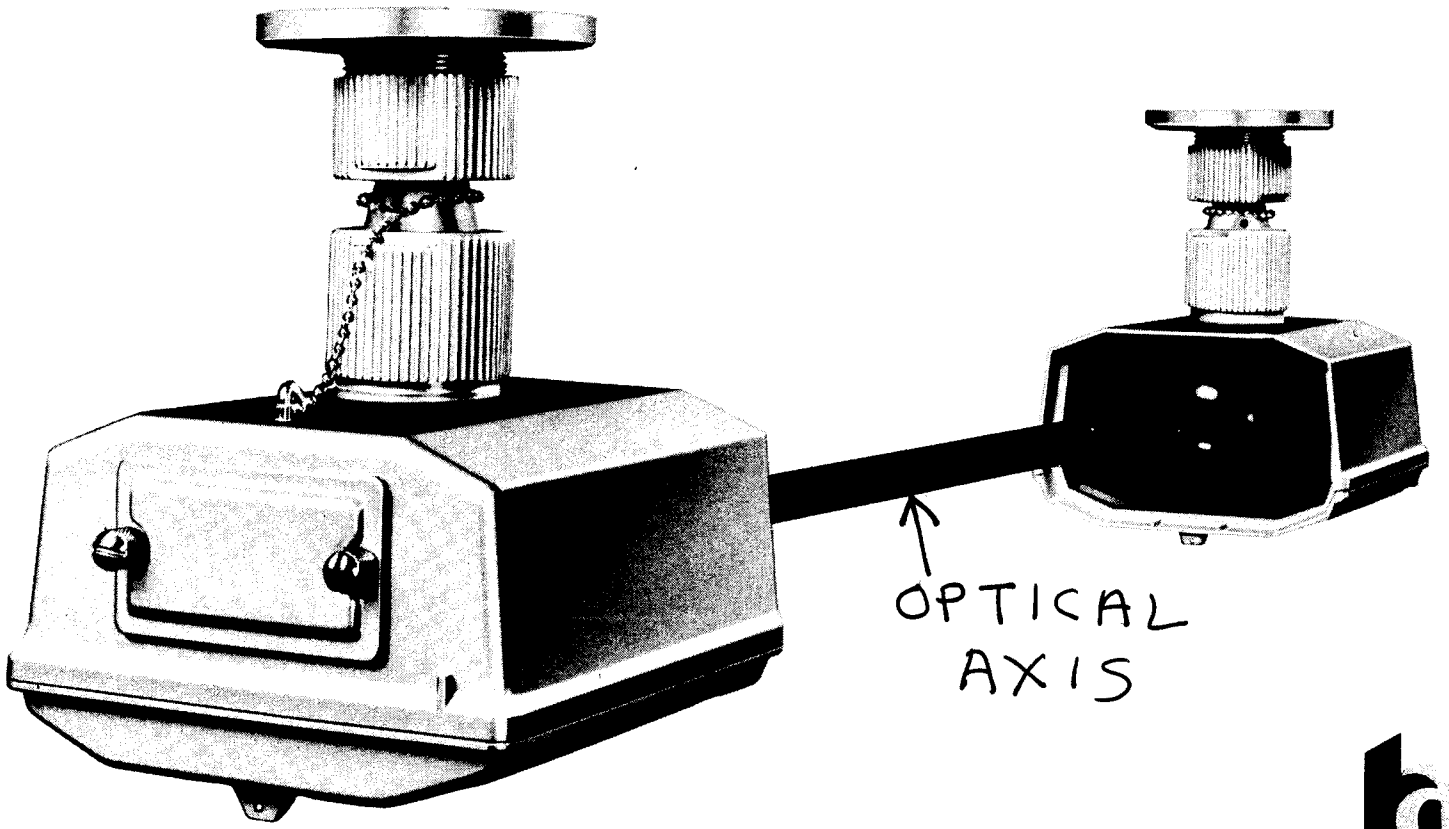
PROJECTED BEAM SMOKE DETECTOR

MODEL SPA-24B INSTRUCTION MANUAL



Alpha-Larm

CONTENTS

We thank you very much for your purchasing our Projected Beam Smoke Detector.
To use and operate the Detector in a proper way, you should familiarize yourself with the information contained in this manual.
This manual must be carefully stored even after the product has been installed at your site.

1. OVERVIEW

(1) General Description

The Projected Beam Smoke Detector consists of an emitter and a receiver which are located separately from each other at a proper distance. In the event of a fire, the smoke generated will decrease the quantity of beams (near infrared) generated by the emitter. The receiver will sense such a decrease in beam quantity thereby identifying the occurence of a fire.

An important feature of the detector is that it monitors the protected area or space linearly. This enables the detector to identify a fire before it spreads or expands even where the smoke has scattered over a wide range of space.

The fire detection sensitivity can be chosen from seven steps of beam obscuring percent: 15 to 70%/span.

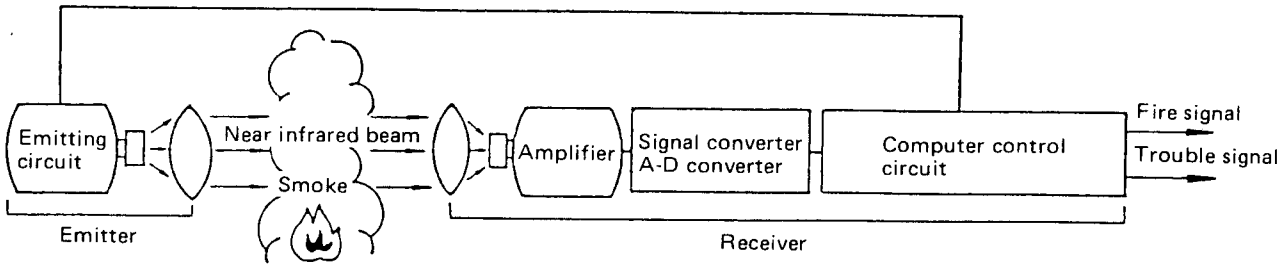
(2) Principle

A near infrared beam (pulse) generated by the emitter enters the photo-diode of the receiver, where it is converted into an electrical signal. It then passes through an amplifier circuit and an A-D converter, and the resulting digital signal enters a microcomputer.

The initial signal (the initial beam data), once stored in the microcomputer, is used as a reference for comparison with subsequent beam signals. If the result of comparison of one beam with the reference shows the occurrence of a fire, then a fire signal is produced. A trouble signal is generated if the axis of a beam signal is completely blocked by any obstacle.

The microcomputer also provides the function of compensating for a change of value with time caused by a contamination of the optics. Since such a change with time appears as a slow change in beam signal, the microcomputer compensates in such a manner that the signal comes close to the reference at a rate of about ±1% at intervals of about one hour. When this compensating capability reaches a limit, the microcomputer automatically generates a trouble signal.

Principle of Operation



2. MAJOR FUNCTIONS

(1) Fire Signal Output and Indication

If the smoke generated becomes so dense as to exceed the preset sensitivity of the detector, a fire signal is generated within one minute after that point of time. At the same time, the FIRE LED (red) at the receiver lights.

(2) Trouble Signal Output and Indication

(a) If the quantity-of-beam setting at the initial time of operation is improper or if the quantity-of-beam compensating capacity exceeds a limit, a trouble signal is generated immediately along with the TROUBLE LED (amber) at the receiver lighting.

(b) If the quantity of beams decreases by about 90% or more immediately, a trouble signal is generated within 30 seconds with the TROUBLE LED lighting.

(3) Monitor Condition Indication

The monitor condition of the emitter and receiver is indicated by pulsing of the MONITOR LED (green) on both the emitter and the receiver.

(4) Signal Output

A form A-contact is activated in a fire or trouble signal condition.

(5) Remote Operation

The following remote operations can be performed with a switch provided outside the detector:

(a) Remote test function

The remote test can be performed by shorting the black and yellow wires together through a test switch. This causes the microcomputer inside the receiver to perform simulated operations and simultaneously generate a fire signal. (At the same time, the fire LED and the trouble LED at the receiver lights up.)

(b) Remote annunciator

The remote annunciator dry form A contacts have been provided for both fire and trouble annunciation.

- See the wiring connections.

(6) Sensitivity Setting

Sensitivity, in terms of beam obscuration percentage, can be chosen from the following according to the protection range and the environment in which the detector is installed:

15, 20, 30, 40, 50, 60, 70 (%/span) – 7 steps

(7) Adjustment of Optical Axis and Quantity of Photo-signals

The optical axis and the quantity of photo-signals can easily be adjusted by a plug connected to the appropriate monitor jack.

(8) Automatic Compensation for Quantity of Photo-signals

The detector can compensate for a change in the quantity of photo-signals from the initial beam data by about ±1% at intervals of about one hour after the start of normal monitoring. The compensation range is from +20% to –50% of the initial beam data. If the compensating range exceeds a limit, a trouble signal is produced.

