INSTRUCTION MANUAL

TB3/TC 911

NIM BIN and POWER SUPPLY
TENNELEC, INC. warrants that the products or components manufactured by it shall be free from defects in material or workmanship for a period of one year from the date of delivery to purchaser. If such product or component is determined to be defective by TENNELEC, its sole warranty obligation shall be limited to either replacing or repairing such defective product or component or allowing credit therefor, at TENNELEC's option. Such warranty is further conditioned upon the purchaser's giving prompt notice of any such defect and satisfactory proof thereof to TENNELEC's customer service manager, thereafter upon TENNELEC's approval, the purchaser shall return such defective product or component to TENNELEC's factory at Oak Ridge, Tennessee, all transportation charges prepaid. TENNELEC shall be responsible only for transportation charges incurred in returning such product or component to purchaser. All customs, brokerage and duty charges shall be at the expense of the purchaser. Damage in transit due to inadequate packaging will be repaired at purchaser's expense. Any repairs or replacements by the purchaser without TENNELEC's approval, any willful abuse or any evidence that the product or component was not properly used and maintained, would automatically void this warranty.

TENNELEC makes no warranty whatsoever in respect to products or components not manufactured by it but instead the applicable warranties, if any, of the respective manufacturers thereof shall apply. Likewise fuses, batteries and input transistors in ultra low-noise amplifiers are specifically excluded from this warranty.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WARRANTY OF MERCHANTABILITY AND FITNESS.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0  INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.0  SPECIFICATIONS</td>
<td>1</td>
</tr>
<tr>
<td>3.0  CONTROLS, CONNECTORS AND INDICATORS</td>
<td>2</td>
</tr>
<tr>
<td>3.1 CONNECTORS</td>
<td>2</td>
</tr>
<tr>
<td>3.2 INDICATORS</td>
<td>2</td>
</tr>
<tr>
<td>4.0 OPERATING PROCEDURES.</td>
<td>2</td>
</tr>
<tr>
<td>4.1 INSTALLATION</td>
<td>2</td>
</tr>
<tr>
<td>4.2 OPERATION</td>
<td>2</td>
</tr>
<tr>
<td>4.3 PREAMPLIFIER CONNECTION</td>
<td>2</td>
</tr>
<tr>
<td>4.4 THERMAL OVERLOAD</td>
<td>3</td>
</tr>
<tr>
<td>4.5 TEST POINTS.</td>
<td>3</td>
</tr>
<tr>
<td>4.6 SLAVE BIN OPERATING</td>
<td>3</td>
</tr>
</tbody>
</table>

**PART I - TENNEBI N-3 NIM BIN**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0  SPECIFICATIONS</td>
<td>3</td>
</tr>
<tr>
<td>3.0  CONTROLS AND CONNECTORS</td>
<td>4</td>
</tr>
<tr>
<td>3.1 CONTROLS</td>
<td>4</td>
</tr>
<tr>
<td>3.2 PG-14, PG-15 and PG-16 CONNECTORS</td>
<td>5</td>
</tr>
<tr>
<td>4.0 OPERATING PROCEDURE</td>
<td>5</td>
</tr>
<tr>
<td>4.1 INSTALLATION</td>
<td>5</td>
</tr>
<tr>
<td>4.2 CIRCUIT CARD INTERCHANGE</td>
<td>5</td>
</tr>
<tr>
<td>4.3 VOLTAGE ADJUSTMENT</td>
<td>6</td>
</tr>
<tr>
<td>4.4 +6V or -6V (OPTIONAL)</td>
<td>6</td>
</tr>
</tbody>
</table>

**PART II - TC 911 POWER SUPPLY**
INSTRUCTION MANUAL
TB-3/TC 911 & TC 966
NIM BIN
AND POWER SUPPLIES

MODEL NO. TB-3/TC 911 & TC 966

SERIAL NO.
1.0 INTRODUCTION

The TB-3/911 Tennebin is a rackmounted modular systems bin designed to accommodate up to twelve NIM (Nuclear Instrument Nodules) standard width modules. The TB-3 bin is constructed of extruded aluminum panels with top and bottom cover plates. Nodule guides of machined extruded aluminum provide for precision fit of modules and eliminate warping, distortion and/or breakage associated with die-cast plastic or teflon guides. Floating power connectors allow for easy insertion of out-of-tolerance modules.

The TC 911 rear mounted power supply provides stable regulated power at ±12V dc at 2A each, and ±24V dc at 1A each and 115 Vac at .5A via AMP 202516-3 floating connectors. In addition, the connectors are provided with a power return ground and a high quality ground for elimination of ground loops. All power connectors are wired in parallel to prevent the cumulative voltage drops associated with "daisy chain" wiring.

