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VA-1ØØN

VIDEO DISTRIBUTION AMPLIFIER

SCHEDULE.....
CONTRACT.....
CONTRACT
ITEM No.....
SERIAL
ITEM No.....

MATERIAL
ACCEPTANCE
CERTIFICATE.....

8Ø1154 21-Ø2-1985

DESIGNED AND MANUFACTURED
IN AUSTRALIA

VA-1ØØN

VIDEO DISTRIBUTION AMPLIFIER

INSTRUCTION BOOK

W A R N I N G

OPERATION OF ELECTRONIC EQUIPMENT INVOLVES THE USE OF VOLTAGES AND CURRENTS WHICH MAY BE DANGEROUS TO HUMAN LIFE. OPERATING PERSONNEL SHOULD OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE COMPONENTS OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH POWER ON UNLESS PROPER PRECAUTIONS ARE OBSERVED. NOTE THAT UNDER CERTAIN CONDITIONS DANGEROUS POTENTIALS MAY EXIST IN SOME CIRCUITS EVEN THOUGH POWER CONTROLS ARE IN THE **OFF** POSITION.

GENERAL DESCRIPTION

The VA-1ØØN is a D.C. powered Video Distribution Amplifier of modular construction having facilities for cable equalization and longitudinal hum reduction.

The input is designed to provide a bridging loop impedance over the video bandwidth with respect to 75 ohm. Six 75 ohm A.C. coupled outputs are provided.

The input is isolated to enable rejection of longitudinally developed hum.

Cable equalization is provided for up to 3ØØ metres of Belden 8281 75 ohm video cable.

Front panel controls allow the video gain to be varied by +/- 3dB, and the cable equlization to be independantly set to compensate for the appropriate length of cable. Internal pre-set controls allow adjustment of the amplifier high frequency response, low frequency response, optimization of the longitudinal hum rejection, the D.C. regulator output voltage and output stage D.C.

The VA-1ØØN is operated from negative 48V D.C.

Equipment provided:-

1	VA-1ØØN Video Distribution Amplifier
1	Slide Tray
1	RB-1N Rear Assembly

ACCESSORIES AVAILABLE

F-1ØØD	Module Mounting Frame :- Provides mounting for up to 1Ø VA-1ØØN amplifiers side by side in 134mm of standard Rack space. (3 Rack Units)
TME-1A	Module Extender: Enables a module to be operated in position and provide access to all circuit boards, transistors and internal adjusments.
RB-1N	Rear Assembly: An additional rear assembly may be puchased to permit bench testing and servicing of the amplifier without disturbing the rear assemblies supplied with the amplifiers.

TECHNICAL SPECIFICATIONS

Power Requirements -	47 to 53V D.C. Positive Earthed, @ 125mA maximum.
Input Characteristics	
Input impedance:	Bridging, loop input with a return loss on 75 ohms of 36dB when tested with a Sine squared T pulse.
Input Signal Range:	Ø.5V to 2.ØV P-P composite or non-composite video for 1V P-P video output.
Input connector:	1.6/5.6
Transfer Characteristics	
Overall Gain:	+/-3 dB.
Frequency Response:	+/-Ø.1 dB to 1Ø MHz. (Ø.5V P-P Sweep signal)
Rise and Fall Times:	Less than 15nS
Pulse and Bar Response:	K Factor less than Ø.2% on Sine Squared T pulse.
Differential Phase: at 4.43 MHz	Using Tektronix 141 Signal Generator less than Ø.5 deg at 1V P-P out.
Differential Gain: at 4.43 MHz	Using Tektronix 141 Signal Generator less than Ø.5% at 1V P-P out.
Gain Stability:	+/-Ø.1 dB over the operating temperature and battery voltage range.
Low Frequency Response:	K factor on 5Ø Hz Square wave: less than Ø.4%
Noise:	Less than 6Ø dB RMS below 1V P-P
Temperature Operating Range:	1Ø deg C to 55 deg C
Longitudinal Hum Rejection:	With input and output grounds isolated, better than 4ØdB at 5ØHz.
Cable Equalization:	Front Panel Control:- Equalizing of up to 3ØØ metres of 75 ohm cable.