3. INSTALLATION EXAMPLES AND PRECAUTIONS

(1) Applicable Sites

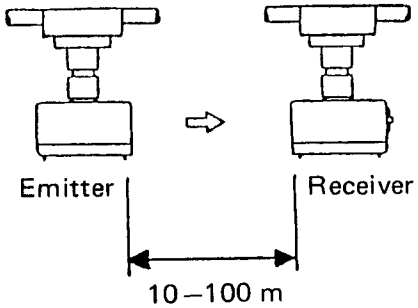
The projected beam smoke detector is applicable to a building with a high ceiling and large space, or to a potentially hazardous place, such as:

(a) Gymnasium, lecture hall, theater
(b) Workshop, warehouse, vehicle base
(c) Underground streets, tunnel, cave-way
(d) Substation, electrical room

* For a place where a liquid fire may occur, we suggest the beam detector should be installed with spot type fire and smoke detectors.

(2) Installation Examples

(a) Box Mounting



Installation Standard

See Section 4-1 to 4-5 of NFPA 72E for the installation standard of the projected beam smoke detector.

(3) Precautions

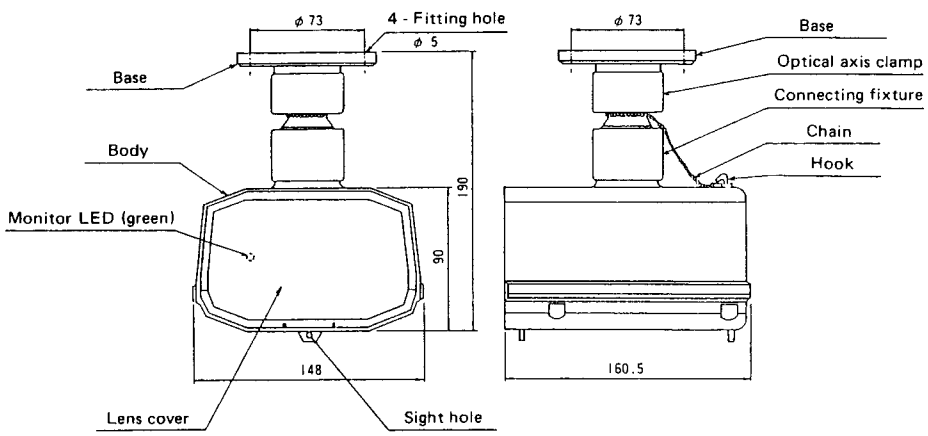
(a) Select a place where there is no obstacle affecting the optical axis (such as beam, column, or crane).
(b) Select a place where the detector can easily be accessed for maintenance.
(c) Provide guards if the detector is mounted in a place where some moving object may strike the detector such as in a gymnasium.
(d) The receiver must be located near the control panel.
(e) The side of the detector on which light is received must be kept out of direct sunlight.
(f) Place the optical axis as far from any obstacle as possible (at least 0.6 m).

Same

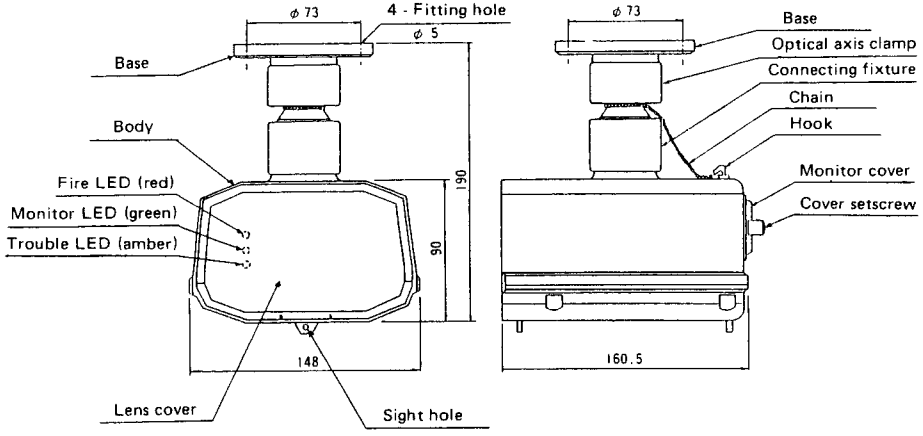
1½ ft

4. NAMES OF PARTS

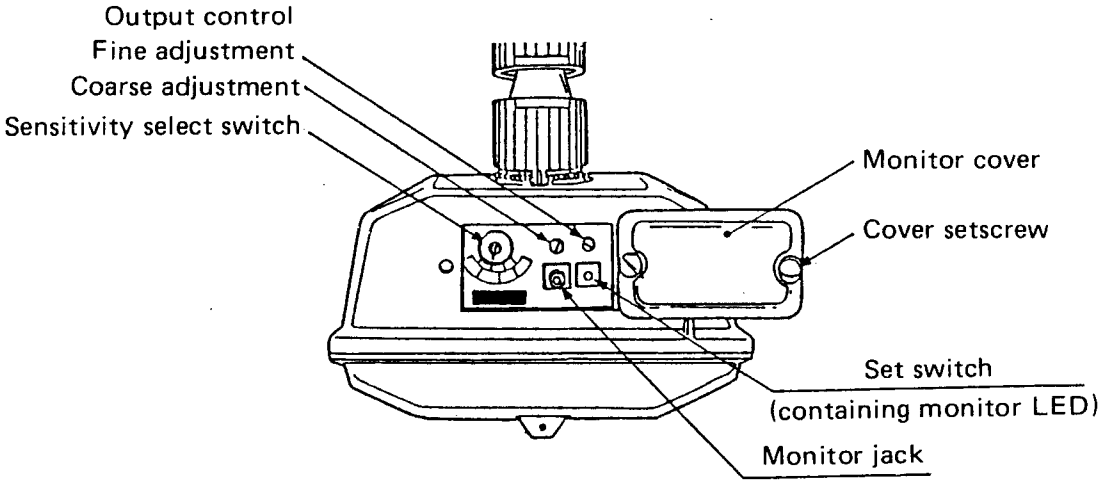
■ EMITTER



■ RECEIVER



■ INSIDE OF MONITOR COVER



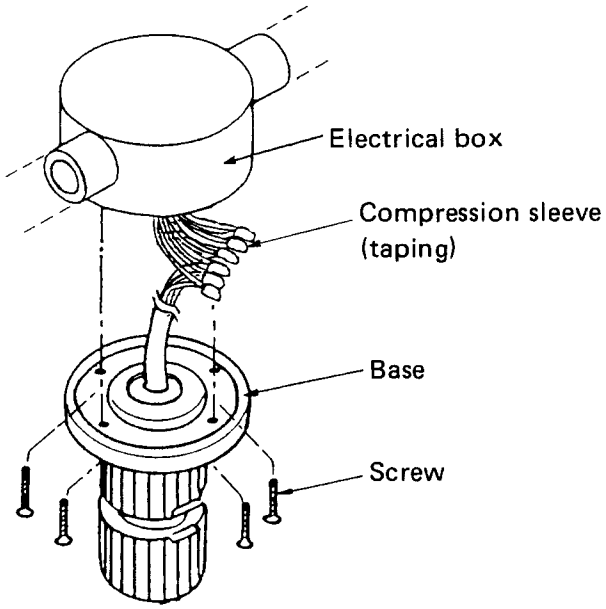
5. INSTALLATION PROCEDURE

(1) Mounting the Base (for Emitter and Receiver)

(a) Using compression sleeves, connect the wires coming from the fixture or box to the leads from the base.
Fix each connection with PCV tape (at least two turns).
* Be sure to tape leads that are not used.

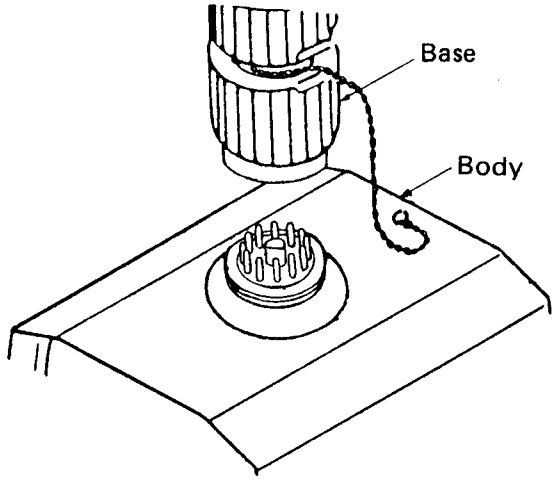
(b) Using four screws, lock the base to the box.

