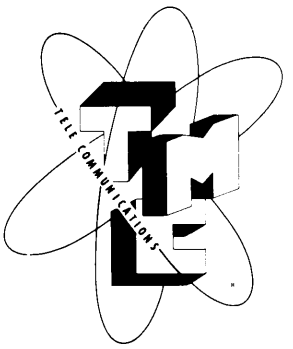
INSTRUCTION BOOK

for

DIVERSITY COMBINING UNIT MODEL DCU



THE TECHNICAL MATERIEL CORPORATION
Mamaroneck, New York

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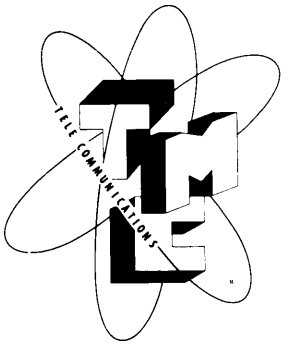

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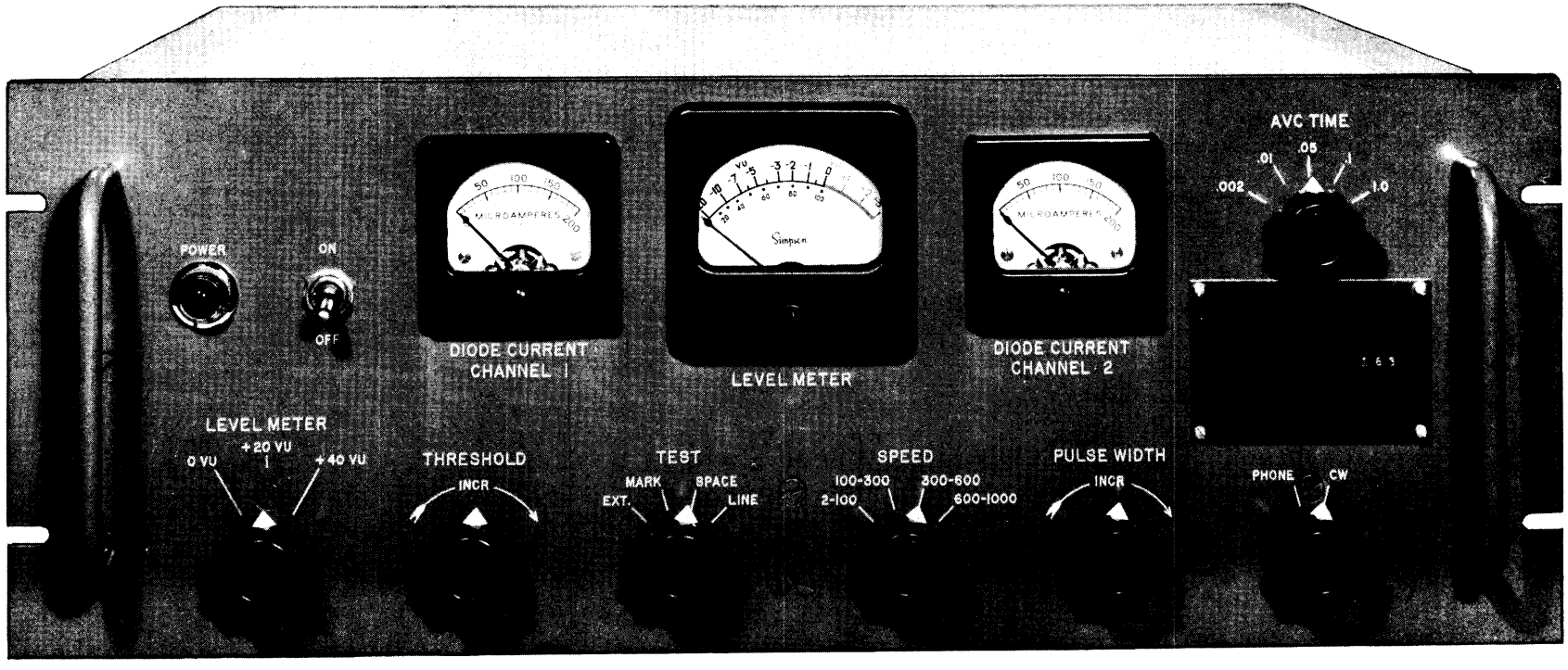

Figure 1-1. Diversity Combining Unit, Model DCU-1. Front View.

