

TYPE 744 DIFFERENCE ALARM (FACTORY STYLE 2)

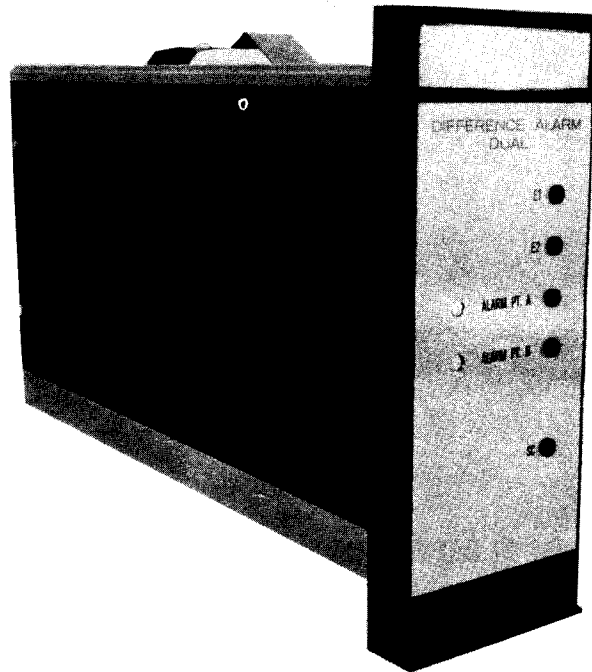


FIGURE 1 – Type 744 Difference Alarm

FOREWORD

This publication provides installation, operation, service and parts information for standard models of the Type 744 Difference Alarm. Information covering special Difference Alarm models is provided in separate publications identified as Difference Data Sheets. For information concerning installation of shelves, racks and cables, refer to publication 4576K11-001.

| WARNING | AVERTISSEMENT |
|--|--|
| <u>INSTRUCTION MANUALS</u> | <u>MANUELS D'OPERATION</u> |
| DO NOT INSTALL, MAINTAIN OR OPERATE THIS EQUIPMENT WITHOUT READING, UNDERSTANDING AND FOLLOWING PROPER Babcock & Wilcox Bailey Controls Co. U.S.A. INSTRUCTIONS AND MANUALS, OTHERWISE INJURY OR DAMAGE MAY RESULT. | NE PAS METTRE EN PLACE, RÉPARER OU FAIRE FONCTIONNER CE MATÉRIEL SANS AVOIR LU, COMPRIS ET SUIVI LES INSTRUCTIONS RÉGLEMENTAIRES DE Babcock & Wilcox Bailey Controls Company, U.S.A. TOUTE NÉGLIGENCE À CET ÉGARD POURRAIT ÊTRE UNE CAUSE D'ACCIDENT OU DE DÉFAILLANCE DU MATÉRIEL. |

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Section I

Introduction

The Difference Alarm units are available in single or dual form for rack or shelf mounting. A single alarm is able to perform one of ten alarm functions using one or two input signals and an alarm point setting. A dual alarm contains two alarms each capable of performing one of ten alarm functions identical to those in the single alarm.

Properly set staple jumpers allow alarm input to be compared to the alarm point setting as required by the alarm function. Comparison is made in a voltage sensitive, solid-state comparator. In an alarm state this comparator de-energizes an integral electromechanical relay. Alarm point settings are adjustable from the front plate and cover a range of 0 volts to over 5 volts.

The nuclear qualified unit is available only as a rack-mounted unit and has a special locking device on the front plate for securing the module to the rack unit.

NOMENCLATURE

| Digit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Description |
|-------|---|---|---|---|---|---|---|---|---|----|----|--|
| | 7 | 4 | 4 | * | * | * | A | A | A | * | 2 | Difference Alarm |
| | | 1 | ↓ | | | | | | | | | Single |
| | | 2 | ↓ | | | | | | | | | Dual/Duplex |
| | | | 1 | ↓ | | | | | | | | Rack-mounted |
| | | | 2 | ↓ | | | | | | | | Shelf-mounted |
| | | | 3 | ↓ | | | | | | | | Rack-mounted with circuit board cover |
| | | | | 0 | | | | | | | | Standard Relay |
| | | | | 1 | | | | | | | | Standard Relay, Time Delayed ON |
| | | | | 2 | | | | | | | | Sealed Relay |
| | | | | 3 | | | | | | | | Sealed Relay, Time Delayed ON |
| | | | | | | | | | | A | | CSA certified for use in a general purpose |
| | | | | | | | | | | ↓ | | (non-hazardous) location |
| | | | | | | | | | | N | | Nuclear Qualified (744□1 only) |

WARNING

THIS DEVICE MUST NOT BE LOCATED IN A HAZARDOUS (CLASSIFIED) LOCATION (AS DEFINED BY CHAPTER 5 OF THE NATIONAL ELECTRICAL CODE, NFPA 70-1978, ANSI C1-1978 AND SECTION 18 OF THE CANADIAN ELECTRICAL CODE, PART I, CANADIAN STANDARDS ASSOCIATION STANDARD C22.1-1975).

AVERTISSEMENT: CE DISPOSITIF NE DOIT PAS ETRE EMPLOYE EN ATMOSPHERE DANGEREUSE TELLE QUE DEFINIE AU CHAPITRE 5 DU NATIONAL ELECTRICAL CODE, NFPA 70-1978, ANSI C1-1978, ET DE LA SECTION 18 DU CODE CANADIEN DE L'ELECTRICITE, 1ere PARTIE, DE L'ASSOCIATION CANADIENNE DE NORMALISATION C22.1-1975.

NOTES

Section II

Receiving, Handling, Storage, Shipment

RECEIVING

Immediately upon receipt of the unit, examine it for any damage which may have occurred in transit. Immediate examination is especially important if rough handling is evident. If damage is found, a damage claim should be filed promptly with the transportation company, and the nearest Bailey sales office should be notified. The shipping container should be retained by the user to assist in evaluating the damage to the unit or for storage and reshipment.

HANDLING

The Difference Alarm is an electronic device, weighing approximately 2 pounds (.91 kg) for a shelf-mountable unit and 1 pound (.45 kg) for a rack-mountable unit. Observe normal precautions for electronic equipment during handling.

STORAGE

If the unit is to be stored prior to use, repack it in its original packing material and container, if possible. Store it in an area free of corrosive vapors and extremes in temperature.

SHIPMENT

To provide adequate protection for the unit when shipping it from one location to another, or returning it to the factory, it should be packed in the original packing. If this packing is not available, float the unit in a box large enough to permit four to five inches of wedging with shredded paper, rubberized hair or equivalent. Use a method of shipment which will insure that normal precautions for electronic equipment are observed.

NOTES

Section III

Installation

GENERAL

The Type 744 Difference Alarm is designed for mounting in Bailey 7000 shelf and rack units. The one unit wide shelf module mounts in a Type 762 Shelf and is connected to other devices and/or other components in a control system using Bailey Type 763 Cables. The one unit wide rack module mounts in Type 761 Rack Units, Type 7655 Processor Mounting Units (PMU) or Type 7657 Rack Termination Units (RTU) For information concerning installation of shelves, rack units and cables, refer to Bailey publication 4576K11-001.

CONNECTIONS

External connections for shelf-mountable devices are made by means of either terminal board-terminated cables (Type 7631 Cable, Connector and Terminal Board Assembly) as shown in Figure 3-1, or extended cable-terminated cables (Type 7632 Cable and Connector Assembly) as shown in Figure 3-2. External connections for rack-mountable devices are made by means of terminal boards mounted on the rear of the rack unit as shown in Figure 3-3 or by extended cables (Type 7633 Cable and Connector Assembly) as shown in Figure 3-4.

Refer to Table 3-1 which shows external connections to the terminal board, and color identification of cable conductors for connecting extended cables to customer-supplied remote terminals.

After external connections have been made, the shelf-mountable device is connected into the system by plugging the cable connector onto the terminal end of the Difference Alarm circuit board, which protrudes through the rear of chassis. The Difference Alarm may then be inserted into the shelf by sliding the bottom rails over the guide rails in the shelf, and at the same time, depressing the spring latch on top of the chassis.

The rack-mountable device is connected into the system by inserting the circuit board of the device into its guide and sliding it all the way into the rack. This will cause the terminal end of the circuit board to be plugged into the cable or terminal-board connector.