Box mounting

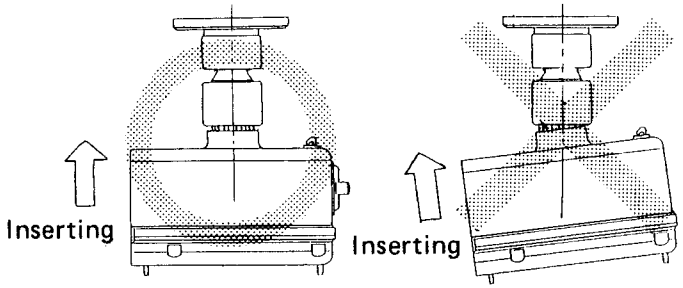


(2) Mounting the Detector (for Emitter and Receiver)

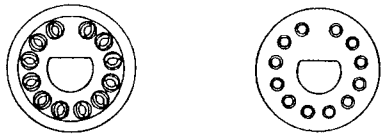
(a) Insert the detector in parallel with the base.



* Be sure to insert the correct base into the beam detector body.
The labels on the base and body are color coded to assure correct installation for both emitter and receiver.
* Inserting the detector with the connectors improperly set together or obliquely to the base can cause damage to the connectors.



Set for the same direction.



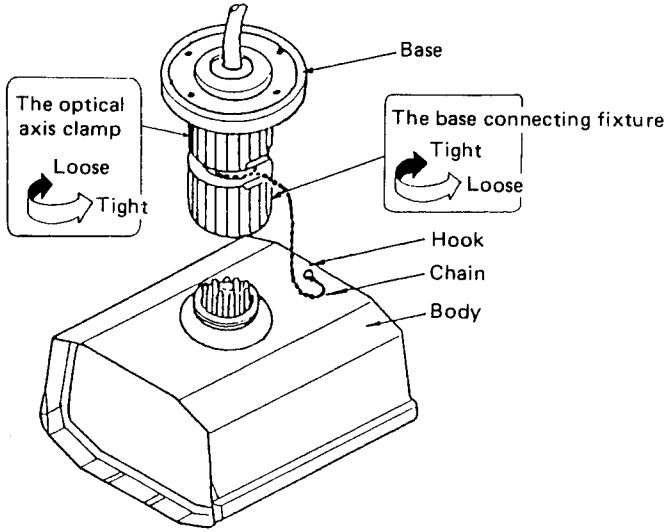
Base connector (socket)

Detector connector (plug)

(b) Screw the base connecting fixture into the detector body. Using the wrench (provided), lock them.
* Tighten the fixture until it just stops.

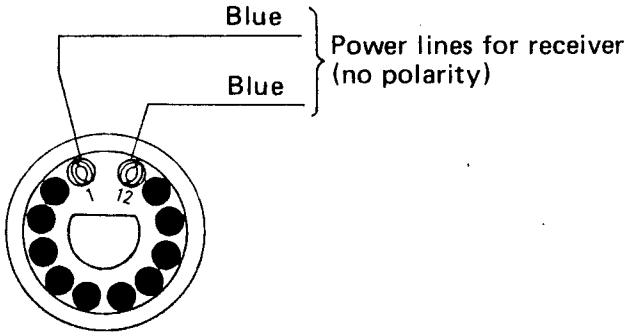
(c) Loosen the base's optical axis clamp, and place the front side of the detector toward the associated emitter or receiver. Then lightly tighten the clamp. (This is needed for later optical axis adjustment.)
* Do not loosen the optical axis clamp excessively. If excessively loosened, it can come off and no longer return to its home position.

(d) Set the chain of the base to the hook on the detector body. (This is to prevent the detector from falling.)



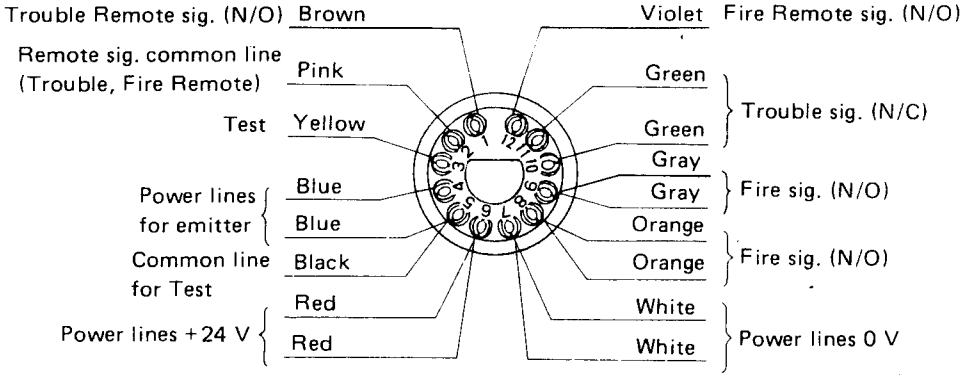
6. TERMINAL LAYOUT

(1) Emitter



* The black circles indicate free terminals.
* The terminal layout diagram shows the connector of the base as viewed from the top.

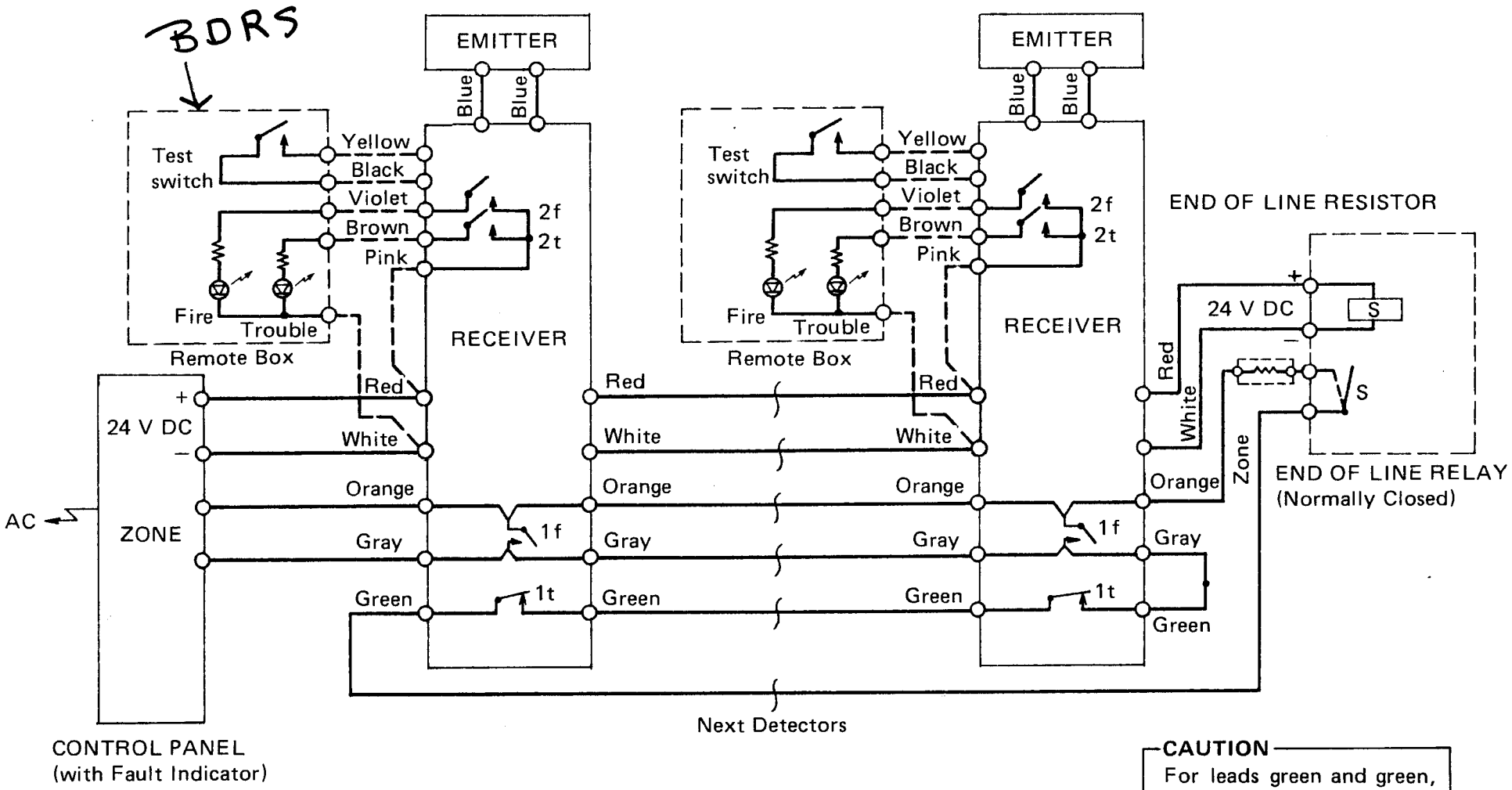
(2) Receiver



* The terminal layout diagram shows the connector of the base as viewed from the top.
* The fire and trouble signal outputs are Form A dry contact.
  Contact rating: 24 V DC, 0.5 A
* The fire and trouble remote outputs are Form A dry contact.
  Pink line is common for the fire and the trouble remote signal.
  Contact rating: 24 V DC, 0.5 A
* Tape each terminal (lead) which is not used. (The purpose of taping is to provide insulation.)