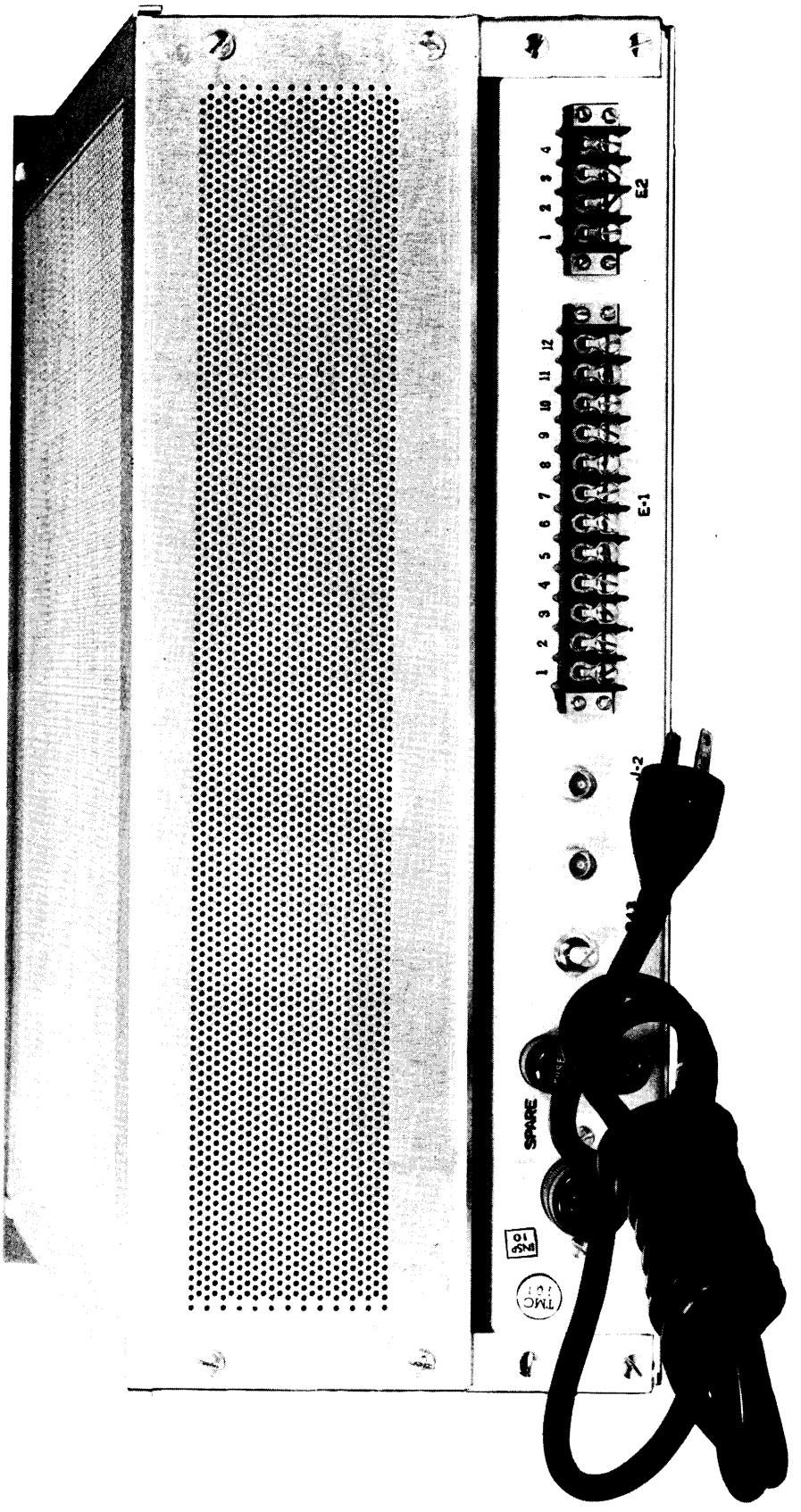

Figure 1-2. Diversity Combining Unit, Model DCU-1. Rear View.

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SECTION I
GENERAL DESCRIPTION

1. PURPOSE AND BASIC PRINCIPLES

a. The Diversity Combining Unit, Model DCU, designed for application with the model DDR-2 system, can also be utilized as a separate diversity combining unit for CW, MCW and PHONE reception.

b. The DCU provides facilities for Diversity Reception of two CW/MCW or PHONE signals by combining the IF voltages of two receivers into a common diode load. This DCU function permits the keying of a self contained tone oscillator, external keying by combined DC pulses, feeding of combined Phone signals to an external audio amplifier or to the audio stages of one of the diversity receivers.

c. The DCU will receive a noise filled signal of varying amplitude (dependent upon fade conditions) and reproduces a noise free tone of constant amplitude and stable frequency. The tone output is virtually transient free. The pulse width may be varied over a wide range by the operator.

d. A Speed Control is provided to give optimum reception for given speed ranges.

e. The DCU also provides for the combining of the two receiver AVC Voltages into a controlled AVC TIME CONSTANT. This function of the AVC TIME CONSTANT control takes into consideration the daily effect of signal reception related to selective fading, signal to noise ratio, key clicks and strong signal thumps. Judicious use of this control by the operator in routine tuning operations will permit the continued operation of communication circuits heretofore considered "unusuable or sub-normal".

f. Fast Monitoring of receiver I.F. output level and signal diversity action is obtained thru the use of microammeters in each combining IF Diode plate section.

g. A VU Meter is provided for monitoring audio levels.

2. DESCRIPTION OF UNIT

a. The front panel is 19" wide by 7" high by 3/16" thick, finished in TMC Gray enamel. The DCU chassis extends 14" behind the panel. The weight of the unit is 25½ lbs.

b. INPUT:

1. 455 kcs IF from each receiver.
2. AVC voltage from each receiver.
3. EXTERNAL KEYING of tone oscillator.
4. Audio level to VU METER.

c. OUTPUT:

1. Single frequency tone (*) for feeding a line or teleprinter input, relay or ink-recording equipment, 600 ohms.
2. Combined D.C. pulses to feed the high impedance input of a recorder.
3. Combined detected audio to be fed to the high impedance input of an audio amplifier.

d. METERING:

1. Two microammeters in series with separate diodes in each channel indicate signal level and diversity action.
2. One VU Meter to indicate level from all audio circuits.

e. CONTROLS:

Front Panel.
1. Primary power switch.
2. Phone - CW switch.
3. Pulse width CW - MCW.
4. Threshold CW - MCW.
5. AVC TIME (1.0, .1, .05, .01 and .002 seconds)
6. Speed Control (2-100 wpm, 100-300 wpm, 300-600 wpm, 600-1000 wpm).
7. Test switch.
8. Level Meter range switch.

Top Chassis.
1. Bias Control.
2. Tone Calibrate.
3. Balance Control.
4. IF Plate Tuning.

Rear Apron:
1. Tone Oscillator output control.

f. POWER REQUIREMENTS:

1. Input voltage 110/220 volts.
2. Frequency 50 - 60 cycles.

(*) A 2125 cps tone is furnished as standard with the equipment, in the form of a vector plug in unit. However, any standard tone will be available upon request.

3. Power consumption 70 watts.
4. Fuse protection, 2 amp.

g. TUBE COMPLEMENT:

V-1	6BA6	IF Amplifier, receiver #1.
V-2	6BA6	IF Amplifier, receiver #2.
V-3	6AL5	Detector, receiver inputs 1 and 2.
V-4	6AL5	$\frac{1}{2}$ Noise Limiter section, $\frac{1}{2}$ Clamp circuit.
V-5	6AU6	First Pulse Amplifier.
V-6	6AU6	Second Pulse Amplifier.
V-7	6C4	Keyer Tube.
V-8	12AU7	Tone Amplifier.
V-9	6AQ5	Tone Oscillator.
V-10	5Y3GT	Power Supply Rectifier.
V-11	6X4	Negative Power Supply Rectifier.
V-12	OB2	Power Supply Voltage Regulator.
V-13	OB2	Power Supply Voltage Regulator.
V-14	OA2	Negative Supply Regulator.
V-15	OB2	Negative Supply Regulator.

h. COMPONENTS AND CONSTRUCTION:

All equipment is manufactured in accordance with JAN specifications wherever practicable.

SECTION II
THEORY OF OPERATION

1. GENERAL DESCRIPTION OF CIRCUITS

NOTE

When reading this section constant reference should be made to Block Diagram, Fig. 2-1, and the Schematic Diagram Figure 7-1.

a. THE I.F. AMPLIFIERS: (V1, V2)

Each diversity channel provided with an especially high gain pentode I.F. Amplifier to permit operation with relatively weak signals. The additional gain also serves to maintain the equipment within its operational threshold when deep fades occur.

In the case of phone operation, however, it is necessary to reduce the gain of these stages (by increasing the negative grid bias through the removal of R5 in the bias voltage divider). This serves to produce optimum gain with the least amount of distortion.

b. THE DETECTORS: (V3)

Each amplified 455 Kc. I.F. channel is fed to a diode detector which rectifies the carrier. The carrier then passes through a filter network (L4 & C11 or L3 & C10) and on to the common diversity load (R14). The individual diode currents are indicated on M1 and M2. In the case of CW or MCW operation, the DC pulse level produced by the carrier rectification may be re-introduced into the clamp circuit which follows. The DC Pulse may also be extracted for the purpose of activating a recording mechanism. (Terminals 5, 6 & 7). Otherwise, the detected combined audio of a radiotelephone carrier is extracted at this same point and called diversity output.

c. THE NOISE LIMITER: ($\frac{1}{2}$V4)

One half of V4 is so connected that a sharp noise peak of the impulse type causes the diode to conduct and thus effectively place C12 across the diversity load. This serves to by-pass the noise peak.