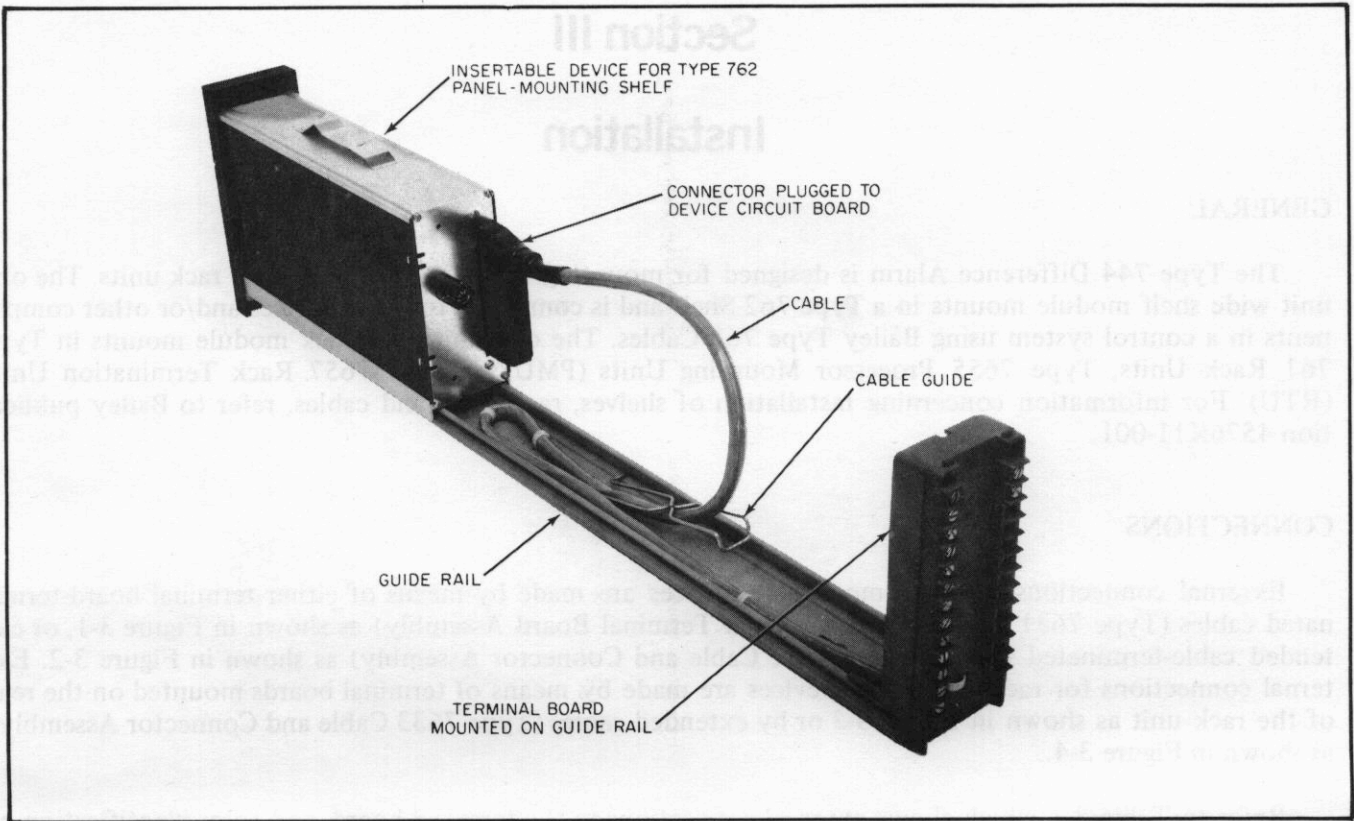


FIGURE 3-1 — Connections Using Type 7631 Cable; Connector and TB Assembly

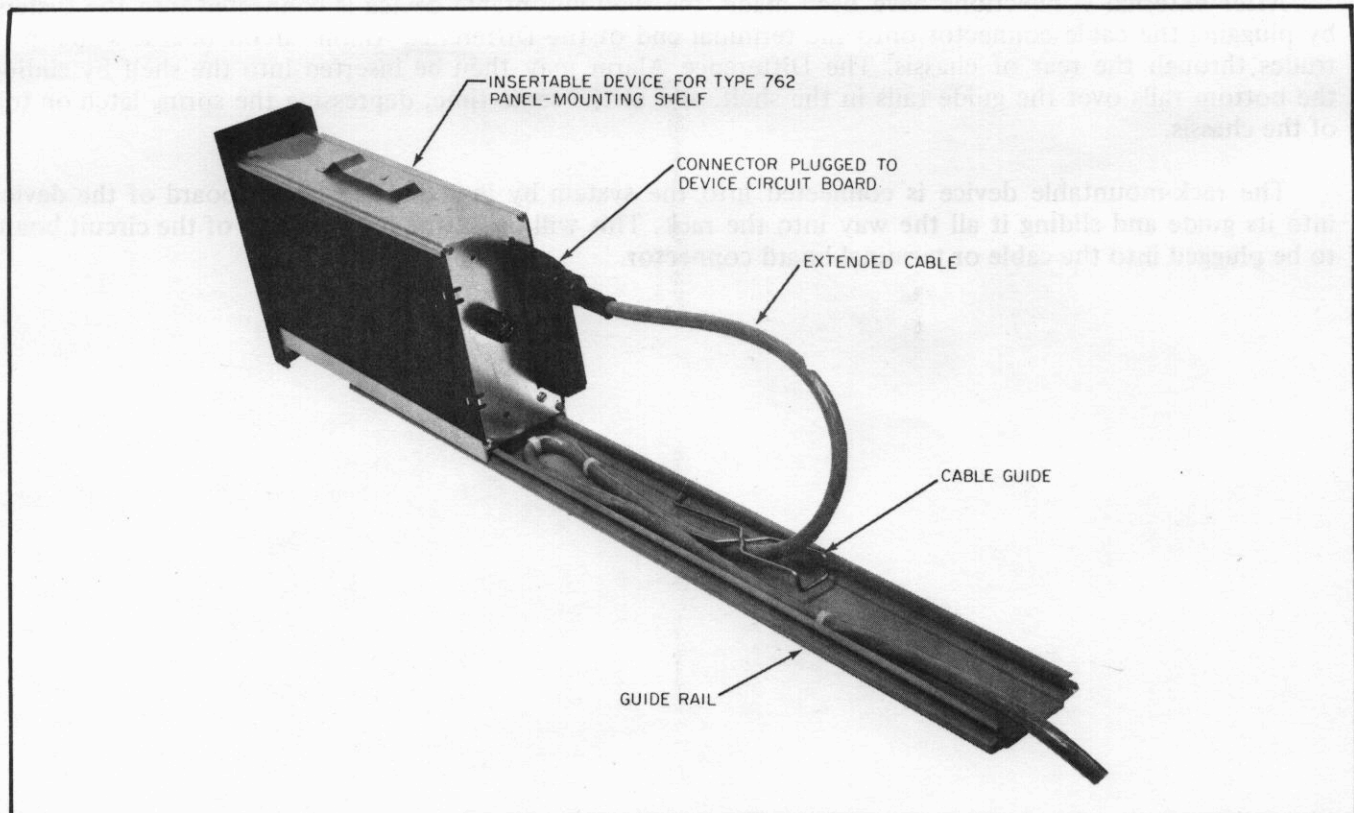


FIGURE 3-2 — Connections Using Type 7632 Extended Cable

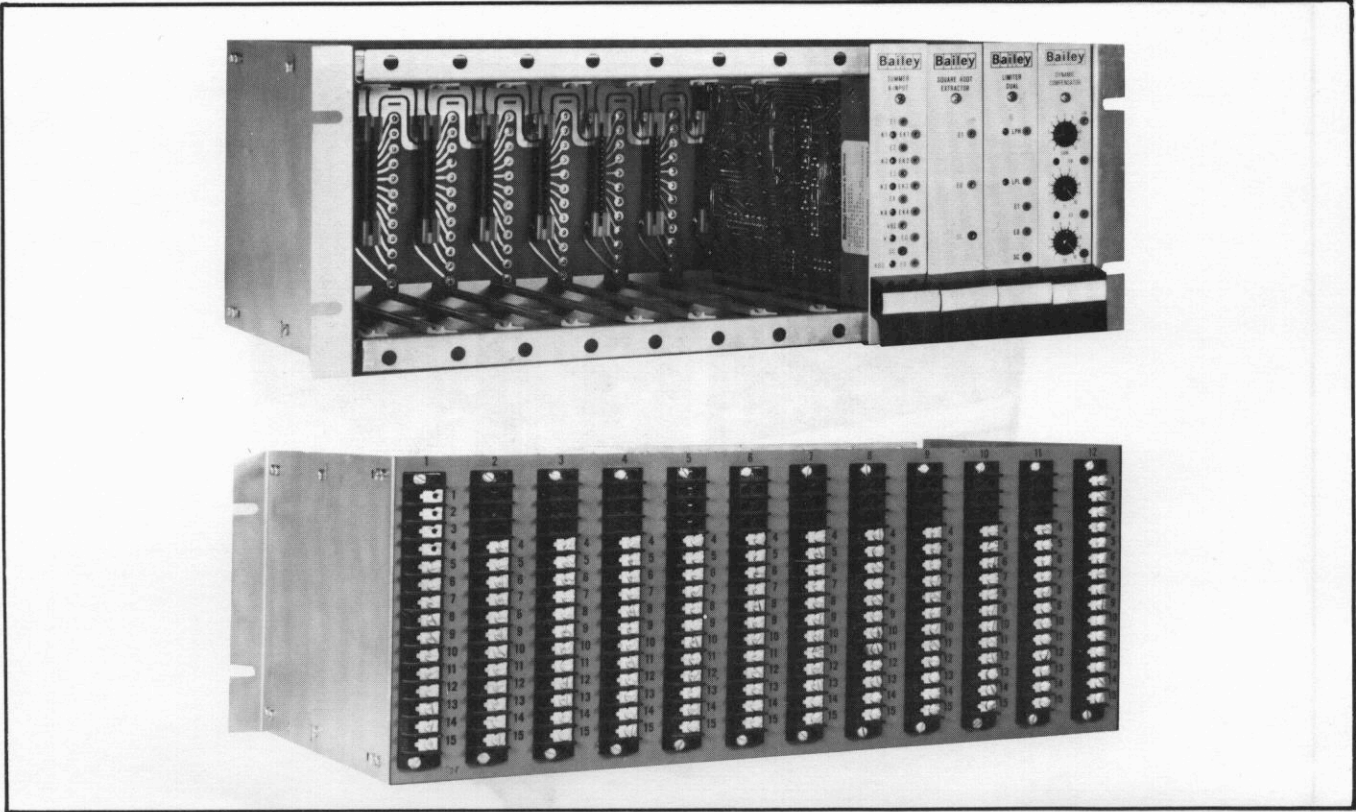


FIGURE 3-3 – Front and Rear Views, Rack Unit, Terminal Board Style

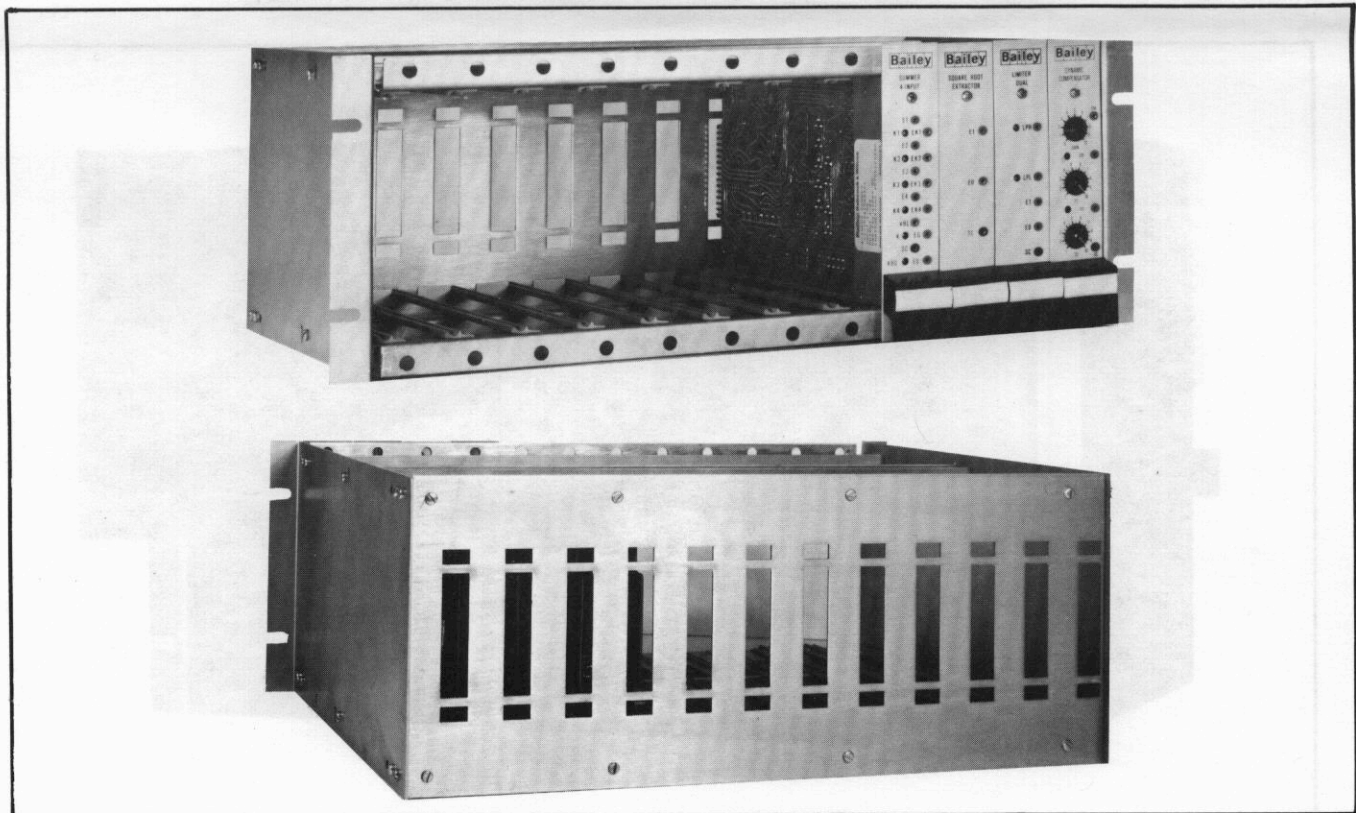


FIGURE 3-4 – Front and Rear Views, Rack Unit, Extended Cable Type



FIGURE 3-5 – Type 765500 Processor Mounting Unit (PMU)

