

ROYAL CANADIAN AIR FORCE



DESCRIPTION AND MAINTENANCE  
INSTRUCTIONS

AIRCRAFT  
FIRE DETECTION SYSTEMS  
TYPE "A" EDISON

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

26 NOV 53

LIST OF RCAF REVISIONS

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## INTRODUCTION

The Edison type A aircraft fire detection system was originally developed to detect the presence of fire in aircraft power plants. It is equally well adapted to installation in other potential fire zones such as combustion heaters and hydraulic and electrical equipment compartments.

The system is a rate-sensitive device having a minimum time-constant. In actual service in both military and commercial operation this method of fire detection is repeatedly proving itself to be the most reliable way of sensing fire with the minimum possibility of false alarms. In a properly engineered installation no safe operating temperature can cause an alarm since the electrical characteristics of the detectors are not affected by ambient temperature nor by gradual rises due to engine warm-up or power runs.

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## DESCRIPTION

## GENERAL

1 Having established the functional objective for the system, Edison engineers designed into the device what they felt were requisites necessary to safety beyond the usual requirements for aircraft equipment.

2 The detectors are designed to operate properly in flame for two successive one minute periods and still produce an alarm when again subjected to fire.

3 The detectors are unaffected by extreme vibration, chemical action of aromatic fuels, oil, or exposure to extreme climatic conditions.

4 No special tools are required for overhaul or maintenance of the system.

5 The integrity of the entire system, including the detectors, may be tested at any time by operating a simple test switch.

6 When the fire is out the alarm ceases and the system is immediately ready to give an alarm in case of re-ignition.

7 No current from the aircraft power supply ever flows through the detector circuit to become an additional hazard in the potential fire zones.

## CONSTRUCTION, see Figure 1-1.

8 Three simple circuits make up the system. The detector circuit is permanently closed. It consists of the detector thermocouples and a test thermocouple connected in series with the coils of the sensitive relay. The contacts of this relay, a slave relay, and such warning signal and other devices as may be required for the given installation, constitute the fire warning circuit which is energized by the aircraft power supply. The test circuit is made up of a momentary contact switch which sends current from the aircraft power supply to a heating coil adjacent to the test thermocouple.

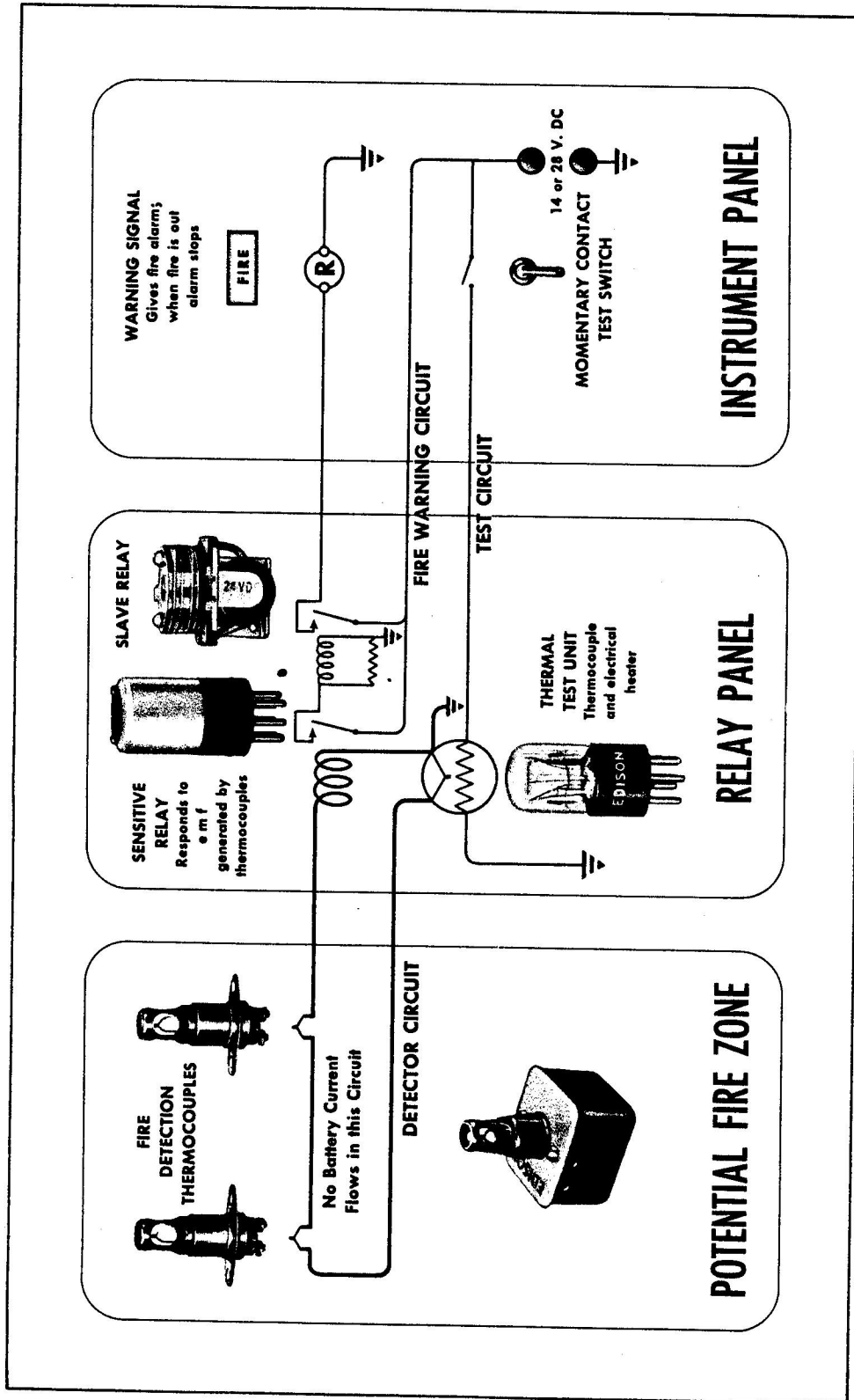


Figure 1-1 Basic Circuit of the System

## PART 2

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## INSTALLATION

## DETECTOR THERMOCOUPLES

1 The fire sensing unit of the system consists essentially of two wires of dissimilar metals with their outer ends twisted and welded together. They are furnished in two designs, each for a specific application.

