NEW ZEALAND POST OFFICE

VOLTAGE MONITOR UNIT MK II USED IN CONJUNCTION WITH EM7A, EM11 OR D.C. DISTRIBUTION PANELS

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1. GENERAL

1.1 The increased use of single battery type power plants associated with NC100 crossbar exchanges and other small telecommunication installations has necessitated the development of a suitable voltage monitor unit for alarm purposes.

1.2 The Mark II voltage monitor unit has been designed to extend prompt and deferred alarms, light indicator lamps and provide a high voltage rectifier cutout facility.

1.3 D.C. Distribution panels (ref. Drg NZPO 39741) incorporating voltage monitor units meet the requirements of most NC100 and similar sized exchanges and radio stations.

1.4 EM11 panels (ref. Drg NZPO 39322) are similar to D.C. Distribution panels but incorporate alarm fuses and are usually associated with installations which include transmission equipment.

2. ASSOCIATED DRAWINGS.

2.1 NZPO 39742 Sheet 1 Voltage Monitor Unit MK II, 12V, 24V or 50V - Circuit Diagram.
NZPO 39742 Sheet 2 Voltage Monitor Unit MK II, 12V, 24V or 50V - Construction Details.

3. V.M.U. DESCRIPTION.

3.1 The unit consists of a 135 x 120 mm printed circuit board on which are mounted various electronic components, capacitors, resistors and relays.

3.2 The unit is designed to operate on 24 or 50 volts. Separate inputs are provided for each voltage. The unit may also be operated on 12 volts by making the modifications detailed in the notes of Drg. 39742.

3.3 A removable link is provided to facilitate testing and setting up. For normal operation, the link must be in the position designated “LINK”.

4. INSTALLATION.

4.1 The unit is to be mounted on four 4BA CSK., brass screws inside the EM11 or D.C. Distribution panel door. The 4BA screws are to be held in position on the mounting panel with lock washers and nuts. Additional nuts and lock washers should be positioned on the screws so as to stand off the unit approximately ½ in. from the mounting panel.

4.2 External connections to the unit consist of a “Molex” harness connector incorporating crimp type terminals. External wiring details are given in the appropriate drawing.

4,3 When commissioning the unit, care should be taken to ensure the harness connector is inserted in the correct position for the plant operating voltage.

5. ADJUSTMENT.

5.1 Normal adjustment procedure is as follows :-

5.1.1 Remove the 15 way harness connector isolating the unit.

5.1.2 Remove the time delay "Link" and use it to strap input pins 2 and 3.

5.1.3 Note the plant operating voltage (12, 24 or 50 volts) and connect a stabilised variable voltage supply to pin 15 (negative) and pin 5 (positive).

5.1.4 Turn potentiometers R22 (CF) and R12 (LV) fully clockwise and R16 (HV) fully anti-clockwise.

5.1.5 Adjust the power supply to the voltage specified for charge fail alarm.

5.1.6 Turn R22 slowly anti-clockwise until the CF relay just releases.

5.1.7 Adjust the power supply to the voltage specified for low volts alarm.

5.1.8 Turn R12 slowly anti-clockwise until the HLV relay just releases.

5.1.9 Adjust the power supply to the voltage specified for high volts alarm.

5.1.10 Turn R16 slowly clockwise until the HLV relay just releases.

5.1.11 Recheck the settings. By varying the power supply voltage, check the settings and re-adjust if necessary.

5.1.12 Switch off and disconnect the power supply.

5.1.13 Replace the delay "Link" in its correct position.

5.1.14 Replace the 15 way harness connector in the appropriate position restoring the circuit to normal.

5.2 Operate the "LV Test", "HV Test" and "HV Reset" keys in accordance with clause 6 to check the operation of indicator lamps and extended alarms.

6. TESTING.

6.1 Facilities are provided in the EM7A, EM11 and D.C. Distribution panels for testing "High Volts", "Charge Fail" and "Low Volts" alarms.

6.2 <u>Test Low Volts and Charge Fail</u>

6.2.1 Operate the "LV Test" key. After approximately 15 seconds the "High/Low Volts" lamp and "Charge Fail" lamp will light and both prompt and deferred alarms will be extended.

6.2.2 To reset the alarms, release the "LV Test" key.

6.3 <u>Test High Volts</u>

NOTE: This test will result in the loss of output from all rectifier sets for a short period.

6.3.1 Operate the “HV Test” key. After approximately 15 seconds the “High/Low Volts” lamp will light, a prompt alarm will be extended and the output from all the rectifiers will be switched off.