Output Characteristics

Number of Outputs:	6-A.C. coupled
Output Impedance:	75 ohm with a return loss better than 3Ø dB on a Sine Squared T Pulse.
Output Load Impedance:	75 ohm
Maximum Outputs:	2.ØV P-P comp. or Non comp. Video 3.ØV P-P Sine Wave at 1MHz. 2.5V P-P Sine Wave at 5MHz. 2.ØV P-P Sine Wave at 1ØMHz.
Output connector:	1.6/5.6

CIRCUIT DESCRIPTION

The VA-1ØØN consists of a common emitter stage providing a high input impedance and signal inversion followed by two inverting stages, a driving stage and a low impedance output stage.

Amplifier Stages

Q2 and Q3 form a high impedance common emitter stage to bridge the video line and provide common mode rejection and inversion of the input signal. The load placed across the input line by the common emitter stage is compensated within the pass band by a series inductance mounted in the rear assembly.

The collector of Q2 is D.C. coupled to Q9 which again inverts the signal and provides feedback via R6 to the base of Q3, and also drives via R1Ø/C8, a further invertinng stage Q4. The gain of the amplifier is set by front panel control RV1. The signal is once more inverted and fed via the collector of Q4 to the base of Q5 which provides the drive to the output stage. L1 in the emitter of Q5 tailors the amplifier response and prevents amplifier instability. the signal from the Q5 collector feeds the base of output drive transistor Q6. A portion of the inverted signal from the Q6 collector is fed via ZD2 and C7 to the base of Q7. Q6 and Q7 operate in a push pull mode to provide a very low output impedance.

A.C. feedback is taken from the output side of the output coupling capacitors via R18,R2Ø,C12 and C13 to the emitter of Q4. Thus Q4,Q5 and Q7 form a 12 dB gain stage with low impedance.

Varying C12 provides adjustment to the high frequency response. C24 and RV5 provide compensation for the low frequency response.

R24 to 29 provide output impedance of 75 ohm for the six outputs.

R22 provides an earth return for the output capacitors whenever the outputs are unterminated.

Power Supply

The series regulator Q1, Zener ZD1 and control transistor Q8 and Q1Ø provide a regulated supply of approximately 2ØV.

Under fault conditions the maximum current that can be drawn by the amplifier is limited by resistor R23. The power rating of this resistor is such that it will remain within its ratings even if the amplifier power rail is short circuited.

Cable Equalization

To provide a rising response necessary to equalize long video cables the emitter resistor RV2 of Q4 is partially bypassed by the network comprising R3Ø-33 and C17-2Ø and C25-28. This network is factory adjusted to suit Belden type 8281 75 ohm Coaxial Cable. Should other cable equalizers be required they can be fitted inside the amplifier chassis on standoffs. The wire link between RV2 and R33 is easily removeable, facilitating the connections of the new equalizer.

INSTALLATION

The VA-1ØØN is supplied with a slide tray, rear assembly and associated hardware, for mounting in an F-1ØØD frame.

Slide Tray

The slide tray is a shallow tray which supports the amplifier in the frame. It is mounted on the front and rear cross members of the frame and is fixed in place with steel clips (speed nut type) provided.

Rear Assembly

The rear assembly is mounted on the rear of the frame with the screws provided. Care should be taken not to over tighten these screws, as excessive force will damage the thread in the mounting frame.

Signal Connections

Signal connections are made via coaxial connectors mounted on the rear assembly. The input loop, if not used should be terminated in 75 ohm as should any unused outputs of the amplifier.

SETTING UP PROCEDURE

The amplifier should be set up in the position in which it is intended to be operated. Adjustments can then be made using the intended lenghts of cable and with all outputs terminated as they would be in service.

The cable equalizing should be set to its minimum and the gain control adjusted to give the required low frequency gain. Using a suitable test signal, such as pulse and bar, multiburst or sweep, the cable equalization can be advanced to compensate for cable losses.

It should be noted that the equalizers are factory set to match Belden type 8281 75 ohm cable.

