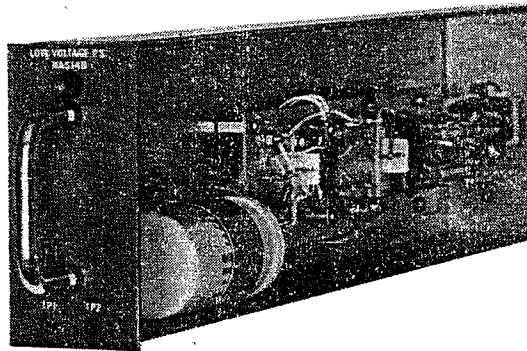


SERVICE INSTRUCTION

NAS14B

LOW VOLTAGE POWER SUPPLY MODULE



NAUTICAL ELECTRONIC LABORATORIES LIMITED

RR1 TANTALLON, HACKETT'S COVE

HALIFAX COUNTY, NOVA SCOTIA, CANADA

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LIST OF EFFECTIVE PAGES

The list of effective pages lists the status of all pages in this manual. Pages of the original issue are identified by a zero in the Change No. column. Pages subsequently changed are identified by the date of the change number. On a changed page, the text affected by the latest change is indicated by a vertical bar in the margin opposite the changed material.

Original 01 December 1985
Change 1 15 May 1986

Total number of printed sides in this manual is 10 as listed below:

PAGE	CHANGE No.	DATE	PAGE	CHANGE No.	DATE
Title	0	01 December 1985	5	1	15 May 1986
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INTRODUCTION

1. The NAS14B low voltage power supply module contains the unregulated +24 volt dc and regulated +15 volt dc power supplies for Nautel's AMPFET series of transmitters. Trouble shooting and repair of the module is performed on a work bench independent of it's associated transmitter. This document provides the information required for a competent technician to understand the operation of the electrical circuits and the procedures to restore defective modules to a serviceable status; using tools and test equipment normally available at an AM radio station workshop. An alternative to procedures provided in this document is to utilize Nautel's module exchange/repair service facilities.

FACTORY EXCHANGE/REPAIR SERVICE

2. Nautel provides a factory, module exchange/repair service for users of Nautel's AMPFET series of transmitters. Users who do not have repair facilities or who are not able to repair a module may utilize this service for a nominal fee.

MECHANICAL CONFIGURATION

3. The NAS14B low voltage power supply module utilizes a formed, metal chassis. An electrical connector and a guide pin are installed on the rear of the chassis; a stamped panel containing a handle, warning lamp and two test points, is installed on the front. All electrical components, except the filter capacitor which is mounted on the chassis, are mounted on a metal terminal board. Electrical interconnection between the components on the terminal board and between the terminal board and the remaining components is by soldering to standoff terminals or directly to the component. Refer to figure 3 for the assembly detail.

THEORY OF OPERATION (see figure 2)

4. The NAS14B low voltage power supply module provides unregulated 24 volt dc (nominal) and regulated 15 volt dc outputs for its associated transmitter.

4.1 A nominal 36 volt ac input is applied to full wave rectifier A1U1 thru fuses A1F1 and A1F2. The resultant unregulated 24 volts dc is smoothed by capacitor C1. Transients on the ac input are limited to 33 volts at the output of A1U1 by zener diode A1CR1. This unregulated 24 volts dc is applied thru diode A1CR3 to P1-3, as the associated transmitter's unregulated 24 volt dc power source; and through resistor A1R3 to test point TP1, which provides an external monitoring test point.

4.2 The unregulated 24 volts dc is also applied thru resistor A1R1 to 15 volt dc regulator A1U2. The resultant regulated 15 volt dc output of A1U2 is applied thru diode A1CR4 to P1-4, as the associated transmitter's regulated 15 volt dc power source; and through resistor A1R4 to test point TP2, which provides an external monitoring test point. Capacitors A1C2 and A1C3 provide additional filtering of the regulated 15 volt dc output.

4.3 If the output of A1U2 exceeds 16 volts dc, current will flow thru resistor A1R2 and zener diode CR2. When this current exceeds a nominal 10 milliamperes, the resultant voltage drop across A1R2 will forward bias thyristor A1Q1 and cause it to turn on. When A1Q1 is turned on, the input to A1U2 will be clamped to ground potential and the 15 volt dc output of A1U2 will be inhibited. The current flow thru A1R1, as the result of A1Q1 being turned on, will cause fuse F1 and/or F2 to blow. This circuit protects the associated transmitter's 15 vdc circuits from overvoltage if A1U2 fails in a short circuit condition. Transmitters that have only one low voltage power supply module will be shut down until the module is repaired or replaced. Transmitters that have more than one low voltage power supply module will continue to operate on the remaining low voltage power supply module(s).