Most of the remaining noise is rejected by the low pass filter composed of L5 and the associated components around it.

d. THE CLAMP: ($\frac{1}{2}$V4)

In order to prevent the breaking through of noise peaks between dots and dashes and during stand-by periods, a clamp and threshold control combination has been devised. When the clamp diode operates, it forces C14 to charge and discharge so that the signal appearing at the junction of C14 and R18 will always be oriented.

The pulse may vary in amplitude as does the received signal carrier, however, its position with respect to ground will always remain the same due to clamping action.

e. THE FIRST PULSE AMPLIFIER: (V5)

As the threshold control is rotated clockwise a positive DC voltage of increasing magni-

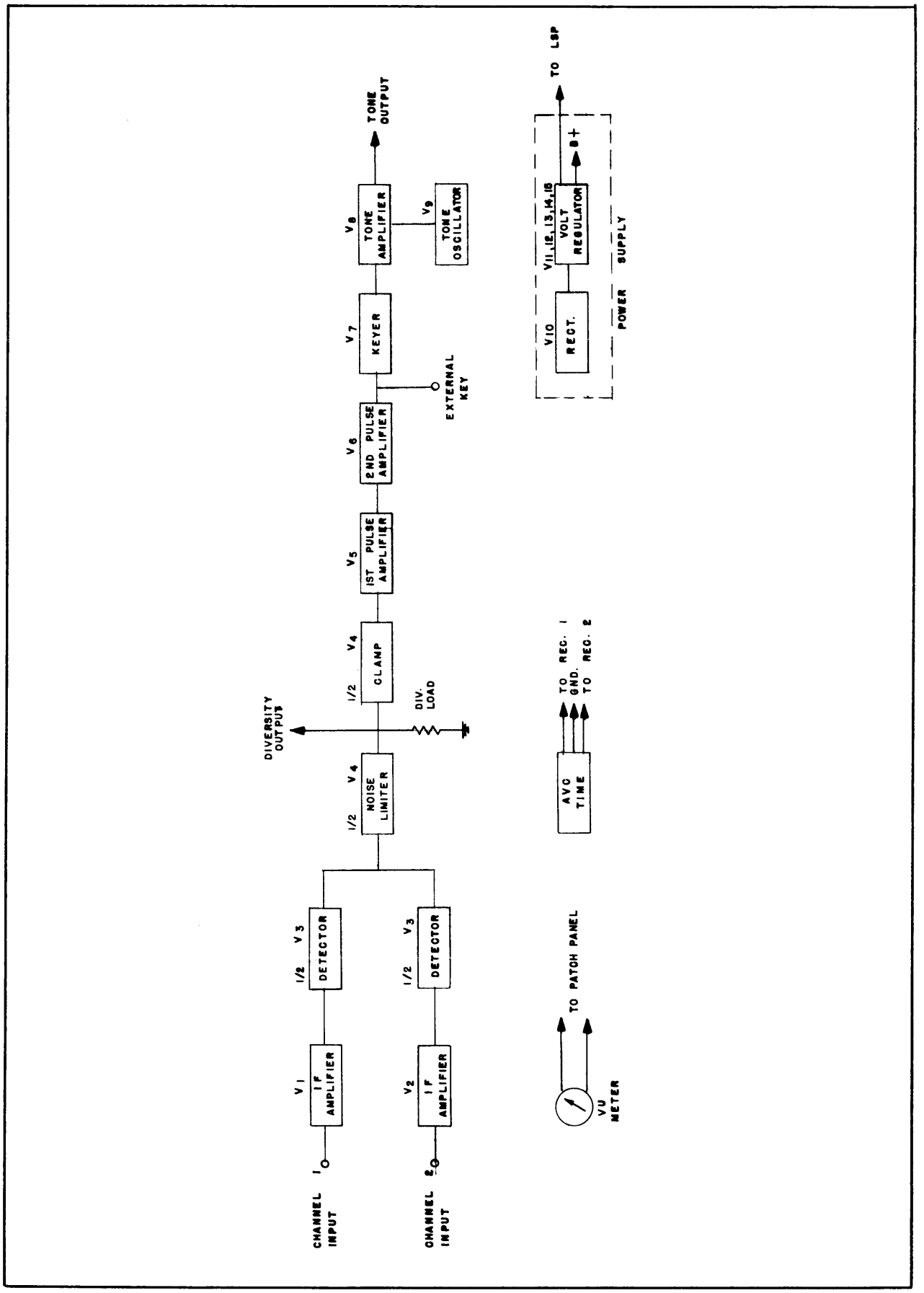

Figure 2-1. Block Diagram

tude is applied to the clamp output at the junction of R18 and R19. This serves to elevate the signal pulse.

Since V5 is a sharp cut-off pentode which is operated at zero bias, a small positive signal will drive the tube to grid saturation and a small negative signal will drive it to cut-off. In this manner, when a reasonably strong signal appears (i.e., any signal operating within the A.V.C. of the receiver) the noise will always be forced to remain outside the operating region of V5.

In the event that the signal disappears or the transmitting station stands by, the positive voltage derived from the threshold control will maintain the grid of V5 in a highly saturated position and prevent receiver noise from activating the tone keyer.

It stands to reason, then, that for weak signals less threshold must be used and less noise may be tolerated otherwise noise peaks may succeed in penetrating the operating region of V5.

f. THE SECOND PULSE AMPLIFIER: (V6)

The output of the first pulse amplifier is essentially a square wave which is subsequently integrated when it passes through the network consisting of R25, R26, R27 and either C16, C17, C18, or C19. The pulse width control (R26) then applies a DC potential to this waveform whose average may be varied above and below ground by rotating the aforementioned control. It is in this way that the operating time base and therefore, the output pulse width of V6 is varied.

The amount of integration needed changes with signal speeds so that the proper circuit constants must be chosen by use of the speed switch (S2).

g. THE KEYER TUBE: (V7)

If the test switch (S3) is turned to the line position, the square wave from V6 will operate the keyer tube which, in turn, places changing bias voltage on the grid of the tone amplifier (V8). In space position the grid of V7 receives a negative DC voltage which cuts it off. This permits its plate voltage to rise and the output from the divider network (R39, R40, R41) to approach ground potential. When S3 is in MARK position, V7 is in a condition of grid saturation which means that its plate voltage falls to a low value and the output from the divider network goes highly negative. (The proper orientation of these voltage extremes with respect to ground is adjusted by use of the bias pot (R40).