Whilst for short runs this equalizer will be satisfactory for most 75 ohm solid dielectric cables, for longer runs of some cables the equalizer may have to be reset (a factory adjustment) or replaced with a specially designed module.

MAINTENANCE

Once having been adjusted the Video Distribution Amplifier will need little attention. It is wise however to ocasionally check the adjustments as described earlier. This will also be necessary after a component has been replaced.

Most faults can be readily traced by checking the D.C. voltages at various points in the circuit. The table of voltages given in this book can be used as a guide but deviations sometimes in the vicinity of +/-1 volt can be expected in some units. The voltages should be checked starting from the input as the D.C. conditions of the whole amplifier are set in the first stage, thus a fault early in the circuit will cause errors at the output.

TABLE OF VOLTAGES

Q	Emitter	Base	Collector
1	19.8	2Ø.5	27.Ø
2	5.5	6.1	19.1
3	5.5	6.1	19.8
4	5.5	6.1	19.1
5	19.7	19.1	5.6
6	5.Ø	5.65	15.Ø
7	Ø	Ø.7	5.Ø
8	5.7	6.3	2Ø.4
9	19.8	19.2	6.1
1Ø	43.Ø	42.6	2Ø.4

All voltages measured with a high input impedance multimeter under conditions of unity gain. All voltages are measured with respect to earth. Supply voltage is -5Ø.ØV D.C. Test signal is 1V P-P composite Stair Step.

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TEST PROCEDURE

TEST	TEST EQUIPMENT	TOLERANCE
Plug unit under test into Testing Jig which has all six outputs terminated in 75 ohms, and apply 5ØV DC power. Set control RV2 to minimum. Set overall gain to Output 6 to approximately ØdB using RV1(Gain). Check for similar output level on other 5 outputs.	CRO, CRO probe, 141 Signal Gen, 75 ohm termination.	
Set regulator output volts to -19.8	Voltmeter.	19-2ØV
Adjust DC voltage at -ve lead of C14 using RV3 to approximately 4.8V	Voltmeter.	4.2-5.4V
Using co-axial transformer, adjust HUM BAL (RV4) for maximum hum rejection. Result to be within tolerance.	Co-axial Transformer, CRO, 141 Sig Gen.	>4ØdB
Measure output signal amplitude on an output at maximum and minimum setting of Gain (RV1). Result to be within tolerance.	CRO, 141 Sig Gen, 75 ohm term.	<Ø.7V >1.4V
Adjust Tilt (RV5) for minimum tilt using Field Rate Square Wave test signal. Result to be within tolerance.	148 Sig Gen, CRO, 75 ohm term	Ø.5%
Using Marconi TF1Ø99 Differential Sweep Unit adjust C12 for ØdB gain at 1ØMHz. (Sweep output set to Ø.5V P-P approximately). Passband ripple to be within tolerance.	TF1Ø99 Sweep, CRO.	+/-.1dB <1ØMHz
Using a mod stairstep signal and Vectorscope measure the differential phase at 4.43MHz at 1V P-P and an APL of 1ØØ%. Result to be within tolerance.	141 Sig Gen, 52Ø Vectorscope.	Ø.5 deg
Using equipment as above measure differential gain. Result to be within tolerance.	As above	Ø.5%

Using a mod stairstep signal and Vectorscope measure the differential phase at 4.43 MHz at 1.4V P-P, and an APL of 1ØØ%. Use the standard 1V P-P signal as the input but increase the gain to achieve the 1.4V P-P output signal. Result to be within tolerance.	As above	1 deg
Using equipment and setup as above measure differential gain. Result to be within tolerance. At completion of test return gain to ØdB.	As above	1 %
Check regulator output voltage (-ve lead of C3) is constant for inpuit voltages between 47 and 53.	Variable PSU, Voltmeter	+/-.1V
Check VDA still operates with supply voltage of 43 ie still passes video but with some low frequency distortion	141 Sig Gen, Variable PSU, CRO	
With gain set at ØdB read noise at output in V RMS. Result to be within tolerance.	31ØB VTVM	2ØØuV
Check return loss at input. Result to be within tolerance.	1T P&B Return Loss Bridge, CRO	36dB
Check return loss of an output. Result to be within tolerance.	As above	3ØdB
Check isolation between outputs 4 & 5 at 4.43 MHz. Result to be within tolerance.	Vector Volt Meter, Sub-Carrier	4ØdB
Check amplifier stability by removing all output terminating resistors.	CRO	
Adjust cable equaliser.(RV2, C17-2Ø)	CRO, 1T P&B, Belden 8281 co-ax.	Best fit.
Adjust knob on RV1 to show Ø for ØDB gain.		
Vibration test the VDA.		