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4.4 The regulated 15 volts dc output of A1U2 is also applied to the anode of light emitting diode DS1. DS1 will turn on when the output of 15 volt dc regulator A1U2 is 15 volts dc. When DS1 is on, it can be assumed the NAS14B low voltage power supply has ac power applied to it and its unregulated 24 volt dc and regulated 15 volt dc outputs are being produced.

TROUBLESHOOTING

5. Troubleshooting of NAS14B low voltage power supply modules that are defective or are suspected of being defective consists of performing a visual inspection and then conducting a functional test to isolate the defective components.

5.1 TEST EQUIPMENT AND SPECIAL TOOLS: The test equipment required is listed in table 1. There are no special tools required.

5.2 VISUAL INSPECTION: It is recommended that a visual inspection be performed on the low voltage power supply module prior to applying power. Inspect the module for the following:

- (a) Inspect all electrical components for evidence of overheating or physical damage.
- (b) Verify fuses A1F1 and A1F2 are the correct value and are not defective.
- (c) Inspect all solder connections for good mechanical bond and adequate solder.
- (d) Verify connector P1 does not contain damaged or loose pins and that it is securely fastened to the chassis.
- (e) Verify the guide pin is present and that it is securely fastened.
- (f) Verify all wiring insulation is not pinched, frayed, broken or otherwise damaged.
- (g) Verify wire strands of wiring conductors are not broken or otherwise damaged.
- (h) Verify the chassis and terminal board is free from solder slivers and other conductive foreign objects.
- (i) Verify all fastening hardware is securely tightened.

5.3 FUNCTIONAL TEST: A functional test of the low voltage power supply module is the recommended first step in troubleshooting a defective module and also verifies the module is operating within design limits after corrective action has been taken. Modules that meet the requirements of the functional test may be considered to be operating satisfactorily and returned to service.

NOTE

Final testing of the low voltage power supply module is performed with the module installed in its associated transmitter. Instructions are provided in the associated transmitter's instruction manual.

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5.3.1 PREPARATION FOR TEST: Prepare the low voltage power supply module for test as follows:

- (a) Verify the visual inspection has been completed.
- (b) Connect the low voltage power supply module to test setup depicted in figure 1.
- (c) Switch on test setup's 24 volt dc power supply and verify its output is 24.0 volts dc and it is set to limit the maximum current to 1.0 amperes.

5.3.2 TEST PROCEDURE: Perform a functional test of the NAS14B low voltage power supply module as follows:

- (a) Lamp DS1 should be turned on.
- (b) Connect a digital multimeter between TP1 (+) and chassis ground.
- (c) Multimeter indication should be 23.0 \pm 0.5 volts dc.
- (d) Connect a digital multimeter between TP2 (+) and chassis ground.
- (e) Multimeter indication should be 15.0 \pm 0.3 volts dc.
- (f) Momentarily apply and then remove a short circuit between A1U2-1 and A1U2-2.
- (g) Multimeter indication should go to and remain at zero volts dc.
- (h) Momentarily switch off test setup's 24 volt dc power supply and then switch it on.
- (i) Multimeter indication should return to 15.0 \pm 0.3 volts dc.
- (j) Switch off test setup's 24 volt dc power supply and connect its positive lead to P1-2.
- (k) Switch on test setup's 24 volt dc power supply, verify its output is 24.0 volts dc and then repeat steps (a) thru (e).

REPAIR

6. There are no special procedures to be observed when replacing components.

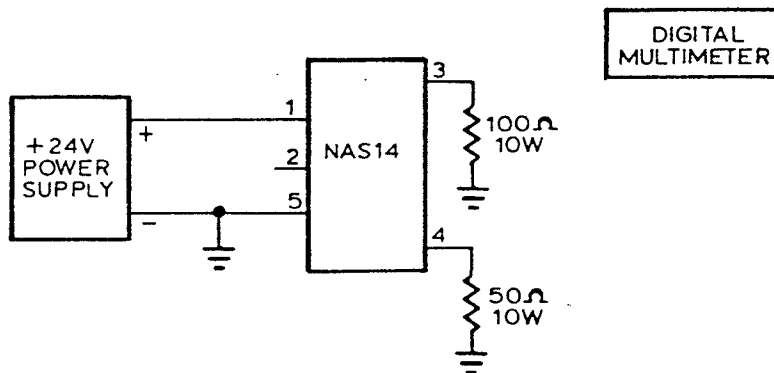


Figure 1 Test Setup
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Table 1 - Test Equipment