7. WIRING CONNECTIONS

(1) 4-wire System



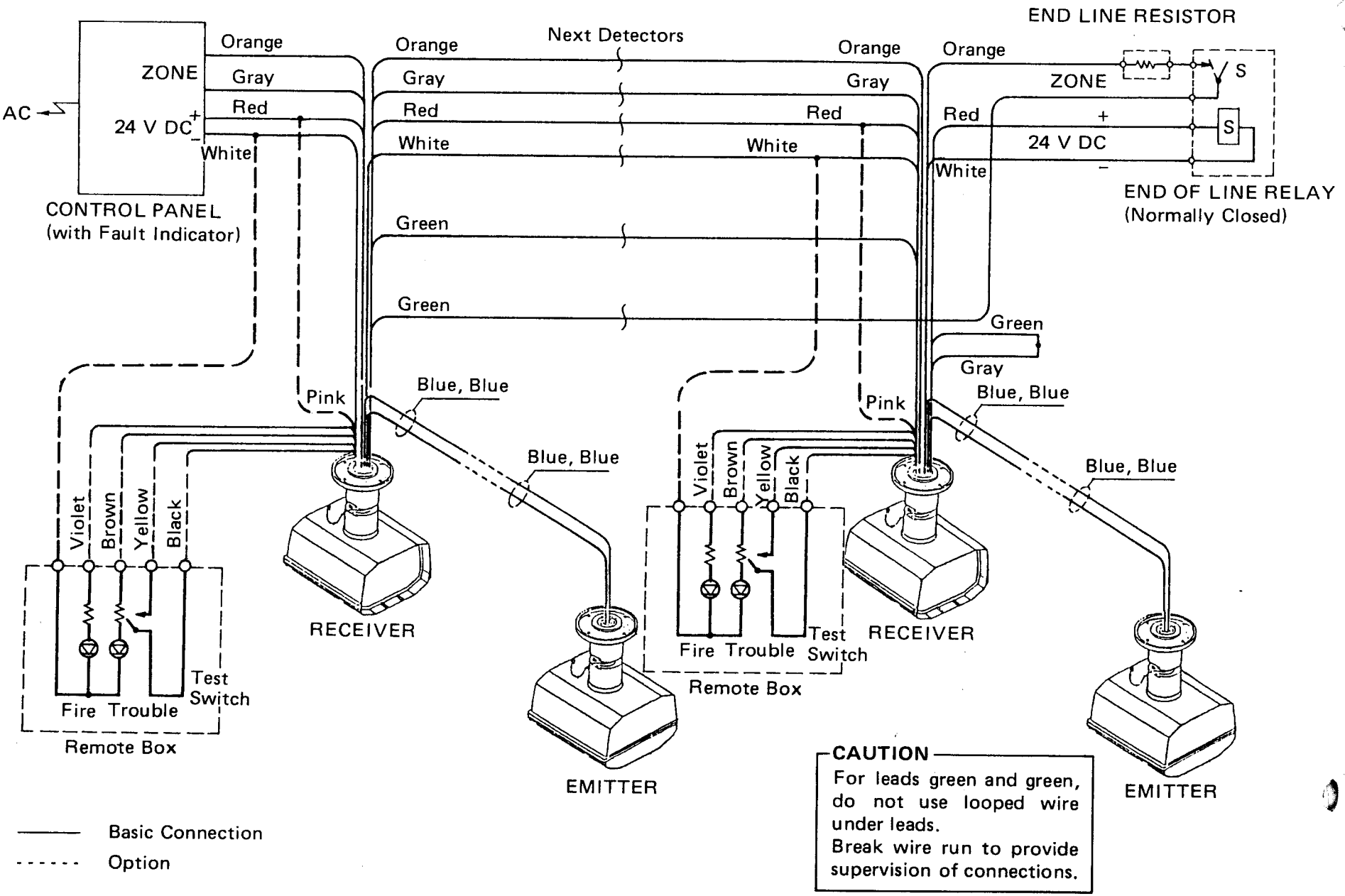
Basic connection

Option

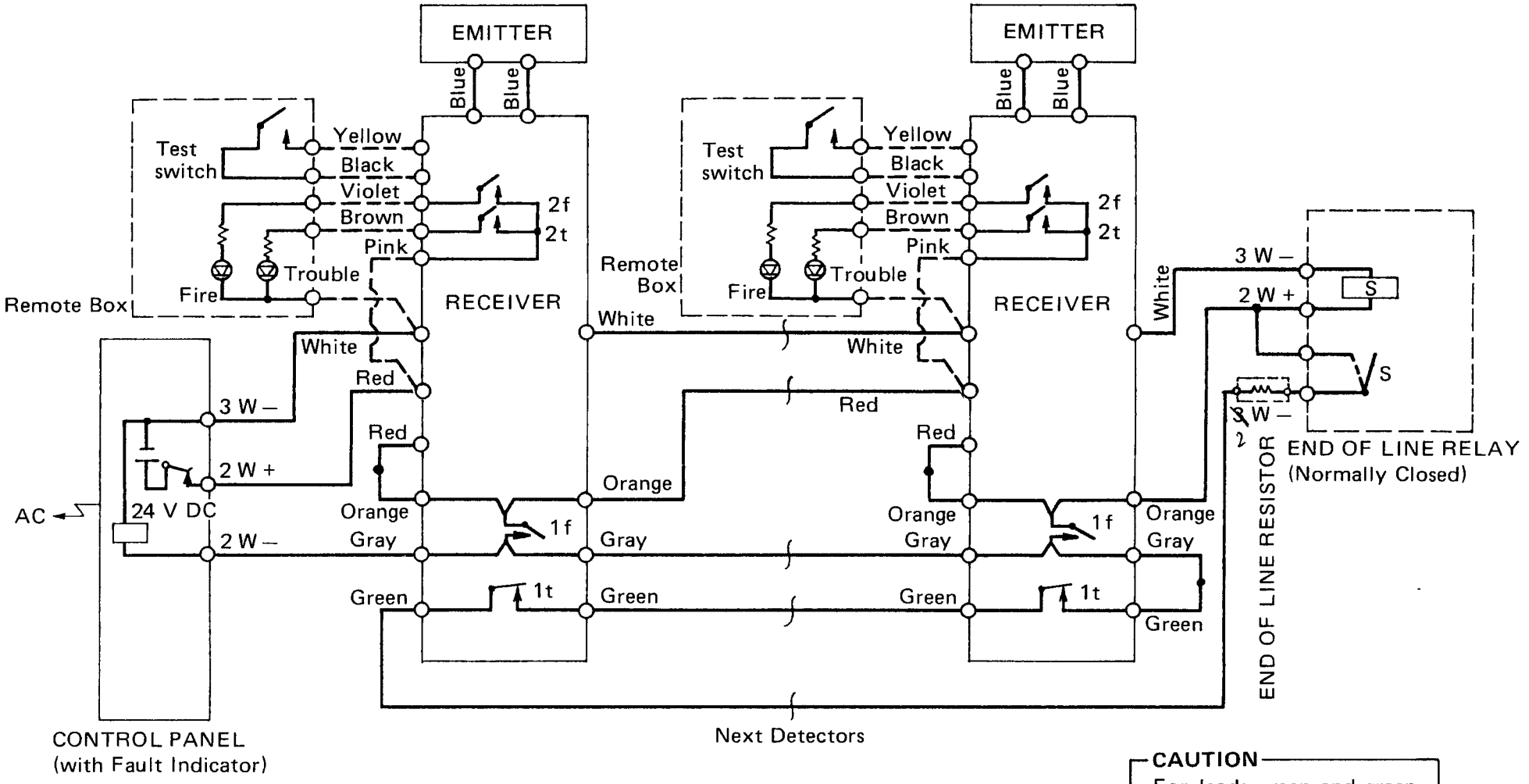
1f : FIRE RELAY CONTACT (Normally Open)
1t : TROUBLE RELAY CONTACT (Normally Closed)
2f : FIRE REMOTE RELAY CONTACT (Normally Open)
2t : TROUBLE REMOTE RELAY CONTACT (Normally Open)

CAUTION

For leads green and green, do not use looped wire under leads.
Break wire run to provide supervision of connections.