The EXTERNAL position of S3 permits keying of V7 by an external voltage which is varying from zero to some negative potential greater than ten volts.

h. THE TONE AMPLIFIER: (V8)

The Tone Amplifier is a push pull audio stage whose grid bias voltage is varied from the operating region to cut-off. The oscillator output is either amplified or cut-off in accordance with the pulses received from the KEYER TUBE.

i. THE TONE OSCILLATOR: (V9)

The Tone Oscillator is of the RC type and has been designed for good frequency stability.

SECTION III
INSTALLATION AND OPERATION

1. INSTALLATION PROCEDURE

When the Model DCU is being installed as part of the TMC DDR-2 receiving equipment interconnecting cables are furnished. Figures 3-6 and 3-7 in the DDR-2 instruction manual illustrates all the terminal connections.

The DCU is mounted in the upper portion of the rack. The top chassis controls of the unit controlling the plate tuning input of the IF diodes, the Bias Control, the Tone Calibration setting, and the Balance Control of the tone amplifier are all factory preset and sealed. The input power requirements of the unit are 110 volts, 50/60 cycles, and, as the case in most of the DDR-2 component units, for 220 volt operation the power transformer primary taps must be rewired.

The combined audio output is brought out to the LINE PATCH PANEL (from terminals 5 and 6 of the DCU to jacks 25 & 26 of the LPP). For CW operation, the terminals 5 and 6 are stripped together, thus permitting the entire functioning of the DCU. While for PHONE operation, when the patching plug is inserted into the DIVERSITY OUTPUT jacks of the LPP, terminals 5 and 6 are open, thus making available the diversity phone output for one of the receivers' audio amplifier from terminals 5 and 7 (GD).

SECTION IV
OPERATION

1. INITIAL ADJUSTMENTS

CW/MCW OPERATION.

The overall sequence of steps for operation of the DCU for diversity reception of CW/MCW and PHONE signals is as follows:

a. Throw Power switch S-5 to ON position.
b. Throw CW-PHONE switch S-1 to CW position.
c. Adjust AVC Time Constant switch S-6 to proper position, dependent upon incoming signal speed, signal fading, noise conditions.

NOTE

For slow speed signals a long AVC TIME CONSTANT should be applied. This will permit attenuation of the rising noise level present between pulses. Variable fading conditions will materially effect the AVC TIME CONSTANT to be applied, therefore, no specific standard can be set up due to the individual variables present in the speed of signal transmission, speed of fading, signal to noise ratios.

However, as a OPERATING GUIDE only, recommended settings are listed below as a preliminary adjustment, until practical experience is attained in routine daily operations.

d. Adjust SPEED control switch SW-2 depending upon the speed of incoming signal.
e. Adjust TEST switch SW-3 to Line position preparatory to tuning in signals on receivers.
f. Set PULSE WIDTH control at center point of rotating position. This control is primarily used to vary the pulse width of received signals. For Morse operation adjust this control near center of rotating point for optimum signal response, i.e., clean, well defined characters.
g. Set THRESHOLD CONTROL at its maximum clockwise position. (Dependent upon the amplitude of signal to noise ratio, adjust the THRESHOLD CONTROL in a gradual counter clockwise movement until satisfactory signal response is obtained.
h. Adjust the VU Level Meter with S-4, depending upon the circuit level requirements.

2. INITIAL ADJUSTMENTS

PHONE OPERATION.

A volume indicator meter is provided for monitoring the various audio levels. This meter is calibrated in volume units covering a range from -20 to +43. The meter range is altered by a 3 position switch (S-4) available at the front panel. The level meter terminals have been brought out to the Line Patch Panel, so that monitoring of the receiver audios and the DCU tone output may be affected handily.

a. Throw POWER switch S-5 to ON position.
b. Throw CW-PHONE switch S-1 to PHONE position.
c. Adjust AVC TIME CONSTANT switch S-6 to position .002.
d. Patch or connect the VU Level Meter and its associated multipliers across the output of the audio amplifier or the receiver output.

e. Tune the Diversity Receivers to the de-

OPERATING GUIDE OF PRELIMINARY ADJUSTMENTS

SPEED OF TRANSMISSION WPM	FADING CONDITIONS	NOISE CONDITION	AVC TIME CONSTANT
10 to 50	SLOW	LOW	1.
10 to 50	SLOW	HIGH	1.
10 to 50	FAST	LOW	.05
10 to 50	FAST	HIGH	.1
50 to 100	SLOW	LOW	.05
50 to 100	SLOW	HIGH	.05
50 to 100	FAST	LOW	.01
50 to 100	FAST	HIGH	.01
ABOVE 100	ANY CONDITION	ANY CONDITION	.002

sired PHONE signal and adjust for desired output level.

f. Connect or patch the DCU diversity output to a high impedance input of an available audio amplifier. BE SURE audio amplifier input has the .01 mfd. condenser in series with the DCU output of terminal 5.

If desired, the DCU diversity output can be connected to one of the diversity receivers, by patching the DIV OUT to the AUDIO IN of either receiver on the LINE PATCH PANEL.

SECTION V
OPERATOR'S MAINTENANCE

The Model DCU Diversity Combining Unit has been designed to provide long term, trouble free, continuous 24 hour a day operation. It is recommended that any maintenance to the equipment be done by a competent maintenance technician.

1. EMERGENCY MAINTENANCE

a. NOTICE TO OPERATORS.- Operators should not perform any of the following emergency maintenance procedures without proper authorization.

b. REPLACEMENT OF TUBES AND FUSES.

(1) Replacement of Fuses -

WARNING

Never replace a fuse with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been corrected.

(a) Fuse failure in the DCU would normally be indicated by failure of the pilot lamp to be on when the power switch is turned on. The Pilot lamp in the equipment is operated at 1/2 voltage and therefore would not ordinarily be the cause of no indication. In addition to the pilot lamp not lighting, the Vacuum tubes in the DCU would not be lighted. In this case, the 2 ampere fuse on the rear panel should be checked and replaced if defective.

(2) Replacement of Tubes.- The tubes may be checked visually to see if they are lighted, or for warmth. When necessary the tubes should be carefully removed and tested and when replaced care should be taken to install tube shields.

SECTION VI
PREVENTIVE MAINTENANCE

In order to prevent actual failure of the equipment due to corrosion, tube failures, dust and other destructive ambient conditions, it is suggested that the following preventative maintenance be performed.