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TYPE VA-1ØØN

TEST RESULTS

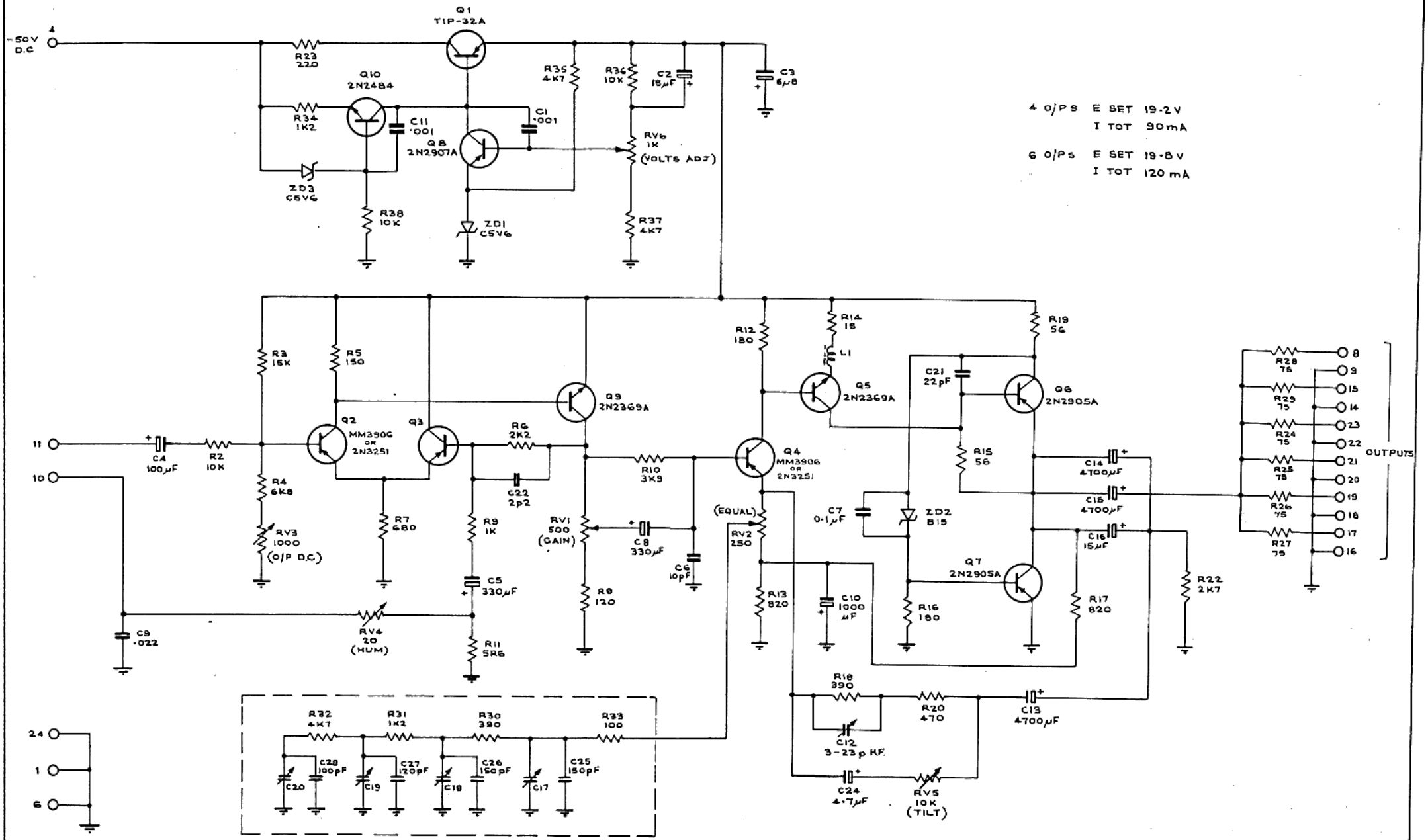
For explanation of tests refer to Drawing 8Ø1182