END LINE RESISTOR
Next Detectors
AC
ZONE
24 V DC
+
−
Orange
Gray
Red
White
Green
Green
CONTROL PANEL
(with Fault Indicator)
ZONE
+
24 V DC
−
S
S
END OF LINE RELAY
(Normally Closed)
Pink
Blue, Blue
Blue, Blue
Violet
Brown
Yellow
Black
Test
Switch
Fire Trouble
Remote Box
RECEIVER
EMITTER
Green
Gray
Blue, Blue
Blue, Blue
Violet
Brown
Yellow
Black
Test
Switch
Fire Trouble
Remote Box
RECEIVER
EMITTER
Basic Connection
Option
CAUTION
For leads green and green, do not use looped wire under leads.
Break wire run to provide supervision of connections.

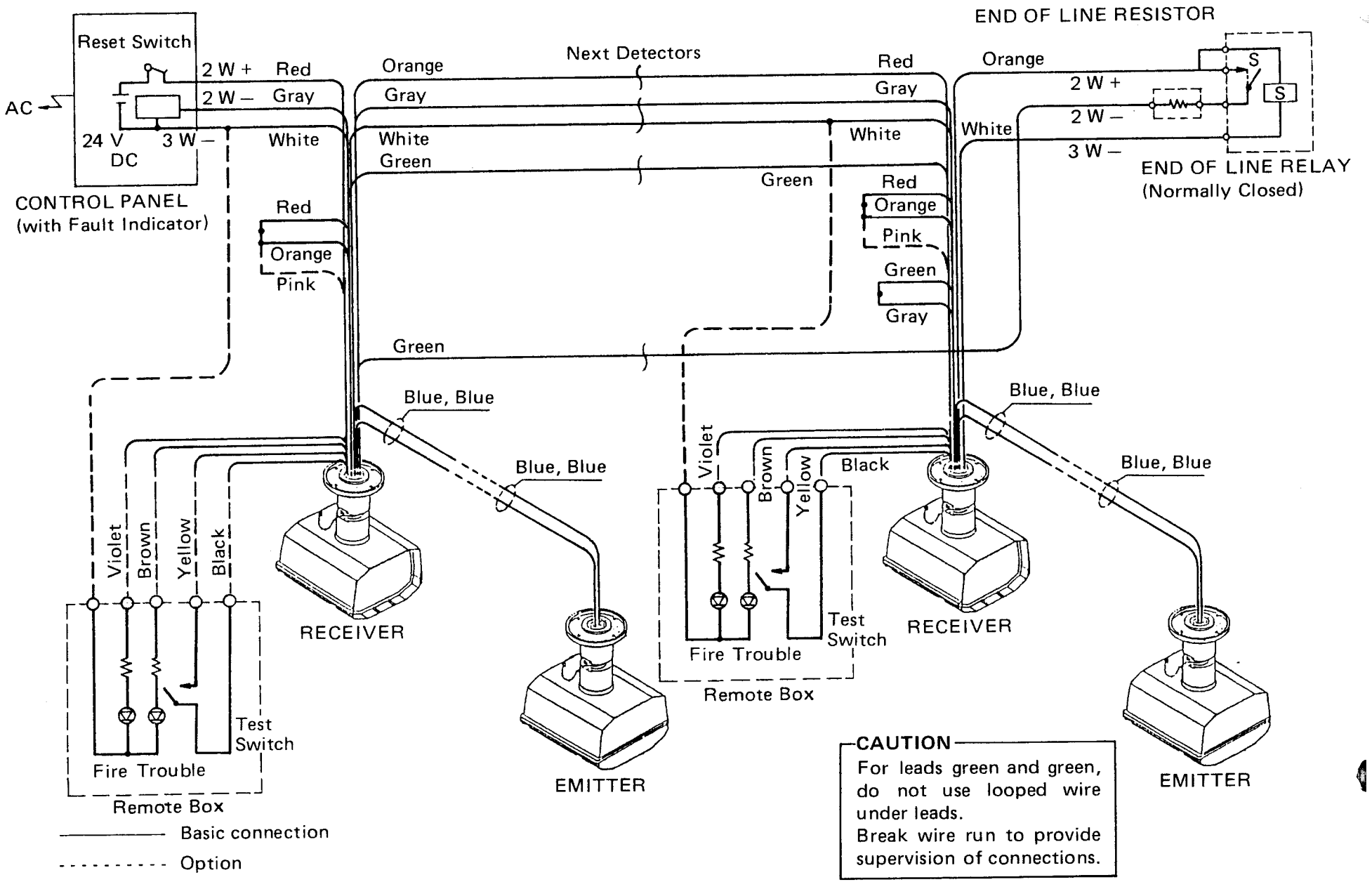
(2) 3-wire System



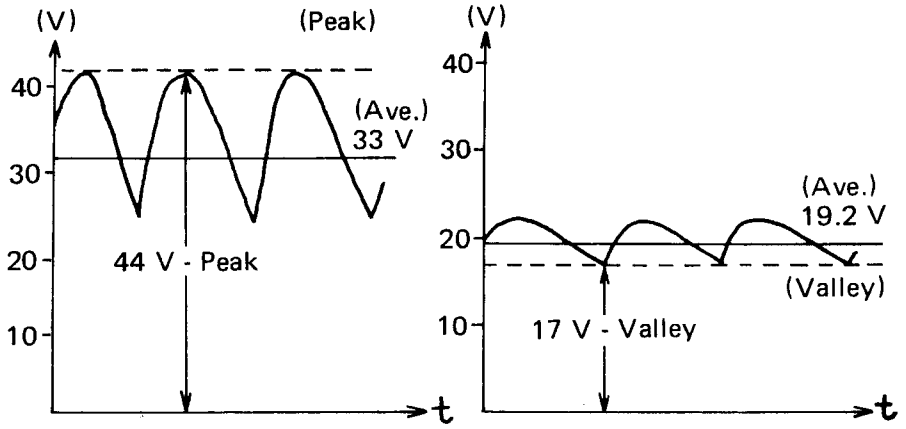
1f : FIRE RELAY CONTACT (Normally Open)
1t : TROUBLE RELAY CONTACT (Normally Closed)
2f : FIRE REMOTE RELAY CONTACT (Normally Open)
2t : TROUBLE REMOTE RELAY CONTACT (Normally Open)

——— Basic Connection
- - - - - - Option

CAUTION
For leads green and green, do not use looped wire under leads.
Break wire run to provide supervision of connections.


Reset Switch
AC
2 W +
2 W –
24 V DC
3 W –
Red
Gray
White
CONTROL PANEL
(with Fault Indicator)
Red
Orange
Pink
Violet
Brown
Yellow
Black
Test Switch
Fire Trouble
Remote Box
RECEIVER
Blue, Blue
EMITTER
Orange
Next Detectors
Gray
White
Green
Red
Orange
Pink
Green
Gray
Green
Blue, Blue
Violet
Brown
Yellow
Black
Test Switch
Fire Trouble
Remote Box
RECEIVER
Blue, Blue
EMITTER
END OF LINE RESISTOR
Orange
2 W +
2 W –
3 W –
White
S
S
END OF LINE RELAY
(Normally Closed)
Basic connection
Option
CAUTION
For leads green and green, do not use looped wire under leads.
Break wire run to provide supervision of connections.

* The detector can be connected to a control panel which is provided with an automatic fault indicator. (A trouble signal takes the form of a line fault signal when sent to the control panel.)
* The power supply (24 V DC) to be supplied to the detector must meet the following requirements:
  (1) Supply voltage regulation : 19.2 to 33 V (mean)
  (2) Ripple content : 30% or less
  (3) Allowable waveform : Peak voltage at maximum supply voltage must not exceed 44 V. Valley voltage at minimum supply voltage must be at least 17 V.



Maximum supply voltage **Minimum supply voltage**

* Remote operation is effective in making a simple check of the detectors at remote locations.
  TEST : Non-locked switch
  Place the switches for remote operations at a location just under the receiver. (less than 25 m or 80 ft)

8. ADJUSTMENT PROCEDURE

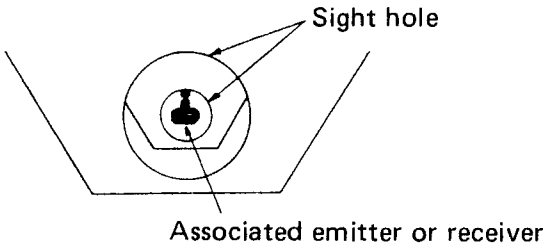
(1) Optical Axis Adjustment

The optical axis can be adjusted in two phases: (1) using the sight hole and (2) using the monitor output.

(a) Adjustment using sight hole (coarse adjustment)

(i) Loosen the optical axis clamp of the emitter. While looking in at the sight hole, move the detector body and align the associated receiver nearly to the center of the hole. Then tighten the clamp so lightly as to allow movement of the body.