NOMENCLATURE	PART, MODEL, OR TYPE NUMBER (EQUIVALENTS MAY BE USED)
Digital Multimeter	3 1/2 digit, ac and dc volts, ohms and amps, $\pm 0.5\%$ accuracy. Beckman 3010
24 Vdc Power Supply	24 Volts dc, rated at a minimum of 1.0 amperes, with current limiting capability of 1.0 amperes.
Resistor	100 ohm, 10 Watt
Resistor	50 ohm, 10 Watt

Table 2 - Wiring List NAS14B Low Voltage Supply Module

SOURCE	DESTINATION	CODE	SIZE	FUNCTION
XDS1-Cathode	Ground	RAP10 Resistor	1800 ohms	R1
P1-1	XF1-1	1 Grey	18	
P1-2	XF1-3	2 Grey	18	
P1-3	A1-6	3 Orange	20	
P1-4	A1-3	4 Red	22	
P1-6	C1(-)	5 Black	22	
TP1	A1-4	6 White	22	
TP2	A1-1	7 White	22	
C1(+)	A1-9	8 Orange	20	
P1-5	AIU2-3	9 Black	22	
A1-8	XDS1-Anode	10 White	22	

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Table 3 NAS14B Low Voltage Power Supply Module Reference Designation Index

REF DES	NAME OF PART AND DESCRIPTION	NAUTEL'S PART NO.	JAN, MIL OR MFR PART NO.
-	Low Voltage Power Supply	NAS14B	139-5011-2
A1	Low Voltage Plate Assembly	139-5013-1	139-5013-1
A1C1	Capacitor, Tantalum, 1.0uF 10%, 50V	CCP24	CSR13G105KM
A1C2	Capacitor, Tantalum, 1.0uF 10%, 50V	CCP24	CSR13G105KM
A1C3	Capacitor, Tantalum, 6.8uF 10%, 35V	CCP19	CSR13F685KM
A1CR1	Diode, Zener, 33V, 5W	QL35	1N6283A
A1CR2	Diode, Zener, 16V, 1.5W 2%	QL23	1N5930C
A1CR3	Diode, Power Rectifier, 3A	QG31	1N5624
A1CR4	Diode, Power Rectifier, 3A	QG31	1N5624
A1F1	Fuse, 3A, 250V, Slo-Blo, Type 3AG	FA10	313003
A1F2	Fuse, 3A, 250V, Slo-Blo, Type 3AG	FA10	313003
A1Q1	Thyristor, Power	QA12	2N3228
A1R1	Resistor, Wirewound, 1.0 ohms, 5% 15W	RS05	HLM15-1.0 Ohms-5%
A1R2	Resistor, Film, 100 ohms, 2% 1/2W	RAP05	RL20S101G
A1R3	Resistor, Film, 10K ohms, 2% 1/2W	RAP13	RL20S103G
A1R4	Resistor, Film, 10K ohms, 2% 1/2W	RAP13	RL20S103G
A1U1	Diode, Pair Assembly, (+Ve) 400V, 15A	UL27	R704
A1U2	IC, Voltage Regulator, +15 Volt, 2%	UC09	MC78T15ACK
A1XF1	Fuse Block, 2 Pole, Type 3AG	FA25	357002
C1	Capacitor, Electrolytic, 2200uF, 75V	CCD15	500222U075AB2B
DS1	Diode, Light Emitting, Green	QK12	5082-4992
P1	Connector, Plug, 6-pin	JD09	P-3306-AB
R1	Resistor, Film, 1800 ohms, 2% 1/2W	RAP10	RL20S182G
TP1	Jack, Tip, Red, Teflon	JO19	450-4355-1-0312
TP2	Jack, Tip, Red, Teflon	JO19	450-4355-1-0312
XDS1	Socket, LED	QK25	PS-200-B

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Table 4 NAS14B Low Voltage Power Supply Module Quantities Per Unit Index

