1641

CLA-40A
COMPRESSOR/LIMITER
AMPLIFIER

MARTI *Electronics, Inc.*

INSTRUCTION MANUAL

1541

CLA-40A
COMPRESSOR/LIMITER
AMPLIFIER

WARRANTY:

Except as otherwise provided in this section, the equipment described herein is sold under the following guarantee:

Marti agrees to repair or replace within a one (1) year period and without charge, any equipment or parts which are defective as to workmanship or material and which are returned to Marti at its factory, transportation prepaid and properly insured, provided:

(a) Notice of the claimed defect is given Marti within one (1) year from date appearing on invoice and goods are returned in accordance with Marti instructions.

(b) Equipment, accessories, tubes and batteries not manufactured by Marti are subject to only such adjustments as Marti may obtain from the supplier thereof.

(c) Equipment or accessories shall not be deemed to be defective if, after examination by Marti or its appointed representative, the equipment evidences damage from moisture, improper handling, installation or operation.

(d) In the event that Marti is required to demonstrate equipment capability either as to specifications or defects in parts or workmanship and where it is found that the equipment meets specifications, Marti shall be entitled to collect all reasonable expenses from the Buyer including but not limited to, travel, per diem living expenses and hourly wage rates which have been established by Marti and which are in effect at the time.

Marti further guarantees that any radio transmitter described herein will deliver specified radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus. The guarantee of these paragraphs is void if equipment is altered or repaired by others than Marti or its authorized service Representative, or unless specifically authorized in writing by Marti. No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements contained in this paragraph. In no event shall Marti have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

CLA-40
SPECIFICATIONS

Application	AM or FM (Characteristics Selectable.) Combines both compression and limiting functions. Symmetrical peak limiting for FM, selectable asymmetrical or symmetrical peak limiting for AM. Peak limiting level adjustable.
Input and Output Impedances	600 ohms balanced or unbalanced.
Input Level	-15 to +20 DBM
Maximum Output Level	+20 DBM RMS
Frequency Response	50 Hz. to 15 KHz flat within 0.5 DB in AM or FM mode.
Maximum Gain	40 DB
Noise Level	Minus 66 DB Ref. +10 DBM output (FM Mode)
Distortion	Less than 1% THD (Normal compression levels)
Compression Ratio	Better than 10:1
Automatic Gain Control Range	40 DB Dynamic
Release Time	Adjustable 800 milliseconds, 2 sec., 5 sec. approx. CLA-40A.
Attack Time	Less than 1 microsecond in compress/ limit mode.
Metering	Gain reduction, output level, +4 VU, +10 VU.
AM - FM Operation	Both. Standard 75 microsecond pre-emphasis/de-emphasis used in FM operation.
Shielding and RF Filtering	For use in high RF fields.
Operating Temperature	-20°C to +50°C.
Physical Dimensions	$3\frac{1}{2}$" by 19" rack panel or 1/16th of 7" by 19" rack housing.
Power Requirement	120/240 volts, 50-60 Hz., 10 watts
Weight	6 pounds.

TEST REPORT

MODEL: CLA-40A SERIAL NUMBER 1641 DATE 2-18-76

FREQUENCY RESPONSE

		AM		FM	
50	Hz.	+0.20 DB	50	Hz.	+0.20 DB
100	Hz.	+0.10	100	Hz.	+0.10
400	Hz.	0.0	400	Hz.	0.0
1	KHz.	0.0	1	KHz.	+0.05
3	KHz.	0.0	3	KHz.	+0.20
5	KHz.	+0.05	5	KHz.	+0.30
7.5	KHz.	+0.10	7.5	KHz.	+0.40
10	KHz.	+0.15	10	KHz.	+0.40
12.5	KHz.	+0.20	12.5	KHz.	+0.40
15	KHz.	+0.30	15	KHz.	+0.30

DISTORTION (COMPRESS ONLY)

AT + 10 DBM 0.1% 0.13 %

NOISE

RE: + 10 DBM -62 DB -66 DB

COMPRESSION RATIO

ABOVE VU -1.5 11:1

LIMIT LEVEL SET

DISTORTION INTRODUCED AT
7 DB COMPRESSION (400 Hz.)

0.9% 0.99 %

BY: JI I. Nord

matched with SN 1640

TEST REPORT

MODEL: CLA-40A SERIAL NUMBER _____ DATE _____

FREQUENCY RESPONSE

	AM		FM	
50	Hz.	0. DB	Hz.	0. DB
100	Hz.	0.	Hz.	0.
400	Hz.	0.	Hz.	0.
1	KHz.	0.	KHz.	0.
3	KHz.	0.	KHz.	0.
5	KHz.	0.	KHz.	0.
7.5	KHz.	0.	KHz.	0.
10	KHz.	0.	KHz.	0.
12.5	KHz.		KHz.	
15	KHz.		KHz.	

DISTORTION (COMPRESS ONLY)

AT + 10 DBM _____ % _____ %

NOISE

RE: + 10 DBM _____ DB _____ DB

COMPRESSION RATIO

ABOVE VU -1.5 _____

LIMIT LEVEL SET

DISTORTION INTRODUCED AT
7 DB COMPRESSION (400 Hz.)

_____ % _____ %

BY: _____

CLA-40
COMPRESSOR/LIMITER AMPLIFIER

INSTALLATION & OPERATING INSTRUCTIONS

INSTALLATION:

1. The model CLA-40H unit requires 3-½ inches of standard rack space. Model CLA-40V unit is 1/6 rack space wide and 7" high and 15 inches deep for use in Marti Type RS-1 rack shelf.