(ii) Take the same steps as above for the receiver, i.e., align the associated emitter nearly to the center of the sight hole. Then tighten the clamp lightly.



(b) Adjustment using monitor output (fine adjustment)

(i) Open the monitor cover of the receiver. (Loosen both the right-handed and left-handed screws and remove the left-handed screw alone. The other cannot be removed.)

(ii) Make sure that the MONITOR lamp (red) within the set switch is pulsing.

(iii) Set the sensitivity select switch to "OFF".

(iv) Insert the monitor plug (provided) into the monitor jack, and connect it to a tester.

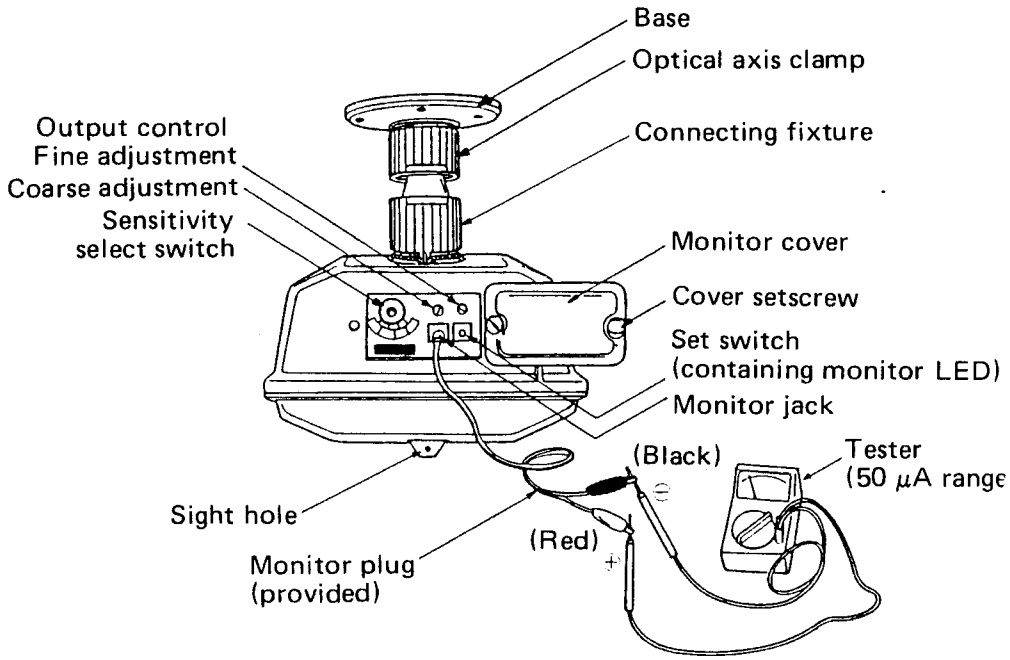
* The tester must be set to the 50 μA range or similar to obtain good resolution of the reading.
* Inserting the monitor plug makes a monitor (beam) cycle shorter.

(v) Turn the two output controls (one for coarse adjustment and the other for fine adjustment) so that a monitor output of about 15 μA is obtained.

* This adjustment is not critical.
* Output control functions:
  Clockwise : higher output
  Counterclockwise : lower output
* Turn the output control slowly. A quick turn can cause idling.
* Never turn the output control more than 3/4 of a turn.

(vi) Move the emitter and receiver slightly and find a position where a maximum output is obtained. At that position, tighten the optical axis clamp to lock the emitter and the receiver.

* If the maximum monitor output exceeds 30 μA (saturated value), lower the output to about 15 μA by the output controls and find a position where the maximum value is reached.



(3) Quantity-of-Beams Adjustment and Sensitivity Selection

(a) After the optical axis has been properly adjusted and both the emitter and the receiver locked, turn the two output controls (one for coarse adjustment and the other for fine adjustment) until the monitor output falls in the range 17 to 22 μA.

(b) Set the sensitivity select switch to an optimum sensitivity position.
Set the sensitivity in accordance with the information given under "Sensitivity Selection", Section 13 - APPENDIX.

(c) Press the set switch after checking that the monitor output is in the range 17 to 22 μA.
* A trouble signal will be produced if sensitivity is set with the monitor output not falling in the range 17 to 22 μA.

(d) Disconnect the plug from the monitor jack, close the monitor cover and tighten the cover setscrews.

(4) Operation Check

Check the detector for operation with the test filter in accordance with the information given under "Operation Tests", Section 10 - MAINTENANCE.

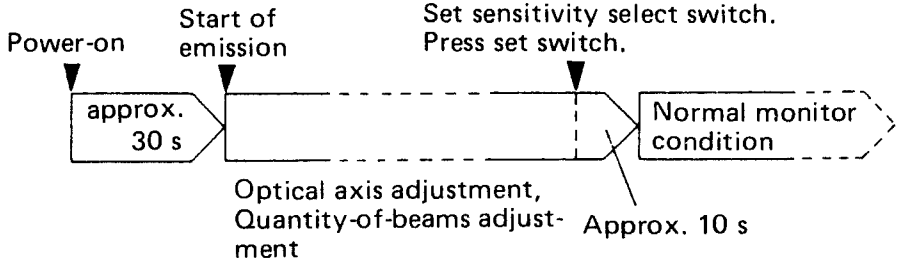
(5) Precautions

(a) Be sure to place the sensitivity select switch into the "OFF" position before performing optical axis or quantity-of-beam adjustment.
* No fire or trouble signal will be initiated with the sensitivity select switch staying in the "OFF" position.

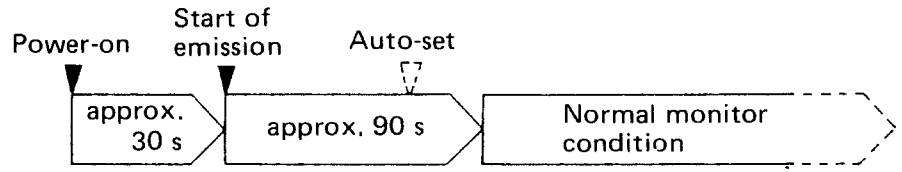
(b) The tester used for monitor output measurement should have the following range:
Range : DC 50 μA (internal resistance: 1 kΩ to 10 kΩ)
* Maximum monitor output is 35 μA.

(c) The following length of time is required until normal monitor condition is reached after power-on. An operation test must be started after normal monitor condition is reached.
Power-on → Start of emission (MONITOR LED pulsing, monitor output) . . . . . approx. 30 seconds
Start of emission → Normal monitor condition
. . . . . approx. 90 seconds

- **At installation and adjustment:**



- **After installation:**



* The detector will be automatically set (i.e., its initial beam data will be updated) when power is on after a long-time power-off condition.

9. OPERATION INSTRUCTIONS

(1) Initial Beam Data Setting (Updating) Function

Setting (updating) the initial beam data can be performed manually or automatically as follows:

(a) Manual setting

The initial beam data can be set (updated) in approx. 10 seconds after either of the following operations is performed:

(i) Place the sensitivity select switch into a position between 15 and 70%/span from the "OFF" position.

(ii) Press the set switch. (The sensitivity select switch must be placed in a selectivity position.)

(b) Automatic setting

If the power is OFF for a long time, the initial beam data is automatically set (updated) in approx. 70—90 seconds after the Power is reapplied and the detector starts generating beams. (The sensitivity selector switch must be placed in a select position.)

* The initial beam data setting (updating) takes approx. 10 seconds. Be careful so as not to block the optical axis during this time.
* When the initial beam data is set improperly (the monitor output on the outside is 17—22 μA), the detector generates a trouble signal. In such a case, return the sensitivity selector switch to the "OFF" position and readjust the quantity of beams.
* The automatic setting is performed only when the Power of the detector has been OFF for 30—60 minutes or more. If the Power is OFF for less than 5 minutes, the initial beam data is not changed.

(2) Fire Signal Output

If the quantity of beams falls below the preset sensitivity because of the smoke generated, the detector generates a fire signal within 60 seconds. At the same time, the FIRE LED at the receiver lights up.

- **Restoration procedure**

After confirming that the smoke is no longer present, operate the restoration switch of the control panel.

* When it is confirmed continuously 10 times that the quantity of beams is below the preset sensitivity, a fire signal is produced.

(3) Trouble Signal Output

Under either of the following (a) to (c) conditions, a trouble signal is generated:

(a) Improper adjustment of quantity of initial beams

If the quantity of initial beams is improperly adjusted, the detector produces a trouble signal. At the same time, the TROUBLE LED at the receiver lights up.

- **Restoration procedure**

Readjust the quantity of beams, press the set switch and operate the restoration switch at the control panel.