1. ROUTINE MAINTENANCE

a. Remove equipment from the rack, and thoroughly inspect the insides of chassis for signs of dirt, dampness, moulding, charring and corrosion. Correct any defect found. A recommended cleaning agent is clean carbon tetrachloride applied with a soft brush. Recommended SEMI-ANNUALLY.

b. Test all DC and AC voltages as indicated on the respective tube voltage data sheets and investigate any serious discrepancies. Recommended SEMI-ANNUALLY.

c. Test each tube one at a time in a reliable tube tester, replacing tube in socket from which it was removed, if its measured characteristics are within the manufacturers tolerances. (usually plus or minus 20% from tube manual values). Replace those tubes only which are found to be below par. Recommended QUARTERLY.

d. When replacing the DCU in the rack, be certain that all terminal strip screw connections at the rear of the equipment are tight.

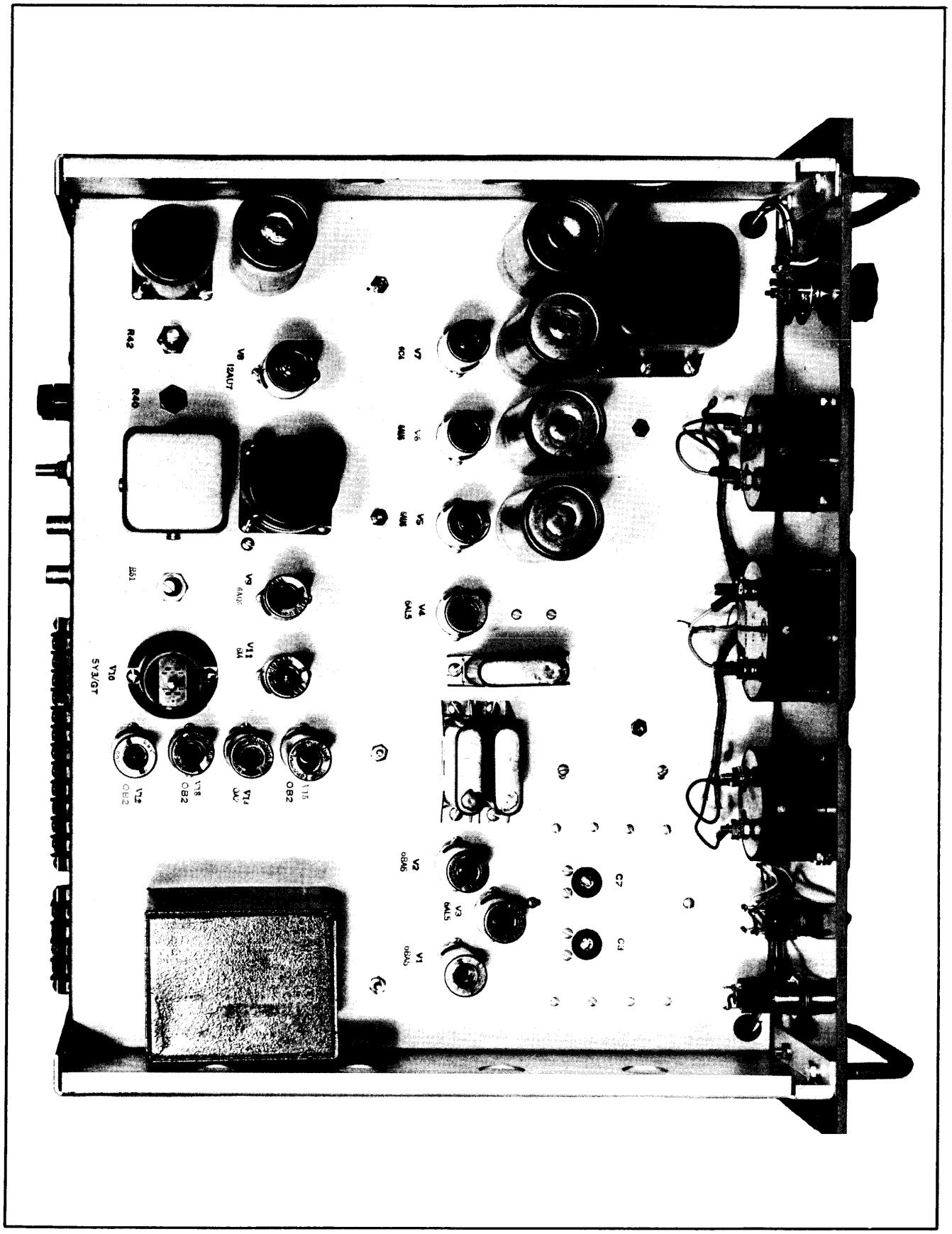

Figure 6-1. Diversity Combining Unit, Model DCU-1. Top View.