2 Cage-type detectors are used at points of air egress and other strategic locations in potential fire zones such as power and accessory sections of engine installations, combustion heaters, auxiliary power units, and hydraulic and electrical equipment compartments. The thermocouple wires are mounted in a heat-resistant insulator and surrounded by a stainless steel cage. The cage is provided with openings to permit heat to reach the exposed "hot" junction with minimum interference while furnishing maximum mechanical protection. The reference junctions or points where the thermocouple wires are attached to terminal screws, lie within the insulator, see Figure 2-1.

3 For installation in aircraft engine fuel induction systems, probe-type detectors are used. The "hot" junction is at the end of a supporting stem which extends through a pressure-tight fitting into the potential fire zone. The connection between the leads and the circuit furnish reference junctions outside the fire zone.

## RELAY PANEL

4 A relay panel, which may be mounted in any accessible location, furnishes a suitable housing for the sensitive relay, slave relay, and thermal test unit. These panels are nor-

mally supplied in models to serve two, four, or six detector circuits. One, three, and eight circuit panels have been furnished when required.

5 The sensitive relay is an entirely enclosed unit provided with a seven-pin base for plug-in mounting in the panel. The moving element is a small permanent magnet which is pivoted between two stationary field coils. Elimination of the usual large fixed magnet substantially reduces weight, while lack of delicate moving coils and multiple current-carrying hair springs greatly simplifies service operation.

6 Since the load-carrying ability of the sensitive relay is necessarily limited, a slave relay is employed which permits the operation of master warning devices.

7 The thermal test unit consists of a thermocouple with a pair of heating coils adjacent to its "hot" junction. In order to secure uniformity of operation and to avoid possible fire hazard, these parts are sealed within a glass bulb. A four-pin base provides for plug-in mounting in the relay panel.

## WARNING DEVICES AND TEST SWITCHES

8 These devices, which are not supplied by the manufacturer of the fire detection system, vary with the installation involved. Warning lights for each detector circuit as well as a master visual or audible warning signal actuated by all circuits is usual. However, where so desired two or more circuits may be caused to operate a single warning device.

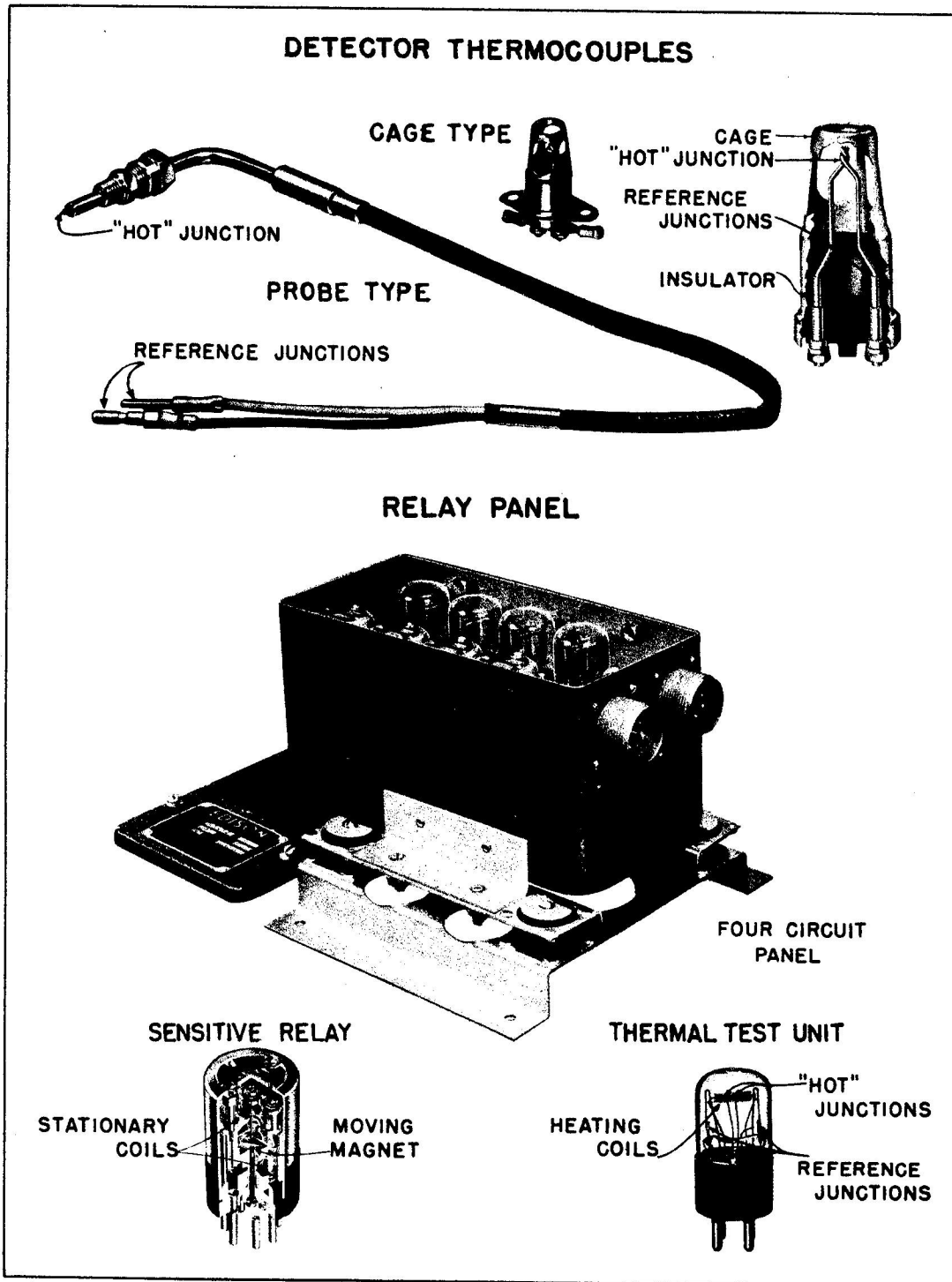


Figure 2-1 Major Parts of the System

## PART 3

PRINCIPLE OF OPERATION  
(Refer to Figure 3-1)

