JERROLD

INSTRUCTION SHEET

435-446.2

SOLID-STATE

ALL-BAND CASCADER MODEL TML-1

Model TML-1

DESCRIPTION

The Jerrold Model TML-1 is a six-transistor mainline amplifier providing high cascade-ability, excellent stability, and long-term trouble-free performance in all-band (54-216 mc) systems. Model TML-1 is a direct replacement for the Jerrold mainline, all-band, tube amplifier Model SCA-213.

The unit incorporates a three-transistor amplifier, two switchable cable equalizer sections, a tilt control, coarse and fine gain controls, a three-transistor internal power supply. Zener diode biasing insures stable transistor operation. Components are mounted on a solid-copper heat sink chassis, equipped with a dust cover of the same material. The amplifier is designed for rack or cabinet mounting with all controls easily accessible.

Model TML-1 provides a minimum 24 db full gain (22 db operational gain) and has a flat response (½ db p-to-v) over the entire 54-216 mc range. Output capability is 44 dbj* per channel for 9 channels at —57 db cross-modulation.

Two cable equalizer sections, either 12 or 17 db respectively, may be selected by a switch. These, together with a variable tilt control (with a compensating capacity for 6 db of cable) provide tilt adjustment for 12 to 23 db of cable spacing.

Gold-plated contacts in the equalizer switch insure long, reliable service.

Coarse gain control is achieved by a Model PIP** plug-in pad. Fine gain control is effected by a screw driver potentiometer over a 3 db range.

The TML-1 incorporates a —17 v dc test point and rf input and output test points for reading 30 db below actual signal levels. A 60-cycle input check point is located on the mounting nut of the power rectifier.

The internal power supply furnishes a —17 volts dc at 300 mA to the amplifier transistors of Model TML-1 as well as those of a Model TBA-1 bridging amplifier.

The ac power source for the unit is a Jerrold Model RPS-15 or RPS-30 which will provide from 19 to 30 volts.

This power is applied to the unit via a Jones plug when the amplifier is at the same location as the power supply, or thru either the RF and AC input or output fittings when power is carried by coaxial cable.

*0 dbj = 1000 microvolts across 75 ohms.
**Pads are available in 3-db steps, from 0 to 15 db. (A PIP-0 pad is shipped with each unit.)

SPECIFICATIONS

FREQ. RANGE	54-216 mc
GAIN (min. full)	24 db
(recommended op.)	22 db
RESPONSE FLATNESS	±¼ db
NOISE FIGURE	
(at ch. 2/full gain)	10 db max.
(at ch. 13/full gain)	11 db max.
GAIN CONTROL (fine)	3 db var.
(coarse)	plug-in-pad (3 to 15 db in 3 db steps)
TILT CONTROL	
(variable)	3 db (for 6 db cable)
(fixed switchable sections)	12 or 17 db (measured at ch. 13)
IMPEDANCE	
(input and output)	75 ohms
VSWR (input and output)	1.38:1 max. (16 db min. return loss)
RECOMMENDED INPUT	5 dbj, lo-ch.; 8 dbj, hi-ch.
MAX. OUTPUT CAPABILITY* at —57 db Cross-Mod.**	
(per ch. for 9 ch.)	44 dbj
(per ch. for 12 ch.)	43 dbj
POWER REQUIRED	19 to 30 v ac @ 0.4 amp. max.
AMBIENT TEMPERATURE RANGE	—30° F to +140° F

*44 dbj output is attained by using a block tilt technique, i.e. lo-band channels are operated 3 db below the high channel level. For flat output, de-rate output capability 2 db.

**At —57 db cross-mod. level, no cross-mod. distortion will be visible even on a white screen. Further, with amplifiers cascaded to the limit and output properly de-rated for cascading, there will be no cross-mod. distortion visible in either black and white or color pictures.