2. Install the unit so that it does not receive excessive heat from tube type equipment which may be located in the same rack. The ambient operating air temperature should not exceed 40°C (104°F). CAUTION: DO NOT INSTALL CLA-40A UNITS NEAR POWER TRANSFORMERS OF OTHER EQUIPMENT WHICH CAN INDUCE NOISE INTO THE AUDIO CIRCUITS.

3. Connect the 600 ohm program line to terminals 1 and 2 of TB-1. Input audio level should be between -15 DBM to +20 DBM. Connect transmitter audio input to terminals 4 and 5 of TB-1. This is the compressed and limited output of the unit, and the level is adjustable up to +20 DBM. When the desired output level of the CLA-40 is below +4 DBM, it is advisable to operate the CLA-40 at approximately +10 DBM output level and insert a 600 ohm resistive pad in the line to obtain the desired level. This will provide the same signal to noise ratio as is obtained at higher levels.

4. Units are shipped connected for 120 volts, 50/60 Hz. operation.

5. Stereo operation of two CLA-40 units is obtained by interconnecting J1 of the units with a short length of RG-58 cable(provided when units ordered for stereo).

AM OPERATION:

1. Set controls initially as follows:
   - Input pad - 0 DB
   - Mode Switch - AM
   - Limiter Switch - Sym. (Symmetrical limiting)
   - Meter Switch - Gain Reduction
   - Compress/Limit Switch - Compress Only
   - Output Level - Maximum counter-clockwise position
   - Input Level - Maximum clockwise position
   - Recovery Time - Position 2 (CLA-40A ONLY)

2. With normal program line level into the CLA-40, adjust input pad until a gain reduction reading between -7 and -20 VU is noted on the meter. Adjust the input level potentiometer for an average gain reduction of approximately -7 VU. The exact gain reduction (compression) setting to be used should be determined by the station engineer.

CLA-40
COMPRESSOR/LIMITER AMPLIFIER

AM OPERATION, continued:

3. The modulation level of the AM transmitter is adjusted with the output level potentiometer while observing the station modulation monitor. This adjustment is made with the compress/limit switch in the compress/limit position. (This switch should always be in this position when program audio is modulating the transmitter.)

4. Symmetrical peak limiting will be obtained in step 3 above because of the initial settings called for in step 1. If a symmetrical peak limiting (Higher positive peaks than negative peaks) is desired, the limiter switch can be set to "Asym." position. It is now necessary to determine the correct polarity (phasing) between the compressor/limiter and transmitter audio input terminals. Proceed as follows:

Feed a 400 Hz. tone into the CLA-40 input terminals at a level to produce -7 VU gain reduction on the meter and approximately 100% modulation of the transmitter. Place the limiter switch in "Asym." position. Select positive peak monitoring on the station modulation monitor. Note the modulation percentage. Reverse the audio output line at terminals 4 and 5 of TB-1 and again observe the modulation percentage. Select negative peak monitoring at the station modulation monitor and adjust output level on the CLA-40 for the desired negative modulation percentage between 90 and 100%.

The conditions established above should produce a positive to negative peak modulation ratio of approximately 1.35 to 1. (This is dependent upon the capability of the transmitter in providing required peak power.)

5. Phasing of the audio input to the CLA-40 is accomplished as follows: With the controls set as in (4) above, reduce "input level" until no gain reduction is shown on the meter. Set modulation monitor for positive peak monitoring. With voice program audio, note positive peak modulation level. Reverse audio input terminals 1 and 2 of TB-1 and again note positive modulation level. Select termination phasing that produces greatest positive peak modulation.

6. Increase input level to the desired gain reduction reading on the meter. This completes the AM adjustment procedure.

FM OPERATION:

1. Set controls initially as follows:
   - Input Pad - ODB
   - Mode Switch - FM
   - Limiter Switch - Sym. (Symmetrical limiting)
   - Meter Switch - Gain Reduction
   - Compress/Limit Switch - Compress Only
   - Output Level - Maximum counter-clockwise position
   - Input Level - Maximum clockwise position
   - Recovery Time - Position 2 (position 1 if CLA-40 is preceeded by AGC Amp.)

CLA-40
COMPRESSOR/LIMITER AMPLIFIER

FM OPERATION: continued.

2. With normal program line level into the CLA-40 input, adjust input pad until a gain reduction reading between -7 and -20 VU is noted on the meter. Adjust the input level potentiometer for an average gain reduction of approximately -7 VU. The exact gain reduction (compression setting to be used should be determined by the station engineer.

3. The modulation level of the FM transmitter is adjusted with the output level potentiometer while observing the station modulation monitor. This adjustment is made with the compress/limit switch in the compress/limit position. (This switch should always be in this position when program audio is modulating the transmitter.) The meter switch can be placed in the +10 or +4 VU position to monitor the actual audio level into the transmitter.

4. When operated in the FM MODE, the CLA-40 employs a 75 microsecond pre-emphasis network before compression/limiting and a 75 microsecond de-emphasis network after compression/limiting. This provides a very effective control of total transmitted RF bandwidth while maintaining the highest average modulation level. However, this FM pre-emphasis characteristic must be considered when making frequency response measurements through the CLA-40 unit.

STEREO OPERATION:

In the FM Mode, two CLA-40 units can be interconnected by a jumper cable of RG-8U coax between J1 of each unit. The gain reduction action of each unit causes a corresponding reduction in the other in order to preserve channel separation.