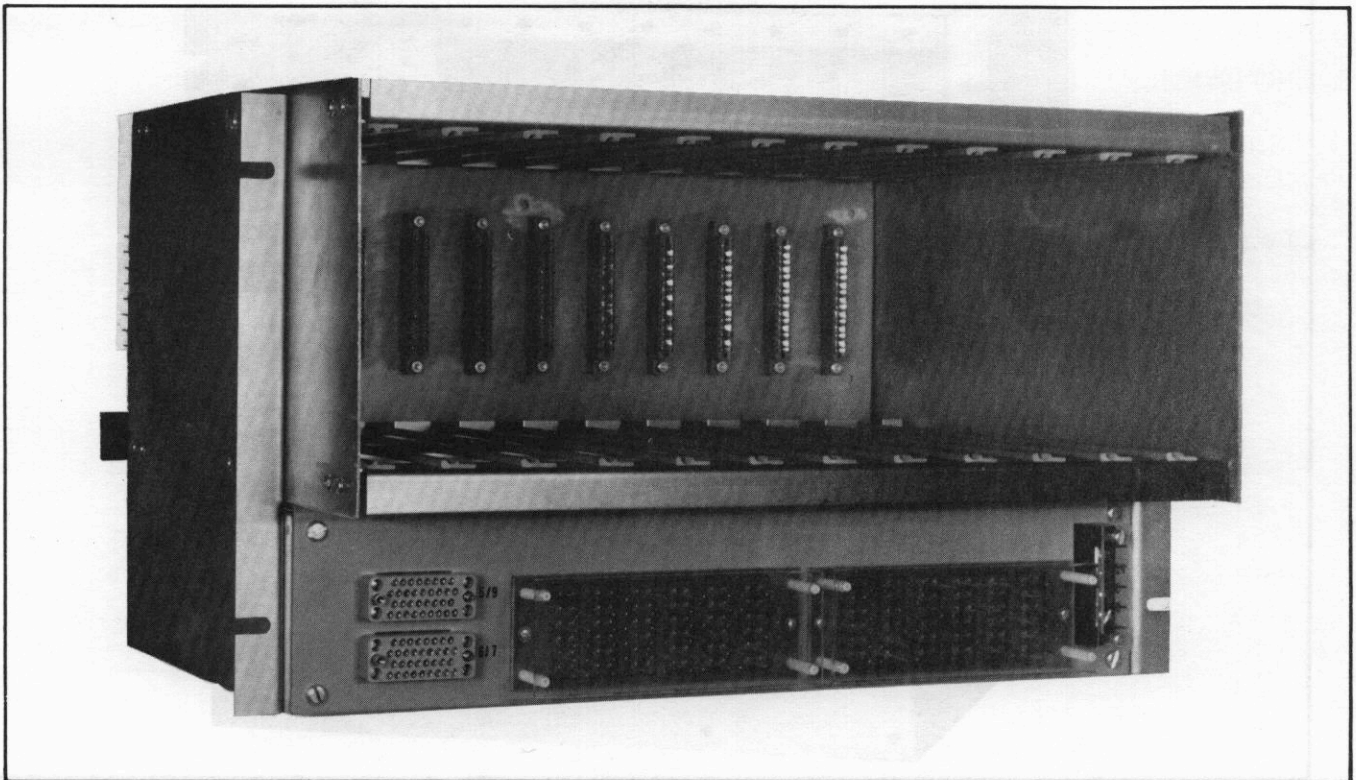


FIGURE 3-6 – Type 765701 Rack Termination Unit (RTU-B)

TABLE 3-1
EXTERNAL CONNECTIONS

| TERMINAL NUMBER (TERMINAL BOARD- TERMINATED CABLE OR TERMINAL BOARD TYPE RACK UNIT) | CABLE CONDUCTOR COLOR | EXTERNAL CONNECTIONS | NOTES |
|---|-----------------------------|---|--|
| 1 | GREEN | EARTH GROUND | |
| 2 | RED | +24 V dc SUPPLY | |
| 3 | BLACK | SUPPLY COMMON | } CONNECT TO SYSTEM SIGNAL COMMON |
| 4 | WHITE | SIGNAL COMMON | |
| 5 | ORANGE | INPUT SIGNAL V1 1 to 5 V dc (±4 V dc) | |
| 6 | BLUE | INPUT SIGNAL V2 1 to 5 V dc (±4 V dc) | |
| 7 | WHITE/BLACK | CONTACT 1 | } * ALARM "A" (SINGLE AND DUAL ALARM) |
| 8 | RED/BLACK | CONTACT 1 | |
| 9 | GREEN/BLACK | CONTACT 2 | |
| 10 | ORANGE/BLACK | CONTACT 2 | |
| 11 | BLUE/BLACK | CONTACT 1 | } * ALARM "B" (DUAL ALARM ONLY) |
| 12 | BLACK/WHITE | CONTACT 1 | |
| 13 | RED/WHITE | CONTACT 2 | |
| 14 | GREEN/WHITE | CONTACT 2 | |
| 15 | BLUE/WHITE | INTERLOCK SIGNAL | +12 V dc |

*See WARNING below



TO MAINTAIN CSA CERTIFICATION, ALARM CONTACTS MUST BE PROVIDED WITH OVER-CURRENT PROTECTION OF 3.2 AMPS OR LESS.

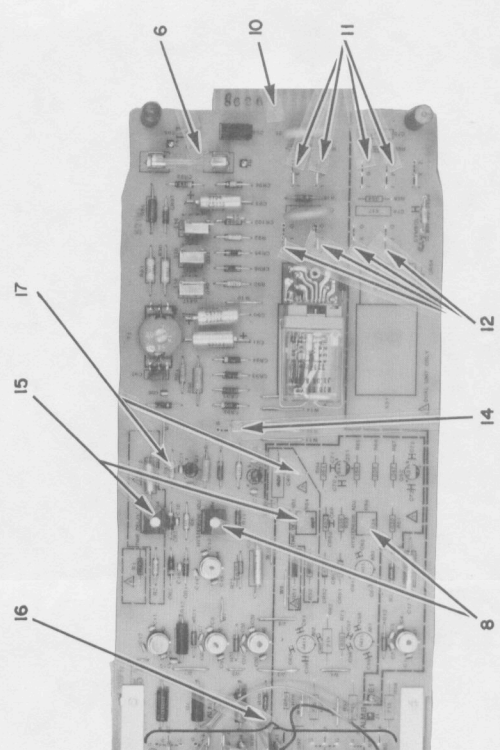
AVERTISSEMENT: POUR RESTER CONFORME AUX NORMES DE L'HOMOLOGATION CSA, LES CONTACTS DES SYSTEMES D'ALARME DOIVENT ETRE MUNIS DE PROTECTIONS CONTRE LES SURINTENSITES AYANT POUR CARACTERISTIQUE 3.2 AMPERES OU MOINS.

Contacts are normally open or closed with internal jumpers. Relays are energized in non-alarm condition.

NOTES

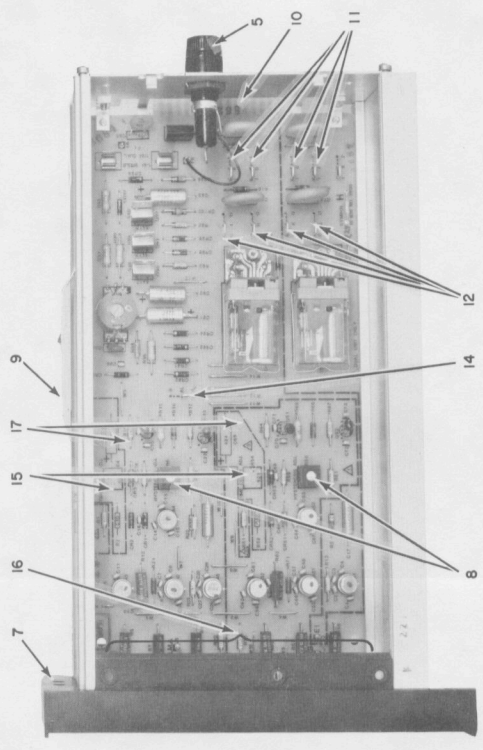
Section IV Description

ther parts required for operating and servicing the Difference Alarms are



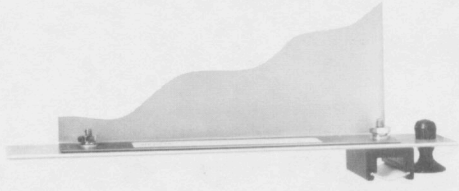
Side View

Rack-Mountable Single Alarm



Side View

Shelf-Mountable Dual Alarm



Nuclear Latch

LEGEND FOR FIGURE 4-1

1. Legend Plate.
2. Test Jacks - Input (E1) on Single Alarm (E1 and E2) on Dual Alarm; Signal Common (SC).
3. Alarm Point Test Jacks - ALM PT. A on Single Alarm, ALM PT. A and ALM PT. B on Dual Alarms.
4. Alarm Point Adjustments - Adjust alarm point, 0 to greater than 5 volts.
5. Fuse Holder - On shelf-mountable device.
6. Fuse Cartridge - On rack-mountable device.
7. Access holes for legend replacement.
8. Dead band adjustment of the alarm point for relay operation. R6 for Alarm A, single and dual alarm; R56 for Alarm B, dual alarm only.
9. Spring Latch.
10. Connector Contacts (terminals).
11. R.C. across Relay Contact jumpers (E, D, F, G) - for selection of in or out R.C. condition. On single-alarm unit; only two jumpers (E, D) are used.
12. Relay Contact Jumpers (H, I, J, K) - for selection of closed or open alarm contacts in alarm condition. On single-alarm unit only two jumpers (H, I) are used.
14. Relay Jumper AL - (A, B) - For selection of separate alarm operation or parallel alarm operation.
15. Relay Response Time Adjustment - R4 for Alarm A of single and dual alarm, R54 for Alarm B, dual alarm only.
16. Alarm Function Jumpers - (A-, A+, AS), B-, B+, BS for dual alarm only.
17. Relay Response Time Jumpers - L, for Alarm A of single and dual alarm; M for Alarm B of dual alarm only.

FIGURE 4-1 - Type 744 Difference Alarm

Section V

Initial Checks & Adjustments/Operation

INITIAL CHECKS

Unless otherwise specified by the customer, the alarm unit is shipped as a standard factory tested device. Check to make sure that the circuit board wiring corresponds to the desired operating mode as outlined in Table 5-1.