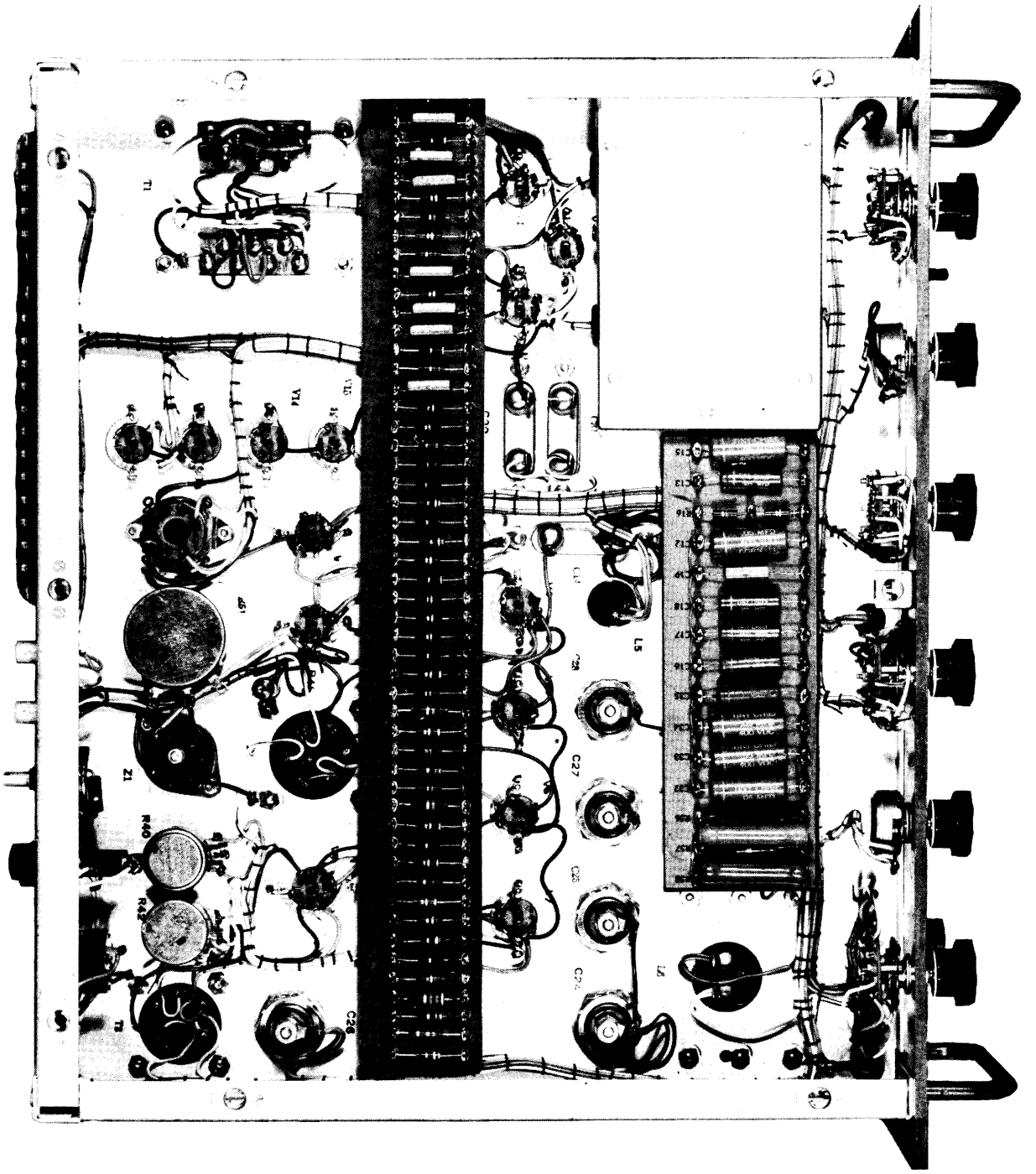

Figure 6-2. Diversity Combining Unit, Model DCU-1. Bottom View.

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SECTION VII
CORRECTIVE MAINTENANCE

1. SYSTEM TROUBLE SHOOTING

For the purpose of trouble shooting the DCU may be broken down into four sections, each of which functions as a unit. These are as follows:

Sec. A: I.F.
- a. The two I.F. amplifiers (V1 and V2).
- b. The two detectors (V3).
- c. The noise limiter ($\frac{1}{2}$V4).

Sec. B: PULSE
- a. The clamp circuit ($\frac{1}{2}$V4).
- b. The first pulse amplifier (V5).
- c. The second pulse amplifier (V7).

Sec. C: TONE
- a. The keyer tube (V7).
- b. The tone amplifier (V8).
- c. The tone oscillator (V9).

Sec. D: POWER
- a. The positive supply rectifier (V10).
- b. The positive supply voltage regulators (V12, V13).
- c. The negative supply rectifier (V11).
- d. The negative supply voltage regulators (V14, V15).

It is strongly suggested that the repair technician devote himself to one section at a time. In this manner he may cross-check one section against another and more readily isolate unit failure. A suggested procedure follows:

In the event of Failure -

A. UNIT LIGHTS UP BUT ONLY ONE OF THE DIODE CURRENT METERS READS.

a. The non-reading meter indicates that its channel is not operating. Voltage and tube checks should be made of this channel of Sec. A.

B. UNIT LIGHTS UP BUT NEITHER DIODE CURRENT METER READS.

a. Turn TEST SWITCH to MARK position.

If no tone output is obtained this signifies that the power supply must not be working (Since both Sec. A and Sec. C are not operating). Check Sec. D for both shorts and tube failures.

If tone output is obtained this signifies that the power supply must be working and that the fault is in both channels of Sec. A. Check connections from receivers, voltages and tubes.

C. BOTH DIODE CURRENT METERS READ BUT NO KEYING IS OBTAINED.

a. Turn TEST SWITCH to MARK position. If tone output is obtained then failure is in Section B. Check tubes and voltages.

b. If tone output is not obtained then failure is in Section C. Check tubes and voltages.

D. BLOWN FUSE.

a. If fuse has blown, replace it with another of equal rating.

b. If replacement fuse blows, remove unit from rack and make routine resistance checks for shorted component or tube.

Once the troublesome section has been isolated, signal tracing may be necessary if simple voltage checks are found to be inadequate.

In the event that it becomes necessary to change the factory pre-set controls, the following procedure may be used:

A. THE BIAS CONTROL (R40):

Set the TEST SWITCH to MARK position and rotate R40 until point F on T2 is approximately minus one volt with respect to ground. (Using a VTVM as a measuring device)

B. THE BALANCE CONTROL (R42):

Load the secondary of T3 with approximately 600 ohms (across terminals 11 and 12 of terminal board E1). Using an oscilloscope, observe the wave envelope of the output voltage across terminals 11 and 12 while the DCU is b

across terminals 11 and 12 while the DCU is being keyed. Set the BALANCE CONTROL for minimum wave envelope distortion.

C. THE TONE CALIBRATION (R51):

Place the TEST SWITCH in MARK position. Observe the output waveform of the tone itself (across terminals 11 and 12 of terminal board E1). Using a stable and well calibrated audio oscillator, connect the oscilloscope so that a Lissajous figure is obtained. Rotate R51 until proper frequency calibration is obtained.

D. THE I.F. TUNING CONDENSERS (C3, C7):

Tune in a phone carrier on one of the receivers while the other is turned off. Tune C3 or C7 (whichever is in the channel containing the received signal) for maximum signal indication on the I.F. diode plate microammeter.