LIMITING LEVEL:

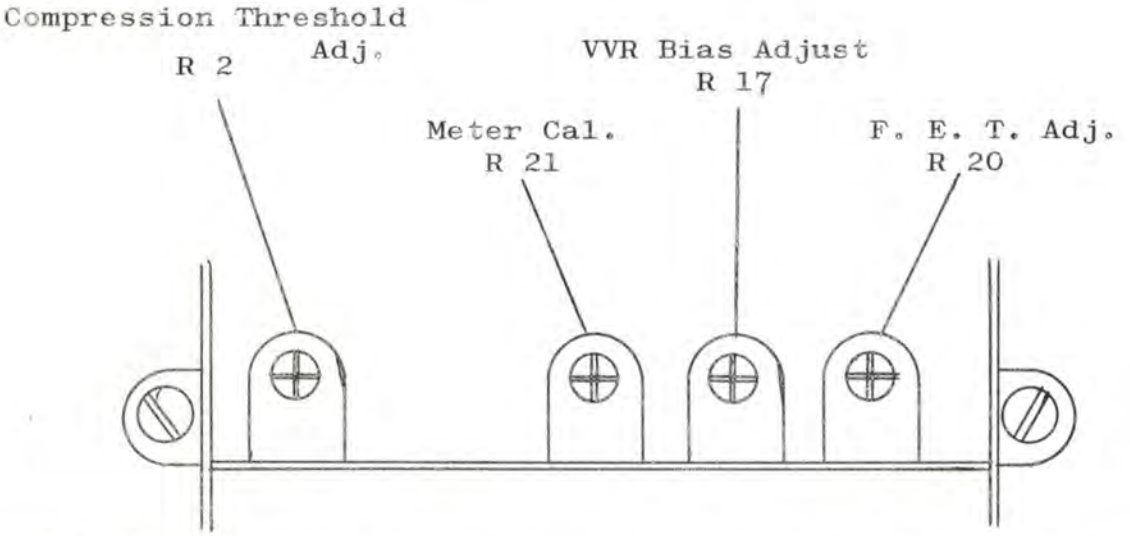
A peak limiting circuit is provided in both AM and FM modes of operation. The Limit Level Adjust potentiometer is factory adjusted such that no more than 1 per cent harmonic distortion is introduced in the peak limiting process. This adjustment can be set to provide a larger or smaller ratio between average and peak modulation. A smaller ratio will necessarily produce an increase in distortion, while a larger ratio will reduce the average modulation level. See Limit Level Adjustment in the Adjustment and Test Procedure Section.

CLA-40
COMPRESSOR/LIMITER AMPLIFIER

ADJUSTMENT AND TEST PROCEDURE

CA-40 AGC MODULE ADJUSTMENT:

1. Remove the CA-40 module from the CLA-40 unit. Remove the CA-40 module cover. Referring to the figure below, initially set the four potentiometers as follows: R-20 fully counter-clockwise, R17 and R21 approximately mid-range, R2 fully clockwise.



2. Set CLA-40 controls as follows: Meter Switch to +10 VU, Compress/Limit Switch to compress/limit out, Input Lever Control to maximum clockwise position, Output Level to maximum counter-clockwise position, Input Pad to "0" DB, AM-FM Switch to AM, SYM-ASYM Switch to SYM position.

Apply a 400 Hz. audio signal at 0 DBM level to input terminals. Connect a 600 ohm load resistor to output terminals. With CA-40 module removed from the unit, set Output Level for 0 VU on the meter (+10 VU). Re-install CA-40 module and tighten hold-down screws. Adjust R17 for -6 VU on the meter.

3. Remove the 400 Hz. signal from input terminals and place Meter Switch in Gain Reduction position. Adjust "Meter Cal." potentiometer R21 for a 0 VU reading on the meter.

4. Apply a 400 Hz. signal to the input terminals at a -15 DBM level. With Meter Switch in Gain Reduction position, Compress/Limit Switch in "compress only" position, adjust R2 at the threshold of gain reduction as indicated by a slight movement in the negative direction from "0" VU meter pointer position.

5. Increase the 400 Hz. input signal level until -5 VU Gain Reduction is indicated on the meter. Slowly rotate R20 in a clockwise direction until an increase in meter reading (positive movement) of approximately $\frac{1}{4}$ VU is obtained. Repeat procedure if necessary. When properly set, the meter should read 4-3/4 VU under the above test condition. This concludes CA-40 adjustment. Replace cover and screws.

CLA-40
COMPRESSOR/LIMITER AMPLIFIER

ADJUSTMENT AND TEST PROCEDURE, continued

FM RESPONSE ADJUSTMENT:

1. Set CLA-40 controls as follows:
   Input Pad -0DB
   Mode Switch - AM
   Limiter Switch - Sym. (Symmetrical limiting)
   Meter Switch - +10 VU
   Compress/Limit Switch - Compress Limit Out
   Input Level - Maximum clockwise position
   Output Level - Set to 0 VU indication on meter with an input signal of 400 Hz. at 0 DBM level

2. Connect an audio voltmeter having a sensitivity greater than -20 DBM to the output terminals of the CLA-40 unit. Also load the output with a 600 ohm resistor. Reduce the input level 15 DB by setting Input Pad Switch to center position. Record output level on the audio voltmeter with the 400 Hz. signal applied as in Step 1 above. Set input signal at 15 KHz at same level. Output voltmeter should read the same as with the 400 Hz. signal + or -0.5 DB.

3. Position Mode Switch to "FM" and note output level. Return Mode Switch to "AM" position and adjust R22 for the same reading as was noted in "FM" mode. Switch again to FM to check that the two levels are the same. R22 is attached to pins 1, 2 and 3 of the output LA-40 amplifier socket, P3.