1 This fire detection system is unique in that thermocouples are used as the fire sensing units. An alarm occurs only when temperature rises at an abnormal rate, and not because it has reached any fixed value. A thermocouple may be considered a simple power generator whose output results from a difference in temperature between its "hot" and reference junctions. The operation of the Edison fire detector thermocouple, however, must not be confused with that of the more conventional thermocouple used to actuate certain types of temperature indicators. In the latter, the object is to compare a variable temperature with a fixed standard. For that reason only the hot junction is exposed to the critical temperature, the reference junctions being completely isolated from its zone of influence.

2 The fire detection thermocouple, on the other hand, is designed to produce an emf proportional to rate of rise of ambient temperature. Both junctions are located in the zone of influence of the variable temperature, with the reference junctions so insulated that their response to a change in ambient temperature will lag behind the response of the "hot" junction by a fixed time interval. The more rapid the change in ambient temperature, therefore, the greater will be the temperature difference between the

"hot" and reference junction and the higher the output of the detector.

3 The fire detection system as installed in an aircraft is so set up that the total output of all of the series-connected thermocouples of a detector circuit is insufficient to operate the sensitive relay under normal operating conditions. But in case of fire the output of any one detector will cause an alarm.

4 Since only current generated by the thermocouples ever flows through the detector circuit, grounded or broken wires can neither prove a fire hazard nor give a false alarm. A thermoelectric current is generated by operating the test switch which heats the thermocouple in the thermal test unit. If there is continuity through all parts of the detector circuit, including the detector thermocouples, the output of the thermal test unit will close the sensitive relay and result in an alarm, thus completely checking the integrity of the system.

5 In order that the system be properly adapted to the operating conditions and fire zone configurations of the particular model of aircraft involved, Edison engineers are ready to assist in the development of prototype installations.

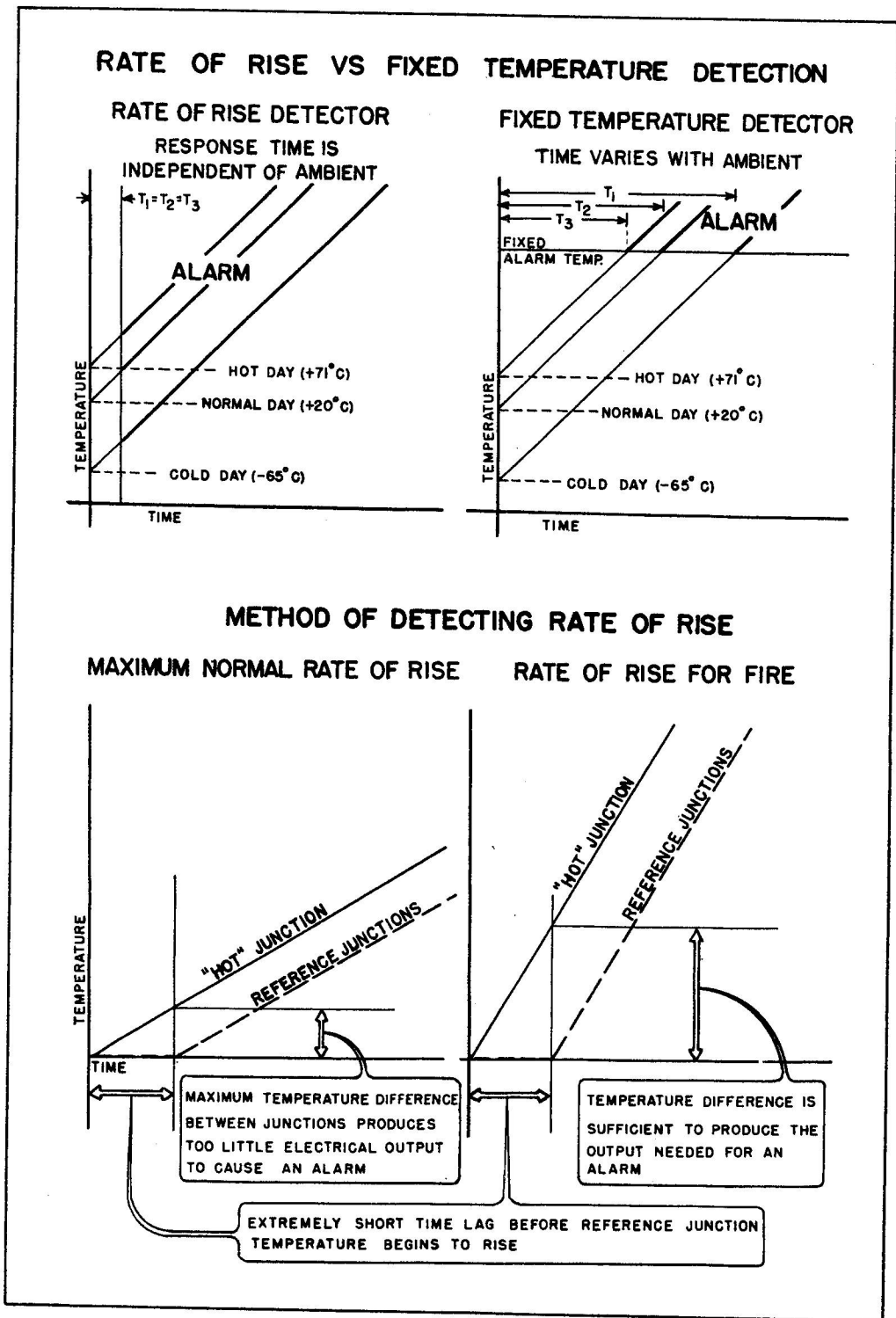


Figure 3-1 Principle of Operation

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## SERVICE AND MAINTENANCE INSTRUCTIONS

## INTRODUCTION

1 The instructions contained herein cover those operations normally performed by line maintenance personnel in connection with the Edison aircraft fire detection system using Model 117 relay panels, control assemblies. Information regarding installation and replacement of components is necessarily general. Data concerning installation in a particular make and model of aircraft must be secured from the aircraft manufacturer or airline engineering department.