NAUTEL'S PART NO.	NAME OF PART AND DESCRIPTION	JAN, MIL OR MFR PART NO.	(OEM) MFR CODE	TOTAL IDENT PARTS
NAS14B	Low Voltage Power Supply	139-5011-2	37338	-
139-5013-1	Low Voltage Plate Assembly	139-5013-1	37338	1
CCD15	Capacitor, Electrolytic, 2200uF, 75V	500222U075AB2B	00853	1
CCP19	Capacitor, Tantalum, 6.8uF 10%, 35V	CSR13F685KM	56289	1
CCP24	Capacitor, Tantalum, 1.0uF 10%, 50V	CSR13G105KM	56289	2
FA25	Fuse Block, 2 Pole, Type 3AG	357002	75915	1
FA10	Fuse, 3A, 250V, Slo-Blo, Type 3AG	313003	75915	2
JD09	Connector, Plug, 6-pin	P-3306-AB	13150	1
JO19	Jack, Tip, Red, Teflon	450-4355-1-0312	71279	2
QA12	Thyristor, Power	2N3228	54590	1
QG31	Diode, Power Rectifier, 3A	1N5624	89473	2
QK12	Diode, Light Emitting, Green	5082-4992	50434	1
QK25	Socket, LED	PS-200-B	15513	1
QL23	Diode, Zener, 16V, 1.5W 2%	1N5930C	04713	1
QL35	Diode, Zener, 33V, 5W	1N6283A	04713	1
RAP05	Resistor, Film, 100 ohms, 2% 1/2W	RL20S101G	36002	1
RAP10	Resistor, Film, 1800 ohms, 2% 1/2W	RL20S182G	36002	1
RAP13	Resistor, Film, 10K ohms, 2% 1/2W	RL20S103G	36002	2
RS05	Resistor, Wirewound, 1.0 ohms, 5% 15W	HLM15-1.0 Ohms-5%	35005	1
UC09	IC, Voltage Regulator, +15 Volt, 2%	MC78T15ACK	04713	1
UL27	Diode, Pair Assembly, (+Ve) 400V, 15A	R704	83003	1

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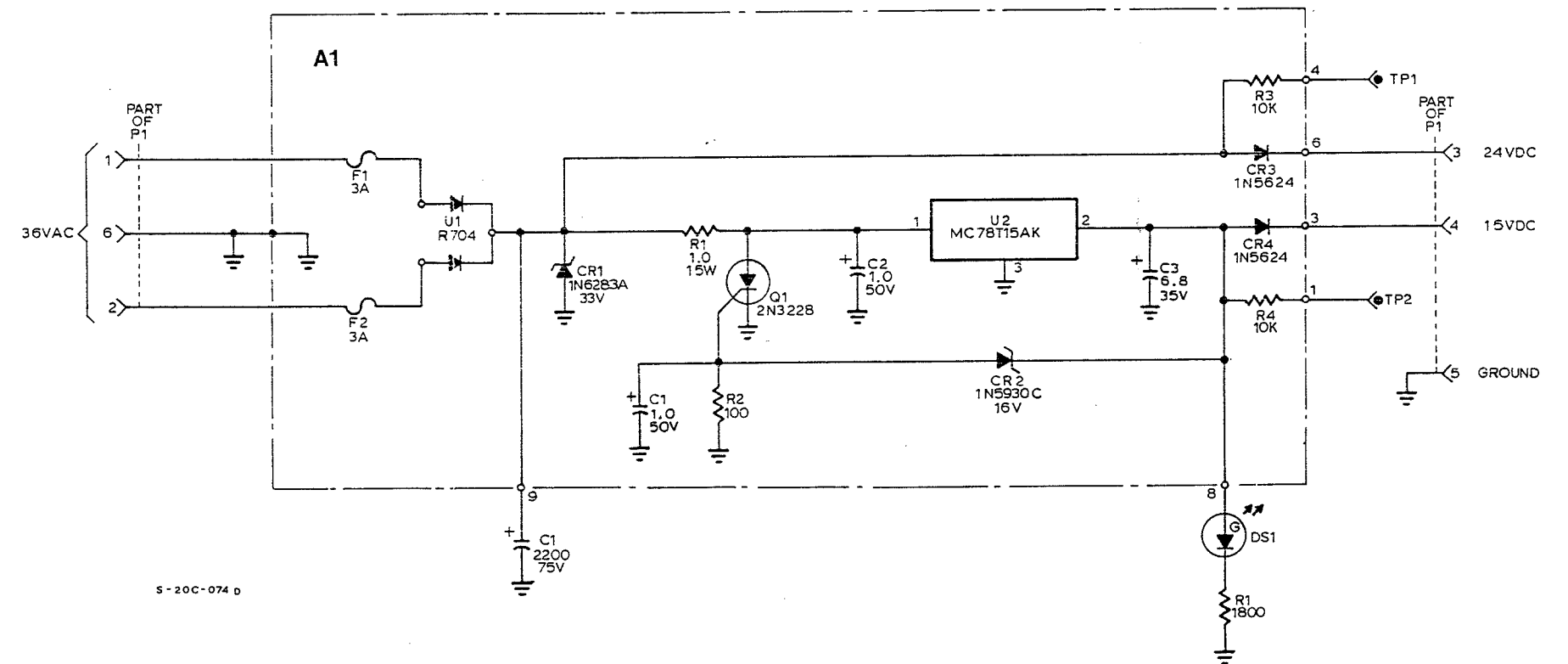