If it is desired to change the circuit board wiring in order to select a different mode of operation, refer to Table 5-1 for the specific jumper changes to be made. The staple type jumpers can be easily removed and inserted with long-nose pliers.

CAUTION

CAUTION: Do not make wiring changes to the circuit board while this unit is connected to the process system. Disconnect this unit from the mounting unit or the cable connector or any other source of electrical power before making wiring changes.

ATTENTION: Ne pas modifier le cablage de la plaquette de circuit tant que l'appareil est raccorde au systeme de processus. Avant toute modification du cablage, il est essentiel de deconnecter cette unite de l'appareil sur lequel elle est montee ou de debrancher le connecteur de cables ou toute autre alimentation electrique.

DEAD BAND ADJUSTMENT

Dead band is the difference between the alarm point (relay dropout) and reset (relay pickup). It is adjustable from 0.5% to 10% of span (0.02 to 0.4 V dc).

Dead band adjustments R6 in the single alarm and R6 and R56 in the dual alarm (8, Figure 4-1) have been set at the factory for 0.5% of span. If a different adjustment is desired, refer to the following procedures which should be carried out at a test bench.

- a. Position staple jumpers for desired alarm function (two alarm functions for dual alarm).
- b. Connect precision voltmeter to jacks marked SC (-) (2, Figure 4-1) and Alarm Point A (3, Figure 4-1) on front panel of single alarm (Alarm Point B on dual alarm) in order to set alarm point.
- c. Adjust alarm point (Point A) to 3.0 volts. Also adjust Alarm Point B on dual alarm.
- d. Connect voltmeter from jacks E1 to SC (2 to SC for dual alarm). Set values of V1 or V2 to place alarm function at least .3 volts outside alarm state. This procedure is performed for each alarm in a dual alarm unit.
- e. If relay response time adjustments are present, they should be adjusted completely counterclockwise (R4 in a single alarm and R4 and R54 in a dual alarm).
- f. Adjust one input signal to approach an alarm state, causing alarm relay to de-energize. Reverse direction of input signal until alarm operates again to a non-alarm state. Voltage difference should be less than .02 volts (.5% of span) which is the factory dead band setting.

g. To increase voltage difference between alarm triggering and alarm reset points, adjust dead band potentiometers (R6 in a single alarm, and R6 and R56 in a dual alarm) in a clockwise direction.

h. Repeat steps D, F and G until desired dead band is obtained.

WARNING

ONLY TEST PROBES SUITABLE FOR THE PURPOSE SHOULD BE USED TO EXTEND CIRCUIT SIGNALS TO OTHER RECORDING/INDICATING INSTRUMENTATION. THE USE OF OTHER MEANS TO EXTEND CIRCUIT SIGNALS MAY ENDANGER PERSONS OR PROPERTY.

The Bailey Controls Company utilizes in its design test jacks standard to the industry. Test probes suitable for the purpose are commercially available from local electronic component suppliers.

ATTENTION: N'UTILISER QUE LE MATERIEL D'ESSAI APPROPRIE POUR L'EXTENSION DES SIGNAUX A D'AUTRES INSTRUMENTS ENREGISTREURS-INDICATEURS. TOUTE AUTRE METHODE D'EXTENSION DES SIGNAUX PEUT ETRE DANGEREUSE POUR LES PERSONNES OU ENDOMMAGER LE MATERIEL.

La Bailey Controls Company a conçu des fiches d'essai normalisées pour tout usage industriel. On peut se procurer les appareils d'essais appropriés dans le commerce en s'adressant aux fournisseurs de composants électroniques.

RELAY RESPONSE TIME ADJUSTMENT (OPTION)

Relay response time is the time delay between the alarm's solid-state comparator reaching an alarm state and the alarm's relay switching to a de-energized alarm state. It is adjustable between .25 and 5 seconds. Staple jumpers L and M allow the time delay circuit to be disabled.

The relay response time adjustments (R4 in the single alarm, and R4 and R54 in the dual alarm) have been set at the factory for .25 seconds. If a different adjustment is desired, refer to the following procedures which should be carried out at a test bench.

a. Position staple jumpers for desired alarm function (two alarm functions for dual alarm).

b. Connect precision voltmeter to jack-marked SC (2, Figure 4-1) and Alarm Point A (3, Figure 4-1) on front panel of single alarm (Alarm Point B on the dual alarm) in order to set alarm point.

c. Adjust alarm point (Point A) to 3.0 volts. Also adjust Alarm Point B on dual alarm.

d. Using a voltmeter from jacks E1 to SC (E2 to SC for dual alarm), set values of V1 or V2 which place alarm function at least .3 volts outside of alarm state. This procedure is performed for each alarm in dual alarm.

e. Relay response time can be increased by adjusting relay response time adjustments in a clockwise direction, (R4 in single alarm and R4 and R54 in dual alarm).

f. A voltmeter should be placed between pin 6 of A4 on circuit board (+) and jack SC (-) for a single alarm or Alarm A of a dual alarm. (Pin 6 of A53 (+) and jack SC (-) for Alarm B of a dual alarm).

g. Using one input signal, approach alarm state, causing voltmeter reading to switch from -11 volts to +11 volts. Time between voltmeter change and relay response is relay response time.

h. Repeat steps d, e, f and g until desired relay response time is obtained.

OPERATION

ALARM POINT ADJUSTMENT

The alarm operating point is adjustable from 1-5 V dc corresponding to 0-100% of the input span. When the alarm unit is connected to the process, the alarm is adjusted to the desired operating point as follows. Refer to Table 5-1 for the various alarm operating modes and the corresponding jumper positions.

1. Connect precision voltmeter to jacks SC (–) and Alarm Point A (+) for single alarm or Alarm A of a dual alarm (Alarm Point B (+) for a Dual Alarm).

2. Adjust alarm point adjustment, R10 for single alarm or Alarm A of dual alarm, to desired alarm point voltage (R60 for Dual Alarm). Range of alarm point adjustments is 0 to greater than 5 volts.

ALARM ACTION

When the input signals satisfy the alarm functions, the alarm contacts will operate. If the input values are close to the alarm point and are noisy (erratic), the resulting frequency of alarm operation may be undesirable. If so, the dead band should be increased. Refer to “Dead Band Adjustment” above under “Initial Checks”.

STAPLE POSITIONS

Relay contacts may be set for normally OPEN or normally CLOSED operation.

A. Single Alarm or Alarm A of Dual Alarm.

Contact 1 - I:C for normally closed relay; 0 for normally open relay.

Contact 2 - H:C for normally closed relay; 0 for normally open relay.

B. Alarm B of Dual Alarm

Contact 1 - K:C for normally closed relay; 0 for normally open relay.

Contact 2 - J:C for normally closed relay; 0 for normally open relay.

R.C. components may be placed across relay contacts or removed by jumper selection.

A. Single Alarm or Alarm A of Dual Alarm

Contact 1 - E:I for in; 0 for out.

Contact 2 - D:I for in; 0 for out.

B. Alarm B of Dual Alarm

Contact 1 - G:I for in; 0 for out.

Contact 2 - F:I for in; 0 for out

Relays in a Dual Alarm may be operated independently or in parallel by use of staple jumper AL.

A. Jumper in A allows independent relay action.

B. Jumper in B allows parallel relay action.

If a precise calibration of the device is to be made, a precision voltmeter and a bench-test setup is required. Refer to the Calibration section for detailed procedures.

Relay Response Time Adjustment (Option) may be disabled by the use of staple jumpers L and M. Jumpers in 1 enable the time delay circuit. Jumpers in 2 disable the time delay circuit.

TABLE 5-1
ALARM OPERATING OPTIONS

| Mode of Operation | Description | Staple Jumper Position |
|--|--|-----------------------------|
| <u>SINGLE ALARM UNIT OR ALARM A OF DUAL UNIT</u> | | |
| Alarm Function | V1-V2 > Alarm A | A- = 1 A+ = 2 AS = + |
| | V1-V2 < -Alarm A | 2 1 + |
| | V2-V1 > Alarm A | 2 1 + |
| | V2-V1 < -Alarm A | 1 2 + |
| | V1 > Alarm A | 1 G + |
| | V1 < Alarm A | S 1 - |
| | V2 > Alarm A | 2 G + |
| | V2 < Alarm A | S 2 - |
| | V1 < -Alarm A | G 1 + |
| | V2 < -Alarm A | G 2 + |
| Alarm Contact Jumpers | Relay Contact 1, NC Position | Staple I in Pos. C. |
| | Relay Contact 1, NO Position | Staple I in Pos. O. |
| | Relay Contact 2, NC Position | Staple H in Pos. C. |
| | Relay Contact 2, NO Position | Staple H in Pos. O. |
| RC Jumpers | Relay Contact 1 with RC | Staple E in Pos. I. |
| | Relay Contact 1 without RC | Staple E in Pos. O. |
| | Relay Contact 2 with RC | Staple D in Pos. I. |
| | Relay Contact 2 without RC | Staple D in Pos. O. |
| Time Delay Jumper | Time Delay Enabled | Staple L in Pos. 1 |
| | Time Delay Disabled | Staple L in Pos. 2 |
| <u>ALARM B OF DUAL UNIT</u> | | |
| Alarm Function | V1-V2 > Alarm B | B- = 1 B+ = 2 BS = + |
| | V1-V2 < -Alarm B | 2 1 + |
| | V2-V1 > Alarm B | 2 1 + |
| | V2-V1 < -Alarm B | 1 2 + |
| | V1 > Alarm B | 1 G + |
| | V1 < Alarm B | S 1 - |
| | V2 > Alarm B | 2 G + |
| | V2 < Alarm B | S 2 - |
| | V1 < -Alarm B | G 1 + |
| | V2 < -Alarm B | G 2 + |
| Alarm Contact Jumpers | Relay Contact 1, NC Position | Staple K in Pos. C. |
| | Relay Contact 1, NO Position | Staple K in Pos. O. |
| | Relay Contact 2, NC Position | Staple J in Pos. C. |
| | Relay Contact 2, NO Position | Staple J in Pos. O. |
| RC Jumpers | Relay Contact 1 with RC | Staple G in Pos. I. |
| | Relay Contact 1 without RC | Staple G in Pos. O. |
| | Relay Contact 2 with RC | Staple F in Pos. I. |
| | Relay Contact 2 without RC | Staple F in Pos. O. |
| Relay Jumper AL | Alarm A & Alarm B operate independently. | Staple AL in Pos. A. |
| | Alarm A & Alarm B operate in parallel. | Staple AL in Pos. B. |
| Time Delay Jumper | Time Delay Enabled | Staple M in Pos. 1 |
| | Time Delay Disabled | Staple M in Pos. 2 |

Section VI

Principles of Operation

The Difference Alarm circuit for both single and dual alarms is shown in schematic Figure 6-2.

Inputs V1 and V2 are filtered and buffered by operational amplifiers A1 and A5, respectively, each with adjoining R-C circuits. Inputs can be +1 to +5 volts or -4 to +4 volts. The buffered outputs of A1 and A5 are applied to test jacks which are accessible from the frontplate. These outputs are also applied to four staple jumpers which are used to select the ten possible alarm functions of each alarm.