(a) Check detector thermocouples to be sure they are securely mounted.

(b) Check to be sure no foreign matter which might ground the exposed junction to the shell has lodged in the thermocouple cage.

(c) Check fire zone wiring to be sure the insulation and conductor is firmly gripped by pre-insulated terminals.

NOTE

To insure permanent, trouble-free service, only approved terminals should be used. Refer to paragraph 17(a).

## PERIODIC INSPECTION

## Preflight Inspection

2 During preflight ground run-up, hold test switch "ON" continuously until all warning lights are on. Any circuit which fails to alarm within 15 seconds is not completely operative.

(d) Check connections for tightness and clean contact.

## Minor Inspection

3 At minor inspection check as follows:

(e) Check all wiring to be sure it is firmly secured and undamaged.

(f) Check resistance of each detector circuit, refer to para. 12(c). Resistance should not deviate more than  $\pm .25$  ohms from original resistance of the circuit.

(g) Check detector circuits for grounds, refer to para. 12(b). With detector circuit disconnected from relay panel, control assembly, resistance to ground should not be less than 5000 ohms.

(h) Inspect relay panel, control assembly for deterioration of shock-mounts or other evidence of damage. Make certain panel is balanced on all mounts and not hindered by dragging lead-in cables, etc.

#### Major Inspection

4 At major inspection check as follows:

(a) Perform all operations described under Minor Inspection.

(b) After detector circuit is reconnected to aircraft circuit, test all detector thermocouples for connection polarity, refer to para. 12(d).

#### NOTE

It is recommended that relay panels, control assemblies, be overhauled after 1000 flying hours.

#### TROUBLE SHOOTING PROCEDURE TEST EQUIPMENT

##### Detector Circuit Test Plug

5 To simplify checking to determine whether or not a defect which is causing malfunctioning of the system is in the detector circuit, it is recommended that a detector circuit test plug be made up as described below. After inserting this plug in the "DETECTOR" receptacle of the relay panel, control assembly, in place of the plug attached to the aircraft wiring, the entire system exclusive of the detector circuits may be checked by means of the regular test switch. Some relay panels have "DETECTOR" connectors which serve other circuits. In these instances cable assemblies to maintain these connections during testing are required.

(a) Obtain an AN3106 or AN3108 socket-type plug of proper size and insert arrangement to fit the "DETECTOR" connector of the relay panel involved, see Table 1 for dash numbers. If a cable assembly is required, also obtain a mating AN3101 socket-type receptacle.

(b) Connect each pair of detector circuit terminals together preferably through 5 ohm resistors, see Table 1. If a cable assembly is required, connect the remaining terminals of the plug to corresponding receptacle terminals by means of 12 inch lengths of #20 aircraft wire.

##### Alarm Circuit Test Receptacle

6 To simplify checking to determine whether or not a defect which is causing malfunctioning of the system is in one of the circuits beyond the relay panel, control assembly, it is recommended that an alarm circuit test receptacle be constructed. After the "ALARM" plug is removed from the relay panel and inserted in this receptacle, warning devices and their associated wiring external to the relay panel may be checked by means of the regular test switch. A pilot light at the test receptacle also checks the power supply to the system. Some relay panels have "DETECTOR" connectors which serve master warning signal or ground connections normally handled through the "ALARM" connector. In these instances, cable assemblies to connect "ALARM" and "DETECTOR" plugs to maintain these circuits during testing are required.

(a) Obtain an AN3101 pin-type receptacle of size and insert arrangement to mate with "ALARM" connector plug used with relay panel involved, see Table 1 for dash numbers. If a cable assembly is required, also obtain an AN3101 pin-type receptacle to mate with the "DETECTOR" plug.

(b) Connect master warning signal, test switch and all warning signal terminals of receptacle or receptacles, using #20 wire.

(c) Connect a 14 or 28 volt lamp, as required, across the power supply and ground terminals.