CHART OF CONTROLS AND CONNECTIONS

NAME	CIRCUIT DESIGNATION	TYPE	FUNCTION
GAIN	R11	Potentiometer	Fine adjustment of gain, 3 db range.
TILT	R21	Potentiometer	Fine adjustment of tilt, compensating for 6 db of cable.
CABLE EQUALIZER	S1	3-pos. Switch	12 db: Selects equalizer circuit for 12 db of cable spacing. 17 db: Selects equalizer circuit for 17 db of cable spacing. THRU: Selects "thru tilt" circuit.
RF & AC INPUT	J1	F-61A Fitting	RF input connection plus 24 vac (nominal) power input in systems where power is transported over coax.
RF INPUT	J2	F-61A Fitting	RF input connection.
TEST —30 DB	J3	F-61A Fitting	Checks RF input voltage 30 db below actual input level.
RF & AC OUTPUT	J7	F-61A Fitting	RF output connection plus 24 vac (nominal) power input in systems where power is transported over coax.
RF OUTPUT	J8	F-61A Fitting	RF output connection.
TEST —30 DB	J9	F-61A Fitting	Checks RF output voltage 30 db below actual output level.
J4	J4	4-pin Plug	Accommodates input from RPS-15, RPS-30, or CPS-4A (24 vac nominal).
J5	J5	4-pin Socket	Connects to Model TBA-1 or TAGC-213.
J6	J6	4-pin Socket	Accommodates plug-in pads.
TEST —17 VDC	TP 1	Tip Jack	Test point for —17 vdc supply.

INSTALLATION

GENERAL

Model TML-1 can be installed either directly in a weather housing, or rack-mounted with the two brackets supplied.

CAUTION: The black finish of the amplifier is designed to provide maximum heat dissipation in order to maintain optimum operational characteristics of the transistors. As black also absorbs heat, it is essential that equipment housing are not left open and unattended, exposing the equipment to direct sunlight.

Accessories shipped with the unit:

1 4-contact connector socket
2 rack-mount brackets
4 screws, #6-32 x ¼, brass with black oxide finish
4 screws, #10-32 x ⅜
1 equalizer plug-in pad, Model PIP-0 (plugged in)

RF AND AC CONNECTIONS

1. The 19 to 30 vac required can be obtained from a Model RSP-15 or RSP-30. Where the power source is available at the TML-1 location, the voltage can be fed directly into the amplifier via plug J4. In this case, rf signal input is applied to the RF INPUT fitting on the amplifier, rf signal output is obtained at the RF OUTPUT fitting. The circuitry at both these fittings blocks 60 cps ac. Where ac is to be passed to other equipment, output connection is made to the RF & AC OUTPUT fitting.
2. Where power is fed into the amplifier via coaxial cable carrying the rf signal voltage, the RF & AC INPUT and RF & AC OUTPUT fittings are used. From a source preceding the amplifier, ac will enter at the RF & AC INPUT; from a source past the amplifier, ac will enter at the RF & AC OUTPUT (in opposite direction to the rf signal flow).

   As in this case the ac voltage will be present at the exposed plug J4, this plug should be covered with the 4-contact socket shipped with the TML-1.
3. a. Where Models TML-1 are used in a cable run without distribution thru bridging amplifiers Model TBA-1, use JT-404 type cable jumpers from bulkhead fittings to the input and output terminals on the TML-1.

   b. Where bridging amplifiers are used, connect RG-59/U type cable from the bulkhead to the RF INPUT for cable runs without ac power.

   c. For cable runs with ac power, use JT-204 or JT-404 type jumpers between the bulkhead fitting and the RF & AC INPUT on the TML-1, and between the RF & AC OUTPUT on the TML-1 and the LINE IN terminal on Model TBA-1.

   NOTE: Model FHC-404 connectors should be used on JT-204 or JT-404 type cable jumpers.
4. In installations with ac carried over coaxial cable, consideration must be given to the power consumption and the voltage drop to every TML-1 location. Since the amplifier requires between 19 and 30 vac, it is necessary to compute the voltage drop from the remote power supply to the amplifiers. The basic formula is $E = IR$, whereby the total current drain is the sum of all individual currents of each piece of equipment fed thru the cable. The resistance of each cable section between equipment depends on length and specific resistance of the cable used.