Amplifier A3 (A52) is a summer with inverting and non-inverting inputs. Alarm A (Alarm B) alarm point, E1 and E2 inputs are applied to the appropriate inputs with six staple jumpers to select one of ten alarm functions. In the alarm-on state, the output of A3 (A52) is negative; in the alarm-off state this output goes positive. The output of A3 (A52) is applied to amplifier A4 (A53) which is used as an adjustable dead band stage.

The alarm-off state of the adjustable dead band amplifier results in an output of A4 (A53) equal to approximately -11 volts. This output reverse biases diode CR1 (CR51) causing A4 (A53) to operate merely as a comparator. As the output of A3 (A52) becomes negative (entering alarm-on state) the output of comparator A4 (A53) switches to approximately +11 volts. This +11 volt signal triggers relay K1 (K51) as well as forward biases CR1 (CR51) causing a dead band with positive feedback. The output signal from A3 (A52) now has to rise above 0 volts to switch the output of A4 (A53) to +11 volts (the alarm-off state). The alarm-on output ($\cong +11$ volts) reverse biases CR2 (CR52) enabling the +12 volt reference to turn on Q1 (Q51) through CR3 (CR53). When an adjustable relay response time option is present, the Q1 (Q51) turn-on voltage slowly builds up in C19 (C69). The change time is settable with potentiometer R4 (R54). The alarm-off output (-12 volt) forward biases CR2 (CR52) and applies a -10.5 volt signal to CR3 (CR53). This signal results in Q1 (Q51) turning off.

Transistor Q2 (Q52) operates as an inverter. In the alarm-on state, Q1 (Q51) saturates and causes Q2 (Q52) to cut off. Relay K1 (K51) de-energizes resulting in a fail-safe alarm condition. In the alarm-off state, the cutting off of Q1 (Q51) saturates Q2 (Q52) and relay K1 (K51) energizes.

Alarm points (Alarm A and Alarm B) are originated in potentiometers placed between a -.10 volt and a +6.2 volt reference. The range of these potentiometers (R10, R60) is from less than 0 volts to greater than +5 volts. Each alarm point is buffered by an operational amplifier (A2, A51) before being applied to the frontplate test jacks.

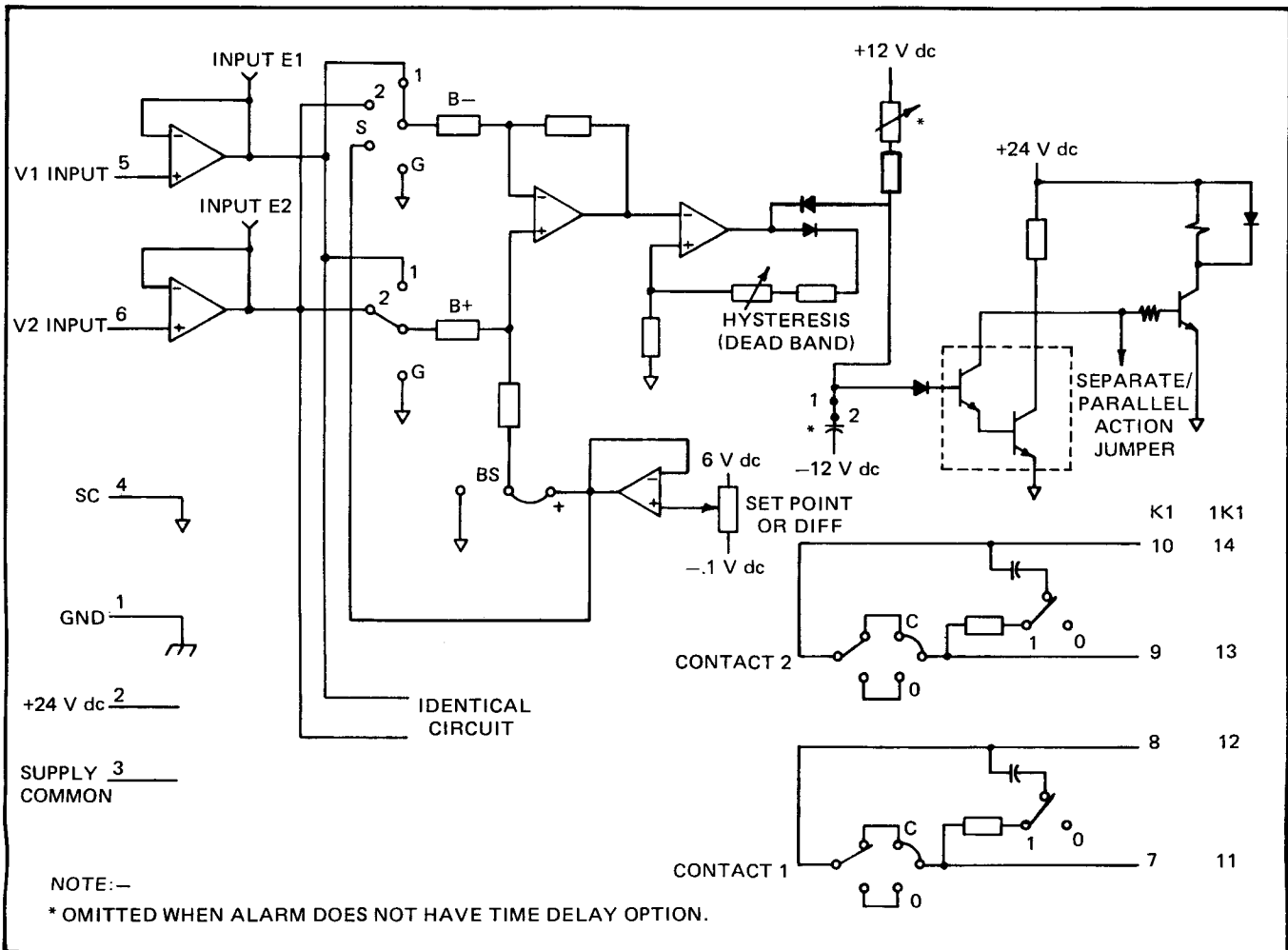


FIGURE 6-1 — Functional Schematic Type 744 Difference Alarm

Section VII

Maintenance and Troubleshooting

MAINTENANCE

CALIBRATION

To perform the calibration procedures, it is recommended that the Difference Alarm be removed from service and connected to a bench test set-up as described below. (See Figure 7-1).

1. Connect supply voltage of 24 V dc (100 mA) to terminals 2 (+) and 3 (–) and 2 precision voltage sources of 1-5 V dc to terminals 5 (+) and 4 (–) and 6 (+) and 4 (–). Short terminals 1, 3 and 4 together.

See “Initial Checks and Adjustments/Operation,” section for the following procedures.

1. Dead Band Adjustment
2. Relay Response Time Adjustment
3. Alarm Point Adjustment
4. Alarm Action



WARNING

ONLY TEST PROBES SUITABLE FOR THE PURPOSE SHOULD BE USED TO EXTEND CIRCUIT SIGNALS TO OTHER RECORDING/INDICATING INSTRUMENTATION. THE USE OF OTHER MEANS TO EXTEND CIRCUIT SIGNALS MAY ENDANGER PERSONS OR PROPERTY.

The Bailey Controls Company utilizes in its design test jacks standard to the industry. Test probes suitable for the purpose are commercially available from local electronic component suppliers.

ATTENTION: N'UTILISER QUE LE MATERIEL D'ESSAI APPROPRIE POUR L'EXTENSION DES SIGNAUX A D'AUTRES INSTRUMENTS ENREGISTREURS-INDICATEURS. TOUTE AUTRE METHODE D'EXTENSION DES SIGNAUX PEUT ETRE DANGEREUSE POUR LES PERSONNES OU ENDOMMAGER LE MATERIEL.

La Bailey Controls Company a conçu des fiches d'essai normalisées pour tout usage industriel. On peut se procurer les appareils d'essais appropriés dans le commerce en s'adressant aux fournisseurs de composants électroniques.

LEGEND PLATE REPLACEMENT

Difference Alarm legend plates are supplied blank, or marked with customer-specified legends. To change legend plates, proceed as follows:

Shelf-Mountable Units

1. Insert small-head screwdriver through two access holes (7, Figure 4-1) at rear of front frame to push out legend plate assembly, (1, Figure 4-1).

2. To replace legend plate, slide plate out of legend holder assembly and replace by sliding new plate back into assembly. Make sure that legend plate does not extend beyond edge of holder.

3. Insert legend holder assembly into Difference Alarm front frame and press to lock into frame.

Rack-Mountable Units

Slide legend plate (1, Figure 4-1) out of slots in withdrawal handle and replace by sliding new plate back into handle slots. Make sure that legend plate does not extend beyond edges of handle.

TROUBLESHOOTING

GENERAL

In the event of Difference Alarm malfunction, the complete unit should be removed from operation and connected to a bench test set up as shown in Figure 7-1. A precision digital voltmeter with input resistance greater than 1 megohm is recommended for making tests; however, a multimeter with an input resistance of 20K ohms/volt is adequate for most tests. An ohmmeter is required to identify the position of relay contacts. When troubleshooting, refer to the appropriate section of the Troubleshooting Procedure and the schematic diagram (Figure 6-2).

RECOMMENDED TEST EQUIPMENT

1. Cable Assembly, Cat. No. 763100FABA1 or 763400FABA1.
2. 24 V dc Power Supply.
3. Precision Digital dc voltmeter with input resistance greater than 1 meg.
4. Two precision voltage sources, adjustable 1-5 V dc.
5. Multimeter, 20K ohms/V dc.

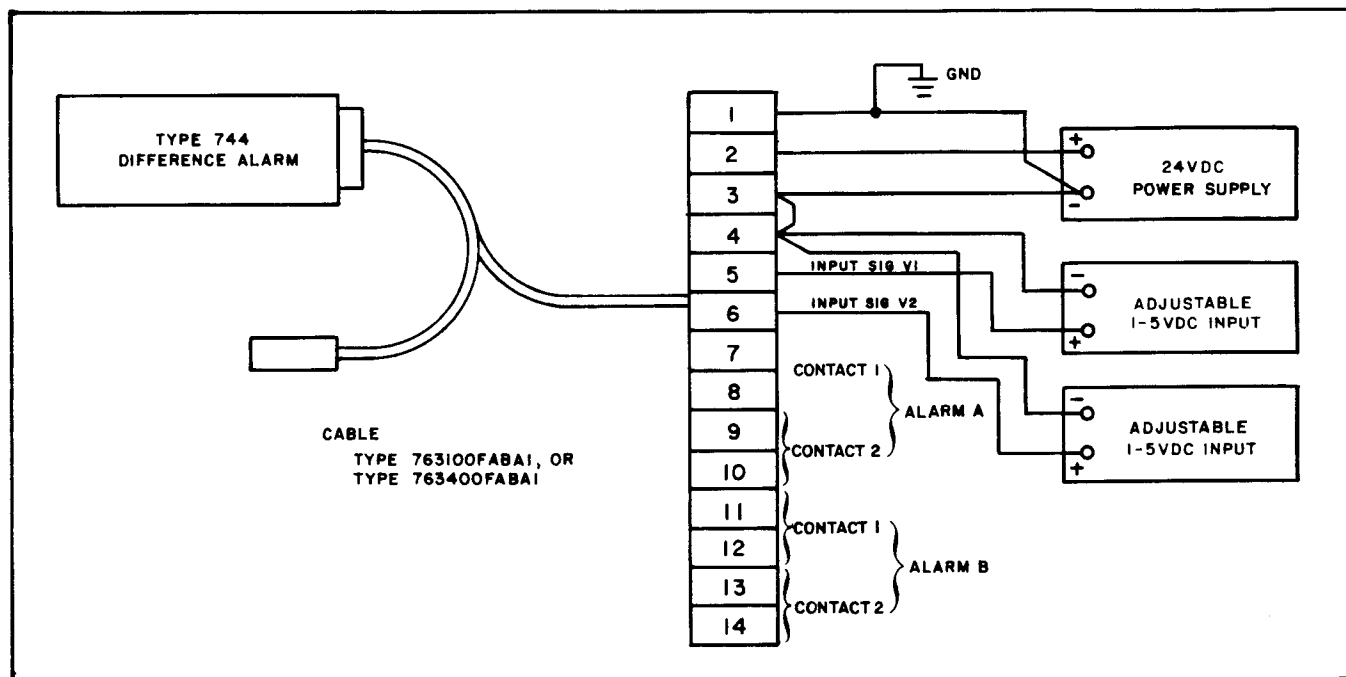


FIGURE 7-1 – Bench Test Set-Up for Troubleshooting and Calibration.