LIMIT LEVEL ADJUSTMENT:

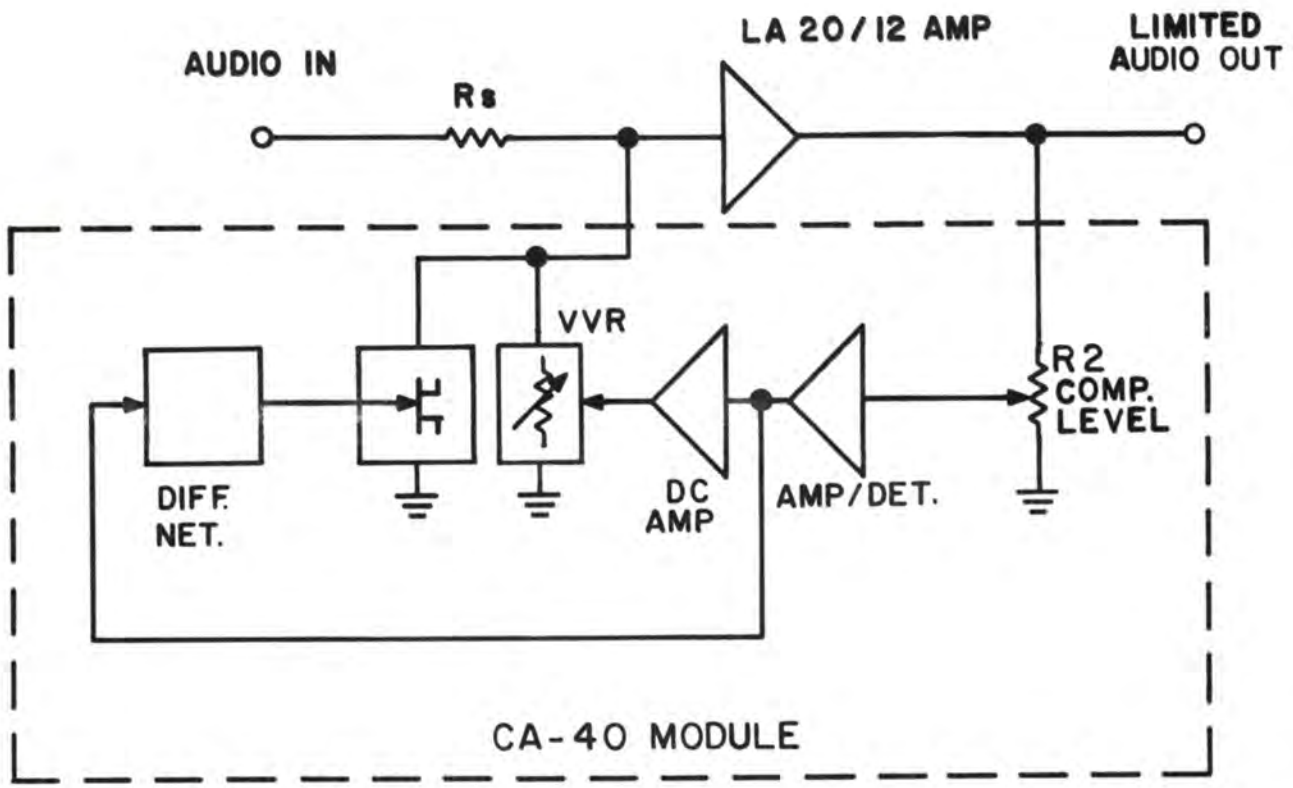
1. Position CLA-40 controls as follows:
   Input Pad -0DB
   Mode Switch - AM
   Limiter Switch - SY. (Symmetrical)
   Compress/Limit Switch - Compress only
   Input Level - Maximum clockwise position