Tennebin-3 also features front-panel-mounted BNC connectors which provide access to preamplifier output signals and test pulse inputs as well as an Amphenol 17-10090 connector wired to TENNELEC preamplifier-amplifier specifications.

Options available with Tennebin-3 are external connectors for muting NIM standard voltages to additional modular systems bins and a cover to improve appearance for stand-alone, table-top installations.

TENNELEC's TC 966 is a ±6V dc power supply designed to operate in conjunction with the TC 911 NIM power supply. It mounts "piggyback" on top of the TC 911 and is hinged on the rear panel for ease of installation and maintenance. The output of the supply, +6V dc or -6V dc at 5A, 30 VA maximum is muted to the TC 911 via the PG-16 connector. Overload protection is provided along with a thermal cut out switch which opens in case excessive operating temperatures are reached.

The unit is constructed of frpddted aluminum with an extruded aluminum rear panel which serves as the heat sink and features a black anodized finish for rapid heat dissipation. The supply may be purchased attached to the TC 911 NIM supply or may be ordered separately at any future date. Field installations takes less than 15 minutes and requires only a screwdriver.

2.0 SPECIFICATIONS

DIMENSIONS: (Standard EIA Rack) 19-in. W x 8.72-in. H x 11.94-in. D (48.26 cm x 22.15 a x 29.23 cm).

CONSTRUCTION MATERIAL: All extruded aluminum construction with machined extruded aluminum module guides.
and OUTPUT, as well as supplying power to the preamplifier. When this connector is used, test pulses may be applied directly at the bin and the praamp OUTPUT may be connected from the bin to the main amplifier.

4.4 THERMAL OVERLOAD

Should the THERMAL OVERLOAD indicator ever come on while the unit is in operation, it indicates that the power supply temperature has exceeded operational limits (60%) and the unit should be shut down until the source of the overload is determined;

4.5 TEST POINTS

Jacks are provided on the front panel for monitoring the output voltages of the bin power supply. These can be used for checking and adjusting power supply voltages if necessary.

4.6 SLAVE BIN OPERATION

The TG-3 can be used as a slave bin receiving power from another NIM power supply. NIM specifications do not include 115V ac on slave bin connectors. Therefore, if the customer desires to use modules (such as scalers) needing ac in a slave bin, he should specify this in ordering.

Part II - TC 911 POWER SUPPLY

2.0 SPECIFICATIONS

(USAEC Standard Class A Supply per TID-20693 (Rev. 4))

INPUT: 103V to 129V ac, 50 to 60 Hz. 230V ±30V ac, 50 to 60 Hz. (Specify 117V ac or 234V ac.)

OPERATING TEMPERATURE OUTPUT: 0° to 60°C.

OUTPUT: ±24V dc at 1A each; ±12V dc at 2A each; 115V ac at 0.5A. Total combined output must not exceed 96VA.

REGULATION: Less than 0.06% for line voltage variation of ±10% or 100% changes in rated load.

RIPPLE AND NOISE: Less than 3mV peak-to-peak.

THERMAL COEFFICIENT OF OUTPUT VOLTAGE: Less than 0.005%/°C.
3.2 PG-14, PG-15 and PG-16 CONNECTORS

The PC-14 connector routes the output from the TC 911 to a NIM bin; it carries the six outputs and the sense lines. To operate the supply independent of the bin, an adapter must be used in order to switch on the supply. The optional PG-15 connector allows parallel operation of the supply with more than one NIM bin. The optional PG-16 connector is provided to accommodate a +6V or -6V input; it is wired in parallel with PG-14 and PG-15. (See Figs. 1 and 2.)

4.0 OPERATING PROCEDURE

4.1 INSTALLATION

The TC 911 should be attached to the rear of a twelve-width NIM bin (TB-3) in the following manner: (a) Connect the PG-14 receptacle to the NIM bin power distribution plug PG-13; (b) Bring the power supply frame flush with the NIM bin; (c) The power supply may now be secured to the bin with the four captive mounting screws; avoid trapping any wires between the power supply frame and the bin.

![Figure 1 Mechanical and Component Placement](image)

4.2 CIRCUIT CARD INTERCHANGE

Ease of maintenance is the primary advantage of plug-in cards; circuit cards may be easily interchanged. Remove cover plate and carefully extract the plug-in circuit card(s) to be interchanged. It is recommended that the power
5.0 CIRCUIT DESCRIPTION

The power transformer and the power transistors are fastened to the frame. Each plug-in circuit card contains a full-wave silicon rectifier, all of the filter capacitors, a Zener reference diode (Q102, IN823A), and an error sensing amplifier. The input stage (IC 101 or IC 201) is a monolithic transistor array to minimize offset due to temperature drift.