TEST	RESULT	TOLERANCE.
O/P Test	.....	All operative
Set Vrail	.....	19-2ØV
O/P DC	.....	4.2-5.4V
Hum rejection	.....	4ØdB
Max gain	.....	>1.4V
Min gain	.....	<Ø.7V
Tilt	.....	Ø.5%
Freq response	.....	Ø.1dB
Delta Phase 1V	.....	Ø.5 deg
Delta Gain 1V	.....	Ø.5%
Delta Phase 1.4V	.....	1.Ø deg
Delta gain 1.4V	.....	1.Ø%
Regulator	.....	+/-.1V
43V operation	.....	
Noise	.....	2ØØuV
I/P return loss	.....	36dB
O/P return loss	.....	3ØdB
O/P isolation	.....	4ØdB
Stability	.....	
Equaliser	.....	
Gain Knob	.....	
Vibration	.....	

Testing Officer

Date / /

Serial No



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TITLE VA-100N VIDEO DISTRIBUTION AMPLIFIER

SIZE | SCALE

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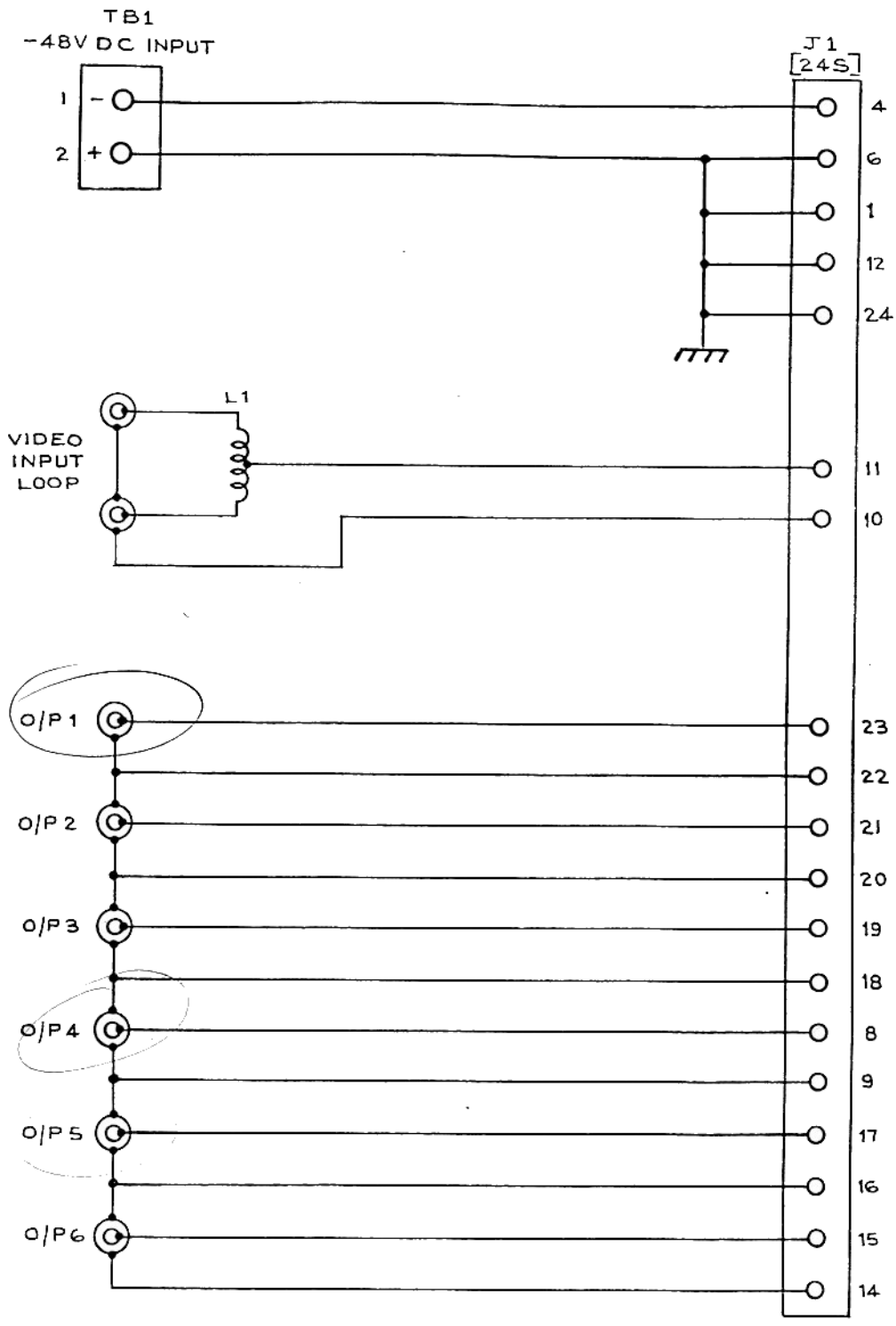