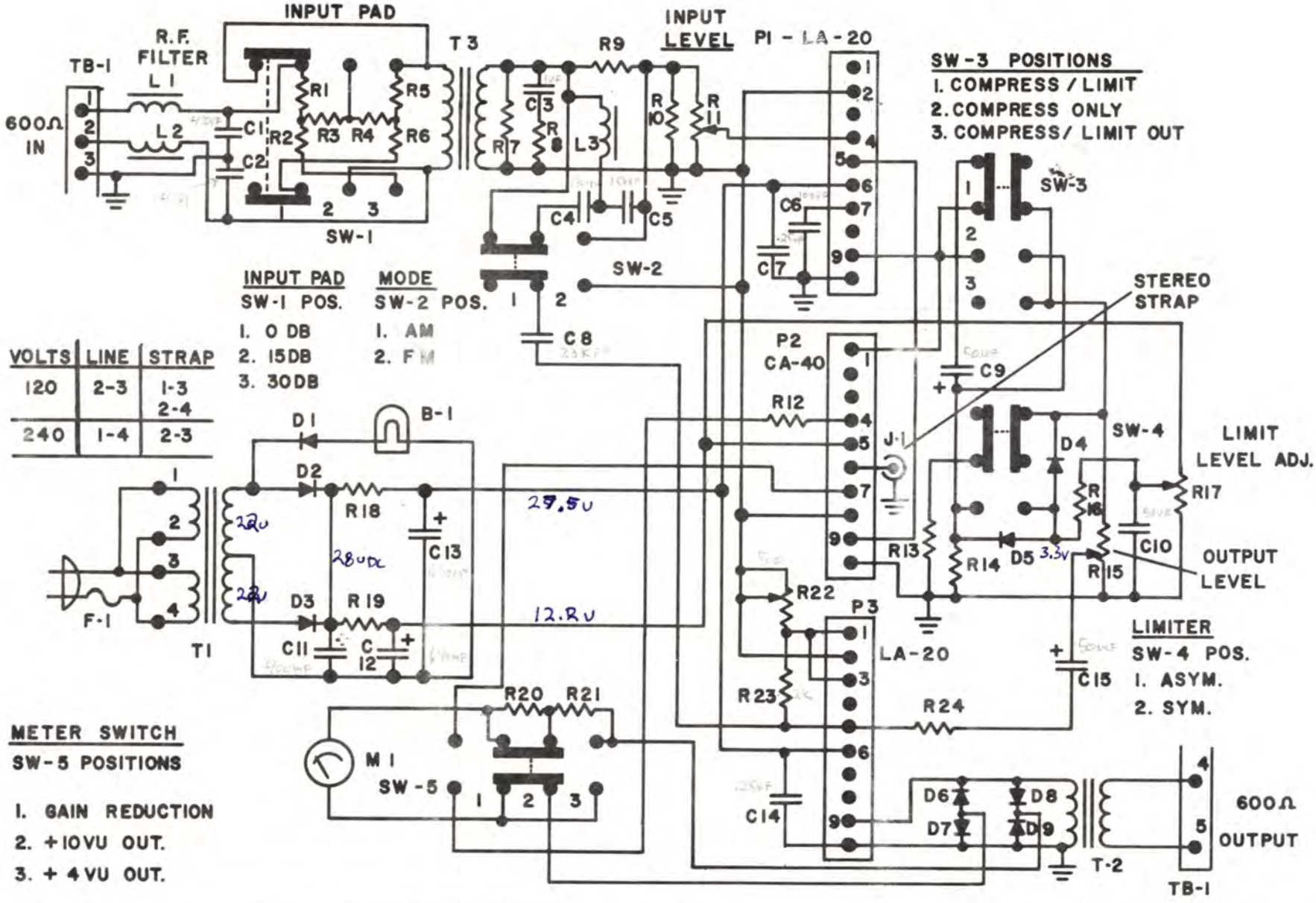
2. Connect a 400 Hz. signal at 0 DBM level to input terminals. Connect a harmonic distortion meter to the output terminals. Also load the CLA-40 output with a 600 ohm resistor. Set input level for -7 VU compression. Set output level for +10 DBM level.

3. Under conditions specified in (2) above, measure the CLA-40 distortion at 400 Hz. It should be 0.15 50 0.45 percent total harmonic distortion. Place compress/limit switch in compress/limit position and adjust Limit Level potentiometer for 0.9 percent distortion.

THEORY OF OPERATION OF THE MARTI CA-40 SOLID STATE COMPRESSOR/LIMITER MODULE

The Marti CA-40 compressor/limiter unit operates on the variable audio attenuator principle. A full wave audio detector provides a voltage proportional to audio peak level which controls a voltage variable resistor (VVR) average level attenuator. This VVR device has a very large dynamic operating range, adds no audio distortion but has a comparatively slow attack time. For instantaneous control of short rise time audio waveforms, the control voltage is differentiated and applied to the gate of a field effect transistor. This device is connected in parallel with the VVR, and serves as an extremely fast attenuator, operating only on short rise time waveforms, thus complimenting the slower VVR device. The result is a compressor with a 40 db dynamic range and a limiter with microseconds attack time.