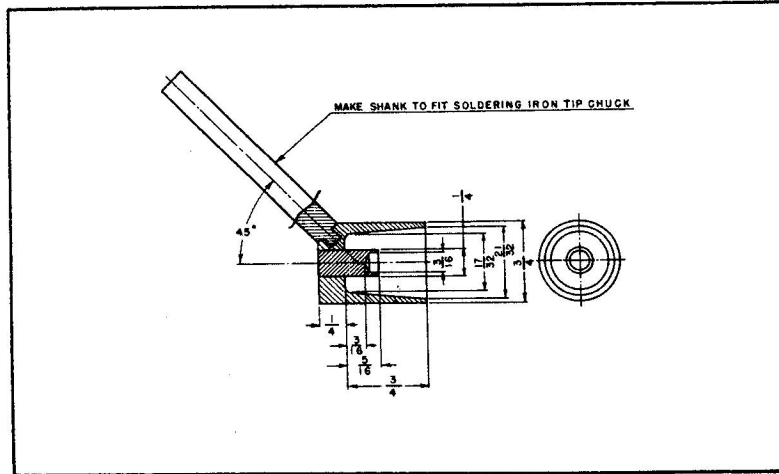


Figure 4-1 Detector Thermocouple Test Heater

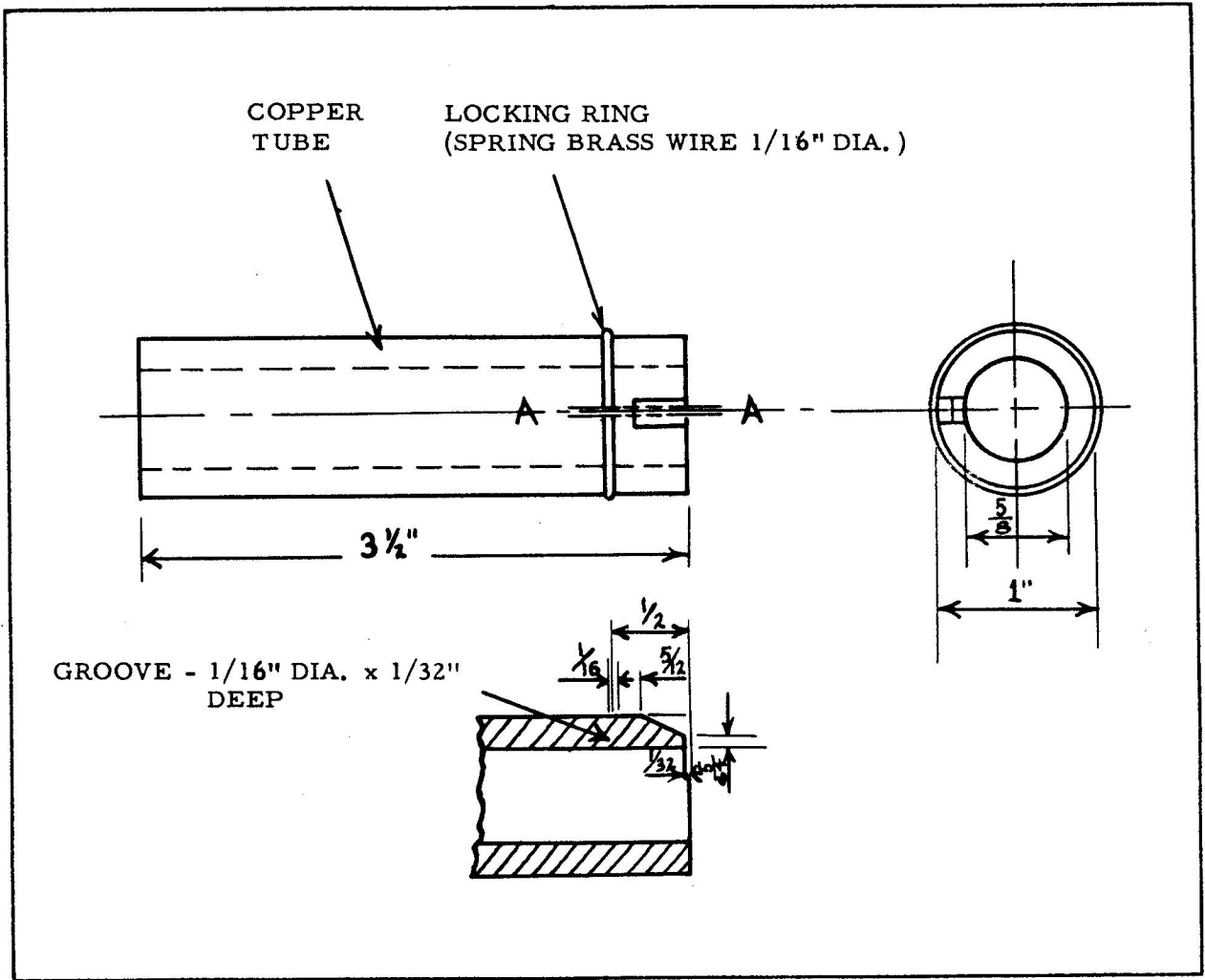


Figure 4-2 Adaptor for IT/1395 Soldering Iron Material as Shown

### Detector Thermocouple Test Heater

7 To simplify testing of cage-style detector thermocouples, it is recommended that a large electric soldering iron be fitted with the special copper tip shown in Figure 4-1, or an alternative adaptor as shown in Figure 4-2. When heated, the self-positioning tip is placed over the detector thermocouple. The resulting rate of temperature rise is sufficient to produce a measurable current.

### Detector Circuit Energizer

8 To simplify testing of detector circuits for open connections, it is recommended that a circuit energizer be constructed.

- (a) Attach a battery clip to the negative side of a size D dry cell.
- (b) Connect a 100 ohm, 2 watt resistor between the positive terminal of the cell and a 4 ft. lead fitted with a test prod.

### Edison Test Sets

9 The Model 140-9 detection test set is recommended for routine testing of the detector circuits. Operating instructions are included with the instruments.

### TESTS

10 Apply the following tests in the order listed to check operation of every part of the system or to locate defects.

#### GENERAL PERFORMANCE TEST

11 Hold test switch "ON" continuously until all warning lights are on. Any circuit which fails to alarm within 15 seconds is defective.

#### DETECTOR CIRCUIT TESTS

12 Test detector circuit as follows:

- (a) If above test proves system to be defective, remove the "DETECTOR" plug from the relay panel, control assembly. In its place insert the detector circuit test plug or cable assembly. Operate the test switch. If an alarm now results, the detector circuit is the defective portion of the system. If no alarm results, proceed directly to alarm circuit test, see para. 13.
- (b) Check the detector circuit for grounds. Use an Edison fire detection test set or, after removing the "DETECTOR" plug from the relay panel, control assembly, connect an ohmmeter between any thermocouple terminal and airframe. If circuit contains grounded probe-type detector thermocouples, Model 108-6, Part

34606, disconnect both detector leads before testing circuit. Resistance must not be less than 5000 ohms. To locate a ground, connect the positive lead of the detector circuit in question to the positive, left hand, test binding post of the Model 140-9 test set, or equivalent meter, and ground the other meter binding post to the aircraft frame. Heat each of the detector thermocouples in turn noting the meter deflection. When two detectors are located that adjoin each other in the circuit, but only one of which causes the meter to deflect when heated, it will indicate that the ground exists between these two detectors. An alternate method would be to disconnect leads from the rear of the detectors until location of the grounded wire is determined.

