DIAGRAM NOTES (ISSUE 1)

concerning

NZPO 34391, ISSUE B (FIG. 2)

titled

ELECTRONIC TIMER

An explanation of the above circuitry is covered under the following headings:

1. GENERAL.

2. FACILITY SCHEDULE.

3. OUTLINE CIRCUIT OPERATION.

4. OPERATIONAL DETAILS.

5. CIRCUIT DESIGN NOTES.

6. FAULT DIAGNOSIS.

PRINTED BY NZPO
July 1974

1. GENERAL.

1.1 This diagram shows the circuit of an Electronic Timer which may be associated with Incoming or Bothway relay sets, or other circuits requiring a similar timing device.

1.2 The diagram should be considered in conjunction with the following diagrams:

NZPO 34181 Bothway Junction Relay Set.

NZPO 34195 Incoming Junction Relay Set.

2. FACILITY SCHEDULE.

Provision is made for:

2.1 Access to "Delayed Operation", the timing of which can be varied to suit requirements.

2.2 Access to an "Immediate Operation".

2.3 A minimum "reset" time during "Preparation" and after disconnection of the "Delayed Operation Earth" or "Immediate Operation Earth".

2.4 The Timer to be de-energised during idle periods by disconnecting the "start earth".

3. OUTLINE CIRCUIT OPERATION.

3.1 Preparation. A "start earth" is provided by the relay set the Timer is associated with, when the relay set is brought into use. This earth "conditions" the circuit prior to the possible application of earth from the associated relay set.

3.2 Delayed Operation Earth. When an earth from the relay set appears on the "DO" terminal, 75 mS later (or as per Table "A" on the diagram) an earth is applied to the "CO" terminal. This operates the "controlled relay".

The "controlled" relay will remain operated as long as the earth is applied to the "DO" terminal.

When the earth is removed, the circuit will return to its "prepared" condition, as long as the "start earth" remains applied to terminal "ST".

3.3 Immediate Operation Earth.

Where an earth from the relay set appears on the "IO" terminal, an earth is applied immediately to the "CO" terminal. This operates the "controlled relay".

The "controlled relay" will remain operated as long as the earth is applied to the "IO" terminal.

When the earth is removed, the circuit will return to its "prepared" condition, as long as the "start earth" remains applied to terminal "ST".

4. OPERATIONAL DETAILS.

4.1 Preparation.

The "start earth" is applied to the "ST" terminal by the associated relay set. Positive (earth) potential quickly builds up on the plate of C1 via D1. The opposite plate becomes negative via D2 and 250 ohms "Resistance Battery".

The "bases" of TR1 and TR2 are of a similar potential (-) and are switched ON. The "collectors" are positive (with respect to the "emitter") and bias the "base" of TR3 positive. Thus TR3 is switched OFF and the potential at the "collector" and "CO" terminal is negative: the "controlled relay" remains released.

4.2 Delayed Operation Earth.

An earth from the relay set is applied to the "DO" terminal. This positive potential causes the capacitor C1 to discharge. The effect of the Resistance/Capacitor Timing components (R7, RV1 and C1) is to delay the "base" current final value of TR1 by 75 mS (or as per Table "A" on the diagram).

At the completion of this delay, the potential at the "base" of TR1 is positive. Current will cease flowing through TR1 and TR2 ("emitter" - "base"); TR1 and TR2 are switched OFF. Both "collectors" will therefore lose their positive potential and the bias of TR3 "base" will become negative (with respect to the "emitter"). TR3 will pass a current flow ("emitter-base") and switch ON. The "Collector" will present a positive potential and the "controlled relay" will operate.

The "controlled relay" will remain operated by the timing circuit as long as the earth is applied to the "DO" terminal.

When the "delay operation" earth is removed, the circuit will revert quickly to the condition described in the paragraph "Preparation".

4.3 Immediate Operation Earth.

When an earth from the relay set appears on the "IO" terminal, the "base" of TR1 is biased positive immediately; TR1 and TR2 will be switched OFF. Therefore the bias of TR3 "base" becomes negative and a "emitter"-"base" current flows, switching TR3 ON. The "collector" will present a positive potential and the "controlled relay" will operate.

The "controlled relay" will remain operated by the timing circuit as long as the earth is applied to the "IO" terminal.

When the "immediate operation" earth is removed, the circuit will revert immediately to the condition described in the paragraph "Preparation".

5. CIRCUIT DESIGN NOTES.

5.1 TR1, TR2 "Darlington Pair"
TR3 "Schmidt Trigger"

5.2 D1 and D2.

When conducting, complete a low resistance charging path for C1 during the preparation and "resetting" of the Timer. These diodes will be reverse biased with the application of an earth to terminal "DO".

5.3 D3. "Catching" diode; prevents collector of TR3 becoming more negative than -50 volts due to back EMF of the relay coil, during TR3s "switch off".

5.4 R1. Presets the desired output conditions of TR3.

5.5 R2. Collector current limiter for TR3.

5.6 R3, R4, and R5. Biasing voltage divider for base of TR3. R4 also functions as collector load for TR1 and TR2.

5.7 R6. Biasing voltage divider for base of TR1. (Also form a minor part of the Resistive element of the R/C Timing Circuit - see R7 and RV1).

5.8 R7, RV1) Together form the major resistive element of the R/C Timing Circuit (see also R6). R7 sets the minimum value of this resistance, thus limiting power dissipation in RV1. The ratio of R7 to RV1 determines the "fineness" of adjustment.

5.9 C1. Is the capacitive element of the R/C Timing Circuit.

6. FAULT DIAGNOSIS.

Refer to Note 2.1 of the diagram for details of typical voltages which are provided to assist with fault diagnosis.

END OF DIAGRAM NOTES