DWG 700 · 098 · 1	MARTI Electronics, Inc.	COMPRESSOR / LIMITER CLA - 40

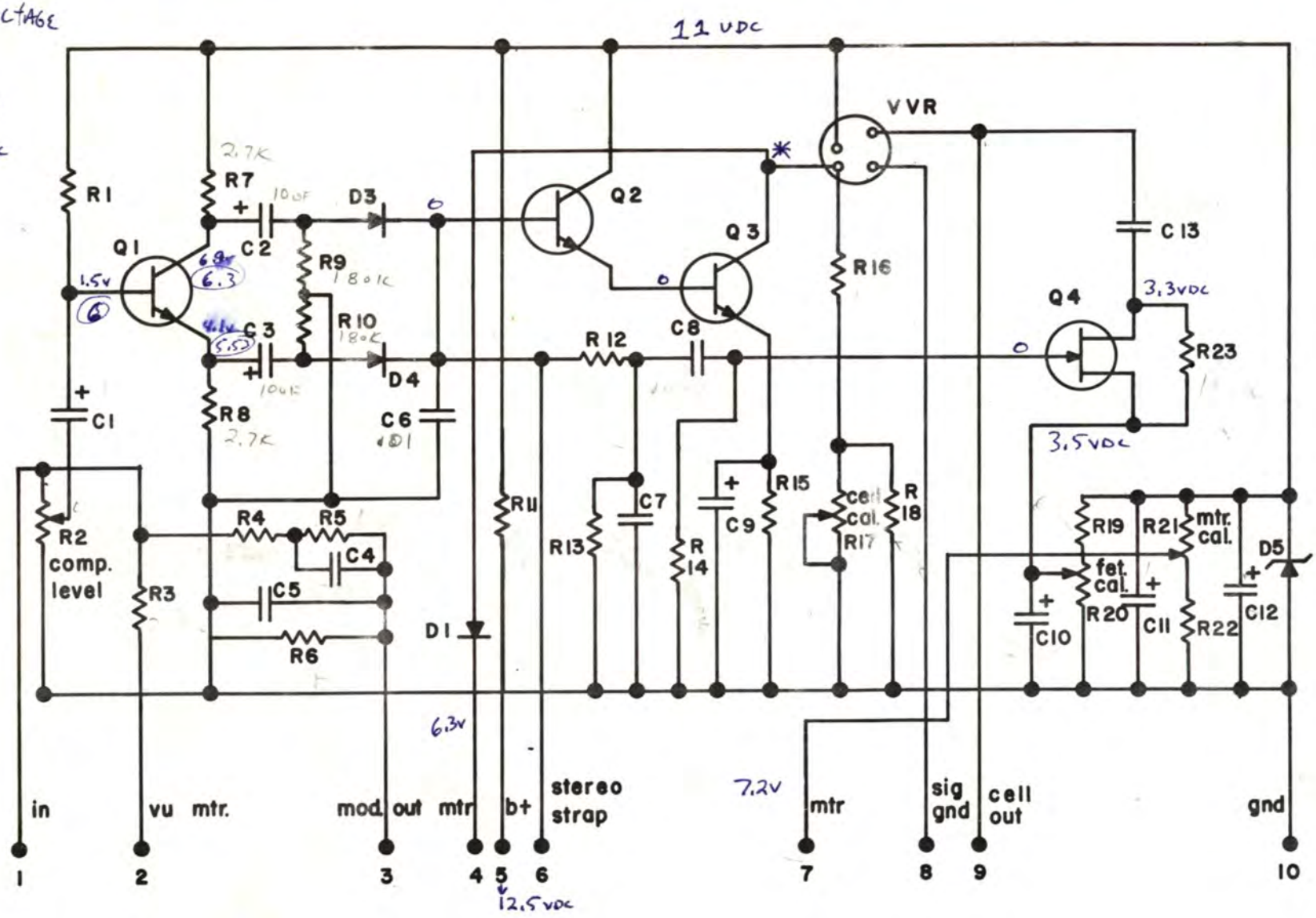
PART LIST
MAIN FRAME CLA-40A

ITEM	PART NO.	DESCRIPTION
B1	383-004	Lamp, 14 volt No. 1813 or No. 756
C1	256-471	Capacitor, 470 PF, 1 KV, 10%
C2	256-471	Capacitor, 470 PF, 1 KV, 10%
C3	226-010	Capacitor, 1 UF, 100 V, 10%
C4	215-682	Capacitor, 6800 PF, 33 V, 5%
C5	256-151	Capacitor, 150 PF, 1 KV, 10%
C6*	215-103	Capacitor, 10,000 PF, 33 V, 5% = .01 uF
C7*	235-254	Capacitor, 0.25 UF, 200 V, 5%
C8	215-333	Capacitor, 33,000 PF, 33 V, 5%
C9*	219-500	Capacitor, 50 UF, 40 V
C10*	219-500	Capacitor, 50 UF, 40 V
C11	219-401	Capacitor,400 MF, 40 V
C12	219-641	Capacitor, 640 MF, 25 V
C13	219-641	Capacitor, 640 MF, 25 V
C14	235-254	Capacitor, 0.25 UF, 200 V, 5%
C15*	215-500	Capacitor, 50 UF, 40 V
C16	255-750	Capacitor, 75 PF, 1 KV, 10%
C17	297-202	Capacitor, .002 UF, 2 KV
C18	297-202	Capacitor, .002 UF, 2 DV
D1	414-007	Diode, 1N4007, 0.75A, 1 KV, PRV
D2	413-193	Diode, 1N3193, 1A, 200 PRV
D3	413-193	Diode, 1N3193, 1A, 200 PRV
D4	410-914	Diode, 1N4148 Matched with D5
D5	410-914	Diode, 1N4148 Matched with D4
D6	412-494	Diode, 5579 Matched with D7,8,9
D7	412-494	Diode, 5579 Matched with D6,8,9
D8	412-494	Diode, 5579 Matched with D6,7,9
D9	412-494	Diode, 4479 Matched with D6,7,8
F1	510-009	Fuse, 3AG, 3/4 Amp (120V) 3/8 Amp (240V)
J1	550-022	Jack, Stereo Strap
L1	330-004	Inductor, 100 uh, 10%
L2	330-004	Inductor, 100 uh, 10%
L3	330-009	Inductor, 5 MH, 10%
M1	030-017	Meter, Special VU