- (c) Check the detector circuit resistance by using an Edison fire detection test set or an ohmmeter connected across the connector plug sockets serving the detector circuit in question, see Table 1. Resistance should not deviate more than  $\pm .25$  ohms from original resistance of circuit after aircraft has been allowed to stabilize at ambient temperature, see Note below. Locate open circuits by means of the detector circuit energizer as follows: Insert the "DETECTOR" plug in the relay panel, control assembly, receptacle then connect the negative terminal clip of the energizer to the aircraft frame. Touch the test prod to the "hot" junction of each thermocouple in turn using care to avoid touching prod to detector cage. When two adjoining detectors are located, only one of which causes a fire signal, the open circuit is between the two. An alternate method is to disconnect the detector circuit plug from the relay panel control assembly, then connect one lead of an ohmmeter to either of the plug sockets which is connected to the defective circuit and the other lead to the airframe. Successively short each thermocouple to ground by inserting a "jumper" wire from the tip of the thermocouple to ground. When two adjoining detectors are located, of which only one gives continuity to ground, the open circuit is between the two.

#### NOTE

It is recommended that original resistance of each detector circuit be noted on inside of cover of relay panel, control assembly, for subsequent reference.

(d) Check detectors for connection polarity after any part of detector circuit other than relay panel connector has been opened for service operations. Reversed detector connections are not made evident by any of the tests outlined in other paragraphs of this part. To check polarity connect an Edison fire detection test set or a milliammeter across the detector plug sockets serving the detector circuit in question, see Table 1. Observe polarity when making the connection. Successively heat the detectors by means of a large soldering iron with tip removed or replaced with detector thermocouple test heater described in para. 7. An explosive rivet heater could be used. Meter deflection must be clockwise with rising temperature.

#### ALARM CIRCUIT TESTS

13 Test alarm circuit as follows:

(a) Remove alarm circuit plug from relay panel, control assembly, receptacle and plug it into the alarm circuit test receptacle. Note whether the circuit is energized by observing

test receptacle lamp. Operate the test switch. Lack of response by any individual warning signal indicates trouble in that particular circuit while lack of all response shows a defective test circuit.

(b) "Press to test" each warning light if this type of light assembly is used.

#### THERMAL TEST UNIT AND SENSITIVE RELAY TESTS

14 With both detector and alarm circuits connected to the relay panel, control assembly, successively check the thermal test unit and the sensitive relay by replacing them with spares and operating the test switch. If the system still fails to operate, the trouble is a defective relay panel, control assembly.

#### REMEDIES FOR TEST FAILURE

15 It is recommended that line maintenance personnel attempt no repairs other than those listed in the trouble chart below. Defective assemblies must be sent to a properly equipped repair shop for further tests and repairs.

| TROUBLE                         | PROBABLE CAUSE                                                                                                                                                                                                                                                                                                                                            | REMEDY                                                                                                                                                                                                                                                                                    |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO ALARM WHEN TEST SWITCH IS ON | Power supply "OFF"<br>Defective detector circuit<br>Grounded wire or terminal<br>Loose or broken wire<br>Broken or damaged thermocouple<br>Defective warning signal circuit<br>Loose or broken wire<br>Defective warning device<br>Defective test switch circuit<br><br>Defective thermal test unit<br>Defective sensitive relay<br>Defective relay panel | Connect battery or turn switch "ON"<br><br>Insulate grounded conductor<br>Tighten or replace wire<br>Replace thermocouple<br><br>Tighten or replace wire<br>Repair or replace device<br>Repair or replace defective part<br>Replace test unit<br>Replace sensitive relay<br>Replace panel |

#### NOTE

This system is designed and installed to "fail safe"; i. e., it is inherently free of false alarms. Should false alarms be reported, make a careful examination of potential sources of sudden temperature rise, such as leaky collector rings, etc. Edison Service Engineers are always available to assist in such investigations.

## MAINTENANCE PROCEDURE

## WIRING

16 Replace wires as follows:

(a) Replace worn or damaged wires in fire zone with #16 wire conforming to USAF Spec. 32659. It is recommended that wire be supported approximately 3 in. from each detector and at 12 in. intervals.

(b) Replace other worn or damaged wire. #20, or larger, wire such as that conforming to Spec. AN-J-C-48a is recommended.

17 Replace terminals, disconnects, and plugs as follows:

(a) Replace all loose or defective terminals in fire zone. Test new wires with approved terminals as listed below. Because the wire recommended for installation in fire zones, para. 16, has insulation of larger diameter than standard high temperature 204°C (400°F) wire, only terminals with larger insulation sleeves give permanent, trouble-free service. Any attempt to squeeze the insulation into too small a terminal sleeve will result in unsatisfactory gripping of the wire insulation by the crimped sleeve. The insulation then pulls away from the pre-insulated terminal exposing the conductor to possible grounding. In addition the unsupported wire becomes subject to undue flexing and probable breakage under prolonged vibration, see Figure 4-3. To insure the best possible installation of the terminals the following procedure should be employed.

(1) Strip  $3/16 \pm 1/32$  in. of insulation from end of wire.

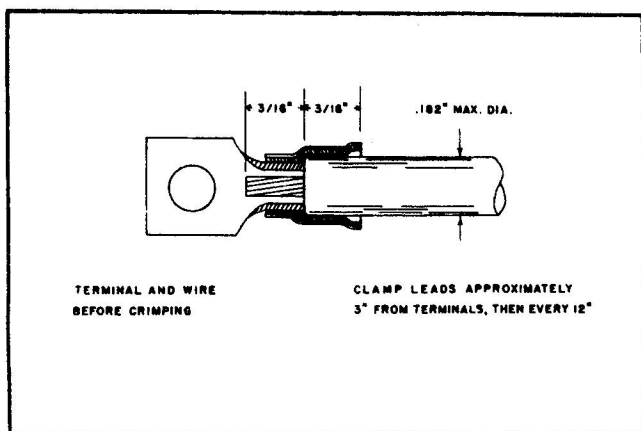


Figure 4-3 Correct Installation of Approved Fire Zone Terminals

(2) Insert stripped section of wire into the correct terminal until  $3/16$  in. of the insulation has entered the pre-insulated sleeve, see Figure 4-3.