TROUBLESHOOTING PROCEDURES

1. (+) and (-) 12 V Reference Failure

| Problem | Symptom | Correction |
|---|---|---|
| +24 V reference is faulty | Cathode of CR100 is not approximately supply voltage. | Replace fuse F1 |
| +24 V is present but ± 12 V is faulty | Emitter of Q92 is not +18 V ± 2 V | Check and replace if necessary Q92, CR97, CR99, CR98. |
| +18 V is present but ± 12 V is faulty | Voltage wave form from collector to emitter of Q91 and Q90 is not approximately 35 V P-P and approximately 15KHz. | Check and replace if necessary Q91, Q90. |
| | Transistors are switching but ± 12 V is still faulty. | Check CR91, CR94. |
| ± 12 V is present but +6.2 V is faulty. | Voltage across CR90 is not 6.2 V. | Replace CR90 or R94. |

2. Test-Jack Voltage Failure.

The following troubleshooting chart assumes that (+) and (-) 12 V references are present.

| Problem | Symptom | Correction |
|--|---|-------------------|
| Alarm A test jack (Alarm B) can not be set to the correct alarm point. | +6.2 V is not dropped across CR90. | Replace CR90. |
| | The +6.2 V reference is present, but the range of R10 (R60) is not from 0 V to over +5 V. | Replace R10 (R60) |
| | A gain of +1 is not found between pin 3 and pin 6 of A2 (A51) | Replace A2 (A51) |
| Input E (E2) test jack does not monitor input voltage V1 (V2). | Input E1 (E2) differs from V1 (V2) by more than ± 6 mV. | Replace A1 (A5) |

3. Alarm-On State Failures

The following troubleshooting chart assumes (+) and (-) 12 V references and functioning test jacks are present.

When troubleshooting failures in the Alarm state all staple jumpers must be put in the solid line positions. When the time delay option is present, R4 (R54) should be adjusted completely CCW.

If testing Alarm A: Alarm A test jack should be adjusted to +1.000 V, input V1 = 1.000 V, and input V2 = 3.000 V.

If testing Alarm B: Alarm B test jack should be adjusted to +1.000 V, input V1 = 3.000 V, and input V2 = 1.000 V.

| Problem | Symptom | Correction |
|---|---|---|
| Relay K1 (K51) is not de-energized in the alarm state | Pin 6 of A3 (A52) is not -1 V, ±1 mV. | Replace A3 (A52). |
| | Pin 6 of A3 (A52) is -1 V and pin 6 of A4 (A53) is not approximately +11 V. | Replace A4 (A53). |
| | Pin 6 of A4 (A53) is approximately +11 V and cathode of CR3 is approximately +1 V, but the voltage from collector of Q1 (1Q1) is not approximately +.6 V. | Replace Q1 (Q51) |
| | Pin 6 of A4 (A53) is ≈ +11 V but voltage at cathode of CR3 is not approximately +1 V. | Check CR3 (CR53) and R4 and C19 (R54 and C69) if time relay is present. |
| | Collector voltage of Q1 (Q51) is approximately +.6 V but K1 (K51) is energized | Replace Q2 (Q52) |

4. Failure in Alarm-Off State.

All the assumptions made in procedure 3 are made for this Troubleshooting section.

In testing Alarm A (Alarm B): Adjust Alarm A (Alarm B) test jack to +1.000 volts, input V1 = +1.000 volts, and input V2 = +1.000 volts.

| Problem | Symptom | Correction |
|---|--|---------------------|
| Relay K1 (K51) is not energized in the Alarm-Off State. | Pin 6 of A3 (A52) is not +1 V, ± 1 mV. | Replace A3 (A52). |
| | Pin 6 of A3 (A52) is +1 V, but pin 6 of A4 (1A2) is not approximately -11 V. | Replace A4 (1A2). |
| | Pin 6 of A4 (A53) is approximately -11 V but cathode of CR2 (CR52) is not. | Replace CR2 (CR52). |
| | Cathode of CR2 (CR52) is approximately -11 V but the collector of Q1 (Q51) is not approximately +19 V. | Replace Q1 (Q51) |
| | Base of Q2 (Q52) is +.7 V but K1 (K51) is not energized. | Replace Q2 (Q52). |
| | 24 V appears across the coil of K1 (K51) but the relay is not energized. | Replace K1 (K51) |

5. Dead Band and Time-Delay Failures.

It is assumed that units switch into the Alarm-On state and out of the Alarm-Off state.

| Problem | Symptom | Correction |
|---|--|---|
| Adjustable dead band is faulty | Alarm A (B) switches both on and off at the same set of input voltages. (No dead band is present.) | Replace CR1 (CR51). |
| | Dead band is not properly adjustable. | Replace R6 (R56) |
| Time delay does not have an adjustable range of .25 seconds to 5 seconds. | Only a fast time constant is possible. | Check position of staple jumper L (M) Replace C19 (C69). |
| | The time delay is not adjustable. | Check position of staple jumper L (M) Replace R4 (R54). |

Section VIII

Specifications

| | |
|--|--|
| Input: | |
| Signals | 1-5 V dc -4 to 0 to +4 V dc |
| Resistance | Exceeds 1 megohm. |
| Alarm Point | 0 to 5 V dc. |
| Deadband | <0.5% to >10% of span (0.02 to 0.4 V dc). |
| Response Time Constant | Nominal - < 100 ms Optional - <0.25 to > 5 seconds |
| Relay Type | 2 sets (Form A or Form B) contacts per alarm. |
| Relay Contact Rating | 2 amperes 120 V ac, 50/60 Hz 2 amperes 24 V dc, non-inductive; |
| Test Jacks | Inputs, Alarm Points and Signal Common. |
| Accuracy (at 24 V dc and 80°F (27°C)) | ±0.5% |
| Power Supply Requirements | 0.2 amp. @ 24 V dc ±2 V. |
| Design Conditions: | |
| Supply Voltage | Reference: 24 V dc Normal: 22 to 26 V dc Operative Limits: 20 to 28 V dc |
| Ambient Temperature | Normal Operating Range: 40°F (4°C) to 120°F (49°C). Operative Limits: 20°F (-7°C) to 140°F (60°C) Storage Temperature: -70°F (-57°C) to 180°F (82°C) |

| | |
|----------------------------------|---|
| Operating Influences: | |
| Supply Voltage | ±0.2% (±2 V dc from 24 V dc) |
| Ambient Temperature | ±0.5% (±40°F from 80°F) |
| RFI Protection | 150 MHz Band - (147 to 160 MHz), Field Strength - 15 V/m (radiated), ±1% effect on accuracy when tested to proposed SAMA PMC33.1. |
| Physical Aspects: | |
| Size | Rack: 1.4" W x 7" H x 11.5" D (35.6 mm x 177.8 mm x 292.1 mm) Shelf: 2.75" W x 7.25" H x 11.5" D (69.9 mm x 184.2 mm x 292.1 mm) |
| Weight | Rack: Net 1 lb. (0.5 Kg), Shipping 4 lbs. (1.8 Kg) Shelf: Net 2 lbs. (.9 Kg), Shipping 5 lbs. (2.3 Kg) |
| Mounting | Rack: In Type 761 Rack Unit, Type 7657 RTU, Type 7655 PMU (refer to Product Specifications E98-761, E98-765-10, E98-765-11) Shelf, on Type 762 shelf and requires one unit of space. Refer to Product Specification E98-762. |
| Cable Legend | 15-conductor cable. Shelf instruments - a white translucent legend plate is provided at the top of panel-mountable instruments. Capacity is one or two lines of .16-inch characters, each line having 19 character spaces. Rack instruments - the legend plate holder is integral with the withdrawal handle. Legend for Nuclear Qualified Unit is contained in a separate holder mounted on frontplate. Capacity is one or two lines of .16-inch characters, each line having 11 character spaces. |
| Electrical Classification | Canadian Standards Association (CSA) Certified for use in ordinary (non-hazardous) locations. |

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

NOTES

Section IX

Service and Renewal Parts

SERVICE

The Bailey Controls Company is ready to assist in the use and repair of its products. Requests for sales and/or application services should be made to its nearest sales office.

Requests for installation, repair, overhaul and/or maintenance contract services should be made to its nearest sales office. Sales offices and service facilities listings are provided on the last page of this publication.

REPLACEMENT PARTS AND ORDERING INSTRUCTIONS

If the user is to make repairs at his own facilities, replacement parts should be ordered through a Bailey sales office. It is requested that the following information be provided to expedite the handling of parts orders.

1. Part description, Bailey catalog number or part number, and quantity.
2. Model and serial (if applicable) number(s) and rating of component for which the part has been ordered.
3. Bailey publication number and reference used in identifying the part.

It is recommended that standard parts be purchased from local supply houses. If standard parts are ordered from the Bailey Controls Company, it is requested that the Bailey catalog number (provided in the part number column of the Renewal Parts section) be provided in addition to the commercial description of the part (listed in the description column of the Renewal Parts section).

Parts which do not have a commercial description provided in the description column of the Renewal Parts section must be ordered from the nearest Bailey sales office.

Priced recommended spare parts lists on standard components may be obtained through the nearest sales office.

TRAINING

The Bailey Controls Company has available for in-plant training of customer's personnel a modern training facility equipped to provide service and repair instructions. Additional information on specific component coverage and available schedules may be obtained from a Bailey sales office.

TECHNICAL DOCUMENTATION

Additional copies of this publication must be obtained through the nearest sales office. Copies, over and above those provided at no charge with the original purchase, are available at a minimum charge to the customer.

Requirements for technical documentation to specific preparation specifications must be negotiated for price and delivery through the nearest Bailey sales office.

RENEWAL PARTS

This parts list describes replaceable parts for the Type 744 Difference Alarm. It is not to be taken as the authority for the procedure of assembly or disassembly of the equipment. Instead, it is intended for use in requisitioning, storing, issuing and identifying parts.