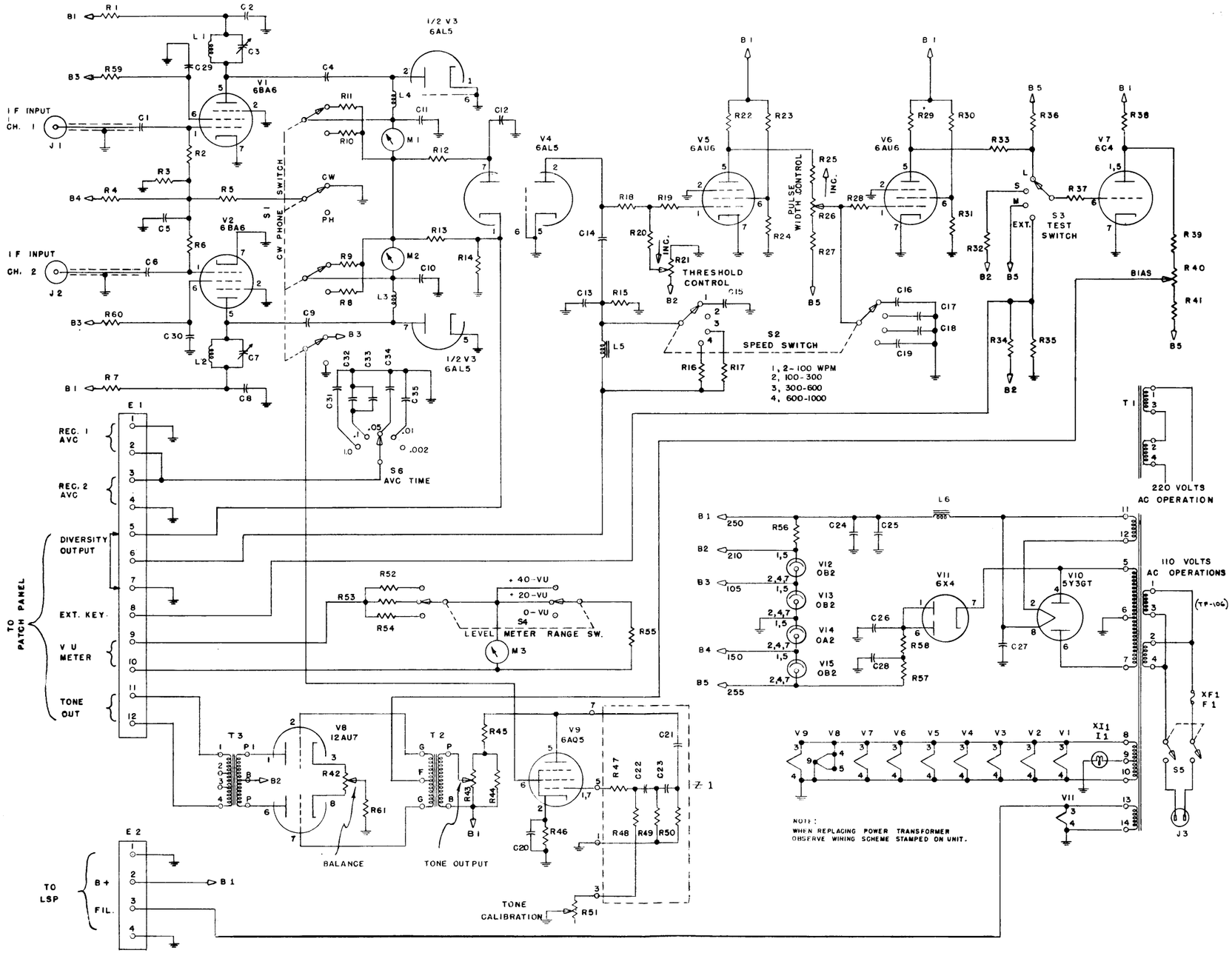

Figure 7-1. DCU-1 Schematic Diagram

ELECTRICAL PARTS LIST

FOR

DIVERSITY COMBINING UNIT, MODEL DCU

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C1	CAPACITOR, fixed: mica; 200 mmfd, ±10%; 500 wvdc.	V1 Grid Coupling	CM20A201K
C2	CAPACITOR, fixed: mica; 1000 mmfd, ±10%; 500 wvdc.	V1 Plate Coupling	CM20A102K
C3	CAPACITOR, variable: ceramic; rotary type, single sect; 7-45 mmfd; 500 wvdc.	V1 Plate Decoupling	CV11C450
C4	CAPACITOR, fixed: mica; 100 mmfd, ±10%; 500 wvdc.	V1 Plate Coupling	CM20A101K
C5	CAPACITOR, fixed: mica; 1000 mmfd, ±10%; 500 wvdc.	V1, V2 Grid Bypass	CM20A102K
C6	CAPACITOR, fixed: mica; 200 mmfd, ±10%; 500 wvdc.	V2 Grid Coupling	CM20A201K
C7	CAPACITOR, variable: ceramic; rotary type, single sect; 7-45 mmfd, 500 wvdc.	V2 Tuning	CV11C450
C8	CAPACITOR, fixed: mica; 1000 mmfd, ±10%; 500 wvdc.	V2 Plate Decoupling	CM20A102K
C9	CAPACITOR, fixed: mica; 100 mmfd, ±10%; 500 wvdc.	V2 Plate Coupling	CM20A101K
C10	CAPACITOR, fixed: mica; 200 mmfd, ±10%; 500 wvdc.	V3 Plate Filter	CM20A201K
C11	CAPACITOR, fixed: mica; 200 mmfd, ±10%; 500 wvdc.	V3 Plate Filter	CM20A201K
C12	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc; tubular plastic molded case.	V4 Plate Bypass	CN-100-3
C13	CAPACITOR, fixed: paper; .005 mmfd, +40, -20%; 600 wvdc; tubular plastic molded case.	V5 Input Filter	CN-100-13
C14	CAPACITOR, fixed: paper; 1.0 mfd., ±10%; 600 wvdc; hermetically sealed metal case.	V5 Grid Coupling	CP69B1EF105K
C15	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc; tubular plastic molded case.	V5 Input Filter	CN-100-3

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C31	CAPACITOR, fixed: paper dielectric; 1.0 mfd, ±10%; 600 wvdc; hermetically sealed metal case.	AVC Time Constant	CP69B1EF105K
C32	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc; tubular plastic molded case.	AVC Time Constant	CN-100-3
C33	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc; tubular plastic molded case.	AVC Time Constant	CN-100-3
C34	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc; tubular plastic molded case.	AVC Time Constant	CN-100-3
C35	CAPACITOR, fixed: paper; .01 mfd, +40, -20%; 400 wvdc; tubular plastic molded case.	AVC Time Constant	CN-100-1
E1	BOARD, terminal: general purpose barrier type; twelve brass nickel plated 6-32 x 1/4'' binding head screws, w/''Y'' type solder terms.	Input - Output	TM-100-12
E2	BOARD, terminal; general purpose barrier type; four brass nickel plated 6-32 x 1/4'' binding head screws, w/''Y'' type solder terms.	Voltage Output Board	TM-100-4
F1	FUSE, cartridge; 2 amp; oper in one hour at 135% and in 25 sec at 200% load, rated continuous at 110% load; 250 volts; one time.	Main Power Fuse	FU-100-2
I1	LAMP, incandescent: 6-8 volts; 0.250 amp; bulb T-3-1/4 clear, miniature bayonet base.	On - Off Indicator	BI-101-44
J1	CONNECTOR, coaxial: female chassis receptacle; BNC type.	Ch 1 Input	UG-625/U
J2	CONNECTOR, coaxial: female chassis receptacle; BNC type.	Ch 2 Input	UG-625/U
J3	CONNECTOR, assembly: male contact; flush motor plug type; two parallel non-polarized straight contacts; 10 amp; 250 volts.	A.C. Line Connector	JJ-100
L1	CHOKE, RF: 2.5 mh; 125 ma; ceramic form.	V1 Plate Coil	CL-109-1
L2	CHOKE, RF: 2.5 mh; 125 ma; ceramic form.	V2 Plate Coil	CL-109-1
L3	CHOKE, RF: 30 mh; 100 ma; ceramic form.	V3 Filter	CL-109-7