(3) Crimp only with Aircraft Marine Products crimping tool 49557, Firezone, Maintain pressure until tool interlock releases and permits opening of tool. Use no substitute tool.

## APPROVED TERMINALS

(As furnished with Model 108-10 Detectors)

| STUD SIZE | EDISON   | * AMP. |
|-----------|----------|--------|
| 6         | NA 13478 | 35727  |
| 8         | NA 13479 | 320041 |

\* Aircraft Marine Products Corp., Harrisburg, Pa.

(b) If knife disconnects are used to facilitate removal of quick engine-change units, replace if defective, with new disconnects, Edison Part NA13503; Aircraft Marine Products Corp., Part 35791. Cover with 4 in. lengths of #5 saturated black fiberglass tubing or equivalent.

(c) Replace defective connector plugs with required straight or angle plugs AN3106 or AN3108, see Table 1 for dash numbers. It is recommended that  $7/8$  in. lengths of vinyl tubing or equivalent be provided to cover each wire connection at the plug terminals, and that at least a 5 in. length of similar tubing of suitable diameter be used to encase the wire bundle where it passes through cable clamp, AN3057, attached to the plug.

## DETECTOR THERMOCOUPLES

18 Maintenance on cage-style detectors is as follows:

(a) Before removal of detector, note polarity of lead connections and identify leads if old type terminals both having the same size holes are used.

(b) Disconnect leads, remove detector.

(c) Remove oil or grease from detectors with Stoddard's Solvent, Spec. 3-GP-8, or aircraft cleaning compound USAF Spec. 20015E. If carbon or other deposit persists, use carbon stripper USAF Spec. 20043A sparingly, or use vapourer soft-grit blast. Use care to avoid damaging thermocouple wires.

- (d) No repair of detectors recommended.
- (e) Install and connect detector in original position, noting which wire was connected to the identified (+) terminal of the defective unit, and connecting the replacement in the same manner.

**CAUTION**

Output from reversed thermocouples will not only fail to operate the system, but will tend to counteract the output of other detectors.

NOTE

It is recommended that all Model 108-5 and 108-8 detectors now in service be replaced with improved Model 108-10 detectors. Both terminals of the Model 108-5 detector are the same size, hence the possibility of accidental reversal of connections is much greater than with later models on which two sizes of studs are used. Installation of the Model 108-10 detector, therefore, requires the replacement of the negative wire terminal, preferably both terminals, with the approved terminals furnished with the new detectors. Use the larger, #8 terminal on the (-) wire. Due to improvements in material and design the Model 108-10 will be found to give more satisfactory service than the Model 108-8 detector, particularly in power zones of reciprocating engine installations and in the burner and tail pipe sections of jet engines. These two models are completely interchangeable.

19 Maintenance on probe-type detectors is as follows:

- (a) Disconnect detector leads from detector circuit wiring.
- (b) If detector is provided with separate mounting nipple, loosen packing nut until it is free on detector stem, then withdraw detector, nut and nylon sleeve, if used, from nipple. If nipple is permanently attached to detector stem, remove entire assembly.
- (c) Replace nylon sleeve or entire separate mounting nipple assembly if defective.

- (d) No repair of detectors recommended.

- (e) Install detector by reversing procedure outlined in steps (a) and (b). Be sure yellow lead of detector is connected to negative (-) terminal of detector circuit wiring. Apply torque of 35 to 45 in. lbs. when tightening packing nut of mounting nipple.

**CAUTION**

Model 108-6, Part 34606, detector contains a grounded thermocouple. This detector must be used, and can only be used in connection with Models 117-1422 and 117-1441 relay panels, control assemblies. Other models of probe-style detectors are interchangeable electrically.

NOTE

Model 109-1, Part 810911, detector supersedes Model 108-7, Part 34606-2.

20 Maintenance on relay panels, control assemblies is as follows:

- (a) Loosen relay panel cover screws and remove cover if replacement of sensitive relays or thermal test units is required. No other internal disassembly of the relay panel should be undertaken by line maintenance personnel.
- (b) To replace relay panel, remove electrical connector plugs and unlatch fasteners to release panel from shock-mount assembly.
- (c) Inspect shock-mount assembly for evidence of deterioration of vibration isolators. Unbolt and replace shock-mount assembly if defective.
- (d) Re-installation procedure is the opposite of that used for removal of components.

21 Carry out final tests as follows:

(a) Test detector connection polarity, refer to para. 12(d).



Output from a reversed detector will not only fail to operate the system, but will tend to counteract the output of other detectors.

(b) Test detector circuit for grounds, refer to para. 12(b).

(c) Measure detector circuit resistance, refer to para. 12(c).

22 Carry out system test as follows:

(a) Successively "press to test" each warning light, if this type of light assembly is used.

(b) Hold test switch "ON" continuously until all warning lights are on. Any circuit which fails to alarm within 15 seconds is defective.

TABLE 1  
REFERENCE DATA

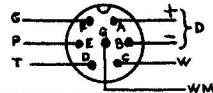
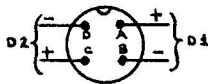
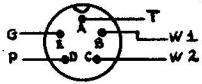
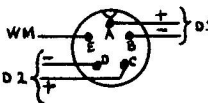
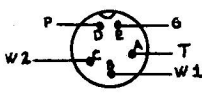
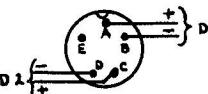