For ease of computation, table 1 gives the resistance per db at channel 13 for four types of coaxial cable.

TABLE 1

CABLE	OHMS/DB @ CH. 13 AT 70° F
JT-1412	0.13
JT-1500	0.084
JT-1750	0.055
JT-408	0.1

INSTALLATION

To determine the total voltage drop for a cable run, compute the individual voltage drops to each amplifier. As Model TML-1 requires a minimum of 19 volts, the total voltage drop to the farthest amplifier location should not exceed 11 volts.

Example: 5 amplifiers in cascade, with no distribution along the run (see fig 2): 30 vac is applied to a JT-1750 type cable at the head-end; cable spacing to the first amplifier is 40 db; cable spacing between the first and second and between each following amplifier pairs is 20 db; each amplifier draws 0.4 amperes of current.

$I_1 = 2$ amp.	$R_1 = 2.2$ ohms	(0.055 x 40)
$I_2 = 1.6$ amp.	$R_2 = 1.1$ ohms	(0.055 x 20)
$I_3 = 1.2$ amp.	$R_3 = 1.1$ ohms	(0.055 x 20)
$I_4 = 0.8$ amp.	$R_4 = 1.1$ ohms	(0.055 x 20)
$I_5 = 0.4$ amp.	$R_5 = 1.1$ ohms	(0.055 x 20)

E Total Drop $= I_1R_1 + I_2R_2 + I_3R_3 + I_4R_4 + I_5R_5$
$= 4.4 + 1.7 + 1.3 + 0.8 + 0.4 = 8.8$ volts:

Hence, $E_5 = 30 - 8{:}8 = 21$ volts approx.

It is seen that the total voltage drop is well below the 11 volts max. specified.

Similarly, using formula $P = EI$, the total power requirement can be derived:

First compute the power required for the equipment installed by multiplying the voltage applied at the head-end by the total current drawn by the units.

Then compute the power drops in the individual cable sections by multiplying the individual voltage drops by the individual currents.

Adding all will give the total power required.

A typical lay-out for computing voltage and current distribution is given in fig. 3.