DETAILED PARTS LIST

The parts list has associated illustrations to portray instrument assembly parts and their relation to one another.

In most cases the listings are arranged in five columns: Fig. & Index No., Part No., Reference Designation, Description, and Units Per Assembly.

Fig. & Index No. Column

This column keys a part to an illustration and the applicable index number.

Part No. Column

This column lists the Bailey part number.

Reference Designation Column

This column is a listing of all reference designations (wiring diagram symbols) which have been assigned to the instrument components.

Description Column

This column contains the following information:

- a. A brief commercial description of the part.
 1. Tolerance on electronic parts are plus or minus unless otherwise stated.
 2. Capacitor working voltage are given in WV dc unless otherwise stated.

Units Per Assembly Column

1. The quantities listed in this column indicate the total quantity of the listed part required per unit or the quantity of the part bearing the listed reference designation.

Terms and Symbols

1. Following is a listing of abbreviations and symbols used in this parts list:

| | | | |
|------|---------------------|------|-----------------|
| A | - Amp | POT | - Potentiometer |
| ASSY | - Assembly | PWR | - Power |
| BKDN | - Breakdown | RES | - Resistor |
| CAP | - Capacitor | SI | - Silicon |
| COMP | - Composition | STL | - Steel |
| K | - One-Thousand Ohms | TANT | - Tantalum |
| LG | - Long | TRM | - Trim |
| MFD | - Microfarad | V | - Volts |
| MMFD | - Micro Microfarad | W | - Watts |
| MFG | - Manufacturing | WW | - Wire Wound |
| OPER | - Operating | | |

Type 744 Difference Alarm

| FIG. & INDEX NO. | BAILEY PART NO. | REF. DES. | DESCRIPTION | UNITS PER ASSY |
|---------------------|--------------------|--------------|-------------|-------------------|
|---------------------|--------------------|--------------|-------------|-------------------|

FRONT HOUSING AND RAILS

(Shelf-Mountable Units)

| | | | | |
|-----|-------------|----|---|---|
| 4-1 | 5721K85G784 | | PLATE, FRONT | 1 |
| | 3730K61G702 | | ASSY, FRAME | 1 |
| | 5974K23P004 | | RAIL, BOTTOM | 1 |
| | 5975K61G701 | | RAIL, TOP | 1 |
| | 5698K68P001 | | PLATE, BACK | 1 |
| | | | (ATTACHING PARTS) | |
| | NDLAT13 014 | | SCREW, SELF-TAPPING, TYPE A, STL, PARKERIZED, NO. 6-18 BY 7/8 LG | 4 |
| | NDFAL12 012 | | SCREW, SELF-TAPPING, TYPE A, STL, PARKERIZED, NO. 6-20 BY 3/4 LG | 4 |
| | 1694K87P001 | | BRACKET | 2 |
| | NBZAL13 004 | | SCREW, SLOTTED PAN HD, STL, CRONAK PLATE, NO. 6-32 BY 1/4 LG | 4 |
| -5 | 4223K69G700 | | HOLDER, FUSE | 1 |
| | 3744K11P028 | F1 | FUSE, 1/2 A AGC 1/2 | 1 |
| | 4223K68G700 | | HOLDER, LEGEND | 1 |
| -1 | 5676K69P000 | | PLATE, LEGEND (BLANK)* | 1 |

FRONT PLATE

(Rack-Mountable Units)

| | | | | |
|-----|-------------|--|---|---|
| 4-1 | 5721K85G787 | | PLATE, FRONT | 1 |
| | | | (ATTACHING PARTS) | |
| | 1694K96P001 | | BRACKET | 2 |
| | 7835K71P064 | | SPACER | 2 |
| | NCNAE13 003 | | SCREW, PHILLIPS PAN HD, STL, NICKEL PLATE, NO. 6-32 BY 3/16 LG | 1 |
| | NBSAE13 006 | | SCREW, SLOTTED PAN HD, STL, NICKEL PLATE, NO. 6-32 BY 3/8 LG | 2 |

*IF FACTORY LEGEND DESIRED - REFER TO NEAREST BAILEY SALES OFFICE

| FIG. & INDEX NO. | BAILEY PART NO. | REF. DES. | DESCRIPTION | UNITS PER ASSY |
|---------------------|--------------------|--------------|---|-------------------|
| 6-2 | 1612B40G000X | | PRINTED CIRCUIT BOARD | |
| | 1081K94P0006 | A1 | OP. AMPLIFIER 741C | 1 |
| | | A2 | SAME AS A1 | 1 |
| | | A3 | SAME AS A1 | 1 |
| | | A4 | SAME AS A1 | 1 |
| | | A5 | SAME AS A1 | 1 |
| | 2092B02P1210 | C1 | CAPACITOR, 1000 μ F, 50 V, CERAMIC | 1 |
| | | C2 | SAME AS C1 | 1 |
| | | C3 | SAME AS C1 | 1 |
| | | C4 | SAME AS C1 | 1 |
| | | C5 | SAME AS C1 | 1 |
| | | C6 | SAME AS C1 | 1 |
| | | C7 | SAME AS C1 | 1 |
| | | C8 | SAME AS C1 | 1 |
| | | C9 | SAME AS C1 | 1 |
| | | C10 | SAME AS C1 | 1 |
| | | C11 | SAME AS C1 | 1 |
| | | C12 | SAME AS C1 | 1 |
| | | C13 | SAME AS C1 | 1 |
| | | C14 | SAME AS C1 | 1 |
| | | C15 | SAME AS C1 | 1 |
| | | C16 | SAME AS C1 | 1 |
| | 2106K70P0054 | C17 | CAPACITOR 5MFD, 20 V, 10%,SLD. TANT | 1 |
| | | C18 | SAME AS C1 | |
| | 2106K92P0053 | C19 | CAPACITOR, 10 MFD, 20 V, 10%, SLD. TANT. | 1 |
| | | C20 | SAME AS C1 | 1 |
| | | C21 | SAME AS C1 | 1 |
| | | C22 | SAME AS C1 | 1 |
| | | C23 | SAME AS C1 | 1 |
| | 2092K90P0011 | C24 | CAPACITOR, .02 MFD, 1 KV, 20%, CERAMIC | 1 |
| | | C25 | SAME AS C24 | 1 |
| | | C26 | SAME AS C1 | 1 |
| | | C27 | SAME AS C1 | 1 |
| | | C28 | SAME AS C1 | 1 |
| | | C29 | SAME AS C1 | 1 |
| | | C30 | SAME AS C17 | 1 |
| | 2106K92P0060 | C90 | CAPACITOR, 22 MFD, 35 V, 10%, SLD. TANT. | 1 |
| | | C91 | SAME AS C90 | 1 |
| | 2092K90P0100 | C92 | CAPACITOR, .001 MFD, 1 KV, 10%, CERAMIC | 1 |
| | | C93 | SAME AS C90 | 1 |
| | 2108K97P0102 | C94 | CAPACITOR, .047 MFD, 50 V, 10%, FILM BLKHK | 1 |
| | 2092K90P0010 | C95 | CAPACITOR, 4700 μ F, 1 KV, CERAMIC | 1 |
| | | C96 | SAME AS C1 | |
| | 6705K90P0010 | CR1 | DIODE, BRKDN IN645 | 1 |
| | | CR2 | SAME AS CR1 | 1 |
| | | CR3 | SAME AS CR1 | 1 |
| | | CR4 | SAME AS CR1 | 1 |
| | 6707K10P0186 | CR90 | DIODE, BRKDN IN825 | 1 |
| | | CR91 | SAME AS CR1 | 1 |
| | | CR92 | SAME AS CR1 | 1 |
| | | CR93 | SAME AS CR1 | 1 |
| | | CR94 | SAME AS CR1 | 1 |
| | 6705K90P0002 | CR95 | DIODE, BRKDN IN457 | 1 |

| FIG. & INDEX NO. | BAILEY PART NO. | REF. DES. | DESCRIPTION | UNITS PER ASSY |
|--------------------------------|--------------------|--------------|---|-------------------|
| FRONT HOUSING AND RAILS | | | | |
| <u>(Shelf-Mountable Units)</u> | | | | |
| 4-1 | 5721K85G784 | | PLATE, FRONT | 1 |
| | 3730K61G702 | | ASSY, FRAME | 1 |
| | 5974K23P004 | | RAIL, BOTTOM | 1 |
| | 5975K61G701 | | RAIL, TOP | 1 |
| | 5698K68P001 | | PLATE, BACK | 1 |
| | | | (ATTACHING PARTS) | |
| | NDLAT13 014 | | SCREW, SELF-TAPPING, TYPE A, STL, PARKERIZED, NO. 6-18 BY 7/8 LG | 4 |
| | NDFAL12 012 | | SCREW, SELF-TAPPING, TYPE A, STL, PARKERIZED, NO. 6-20 BY 3/4 LG | 4 |
| | 1694K87P001 | | BRACKET | 2 |
| | NBZAL13 004 | | SCREW, SLOTTED PAN HD, STL, CRONAK PLATE, NO. 6-32 BY 1/4 LG | 4 |
| -5 | 4223K69G700 | | HOLDER, FUSE | 1 |
| | 3744K11P028 | F1 | FUSE, 1/2 A AGC 1/2 | 1 |
| | 4223K68G700 | | HOLDER, LEGEND | 1 |
| -1 | 5676K69P000 | | PLATE, LEGEND (BLANK)* | 1 |

FRONT PLATE(Rack-Mountable Units)

| | | | | |
|-----|-------------|--|---|---|
| 4-1 | 5721K85G787 | | PLATE, FRONT | 1 |
| | | | (ATTACHING PARTS) | |
| | 1694K96P001 | | BRACKET | 2 |
| | 7835K71P064 | | SPACER | 2 |
| | NCNAE13 003 | | SCREW, PHILLIPS PAN HD, STL, NICKEL PLATE, NO. 6-32 BY 3/16 LG | 1 |
| | NBSAE13 006 | | SCREW, SLOTTED PAN HD, STL, NICKEL PLATE, NO. 6-32 BY 3/8 LG | 2 |