| RELAY PANEL, CONTROL ASSEMBLY, CONNECTOR DATA                                                                 |                       |                                                                                      |                         |                                                                                       |
|---------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------|
| RELAY PANEL<br>MODEL NO.                                                                                      | DETECTOR CONNECTOR    |                                                                                      | ALARM CONNECTOR         |                                                                                       |
|                                                                                                               | CONNECTOR<br>DASH NO. | PIN<br>LAYOUT                                                                        | CONNECTOR<br>DASH NO.   | PIN<br>LAYOUT                                                                         |
| ONE-CIRCUIT PANELS                                                                                            |                       |                                                                                      |                         |                                                                                       |
| 117-13<br>117-23                                                                                              | -16S-1                |    | ONLY ONE CONNECTOR USED |                                                                                       |
| TWO-CIRCUIT PANELS                                                                                            |                       |                                                                                      |                         |                                                                                       |
| 117-7<br>117-14<br>117-21<br>117-22<br>117-26<br>117-27<br>117-28<br>117-31<br>117-31X<br>117-33              | -14S-2                |    | -14S-5                  |    |
| 117-35<br>117-36<br>117-37<br>117-38<br>117-39<br>117-41<br>117-41A<br>117-50<br>117-52<br>117-52A<br>117-212 | -14S-5                |  | -14S-5<br>Pos. X        |  |
| 117-62<br>117-62-1<br>117-62A                                                                                 | -14S-5                |  | -16S-1                  |  |

TABLE 1 (Sheet 1 of 3)

TABLE 1 (Cont'd)

REFERENCE DATA

RELAY PANEL, CONTROL ASSEMBLY, CONNECTOR DATA

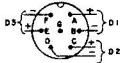
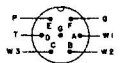
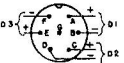

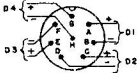
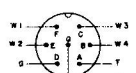
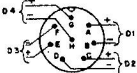

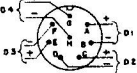
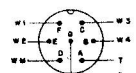

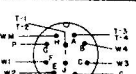
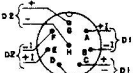

| RELAY PANEL MODEL NO.                                                                         | DETECTOR CONNECTOR |                                                                                     | ALARM CONNECTOR    |                                                                                       |
|-----------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------|
|                                                                                               | CONNECTOR DASH NO. | PIN LAYOUT                                                                          | CONNECTOR DASH NO. | PIN LAYOUT                                                                            |
| THREE-CIRCUIT PANELS                                                                          |                    |                                                                                     |                    |                                                                                       |
| 117-10<br>117-17<br>117-24                                                                    | -16S-1             |    | -16S-1<br>Pos. W   |    |
| 117-10s<br>117-17s<br>117-29<br>117-53                                                        | -16S-1             |    | -16S-1<br>Pos. W   |    |
| FOUR-CIRCUIT PANELS                                                                           |                    |                                                                                     |                    |                                                                                       |
| 117-4<br>117-5<br>117-6<br>117-9<br>117-32<br>117-32X<br>117-44<br>117-55<br>117-66<br>117-99 | -18-8              |  | -18-9              |  |
| 117-15<br>117-20<br>117-34<br>117-40<br>117-42<br>117-46<br>117-49<br>117-54                  | -18-8              |  | -18-8<br>Pos. W    |  |
| 117-55s                                                                                       | -18-8              |  | -18-9              |  |
| Note: Case of this panel must be connected to ground.                                         |                    |                                                                                     |                    |                                                                                       |
| 117-64<br>117-64-1                                                                            | -18-8              |  | -18-1              |  |
| 117-1422<br>117-1424                                                                          | -18-8              |  | -18-8<br>Pos. W    |  |

TABLE 1 (Sheet 2 of 3)



TABLE 1 (Cont'd)

REFERENCE DATA

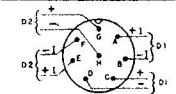
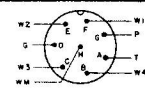
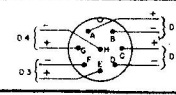
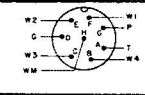

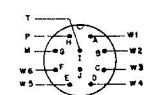
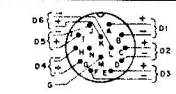
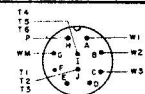
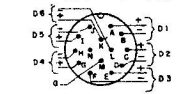
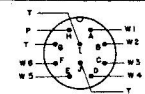
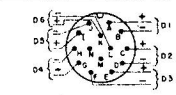
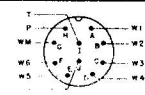
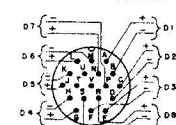
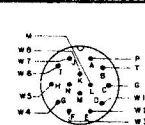
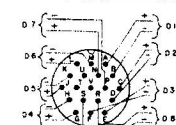
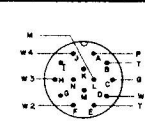
| RELAY PANEL, CONTROL ASSEMBLY, CONNECTOR DATA |                       |                                                                                     |                       |                                                                                       |
|-----------------------------------------------|-----------------------|-------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------|
| RELAY PANEL<br>MODEL NO.                      | DETECTOR CONNECTOR    |                                                                                     | ALARM CONNECTOR       |                                                                                       |
|                                               | CONNECTOR<br>DASH NO. | PIN<br>LAYOUT                                                                       | CONNECTOR<br>DASH NO. | PIN<br>LAYOUT                                                                         |
| FOUR-CIRCUIT PANELS (Cont'd)                  |                       |                                                                                     |                       |                                                                                       |
| 117-1423                                      | -18-8                 |    | -18-8<br>Pos. W       |    |
| 117-1441<br>117-1442                          | -18-8<br>Pos. Z       |    | -18-8<br>Pos. W       |    |
| SIX-CIRCUIT PANELS                            |                       |                                                                                     |                       |                                                                                       |
| 117-16<br>117-30<br>117-47                    | -20-27                |    | -18-1                 |    |
| 117-43                                        | -20-27                |   | -18-1                 |   |
| 117-51                                        | -20-27                |  | -18-1                 |  |
| 117-56                                        | -20-27                |  | -18-1                 |  |
| EIGHT-CIRCUIT PANELS                          |                       |                                                                                     |                       |                                                                                       |
| 117-19<br>117-48<br>117-58                    | -22-14                |  | -20-27                |  |
| 117-25<br>117-45                              | -22-14                |  | -20-27                |  |

TABLE 1 (Sheet 3 of 3)