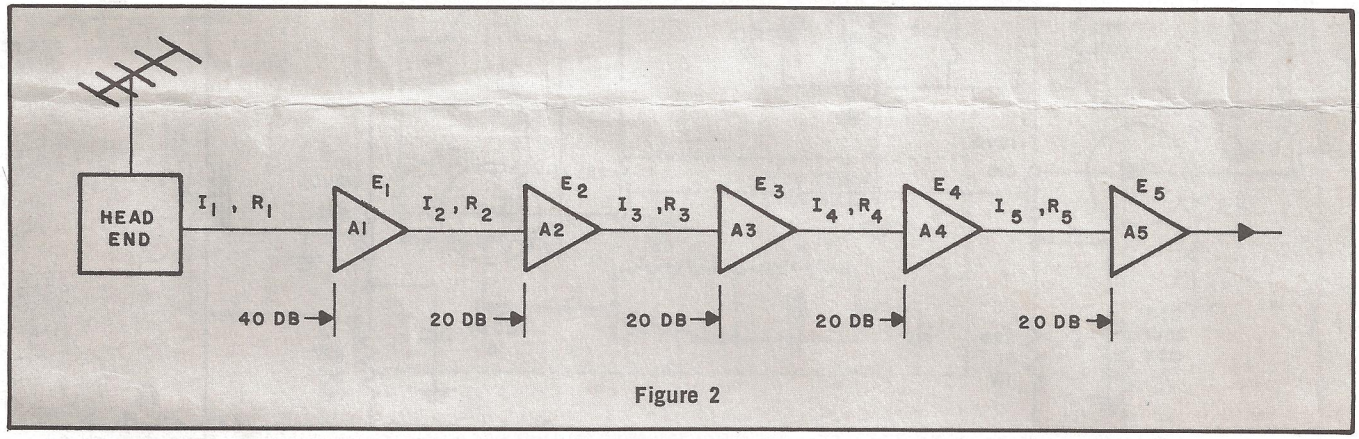

Figure 2

SETTING OF SIGNAL LEVELS

GENERAL

1. Whether or not the amplifier is cable-powered, it is desirable to make all measurements at the INPUT and OUTPUT—30 db TEST points, especially during routine maintenance checks so that subscriber service will not be interrupted. Both test points have a built-in 60 cps blocking circuit to prevent insertion of ac into a field strength meter. The error introduced at either test point will not be more than ±½ db.
2. Where the amplifier is cable-powered, the input signal level can also be measured by setting the equalizer switch to THRU position, removing the PIP pad from its socket J6, and then measure with the field strength meter at the RF INPUT terminal J2.
3. During initial installation it may be desired to measure directly at the incoming trunk line. Where ac is passed over the same cable, an ac blocking device (such as Jerrold Model LF1) must be inserted between the cable and a field strength meter other than Jerrold Model 704-B Series 2; the latter has a built-in ac blocking circuit.
4. Output signal should always be measured at the —30 db TEST point (OUTPUT), especially where the amplifier is cable-powered with ac coming in over the outgoing trunk line; disconnecting the trunk cable would de-energize the amplifier.

INPUT LEVELS

Measure the input levels (for all channels distributed) and record them for future reference.

OUTPUT LEVELS

1. Measure the output signal levels. Where necessary, replace the PIP-0 pad by one having the proper attenuation.
2. Set CABLE EQUALIZER switch either to 12 db or 17 db as required to compensate for the preceding length of cable.

   Example: To compensate for 20 db of cable, set the switch to 17 db.
3. Adjust TILT control to add compensation for 3 db of cable (see example above) at the highest channel distributed.

   In practice, this is accomplished by monitoring the lowest and the highest channel at the —30 db TEST point (OUTPUT) and adjusting the TILT control for the desired operational levels (equal levels for flat output, 3 db difference for block tilt).
4. Adjust GAIN control for the output desired on the highest channel distributed.
5. Measure and record the output levels at the —30 db TEST point for future reference.

MAINTENANCE

Model TML-1 is designed for long life with trouble-free performance. Servicing is to be done only by skilled personnel, experienced in transistor circuitry. For their benefit, a schematic circuit diagram and a parts list are given.

Should it become necessary to replace a transistor, only exactly the same type may be substituted.

The amplifier has a built-in protective circuit to prevent damage to the amplifying transistors in case of a short circuit in the —17 vdc line.

If for any reason (e.g., by a faulty capacitor) such a short is caused, and if the unit is operated for an extended period under high ambient temperature, the power regulator transistor Q1 may burn out. In this case, resistor R30 will burn out too, thus protecting the amplifier transistors.

When removing the cause for the short circuit, R30 must be checked and if found to be damaged, **both R30 and Q1 must be replaced!** On no account should the amplifier be activated before that check and eventual replacement of components, or all transistors will be damaged.