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Replacement Parts List **VA-100N VIDEO DISTRIBUTION AMPLIFIER 801154**

Part No.	Description.	Qty	Cct Ref.	Sup
RMF252-10K	RESISTOR METAL FILM .25W 2%	1	R2	92
RMF502-5R6	RESISTOR METAL FILM .5W 2%	1	R11	92
RMF502-15R	RESISTOR METAL FILM .5W 2%	1	R14	92
RMF502-56R	RESISTOR METAL FILM .5W 2%	2	R15,19	92
RMF502-75R	RESISTOR METAL FILM .5W 2%	6	R24-29	92
RMF502-100R	RESISTOR METAL FILM .5W 2%	1	R33	92
RMF502-120R	RESISTOR METAL FILM .5W 2%	1	R8	92
RMF502-150R	RESISTOR METAL FILM .5W 2%	1	R5	92
RMF502-180R	RESISTOR METAL FILM .5W 2%	2	R12,16	92
RMF502-390R	RESISTOR METAL FILM .5W 2%	2	R18,30	92
RMF502-470R	RESISTOR METAL FILM .5W 2%	1	R20	92
RMF502-680R	RESISTOR METAL FILM .5W 2%	1	R7	92
RMF502-820R	RESISTOR METAL FILM .5W 2%	2	R13,17	92
RMF502-1K	RESISTOR METAL FILM .5W 2%	1	R9	92
RMF502-1K2	RESISTOR METAL FILM .5W 2%	2	R31,34	92
RMF502-2K2	RESISTOR METAL FILM .5W 2%	1	R6	92
RMF502-2K7	RESISTOR METAL FILM .5W 2%	1	R22	92
RMF502-3K9	RESISTOR METAL FILM .5W 2%	1	R10	92
RMF502-4K7	RESISTOR METAL FILM .5W 2%	3	R32,35,37	92
RMF502-6K8	RESISTOR METAL FILM .5W 2%	1	R4	92
RMF502-10K	RESISTOR METAL FILM .5W 2%	2	R36,38	92
RMF502-15K	RESISTOR METAL FILM .5W 2%	1	R3	92
PW10-220R	RESISTOR WIRE WOUND 10W 5%	1	R23	51
H2072Z01	PCB PINS	2		54
63P200	RESISTOR VARIABLE 20R	1	RV4	69
63P102	RESISTOR VARIABLE 1K	2	RV3,6	69
63P103	RESISTOR VARIABLE 10K	1	RV5	69
4322-020-3442	FERRITE BEAD	1	L1	81

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Replacement Parts List **VA-100N VIDEO DISTRIBUTION AMPLIFIER 801154**