PARTS LIST CLA-40A
MAIN FRAME, continued

ITEM	PART NO.	DESCRIPTION
P1	550-059	Connector, PC 10 Circuit
P2	550-059	Connector, PC 10 Circuit
P3	550-059	Connector, PC 10 Circuit
R1	145-561	Resistor, 560 ohms, ¼ W 5%
R2	145-390	Resistor, 39 ohms, ¼ W 5%
R3	145-561	Resistor, 560 ohms, ¼ W 5%
R4	145-431	Resistor, 430 ohms, ¼ W 5%
R5	145-431	Resistor, 430 ohms, ¼ W 5%
R6	145-221	Resistor, 220 ohms, ¼ W 5%
R7	105-821	Resistor, 820 ohms, ½ W 5%
R8	105-272	Resistor, 2.7 ohms, ½ W 5%
R9 *	105-103	Resistor, 10 K ohms, ½ W 5%
R10 *	105-682	Resistor, 6.8K ohms, ½ W 5%
R11 *	100-102	Potentiometer, 1K ohms, ½ W 20%
R12	105-562	Resistor, 5.6K ohms, ½ W 5%
R13	105-472	Resistor, 4.7K ohms, ½ W 5%
R14 *	105-152	Resistor, 1.5K ohms, ½ W 5%
R15 *	100-512	Potentiometer, 5K ohms, ½ W 20%
R16 *	105-272	Resistor, 2.7K ohms, ½ W 5%
R17 *	100-263	Potentiometer, 25K ohms, ½ W 20%
R18	115-820	Resistor, 82 ohms, ½ W 5%
R19	105-561	Resistor, 560 ohms, ½ W 5%
R20	105-821	Resistor, 820 ohms, ½ W 5%
R21	105-562	Resistor, 5.6K ohms, ½ W 5%
R22	100-501	Potentiometer, 500 ohms, ½ W 30%
R23	105-202	Resistor, 2K ohms, ½ W 5%
R24 *	105-473	Resistor, 4.7K ohms, ½ W 5%
R25	105-335	Resistor, 3.3 Megohms, ½ W 5%
R26	105-156	Resistor, 15 Megohms, ½ W 5%
R27	105-226	Resistor, 22 Megohms, ½ W 5%
SW1	530-018	Switch, Input Pad DPTT
SW2	530-001	Switch, Mode DPDT
SW3	530-018	Switch, Compress/Limit DPTT
SW4	530-001	Switch, Limit DPDT
SW5	530-018	Switch, Meter DPTT
SW6	530-018	Switch, Release Time DPTT
T1	320-019	Transformer, Power
T2	310-010	Transformer, Output
T3	310-004	Transformer, Input
TB-1	511-021	Terminal Block
	700-100	Assembly, Panel and Rack Mtg. Brackets
	700-098	Chassis