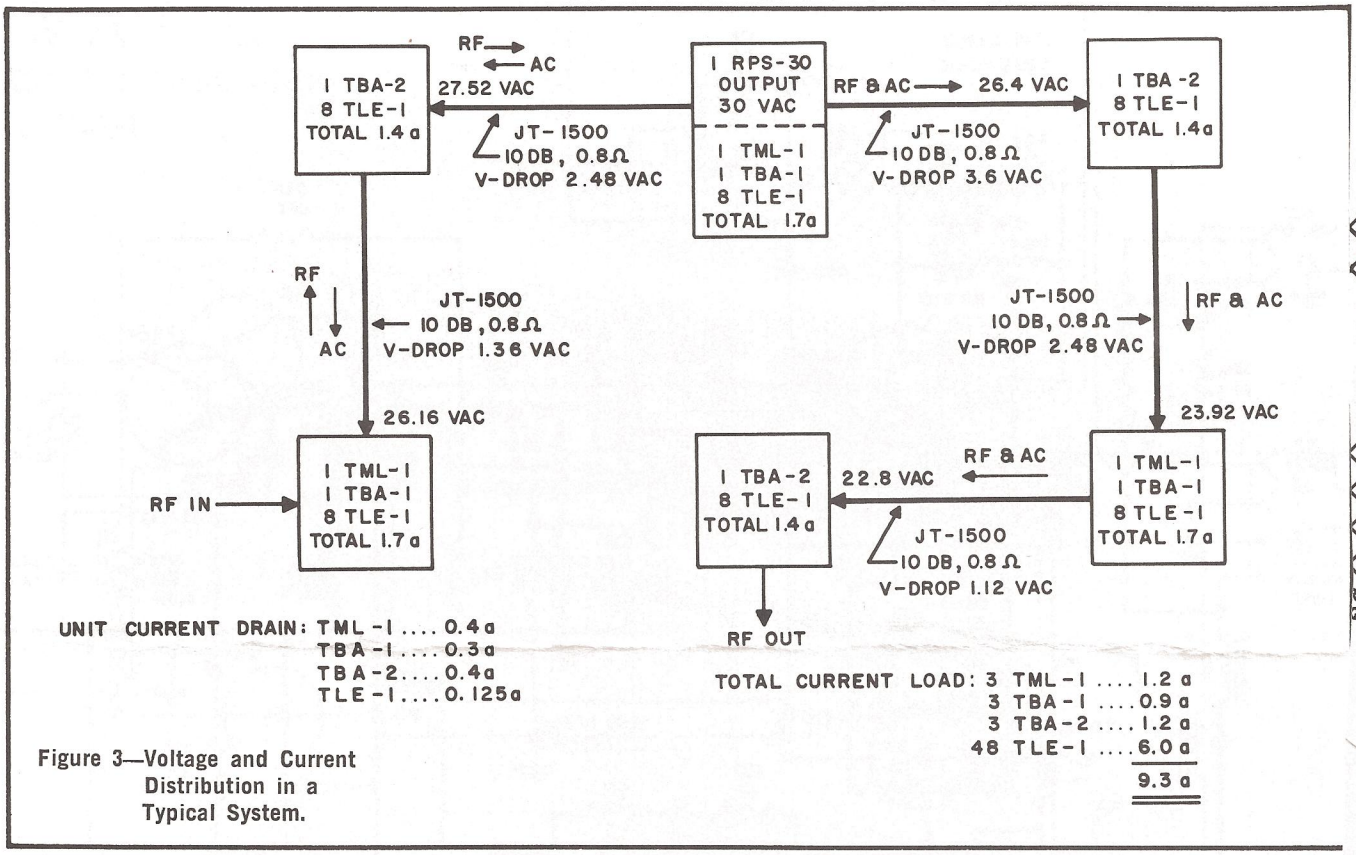

Figure 3—Voltage and Current Distribution in a Typical System.