* If a trouble signal is detected within 10 seconds after the sensitivity selector switch is placed to a sensitivity position or the set switch is pressed, the quantity of beams is not properly adjusted.

(b) Automatic compensation limit for quantity of photo-signals

If the compensating range exceeds a limit, a trouble signal is produced. At the same time, the TROUBLE LED at the receiver lights up.

- **Restoration procedure**

Clean the lens covers of both the emitter and the receiver, press the set switch, and operate the restoration switch at the control panel.

* When a trouble signal is produced with monitor outputs hardly changing, the compensating range is suspected of exceeding a limit.

* If the optical axis is moved out of place gradually by vibration, a trouble signal may be produced even if the lens covers of the emitter and the receiver are clean.

(c) Decrease of quantity of beams by approx. 90% or more

If the quantity of beams decreases by approx. 90% or more immediately, a trouble signal is produced within 30 seconds with the TROUBLE LED lighting up.

- **Restoration procedure**

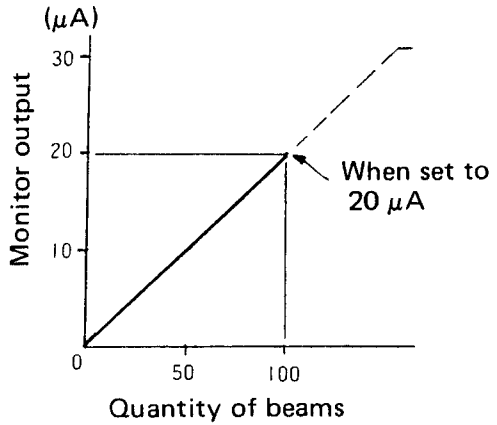
After checking that smoke (or trouble) is no longer present, trouble signal will be restored automatically.

(4) Monitor of Quantity of Photo-signals

(a) The monitor output of the quantity of photo-signals is obtained by using the monitor jack of the receiver.

Output Terminal	Output Mode	Output Level	Measuring Device	Purpose
Monitor jack at the receiver	Current output	0 - approx. 30 μA	Tester (50 μA range)	Adjustment of the optical axis Adjustment of the quantity of beams

- **Relationship between quantity of photo-signals and monitor output**



(b) The monitor output is the signal output obtained by sampling the quantity of beams in an emission cycle. This can be switched over to the current quantity of beams or the moving average of the quantity of beams with the sensitivity select switch.

- **During adjustment**

When the sensitivity selector switch is placed in the "OFF" position, a quantity of beams is produced.

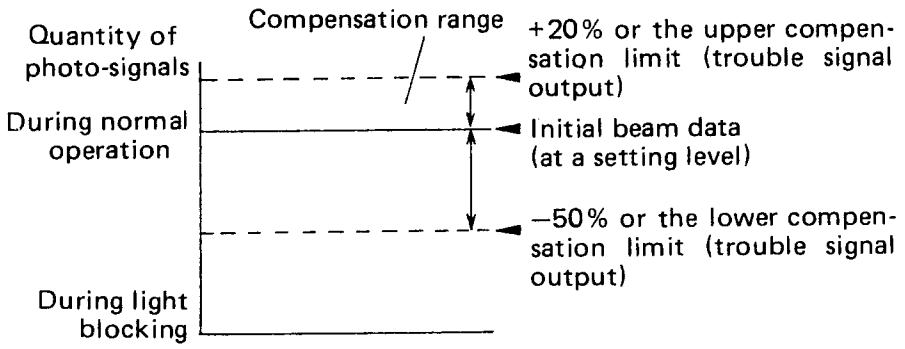
- **During normal monitoring**

When the sensitivity selector switch is placed in a sensitivity position, the automatically compensated moving average of the quantity of beams is produced.

* The moving average is the mean of several quantities of beams (emission pulses).

(5) Automatic Compensation for Quantity of Photo-signals

The detector can compensate for a change in the quantity of photo-signals from the initial beam data by approx. ±1% at an interval of about one hour after the start of normal monitoring. The compensation range is from +20% to −50% of the initial beam data. If the compensating range exceeds a limit, a trouble signal is produced.

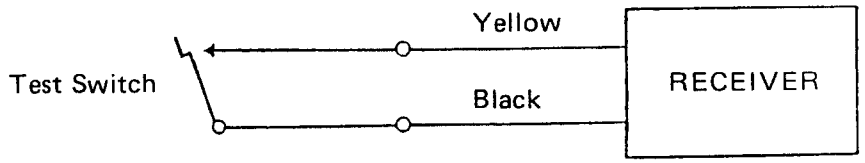


* Automatic compensation is initiated (reset to 0%) by pressing the set switch or placing the sensitivity select switch to "OFF".

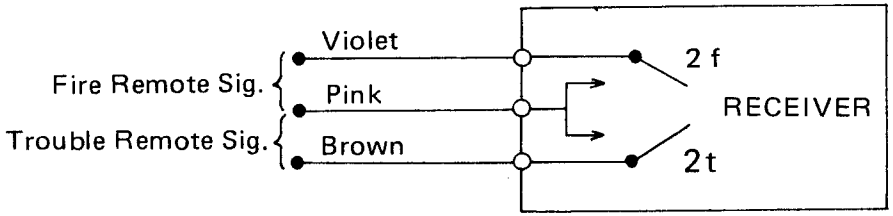
(6) Remote Operations

The following remote operations (simple operation check) can be performed with a switch provided outside the detector:

- **Test function**
  Pressing the test switch causes the microcomputer inside the receiver to perform simulated operations and simultaneously generate a fire signal and a trouble signal.



- **Remote indication**
  The fire and trouble remote contacts can be used.



* The fire and trouble remote contacts are Form A dry contact.
Pink line is common for the fire and trouble remote signal.
Contact rating: 24 V DC, 0.5 A

10. MAINTENANCE

The detector contains an automatic photo-signal compensation circuit which protects its functions from contamination or the like. To maintain its performance, however, the detector must be checked and serviced every six months.

■ Check Items

(1) Visual Check (Emitter and Receiver)

(a) Clean the lens cover on the front of the emitter and receiver.
* Be careful to use soft cloth when cleaning the lens cover.
* Be sure to turn the sensitivity select switch to the "OFF" position when cleaning the lens cover.
No fire or trouble signal will be initiated with the sensitivity select switch in the "OFF" position.

WARNING!!
The sensitivity switch must be placed between the 15% and 70% settings for normal operation of the detector to occur.
Be sure to return the sensitivity switch to the correct position as referenced in the Quantity of Beams Adjustment and Sensitivity Selection.

(b) Check for loose connections between the base and detector body.
(c) Check the chain and hook connection.
(d) Check the optical axis for deviation through the sight hole.

(2) Functional Check

(a) Check the monitor output is in the range to 17 to 22 μA.
(b) Press the set switch for functions (after cleaning) the emitter/receiver lens covers and checking the monitor output.
* Refer to Section 8.(3) of this manual for Quantity-of-Beams Adjustment and Sensitivity Selection.

(c) Using a test filter, perform an operation test and a non-operation test.
(d) Check that the emitter and receiver MONITOR LEDs (green) pulse properly.

(3) Operation Tests

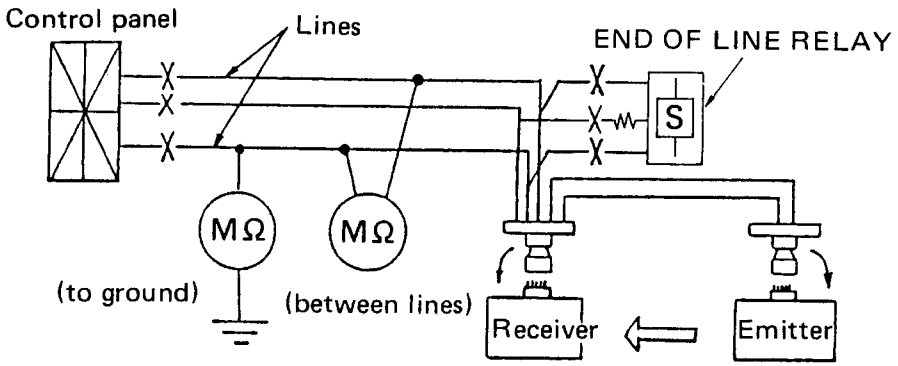
(a) Operation test
The FIRE LED (red) shall light and a fire signal shall be transmitted within one minute after insertion of an appropriate operation test filter (depending on Monitoring distance) into the front of the receiver of the detector.

(b) Non-operation test
The detector shall not operate within one minute after insertion of an appropriate non-operation test filter (depending on Monitoring distance) into the front of the receiver of the detector.

(c) Light blocking test
The TROUBLE LED (amber) shall light within 30 seconds after insertion of a material whose light obscuration percentage is 95% or more into the front of the receiver.
* See "Sensitivity Selection", Section 13 - APPENDIX for the light obscuration percentage of the test filter.