* NO SIGNAL VOLTAGE
7.7 VDC
-7VU = 6.7VDC
-20VU = 6.0VDC



DWG. 800·016·1	MARTI Electronics, Inc.	COMPRESSOR AMP. CA-40

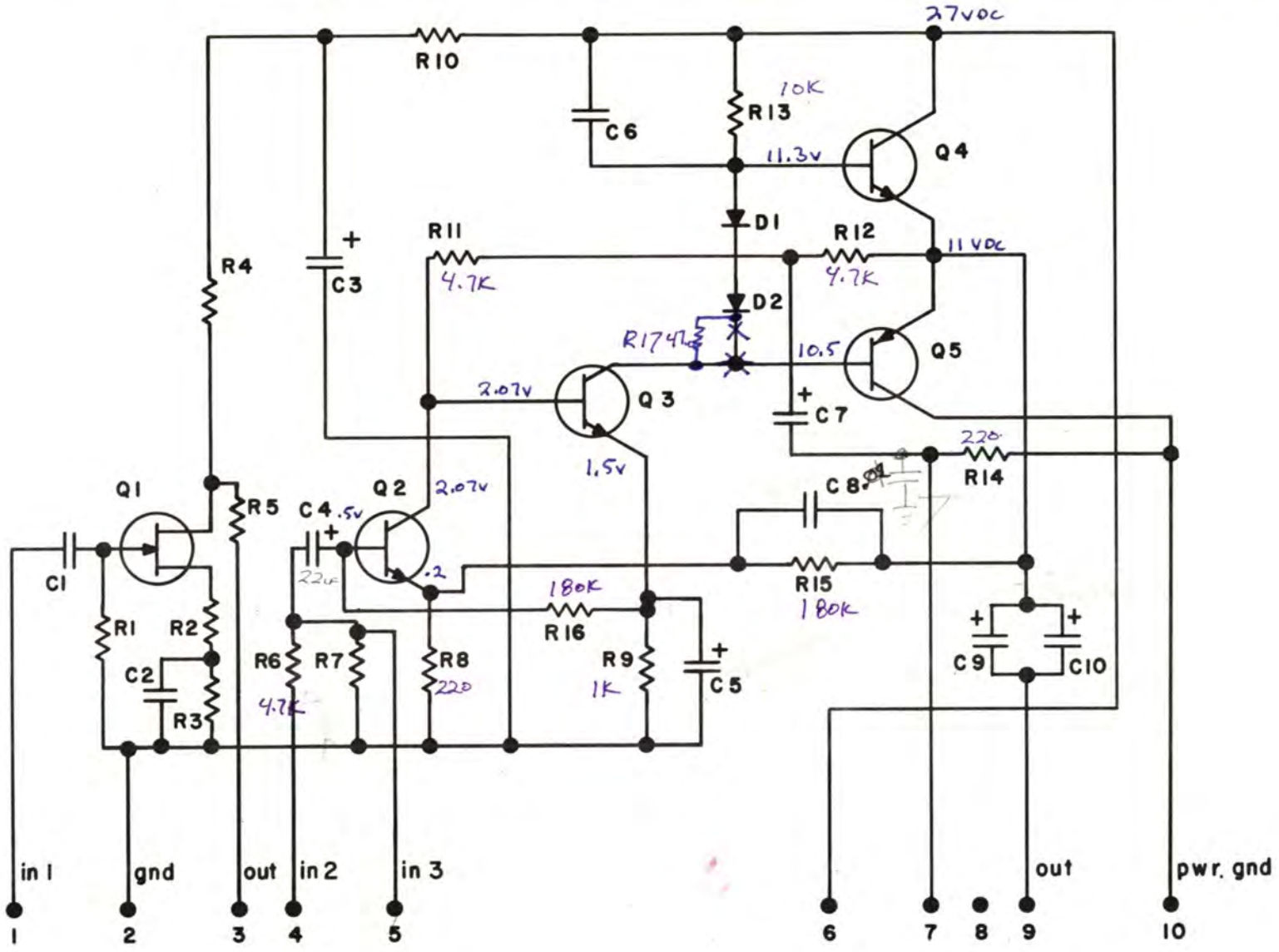
PARTS LIST
LIMITER AMPLIFIER MODULE
MODEL NO. CA-40

ITEM	PART NO.		DESCRIPTION
C1	219-080	.20	Capacitor, 8 uf, 40 V .10 MFD 630
C2	219-080	.20	Capacitor, 8 uf, 40 V " "
C3	219-080	.20	Capacitor, 8 uf, 40 V " "
C4	219-223	.13	Capacitor, .022 uf, 33 V 5%
C5	235-254	.35	Capacitor, .25 uf, 200 V 5%
C6	217-104	.15	Capacitor, .01 uf, 25 V +80-20
C7	226-020	.20	Capacitor, 2.2 uf, 100 V 10%
C8	215-333	.15	Capacitor, .033 uf, 33 V 5%
C9	219-200	.35	Capacitor, 20 uf, 16 V
C11	219-121	.50	Capacitor, 125 uf, 16 V
C12	219-121	.50	Capacitor, 125 uf, 15 V
C13	219-200	.30	Capacitor, 16 V 22 MFD
D1	414-007	.20	Diode 1N4007 R0056
D2	410-914	.05	Diode 1N914 or 1N4148 } R0602
D4	410-914	.05	Diode 1N914 or 1N4148 }
D5	410-110	.50	Diode SZ11.0A. Zener 5%
Q1	422-925	1.00	Transistor, 2N3391 S0015
Q2	425-306	1.00	Transistor, 2N5306 ~~S9100~~ S9103
Q3	450-001	1.00	Transistor, SPS1761
Q4	425-255	1.00	Transistor, 2N5245 F0021
R1	105-106		Resistor, 1 megohm ½ W 5%
R2	100-522	1.00	Potentiometer, 5K ohms, ½ W (IRC) 30%
R3	105-222		Resistor, 2.2K ohms, ½ W 5%
R4	105-470		Resistor, 47 ohms, ½ W 5%
R5	105-182		Resistor, 1.8K ohms, ½ W 5%
R6	105-682		Resistor, 6.8K ohms, ½ W 5%
R7	105-272		Resistor, 2.7K ohms, ½ W 5%
R8	105-272	2.68	Resistor, 2.7K ohms, ½ W 5%
R9	105-184		Resistor, 180K ohms, ½ W 5%
R10	105-184		Resistor, 180K ohms, ½ W 5%
R11	115-820		Resistor, 82 ohms, 1 W 5%
R12	105-473		Resistor, 47K ohms, ½ W 5%
R13	105-156		~~Resistor, 15 megohm, ½ W 5% (Omit on Var. tc)~~
R14	105-150		Resistor, 15 ohms, ½ W 5% 470K
R16	105-821		Resistor, 820 ohms, ¼ W 5%
R17	105-501	1.00	Potentiometer, 500 ohms, ½ W (Mallory) 30%
R18	105-272		Resistor, 2.7K ohms, ½ W 5%
R19	105-682		Resistor, 6.8K ohms, ½ W 5%
R20	100-522	1.00	Potentiometer, 5K ohm, ½ W IRC 30%
R15			15 OHM 5% 1/2W

PARTS LIST, continued
LIMITER AMPLIFIER MODULE
MODEL NO. CA-40

ITEM	PART NO.	DESCRIPTION
R21	100-522	1.00 Potentiometer, 5K ohm, ½ W. (IRC) 30%
R22	100-152	.15 Resistor, 1.5K ohms, ½ W. 5%
R23	100-184	.15 Resistor, 180K ohms, ½ W. 5%
VVR	451-001	Voltage-Variable Resistor VACTEC 75-17 VACTROL 23L53A
	800-016	Board, P.C.
	700-024	Module Metal Assembly

$17.73



DWG 800·005·1	MARTI Electronics, Inc.	LINE AMPLIFIER LA-20/12

PARTS LIST
AMPLIFIER MODULE
MODEL NO. LA-20

MARTI ELECTRONICS
CLEBURNE, TEXAS

ITEM	PART NO.	DESCRIPTION
C4	219-200	Capacitor, 20 uf, 16 V 22uF 25V
C5	209-401	Capacitor, 400 uf, 4V 470 6.3V
C6	256-301	Capacitor, 300 pf, 1KV
C7	219-121	Capacitor, 125 uf, 16V 150uF 25V
C8	255-470	Capacitor, 47 pf, 1KV
C9	219-121	Capacitor, 125 uf, 16 V 150uF 25V
C10	219-121	Same 150uF 25V
D1	413-754	Diode IN 3754 (IN 4007)
D2	413-754	Same
Q2	423-391	Transistor, 2N3391
Q3	423-391	Transistor, Same
Q4	450-001	Transistor, SPS-1761
Q5	450-002	Transistor, SPS-1762
R6	105-472	Resistor, 4.7K ohms, ½ watt, 5%
R7		
R8	105-221	Resistor, 220 ohms, ½ watt, 5%
R9	105-102	Resistor, 1K ohms, ½ watt, 5%
R10		
R11	105-472	Resistor, 4.7K ohms, ½ watt, 5%
R12	105-472	Same
R13	105-103	Resistor, 10K, ohm, ½ watt, 5%
R14	105-221	Resistor, 220 ohms, ½ watt, 5%
R15	105-184	Resistor, 180 K ohms, ½ watt, 5%
R16	105-184	Same
R17	105-222	Resistor 470 OHMS 1/4 watt 5%
	800-005	Board, Circuit LA-20
	700-024	Module Metal Assembly