REPLACEMENT PARTS LIST

MODEL TML-1

ASSEMBLY — REF. DWG. NO.: E861-603

ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
			CAPACITORS	
1	C1, 2, 9, 18, 20, 23, 24, 34	8	1000 pf, GMV, cer. disc.	123-115
2	C3	1	8.2 pf, 5%, 500 v, gimmick	122-053
3	C4	1	6.2 pf, 5%, 500 v, gimmick	122-054
4	C5	1	12 pf, 5%, 500 v, gimmick	122-052
5	C6	1	15 pf, 5%, 500 v, Jeffers 190	122-063
6	C7	1	10 pf, 5%, 500 v, gimmick	122-015
7	C8	1	7.5 pf, 5%, 500 v, gimmick	122-014
8	C10, 11, 15, 16, 21, 25, 26, 28, 30	9	1000 pf, GMV, 600 v, feed-thru	129-205
9	C12	1	0.02 uf, +80 —20%, 25 v, cer. disc	124-078
10	C13	1	0.5-3 pf, 600 v, trimmer, cer. tubular	128-503
11	C14, 19, 22	3	1.5 —20 pf, trimmer	128-537
12	C17	1	10 pf, ±0.5 pf, NPO	121-011
13	C27, 32, 33, 35	4	0.01 uf, 10%, 600 v, cer. disc	124-134
14	C36	1	1000 uf, 50 v, electrolytic	127-061
15	C37	1	100 uf, 50 v, electrolytic	127-050
16	C38, 39	2	25 uf, 15 v, electrolytic	127-065
			CONNECTORS	
17	J1, 2, 3, 7, 8, 9	6	Coaxial chassis fittings, F-61A	C821-155
18	J4	1	Plug, 4-pin	B184-007
19	J5	1	Socket, 4-pin	B184-018
20	J6	1	Socket, for plug-in pad	182-103
21	TP1	1	Tip Jack, red	185-112
			DIODES	
22	CR1, 2	2	1N963B, Zener	137-725
23	CR3	1	Si Rectifier	137-726
24	CR4, 5	2	Si Rectifier	137-718
25	CR6	1	1N750A, Zener	137-724
			RESISTORS	
26	R1, 2, 25, 26	4	1200 ohms, 5%, ¼ w	112-921
27	R3	1	20 ohms, 5%, ¼ w	112-083
28	R4, 5, 8, 9	4	75 ohms, 5%, ¼ w	112-954
29	R6	1	270 ohms, 5%, ¼ w	112-993

ASSEMBLY — REF. DWG. NO.: E861-603

ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO
30	R7	1	120 ohms, 5%, ¼ w	112-093
31	R10, 38	2	47 ohms, 5%, ¼ w	112-992
32	R11, 19	2	500 ohms, 10%, potentiometer	B118-122
33	R12	1	150 ohms, 5%, ¼ w	112-974
34	R13	1	30 ohms, 5%, ¼ w	112-982
35	R14	1	200 ohms, 5%, ¼ w	112-984
36	R15	1	2 k, 5%, ¼ w	112-930
37	R16	1	130 ohms, 5%, ½ w	112-251
38	R17	1	43 ohms, 5%, ¼ w	112-086
39	R18	1	100 ohms, 5%, ¼ w	112-950
40	R20	1	330 ohms, 5%, ¼ w	112-097
41	R21	1	100 ohms, 10%, potentiometer	B118-131
42	R22	1	33 ohms, 5%, ¼ w	112-995
43	R23	1	510 ohms, 5%, ¼ w	112-929
44	R24	1	300 ohms, 5%, ¼ w	112-096
45	R27, 28	2	51 ohms, 5%, 1 w	112-201
46	R29	1	1 k, 5%, ¼ w	112-977
47	R30	1	1 ohm, 5%, 2 w, w.w.	110-105
48	R31, 32	2	470 ohms, 5%, 1 w	112-318
49	R33	1	620 ohms, 5%, ½ w	112-335
50	R34	1	1500 ohms, 5%, ¼ w	112-966
51	R35	1	2700 ohms, 5%, ¼ w	112-931
52	R36	1	100 ohms, 10%, 2 w, potentiometer	118-025
			THERMISTOR	
53	RT1	1	28.2 ohms, @ 25° C	110-025
			TRANSFORMERS	
54	T1, 4, 5	3	Toroid core assembly	B144-093
55	T2	1	Toroid core assembly	B144-091
56	T3	1	Toroid core assembly	B144-090
			TRANSISTORS	
57	Q1	1	factory-selected	130-104
58	Q2	1	factory-selected	130-122
59	Q3	1	factory-selected	130-123
60	Q4	1	factory-selected	A130-125
61	Q5,	1	factory-selected	A130-124-1
62	Q6	1	factory-selected	A130-124-2