*IF FACTORY LEGEND DESIRED - REFER TO NEAREST BAILEY SALES OFFICE

| FIG. & INDEX NO. | BAILEY PART NO. | REF. DES. | DESCRIPTION | UNITS PER ASSY |
|---------------------|--------------------|--------------|---|-------------------|
| 6-2 | 1612B40G000X | | PRINTED CIRCUIT BOARD | |
| | 1081K94P0006 | A1 | OP. AMPLIFIER 741C | 1 |
| | | A2 | SAME AS A1 | 1 |
| | | A3 | SAME AS A1 | 1 |
| | | A4 | SAME AS A1 | 1 |
| | | A5 | SAME AS A1 | 1 |
| | 2092B02P1210 | C1 | CAPACITOR, 1000 μ F, 50 V, CERAMIC | 1 |
| | | C2 | SAME AS C1 | 1 |
| | | C3 | SAME AS C1 | 1 |
| | | C4 | SAME AS C1 | 1 |
| | | C5 | SAME AS C1 | 1 |
| | | C6 | SAME AS C1 | 1 |
| | | C7 | SAME AS C1 | 1 |
| | | C8 | SAME AS C1 | 1 |
| | | C9 | SAME AS C1 | 1 |
| | | C10 | SAME AS C1 | 1 |
| | | C11 | SAME AS C1 | 1 |
| | | C12 | SAME AS C1 | 1 |
| | | C13 | SAME AS C1 | 1 |
| | | C14 | SAME AS C1 | 1 |
| | | C15 | SAME AS C1 | 1 |
| | | C16 | SAME AS C1 | 1 |
| | 2106K70P0054 | C17 | CAPACITOR 5MFD, 20 V, 10%,SLD. TANT | 1 |
| | | C18 | SAME AS C1 | |
| | 2106K92P0053 | C19 | CAPACITOR, 10 MFD, 20 V, 10%, SLD. TANT. | 1 |
| | | C20 | SAME AS C1 | 1 |
| | | C21 | SAME AS C1 | 1 |
| | | C22 | SAME AS C1 | 1 |
| | | C23 | SAME AS C1 | 1 |
| | 2092K90P0011 | C24 | CAPACITOR, .02 MFD, 1 KV, 20%, CERAMIC | 1 |
| | | C25 | SAME AS C24 | 1 |
| | | C26 | SAME AS C1 | 1 |
| | | C27 | SAME AS C1 | 1 |
| | | C28 | SAME AS C1 | 1 |
| | | C29 | SAME AS C1 | 1 |
| | | C30 | SAME AS C17 | 1 |
| | 2106K92P0060 | C90 | CAPACITOR, 22 MFD, 35 V, 10%, SLD. TANT. | 1 |
| | | C91 | SAME AS C90 | 1 |
| | 2092K90P0100 | C92 | CAPACITOR, .001 MFD, 1 KV, 10%, CERAMIC | 1 |
| | | C93 | SAME AS C90 | 1 |
| | 2108K97P0102 | C94 | CAPACITOR, .047 MFD, 50 V, 10%, FILM BLKHK | 1 |
| | 2092K90P0010 | C95 | CAPACITOR, 4700 μ F, 1 KV, CERAMIC | 1 |
| | | C96 | SAME AS C1 | |
| | 6705K90P0010 | CR1 | DIODE, BRKDN IN645 | 1 |
| | | CR2 | SAME AS CR1 | 1 |
| | | CR3 | SAME AS CR1 | 1 |
| | | CR4 | SAME AS CR1 | 1 |
| | 6707K10P0186 | CR90 | DIODE, BRKDN IN825 | 1 |
| | | CR91 | SAME AS CR1 | 1 |
| | | CR92 | SAME AS CR1 | 1 |
| | | CR93 | SAME AS CR1 | 1 |
| | | CR94 | SAME AS CR1 | 1 |
| | 6705K90P0002 | CR95 | DIODE, BRKDN IN457 | 1 |

Type 744 Difference Alarm

| FIG. & INDEX NO. | BAILEY PART NO. | REF. DES. | DESCRIPTION | UNITS PER ASSY |
|---------------------|--------------------|--------------|---------------------------------|-------------------|
| 6-2 | | CR96 | SAME AS CR95 | 1 |
| | 6705K90P0010 | CR97 | SAME AS CR1 | 1 |
| | 6707K10P0187 | CR98 | DIODE, BRKDN IN4746A | 1 |
| | | CR99 | SAME AS CR1 | 1 |
| | 6776K10P0073 | CR100 | DIODE, RECT. SI IN5059 | 1 |
| | 6854K97P0006 | Q1 | TRANSISTOR, 2N5308 NPN | 1 |
| | 6854K90P0052 | Q2 | TRANSISTOR, SI LP 2N3417 | 1 |
| | 6856K93P0008 | Q90 | TRANSISTOR D40D8 NPN | 1 |
| | | Q91 | SAME AS Q90 | 1 |
| | 6856K93P0009 | Q92 | TRANSISTOR, D42C8 NPN | 1 |
| | 6147K33P0409 | R2 | RESISTOR, 12.1K, 1%, 1/4W, FILM | 1 |
| | 6147K33P0401 | R3 | RESISTOR 10K, 1%, 1/4W, FILM | 1 |
| | 5845K33P0047 | R4 | POT, 1 MEG, 10%, CERMET | 1 |
| | 6148K67P0002 | R5 | RESISTOR, 4K, .1%, .3W, WR WD | 1 |
| | | R6 | SAME AS R4 | 1 |
| | | R7 | SAME AS R5 | 1 |
| | | R8 | SAME AS R5 | 1 |
| | | R9 | SAME AS R3 | 1 |
| | 5845K32P0003 | R10 | POT, 10K, 10%, CERMET | 1 |
| | 6147K33P0268 | R11 | RESISTOR 499, 1%, 1/4W, FILM | 1 |
| | | R12 | SAME AS R5 | 1 |
| | | R13 | SAME AS R3 | 1 |
| | 6147K33P0568 | R14 | RESISTOR, 499K, 1%, 1/4W, FILM | 1 |
| | 6147K29P0349 | R15 | RESISTOR, 3.16K, 1%, 1/4W, FILM | 1 |
| | 6147K33P0409 | R16 | RESISTOR, 12.1K, 1%, 1/4W, FILM | 1 |
| | 6147K33P0501 | R17 | RESISTOR, 100K, 1%, 1/4W, FILM | 1 |
| | 6143K25P0121 | R18 | RESISTOR, 51, 5%, 1/4W, COMP | 1 |
| | | R19 | SAME AS R18 | 1 |
| | 6147K33P0309 | R20 | RESISTOR, 1.21K, 1%, 1/4W, FILM | 1 |
| | 6147K33P0357 | R21 | RESISTOR, 3.83K, 1%, 1/4W, FILM | 1 |
| | | R22 | SAME AS R3 | 1 |
| | | R23 | SAME AS R3 | 1 |
| | | R24 | SAME AS R9 | 1 |
| | 6147K29P0401 | R90 | RESISTOR, 10K, 1%, 1/2W, FILM | 1 |
| | | R91 | SAME AS R90 | 1 |
| | 6147K33P0289 | R92 | RESISTOR, 825, 1%, 1/4W, FILM | 1 |
| | | R93 | SAME AS R92 | 1 |
| | 6147K33P0281 | R94 | RESISTOR, 681, 1%, 1/4W, FILM | 1 |
| | 6147K29P0257 | R95 | RESISTOR, 383, 1%, 1/2W, FILM | 1 |
| | 6147K33P0373 | R97 | RESISTOR, 5620 1%, 1/4W, FILM | 1 |
| | 6147K33P0189 | R98 | RESISTOR, 82.5 1%, 1/4W, FILM | 1 |
| | 6147K33P0401 | R99 | RESISTOR, 10K, 1%, 1/4W, FILM | 1 |
| | 2390K71P0017 | | FUSE CLIP | 2 |
| | 1705B02P0001 | | MTG. BRKT. | 3 |
| | 5535B01P0001 | | IC PADS | 4 |
| | 7768K91P0002 | | RELAY SOCKET | 1 |
| | 7984K40P0002 | | STAPLE | 9 |
| | 8615K64G0700 | T1 | | 1 |
| DUAL ALARM | | | | |
| | 1081K94P0006 | A51 | OP. AMPLIFIER 741C | 1 |
| | | A52 | SAME AS A51 | 1 |
| | | A53 | SAME AS A51 | 1 |

4574K14-100 Type 744 Difference Alarm

| FIG. & INDEX NO. | BAILEY PART NO. | REF. DES. | DESCRIPTION | UNITS PER ASSY |
|---------------------|--------------------|--------------|--|-------------------|
| 6-2 | 2092B02P1210 | C55 | CAPACITOR, 1000 ρ F, 50 V, CERAMIC | 1 |
| | | C56 | SAME AS C55 | 1 |
| | | C57 | SAME AS C55 | 1 |
| | | C58 | SAME AS C55 | 1 |
| | | C59 | SAME AS C55 | 1 |
| | | C60 | SAME AS C55 | 1 |
| | | C61 | SAME AS C55 | 1 |
| | | C62 | SAME AS C55 | 1 |
| | | C63 | SAME AS C55 | 1 |
| | | C64 | SAME AS C55 | 1 |
| 2106K92P0053 | | C65 | SAME AS C55 | 1 |
| | | C66 | SAME AS C55 | 1 |
| | | C68 | SAME AS C55 | 1 |
| | | C69 | CAPACITOR, 10 MFD, 20 V, 10%, SLD. TANT. | 1 |
| | | C70 | SAME AS C55 | 1 |
| 2092K90P0011 | | C71 | SAME AS C55 | 1 |
| | | C72 | SAME AS C55 | 1 |
| | | C73 | SAME AS C55 | 1 |
| | | C74 | CAPACITOR, .02 MFD, 1KV, 20%, CERAMIC | 1 |
| 6705K90P0010 | | C75 | SAME AS C74 | 1 |
| | | CR51 | DIODE, BRKDN IN645 | 1 |
| | | CR52 | SAME AS CR51 | 1 |
| | | CR53 | SAME AS CR51 | 1 |
| 6845K97P0006 | | CR54 | SAME AS CR51 | 1 |
| | | Q51 | TRANSISTOR, 2N5308 NPN | 1 |
| | | Q52 | TRANSISTOR, SI LP 2N3417 | 1 |
| | | R52 | RESISTOR 12.1K, 1%, 1/4W, FILM | 1 |
| | | R54 | POT, 1 MEG, 10%, CERMET | 1 |
| | | R55 | RESISTOR, 4K, .1%, .3W, WR WD | 1 |
| | | R56 | POT, 1 MEG, 10%, CERMET | 1 |
| | | R57 | SAME AS R55 | 1 |
| | | R58 | SAME AS R55 | 1 |
| | | R59 | RESISTOR, 10K, 1%, 1/4W, FILM | 1 |
| 5845K32P0003 | | R60 | POT, 10K, 10%, CERMET | 1 |
| | | R61 | RESISTOR, 499, 1%, 1/4W, FILM | 1 |
| 6147K33P0268 | | R62 | SAME AS R55 | 1 |
| | | R64 | RESISTOR, 499K, 1%, 1/4W, FILM | 1 |
| 6147K29P0349 | | R65 | RESISTOR, 3.16K, 1%, 1/4W, FILM | 1 |
| | | R66 | RESISTOR, 12.1K, 1%, 1/4W, FILM | 1 |
| 6147K33P0409 | | R67 | RESISTOR, 100K, 1% 1/4W, FILM | 1 |
| | | R68 | RESISTOR, 51, 5%, 1/4W, COMP. | 1 |
| 6143K25P0121 | | R69 | SAME AS R68 | 1 |
| | | R70 | RESISTOR, 1.21K, 1%, 1/4W, FILM | 1 |
| 6147K33P0309 | | R71 | RESISTOR, 3.83K, 1%, 1/4W, FILM | 1 |
| | | | IC PADS | 4 |
| 5535B01P0001 | | | RELAY SOCKET | 1 |
| | | | STAPLE | 9 |
| 7768K91P0002 | | | | |
| | | | | |
| 7984K40P0002 | | | | |
| | | | | |

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