6.3.2 To restore to normal, release the “HV Test” key and then operate the “HV Reset” key.

7. TEST ALARM FUSE FAIL. (WHEN INSTALLED)

7.1 Insert a blown alarm fuse in one of the sockets. The “Alarm Fuse Fail” lamp will light and a prompt alarm will be extended.

7.2 Remove the blown fuse to restore this alarm.

8. CIRCUIT EXPLANATORY.

8.1 IC1/1 to IC1/4 consist of four integrated circuit operational amplifiers encapsulated in a single package designated IC1 on the printed circuit board.

8.2 The characteristics of each IC stage are such that if the positive input current exceeds the negative input current, the output will be high (12 volts). If the negative input current exceeds the positive input current, the output will be low (0.2 volts).

8.3 Zener diode D11 and resistor R8 provide a supply voltage of 12 volts.

8.4 Zener diode D12 and resistor R26 provide a 6.8 volt reference voltage for the voltage detector stages IC1/1(LV), IC1/2(HV) and IC1/3(CF). Each detector stage is biased by both the reference voltage and the plant voltage. The variable resistors R12, R16 and R22 preset the bias current for the voltage alarm limits required. IC1/4 and capacitor C3 form a delay stage to suppress alarms due to transient voltage fluctuations.

8.5 Under normal conditions the outputs of the three voltage detector stages will be low (0.2V) and transistors TR1 and TR3 will not conduct. When TR1 and TR3 are not conducting, sufficient voltage is available from the 12 volt supply via R32/R33 and R34/R35 to turn on transistors TR2 and TR4 respectively. When both TR2 and TR4 are conducting, relays “CF” and “HLV” will both be operated.

8.6 If the output of one of the voltage detector stages goes high due to the plant voltage being out of limits, the appropriate alarm relay will release after a 15 second delay. This delay applies only to high volts and charge fail alarms. The time delay is achieved by IC1/4 output normally being high (12V) and resistors R30 and R 31 will provided sufficient current to turn on transistors TR2 and TR4 respectively. When either the output of IC1/2(HV) or IC1/3(CF) goes high, capacitor C3 is slowly charged via diode D7 or D8 and resistor R27. When the negative input to IC1/4 goes sufficiently high, the output of IC1/4 will go low (0.2V). This will remove the bias that was keeping transistors TR2 or TR4 turned on and allow relay CF or HLV to release.

8.7 In the event of a high volts condition occurring, it is desirable to disconnect the rectifier(s) to prevent equipment damage. A lock up circuit for IC1/2 is provided via contacts HLV1 to hold the rectifier(s) out of service until manually reset.

9. RELAY LOGIC.

9.1 The following table gives the position of each relay under all operating conditions.

VOLTAGE CONDITION	HIGH/LOW VOLTS RELAY	CHARGE FAIL RELAY
Normal	Operated	Operated
High Volts	Released	Operated
Charge Fail	Operated	Released
Low Volts	Released	Released

10. RELAY FUNCTIONS.

10.1 High Volts

10.1.1 Approximately 15 seconds after the voltage rises above the value at which the high volts detect circuit has been set, the HLV relay will release.

HLV1 changes-over, holding HLV released and CF operated.
HLV2 changes-over, lighting the "High/Low Volts" lamp.
HLV3 changes-over, and indirectly disconnects the A.C. supply to all rectifiers.
HLV4 changes-over, extending a prompt alarm.

10.1.2 Operation of the "High Volts Reset" key on the associated panel will release the lockup circuit, restoring the circuit to normal, provided the plant voltage is within limits.

10.2 Charge Fail

10.2.1 Approximately 15 seconds after the voltage drops below the value at which the charge fail detect circuit has been set, the CF relay will release.

CF1 changes-over, extending a deferred alarm.
CF2 changes-over, lighting the "Charge Fail" lamp.
CF3 spare.
CF4 changes over, preparing a hold circuit for the rectifier A.C. supply in the event of a low volts condition occurring.

10.2.2 The circuit will restore to normal when the voltage returns within limits.

10.3 Low Volts

10.3.1 Immediately the voltage drops below the value at which the low volts detect has been set, the HLV relay will release.

HLV1 changes-over, but will not lock-up HLV relay as the high volts detect stage will not have operated.
HLV2 changes-over, lighting the "High/Low Volts" lamp.
HLV3 changes over, indirectly maintaining the rectifier A.C. supply via CF4 contacts.
HLV4 changes over, extending a prompt alarm.

10.3.2 The circuit will restore to the charge fail or normal condition depending on restoration of normal plant voltage.

11. ALARM FUSE FAIL. (When installed in associated panel)

11.1 If any alarm fuse blows, the isolated alarm contacts will close lighting the “Alarm Fuse Fail” lamp and extend a prompt alarm via the blocking diode D3.