The overload current sensing network consists of R118, R119, R111, and 9102. If the IR drop across R118 and R119 exceeds the set-point voltage across R104 and the upper part of R105, Q102 cuts off Q101. The fold-back circuit consists of Q104, R122, and R123. Q104 is normally nonconducting. If the power supply voltage drops too low Q104 turns on and furnishes signal to Q102 to limit the total output current. In effect, an auxiliary feedback amplifier circuit overrides the path through IC 101.

The basic circuit of each of the cards is the same, differing only in component values and component series number. Above description is for -24V card. +24V card (200 series), +12V card (300 series), and -12V card (400 Series).

Part III - TC 966 POWER SUPPLY

2.0 SPECIFICATIONS

DIMENSIONS: 2.8-in. H x 4.5-in. D x 12-in. W (7.11 cm x 11.43 cm x 30.48 cm).

INPUT: 103 to 130V ac, SD to 60 Hz; 206 to 260V ac. 50 to 60 Hz.

OUTPUT: +6V or -6V at 5A. 30 VA maximum.

RANGE OF ADJUSTMENT: ±0.5%.

REGULATION: Less than 1.0% for line voltage variation of ±10% as the output current varies from no load to full load.

RIPPLE AND NOISE: 5mV peak-to-peak.

THERMAL COEFFICIENT OF OUTPUT VOLTAGE: Less than 0.01%/°C.

STABILITY: Less than 0.3%/six months with constant ambient temperature after warm-up and with constant line voltage and load.

RECOVERY TIME: Less than 200 μsec to return to regulation limits for a 100% step-change in rated load.
To attach the TC 966 to the TC 911, first remove the top cover plate of the TC 911. Plug the connector on the PG-16 cover plate (J2) into the matching connector on the TC 911 Power Supply (J1) as shown in Fig. 2 in the TC 911 section of this manual and attach this cover plate to the TC 911. Use the washers supplied as spacers between the hinge on the TC 966 and the back frame of the TC 911 and screw on the TC 966. The front of the TC 966 is then screwed onto the TC 911. Connecting PG-16 to its mating connector on the TC 911 completes the installation. If access to the TC 911 is necessary, removing the front screws from the TC 966 allows it to swing back on its hinge.

4.1 OPERATION

The power control on the bin controls both the TC 911 and the TC 966. After installation, the unit should be allowed to warm up for about 30 minutes and the voltage checked. A potentiometer located on the right side of the unit (and accessible through the top cover) allows for adjustments to the output voltage if necessary. An insulated screwdriver should be used to prevent accidental grounding of the circuit.

4.2 CAPTIVE LINE CORD

The line cord of the TC 966 should be plugged into the same ac lines as the TC 911 to prevent ground loop problems. A good ground should be provided for both power supplies.

5.0 FIRST-TIME OPERATION

Every instrument from TENNELEC, Inc. is thoroughly checked before it leaves the plant. However, it is possible for damage to occur during shipping; it is therefore advisable to conduct appropriate tests (see Section 4.3) before the instrument is put into actual operation.

Visually check the instrument upon receipt for possible external damage. If the unit is damaged, proceed according to instructions given in the SHIPPING DAMAGE section of this manual.

6.0 SERVICING

In the event of a component failure, replacement may be done in the field or the instrument may be returned to our plant for repair. There will be no charge for repairs that fall within the warranty.

7.0 SHIPPING DAMAGE

Upon receipt of the instrument, examine it for shipping damage. Damage claims should be filed with the carrier. The claims agent should receive a full report; a copy of that report should be sent to TENNELEC, Inc., P.O. Box D,
(1) ALL RESISTORS 1/4W 5% DEPOSITED CARBON EXCEPT AS NOTED.
(2) 34GA COPPER WIRE, PC CARD PROTECTION.
(3) ALL VOLTAGE MEASUREMENTS IN RESPECT TO GROUND (NO LOAD) 117VAC LINE INPUT.
(4) RESISTOR VALUES ARE AS FOLLOWS FOR R218 AND R219:
   TC 909-5.6R
   TC 910-3.6R
   TC 911-2.7R
   TC 930A-3.6R

TENNELEC
P.O. BOX 83, DIXON, KENTUCKY 40426
TC 909-TC 910-TC 911-TC 930A
+24V CIRCUIT DIAGRAM

Sheet No. 10

Design: D. H. M. 2-4-75
Check: W. M. I. 2-4-75

Date: 2-4-75

RN 99416
Sheet 10