMMUNICATIONS POWER INC.
2407 CHARLESTON Rd.
MOUNTAIN VIEW CA 94043
DATE: 15 NOV 76
DRAWN BY MSS
RX-TX CP 400/CP 2000
REVISION 7 STARTS CP400
DRAWING NUMBER
12 D 016-10

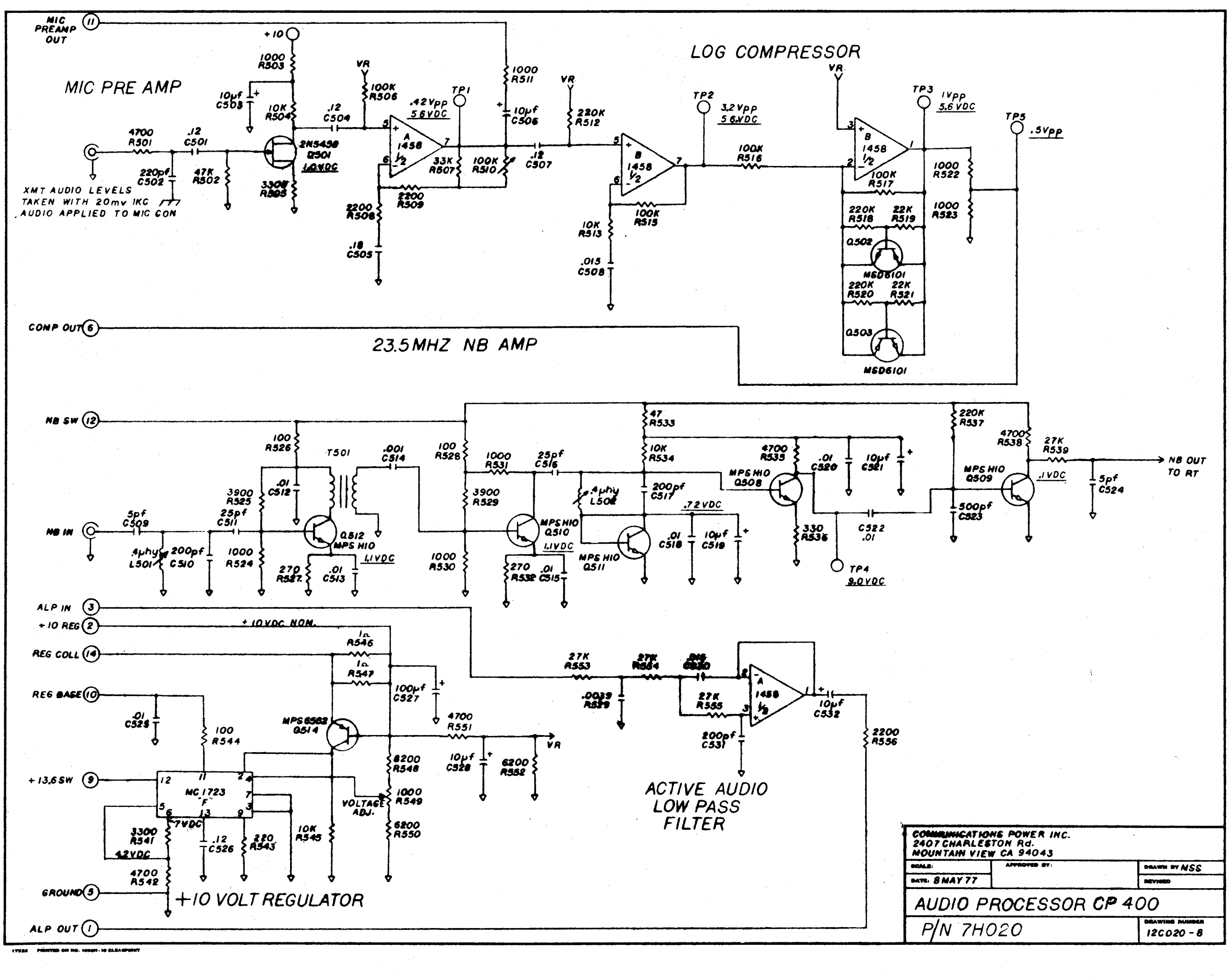


11E17 PRINTED ON NO. 1000H-10 CLEARPRINT FADE-OUT



17X22 PRINTED ON NO. 1000H-10 CLEARPRINT


AUDIO AMP
TX METER AMP
INTERFACE
AUDIO PA OUT
13.6 SWITCHED
AUDIO PA IN
METER
VT
MOD LITE
+13.6
-A
SPEAKER 1
SPEAKER 2
AUDIO AMP DC VOLTAGES
1. 13.6
4. 13.4
5. .72
6. 1.27
7. 6.95
8. .00
12. 6.7
TBA810
2N5461 Q403
MPS 5172 Q401
MPS 5172 Q402
4.1VDC@4W
TX METER CAL
7VDC@4W
PA SAMPLE
MR750 D401
SPEAKER 4Ω
SPEAKER 2
SPEAKER 1
METER
+13.6
SPEAKER COMMON
-A
INT SPEAKER
AUDIO OUT
COMMUNICATIONS POWER INC.
2407 CHARLESTON Rd.
MOUNTAIN VIEW CA. 94043
DATE: 8 MAR 77
DRAWN BY MSS
AUDIO AMP CP 400
DRAWING NUMBER
12B019-5


MIC PREAMP OUT
MIC PRE AMP
LOG COMPRESSOR
XMT AUDIO LEVELS TAKEN WITH 20mv IKC AUDIO APPLIED TO MIC CON
2N5458 Q501
1458
COMP OUT
23.5MHZ NB AMP
MSD6101
NB SW
NB IN
MPS H10
NB OUT TO RT
ALP IN
+10 REG
REG COLL
REG BASE
+13.6 SW
GROUND
ALP OUT
+10VDC NOM.
MPS 6562 Q514
MC 1723
VOLTAGE ADJ.
ACTIVE AUDIO LOW PASS FILTER
+10 VOLT REGULATOR
COMMUNICATIONS POWER INC.
2407 CHARLESTON Rd.
MOUNTAIN VIEW CA 94043
DATE: 8 MAY 77
DRAWN BY NSS
AUDIO PROCESSOR CP 400
P/N 7H020
12C020-8

COMMUNICATIONS POWER, INC.
2407 Charleston Road,
Mountain View, CA 94043
(415) 965-2623