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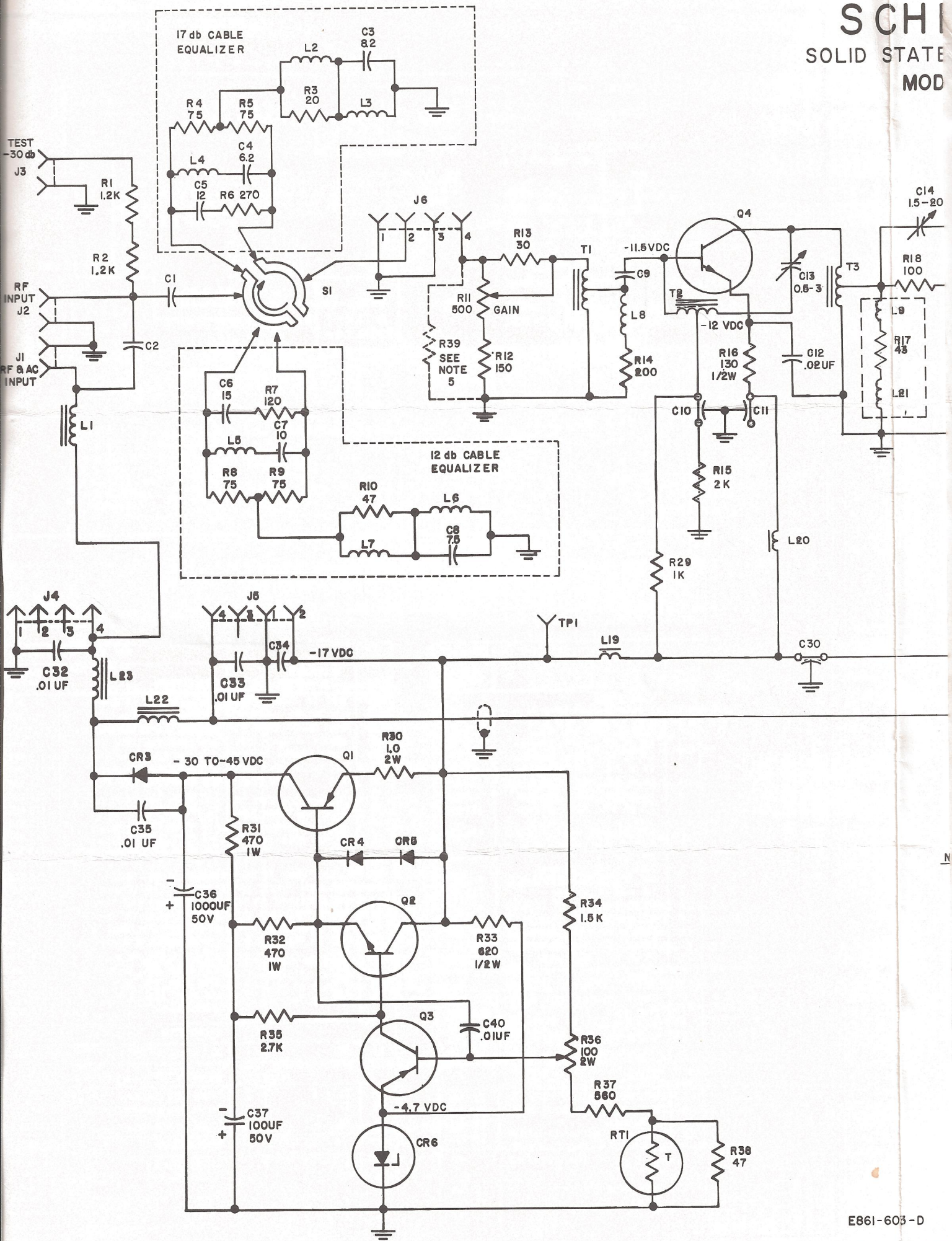
SOLID STATE