Figure 2 Electrical Schematic - NAS14B Low Voltage Power Supply Module

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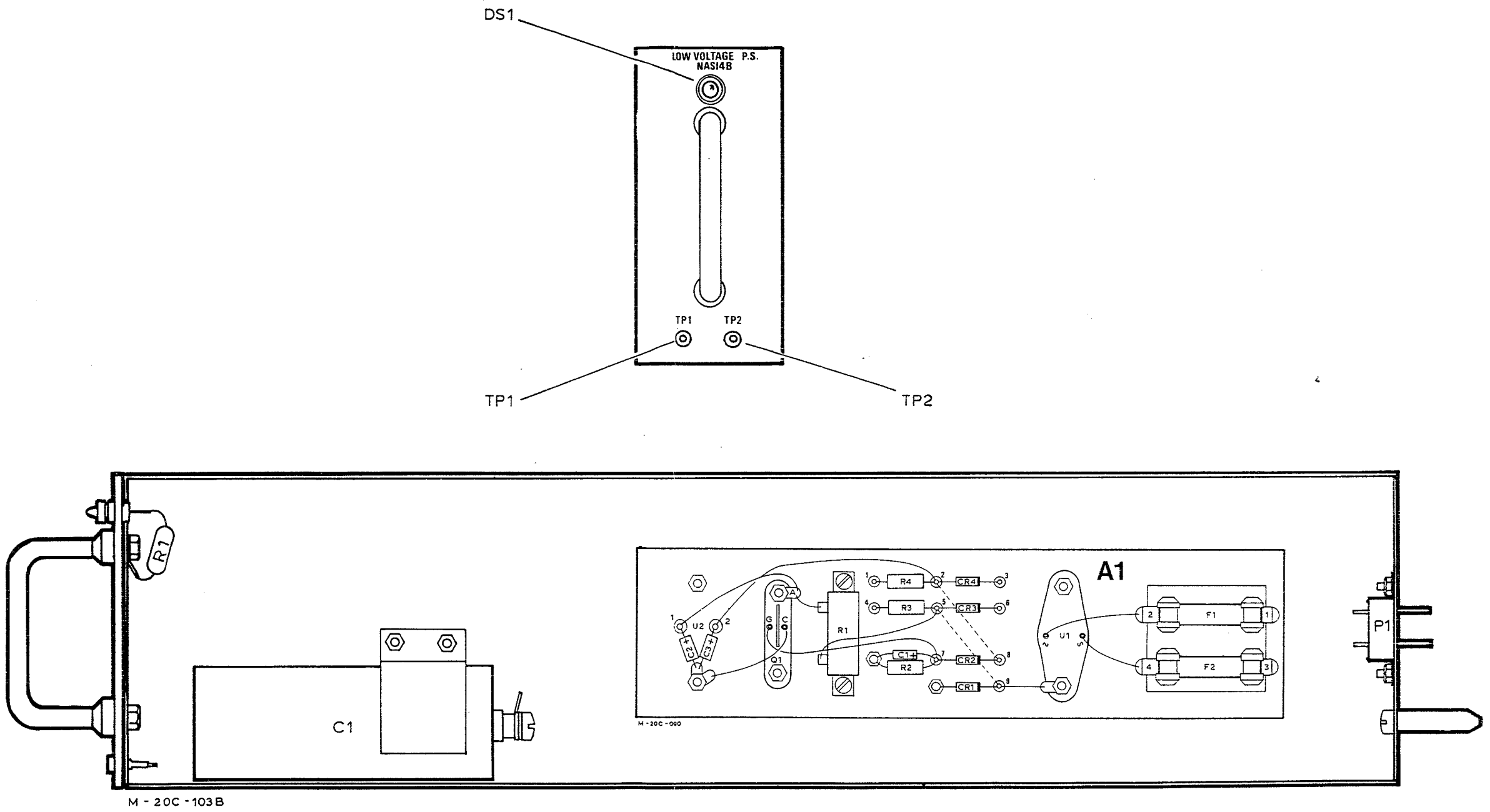


Figure 3 Assembly Detail - NAS14B Low Voltage Power Supply Module