(4) Insulation Test — Precautions

If a projected beam smoke detector is tested for insulation resistance with a megohm-meter with the detector connected, semiconductors used within the unit can be damaged.



Before performing an insulation test, disconnect the lines at the "X" marks (see above) and remove the detector body from the base.

* For details of the maintenance of projected beam smoke detector, consult us or our dealer.

11. SPECIFICATIONS

■ System Specifications

(1) Method : Pulse synchronization and comparison
(2) Operating voltage : DC 24 V (19.2—33 V)
(3) Waveform : Filtered DC
(4) Consumption current : 250 μA
(5) Surge current : 2.5 mA max.
(6) Fire alarm current : 40 mA max.
(7) Trouble alarm current : 40 mA max.
(8) Fire alarm contact : 0.5 A max.
(9) Fire and trouble remote contact : 0.5 A max.
(10) Trouble alarm contact : 0.5 A max.
(11) Coverage : 10 m to 100 m ex 32.5FT → 328FT
(12) Sensitivity : 15, 20, 30, 40, 50, 60 or 70% (7 steps)
(13) Sensitivity error : Within ±10% at 50%/span setting
(14) Signal processing : By 1-chip 8-bit microprocessor
(15) Fire signal delay time : 30—60 seconds
(16) Delay time of detection of blocked beams : 15—30 seconds
(17) Indication of activation : Fire signal . . . . . Red LED on
Trouble signal . Amber LED on
(18) Indication of normal monitor condition : Green LED pulsing
(19) Compensation required by contamination of optics : Automatic compensation for quantity of beams
(20) Fire test terminal

Japan → 14°F
Factory 110°—120°F

(21) Optical axis adjustment : By sight and moving parts of detector base
(22) Operating temperature : +32 to +100°F (with relative humidity not exceeding 95%)
(23) Insulation resistance : More than 50 M-ohms (between terminal and enclosure)
(24) Storage temperature : —4 to +140°F

■ Receiver Specifications

(1) Receiving device : PIN photo-diode
(2) Photo-signal compensation rate : ±1%/50—70 minutes
(3) Adjustment of quantity of photo-signals : Monitored in the 50 μA tester range and adjusted by control to fall in the 17 μA — 22 μA range
(4) Photo-signal monitor terminal : φ 3.5 mm jack (current mode output)
(5) Initial beam data setting : By set switch
(6) Light receiving cycle time : 2.7—3.8 seconds (during monitoring, 1.3—1.8 seconds)

■ Emitter Specifications

(1) Light source : Infrared LED
(2) Light source drive : Pulse drive
(3) Light emitting cycle time : Depends upon the receiver specifications
(4) Light source stability : Built-in temperature compensation

■ Enclosure Specifications

(1) Dimensions	: 160.5(L) x 148.0(W) x 190.0(H)mm
(2) Weight	: Receiver 1.1 kg
	Emitter 1.0 kg
(3) Material	: Diecast aluminium
	Anti-fogging filter
(4) Construction	: Drip-proof
(5) Coating colour	: Metallic silver

■ Detector Base Specifications

(1) Dimensions	: ϕ 90 mm
(2) Weight	: 370 g
(3) Material	: Diecast aluminum
(4) Coating colour	: Metallic silver
(5) Moving part locking	: By wrench (provided)

* As we are constantly improving our products, all specifications are subject to change without notice.

■ Detector Components

The projected beam smoke detector consists of the following components:

No.	Contents	Q'ty	Remarks
1	Emitter	1	
2	Receiver	1	
3	Base (for emitter)	1	2 leads
4	Base (for receiver)	1	17 leads
5	Chain	2	Attached to base
6	Wrench (for locking detector)	1	
7	Monitor plug (for monitor output measurement)	1	with cord
8	Instruction manual	1	
9	Sensitivity seal	1	

* Mount the emitter and the receiver whose production numbers are the same in a pair.
* Attach the sensitivity seal (matching the sensitivity setting) onto the nameplate of the receiver.

12. TROUBLESHOOTING

Trouble	Check	Remarks
1. MONITOR LED (green) fails to light.		
○ Receiver	At least 30 seconds elapsed after power-on?	It takes approx. 30 seconds for inner circuit to be charged.
	Is supply voltage normal?	19.2 to 33 V DC (between red and white leads)
	Improper wiring? (disconnected or shorted)	
○ Emitter	At least 30 seconds elapsed after power-on?	
	Is supply voltage normal?	±14 to 18 V DC (between blue and blue leads)
	Improper wiring? (disconnected or shorted)	
2. Monitor output is not produced.	Is MONITOR LED (green) pulsing normally? (emitter/receiver)	
	Optical axis properly aligned through sight hole?	Align optical axis each for emitter and receiver.
	Is receiver's output controls (coarse and fine adjustment) in full CW position?	Turning control CW increases monitor output.
	Are tester range and connection (polarity) proper?	Range: DC - 50 μA Monitor plug polarity: Red clip (+) Black clip (–)
3. No fire signal produced	At least 90 seconds elapsed after MONITOR LED has started pulsing?	If operation test is performed within 90 seconds, a trouble signal can appear.
	Is sensitivity distance select switch set at "SENSITIVITY"?	With the switch in "OFF" position, no fire and trouble signal is produced.
	Quantity of beams (monitor output) has changed?	Remove the cause, adjust quantity of beams and press the set switch.

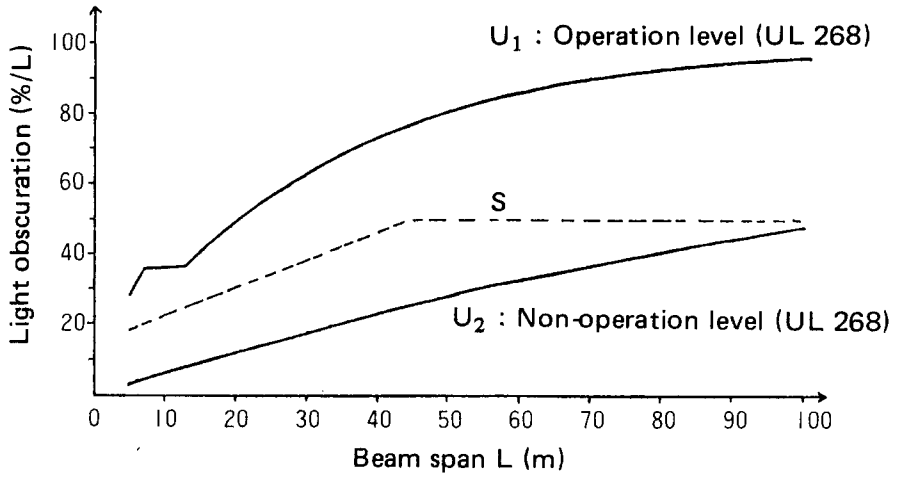
Trouble	Check	Remarks
4. Fire signals continue on (failure to reset)	Any blocking material on optical axis? (e.g., crane and other moving object)	Remove the blocking material.
	Deviation of optical axis?	Check quantity of beams (monitor output).
	Quantity of beams (monitor output) has changed?	Remove the cause.
	Is MONITOR LED (green) of emitter normal?	Check emitter power lines for disconnection or short-circuiting.
	Check for improperly insulated leads.	Check short-circuit between yellow and black leads?
5. Trouble signals continue on (failure to reset)	Take the same check steps as for fire signals (see 4 above).	
	Quantity-of-beams adjusted properly?	Check monitor output (17 to 22 μA). Press set switch.
	Check emitter/receiver lens covers for contamination.	Clean covers and press set switch.
6. No trouble signal produced	Are power supply (trouble circuit) lines normal?	Connect lines to receiver 24 V DC (+).

* For any operation trouble of the detector, take a check step appropriate to the situation.
* If the appropriate check step fails to eliminate the trouble, call your installation service or us.
* Don't disassemble the detector because it is provided with precision optical parts.

13. APPENDIX : SENSITIVITY SELECTION

(1) Sensitivity Selection and Test Filter

Select a sensitivity of the projected beam smoke detector and a test filter referring to UL Standard 268 (U_1 line, U_2 line) illustrated in the following table.



Set the sensitivity select switch so that a sensitivity falls within the range between the U_1 line and U_2 line.

* This S line is not related with UL Standard 268.
It is the sensitivity range recommended by us which offers a guideline for sensitivity setting when a ceiling height is considered. (The S line is not Standard. Refer to it as a guideline.)

Ceiling Height	Recommended Sensitivity (Light Obscuration Percentage)
Less than 4.8 m	Range between U_1 and U_2
4.8 m – 18.3 m	Range between S and U_2

* Use a test filter whose light obscuration percentage has an allowance of ±10% or more for a preset sensitivity value.