Part No.	Description.	Qty	Cct Ref.	Sup
301N7502P2	CAPACITOR TUBULAR CERAMIC 2.2pF	1	C22	92
CC10P	CAPACITOR CERAMIC 10pF	1	C6	43
CC22P	CAPACITOR CERAMIC 22pF	1	C21	43
CC100P	CAPACITOR CERAMIC 100pF	1	C28	43
CC120P	CAPACITOR CERAMIC 120pF	1	C27	43
CC150P	CAPACITOR CERAMIC 150pF	2	C25,26	43
CC10N	CAPACITOR CERAMIC 10nF	1	C1	43
CC22N	CAPACITOR CERAMIC 22nF	1	C9	43
CC100N	CAPACITOR CERAMIC 100nF	1	C7	92
TAS475K020POC	CAPACITOR TANTALUM 4.7/20V	1	C24	67
TAS685K035POC	CAPACITOR TANTALUM 6.8/35V	1	C3	67
TAS156K020POC	CAPACITOR TANTALUM 15/20V	2	C2,16	67
TAS337K006POG	CAPACITOR TANTALUM 330/6V	2	C5,8	67
PEG123HA310	CAPACITOR ALUM 100/25V	1	C4	76
PEG124EF410	CAPACITOR ALUM 1000/10V	1	C10	76
PEG123DJ447	CAPACITOR ALUM 4700/6.3V	3	C13-15	76
808-11229	CAPACITOR VARIABLE 2-20pF	1	C12	43
TZ03P600E	CAPACITOR VARIABLE 10-60pF	4	C17-20	51
BZX79B5V6	DIODE ZENER 5.6V 10%	2	ZD1,3	43
BZX79B15	DIODE ZENER 15V 5%	1	ZD2	43
TIP 32A	TRANSISTOR POWER TO-220 PNP	1	Q1	81
2N2369A	TRANSISTOR RF TO-18 NPN	2	Q5,9	81
2N2484	TRANSISTOR AUDIO TO-18 NPN	1	Q10	81
2N2905A	TRANSISTOR HF TO-39 PNP	2	Q6,7	81
2N2907A	TRANSISTOR HF AMP TO-18 PNP	1	Q8	81
MM3906/2N3251	TRANSISTOR RF AMP TO-18 PNP	3	Q2-4	81
2230B-5	HEAT SINK TO-5	2		81
5022	CO-AX CABLE RG-1788/U	.23m		20

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Replacement Parts List **VA-100N VIDEO DISTRIBUTION AMPLIFIER 801154**

Part No.	Description.	Qty	Cct Ref.	Sup:
STANDOFF .25	STANDOFF 6BAx1/4"	6		43:
PC802054	PCB VA-100N ISSUE 1	1		68:
WA2G024S251U	RESISTOR VARIABLE 250R	1	RV2	2 :
WA2G024S501U	RESISTOR VARIABLE 500R	1	RV1	2 :
021-1220	KNOB 9mm x .125 BLACK + LINE	2	RV1,2	10:
040-1620	CAP 7mm BLACK + LINE	2	RV1,2	10:
26-4100-24P	CONNECTOR 24 PIN P	1	P1	54:
E801172	ESCUTCHEON VA-100N	1		62:
801567	HANDLE S/W	1		26:
800028	COVER S/W MODULE	1		26:
800029	FRAME S/W MODULE	1		26:
801775	SIDE COVER	1		26:
SBV1700/14/0016	BRASS STUD	1		70:
SNU/0520/17/4	"U" NUTS	1		70:

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Replacement Parts List **RB-1N REAR ASSEMBLY 801180 ISSUE 2**

Part No.	Description.	Qty:	Cct Ref.	Sup:
26-4200-24S	CONNECTOR 24 PIN S	1	J1	54
AC40334-A76-A14	CONNECTOR COAXIAL 1.5/6	8		86
2510625300	TERMINAL BLOCK	1	TB1	61
PC801957	PCB I/P LOOP COMP	1	L1	68
PC801171	REAR PLATE RB-1N	1		26
800319	CHASSIS REAR ASSY S/W	1		26
800320	SIDE PLATE REAR ASSY	1		26
	SCREW ALLEN HEAD 4BA BLK	2		4