MOD



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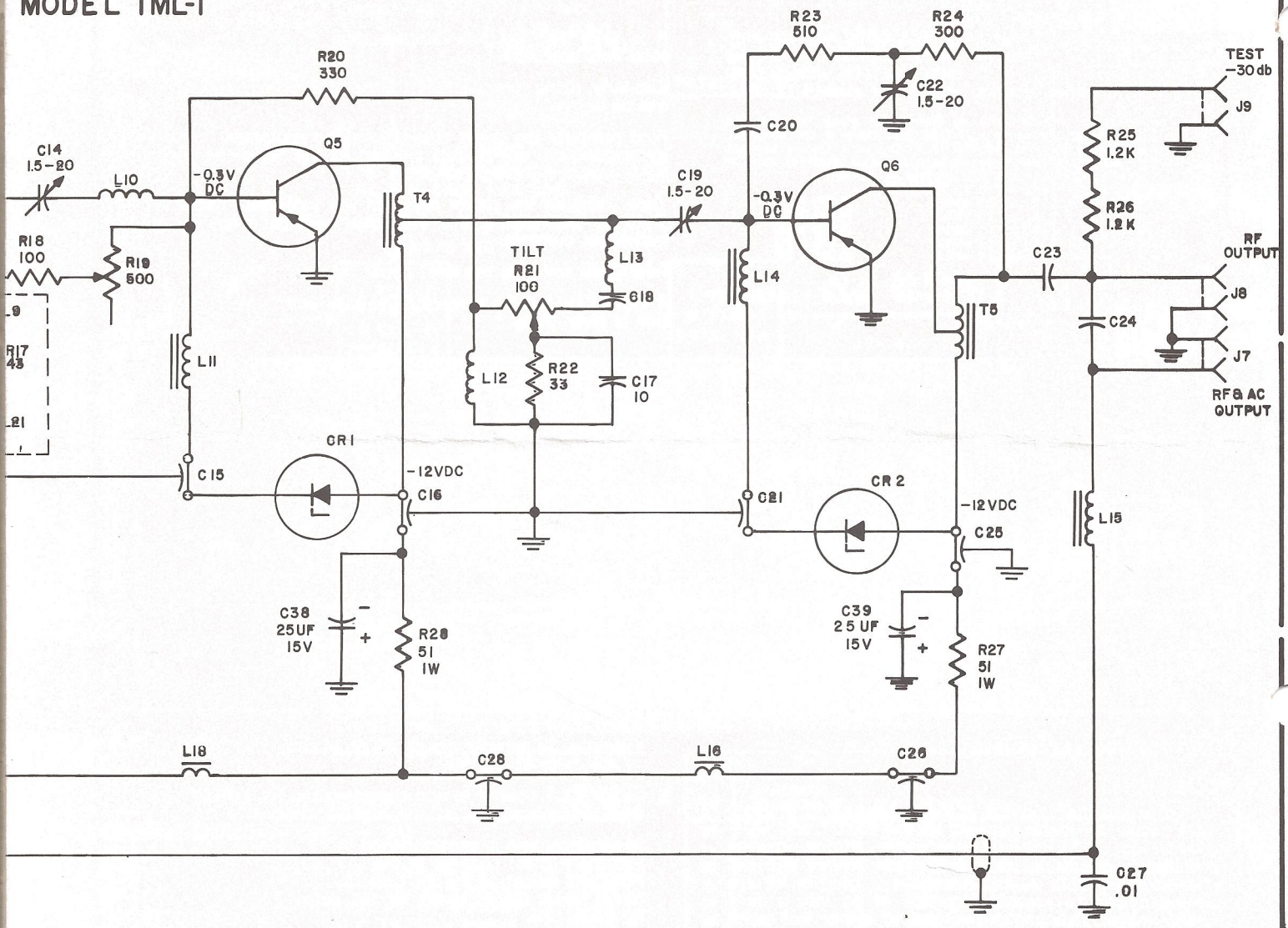
CHEMATIC

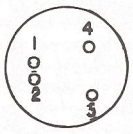
TATE SUPER CASCADER

MODEL TML-1



NOTES

1. UNLESS OTHERWISE SPECIFIED;
   A. ALL CAPACITOR VALUES ARE GIVEN IN PF.
   B. ALL RESISTORS ARE IN OHMS, 5 %, 1/4 WATT.
2. ALL UNMARKED CAPACITORS 1000 PF.
3. ALL VOLTAGES MEASURED WITH A VTVM.
4. DO NOT MEASURE RESISTANCE WITH TRANSISTORS IN CIRCUIT.
5. FACTORY OPTION. R39 IS 51[illegible] OHMS, 5 %, 1/4 WATT.



J6 AS VIEWED FROM WIRING SIDE

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