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R14	RESISTOR, fixed: composition; 100,000 ohms, ±10%; 1/2 watt.	V3 Plate Load	RC20GF104K
R15	RESISTOR, fixed: composition; 220,000 ohms, ±10%; 1/2 watt.	V5 Grid Filter Load	RC20GF224K
R16	RESISTOR, fixed: composition; 82,000 ohms, ±10%; 1/2 watt.	V5 Input Filter	RC20GF823K
R17	RESISTOR, fixed: composition; 150,000 ohms, ±10%; 1/2 watt.	V5 Input Filter	RC20GF154K
R18	RESISTOR, fixed: composition; 100,000 ohms, ±10%; 1/2 watt.	V4 Plate Isolation	RC20GF104K
R19	RESISTOR, fixed: composition; 470,000 ohms, ±10%; 1/2 watt.	V5 Grid Isolation	RC20GF474K
R20	RESISTOR, fixed: composition; 1 megohm, ±10%; 1/2 watt.	V5 Grid Voltage Div.	RC20GF105K
R21	RESISTOR, variable: composition; potentiometer; 500,000 ohms, ±20%; 2 watt; 1/4'' slotted shaft; 7/8'' fr. mtg. sfc.	V5 Grid Voltage Div.	RV4ATSD504B
R22	RESISTOR, fixed: composition; 470,000 ohms, ±10%; 1/2 watt.	V5 Plate Load	RC20GF474K
R23	RESISTOR, fixed: composition; 82,000 ohms, ±10%; 1 watt.	V5 Screen Voltage Div.	RC30GF823K
R24	RESISTOR, fixed: composition; 22,000 ohms, ±10%; 1/2 watt.	V5 Screen Voltage Div.	RC20GF223K
R25	RESISTOR, fixed: composition; 820,000 ohms, ±10%; 1/2 watt.	V6 Grid Voltage Div.	RC20GF824K
'R26	RESISTOR, variable: composition; potentiometer; 2.5 megohms, ±20%; 2 watts; 1/4'' flatted shaft; 7/8'' fr. mtg. sfc.	V6 Grid Voltage Div.	RV4ATFD255B
R27	RESISTOR, fixed: composition; 3.9 megohms, ±10%; 1/2 watt.	V6 Grid Voltage Div.	RC20GF395K
R28	RESISTOR, fixed: composition; 3.3 megohms, ±10%; 1/2 watt.	V6 Grid Isolation	RC20GF335K
R29	RESISTOR, fixed: composition; 470,000 ohms, ±10%; 1/2 watt.	V6 Plate Load	RC20GF474K
R30	RESISTOR, fixed: composition; 82,000 ohms, ±10%; 1 watt.	V6 Screen Voltage Div.	RC20GF823K
R31	RESISTOR, fixed: composition; 22,000 ohms, ±10%; 1/2 watt.	V6 Screen Voltage Div.	RC20GF223K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R50	RESISTOR, fixed: metallized film; 11,111 ohms, ±1%; 1/2 watt. (Part of Z1)	V9 Grid Phasing Network	RR-104-11111
R51	RESISTOR, variable: wire-wound; potentiometer; 15,000 ohms, ±10%; 3 watts; 1/4" slotted shaft; 5/8" fr. mtg. sfc.	V9 Grid Phasing Network	RA-100-3
R52	RESISTOR, fixed: composition; 200,000 ohms, ±5%; 1/2 watt.	M3 Multiplier	RC20GF204J
R53	RESISTOR, fixed: composition; 20,000 ohms, ±5%; 1/2 watt.	M3 Multiplier	RC20GF203J
R54	RESISTOR, fixed: composition; 1,300 ohms, ±5%; 1/2 watt.	M3 Multiplier	RC20GF132J
R55	RESISTOR, fixed: composition; 2,700 ohms, ±5%; 1/2 watt.	M3 Shunt	RC20GF272J
R56	RESISTOR, fixed: wire-wound; 1500 ohms, ±10%; 10 watt.	V10 Voltage Div.	RW-109-26
R57	RESISTOR, fixed: composition; 1000 ohms, ±10%; 2 watts.	V11 Voltage Div.	RC42GF102K
R58	RESISTOR, fixed: composition; 3000 ohms, ±10%; 2 watts.	V11 Voltage Div.	RW-109-30
R59	RESISTOR, fixed: composition; 4700 ohms, ±10%; 1/2 watt.	V1 Screen Drop	RC20GF472K
R60	RESISTOR, fixed: composition; 4700 ohms, ±10%; 1/2 watt.	V2 Screen Drop	RC20GF472K
R61	RESISTOR, fixed: composition; 3900 ohms, ±10%; 1/2 watt.	V8 Cathode Bias	RC20GF392K
S1	SWITCH, rotary: non-shorting; single section; four pole, 2 position.	CW-Phone Switch	SW-119
S2	SWITCH, rotary: non-shorting; single sect; 2 pole, 4 position.	Speed Switch	SW-120
S3	SWITCH, rotary: non-shorting; single sect; 2 pole, 4 position.	Test Switch	SW-120
S4	SWITCH, rotary: non-shorting; single sect; 2 pole, 3 position.	Level Meter Switch	SW-112
S5	SWITCH, toggle: DPST; 3 amp, 250 volts; phenolic body.	Line Switch	ST22K
S6	SWITCH, rotary: non-shorting; single sect; 5 position.	AVC Time Switch	SW-118

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
V13	TUBE, electron: OB2; min. 7 pin voltage regulator.	Plus Supply Voltage Reg.	OB2
V14	TUBE, electron: OA2; min. 7 pin type regulator.	Minus Supply Voltage Reg.	OA2
V15	TUBE, electron: OB2; min. 7 pin voltage regulator.	Minus Supply Voltage Reg.	OB2
XF1	HOLDER, fuse: extractor post type; for single AGC cartridge fuse.	Fuse Holder	FH-100-2
XI1	LIGHT, indicator: w/lens; 1/2'' d. red smooth lens; for min. bay base; T-3-1/4 bulb.	Pilot Light	TS-106-1
XV1, 2,3,4, 5,6,7, 9, 11, 12,13, 14,15.	SOCKET, tube: 7 pin min; one piece saddle mounting.	Socket for V1, 2,3,4,5,6,7,9,11, 12,13,14,15.	TS102P01
XV8	SOCKET, tube: 9 pin min; one piece saddle mounting.	Socket for V8	TS103P01
XV10	SOCKET, tube: octal; mip-moulded-in-plate.	Socket for V10	TS-121
Z1	NETWORK, freq. determining (2125) cps; three series cap. elements, three shunt res. elements; phase shift network; mtd in turret type shielded octal base case.	Freq. Determining Network	A-358

ADDENDUM

DIVERSITY COMBINING UNIT, MODEL DCU-1

The following engineering change has been made in Model DCU-1, Serial No. 179 and up. It is suggested that this change be entered in the Electrical Parts List, Section 7 of your Instruction Manual.

SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C-17	CAPACITOR, fixed: mica; 2700 mmfd, ±5%; 500 wvdc.	V6 Grid Time Constant	CM30C272J

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