INSTALLATION, OPERATION AND MAINTENANCE MANUAL

FOR

DUAL SPECTRUM®
FIRE SENSOR MODEL PM-9CBE

TABLE OF CONTENTS

INTRODUCTION

The Santa Barbara Dual Spectrum® Fire Sensor Model PM-9CBE is a fiber-optically-coupled infrared flame sensor designed to protect areas where conventional detectors would not be practical. The PM-9CBE Fire Sensor System (P/N 411266; Figure 1 and Appendix A) can be used in confined, dirty and hazardous (classified) indoor locations. The sensor electronics (P/N 411265, Appendix B) are non-incendive and sealed providing a rugged weatherproof assembly. The sensor Optic Assembly (P/N 411301-1, Appendix C) has a 60° field-of-view. The electrically non-conductive Fiber Optic Cable (P/N 411288, Appendix D) can be as long as 100 feet and is resistant to MEK, acetone and other common solvents.

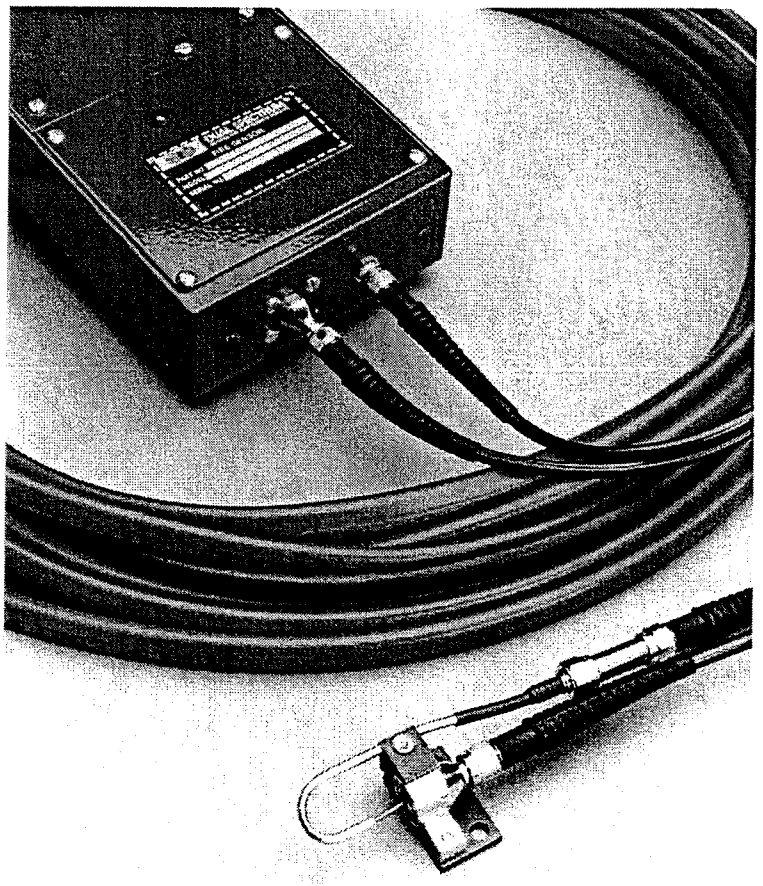


Photo No. 95-2-107

Figure 1. PM-9CBE Sensor.

The PM-9CBE is enclosed in a cast aluminum housing approximately 5.9 x 3.5 x 1.6 inches in size. A bracket assembly (P/N 409000; Appendix E) for mounting the sensor electronics is available that allows adjustment on two axes. The sensor housing has an integral junction box with three 3/4 inch conduit ports, available for connecting to hard or flexible conduit. Electrical connections are made via a terminal block mounted

inside the junction box at the rear of the sensor.

> **NOTE:** This sensor is specifically tuned and tested to respond to the fires described in this manual. The sensor response to fires from other fuel sources not described in this manual may vary. Please contact Dual Spectrum® for further information.

SENSOR USE IN HAZARDOUS AREAS

The Dual Spectrum® Model PM-9CBE Fiber Optic Fire Sensor System is a complete flame detector system. The Optic Assembly, P/N 411301 and Fiber Optic Cable, P/N 411288 may be installed in any hazardous (classified) location. The Fire Sensor PM-9CBE; P/N 411265; is nonincendive and may be located in any Class I or II, Division 2, or Class III location without using expensive explosion-proof or intrinsically-safe wiring methods. See the following sections and Electrical Installation Diagrams for installation instructions. Use Drawing 411322 , Appendix F for a Class B, Style B, and Drawing 411323, Appendix G for a Class A, Style D initiating device circuit installations.

ELECTRICAL CHARACTERISTICS

The PM-9CBE is designed to interface to an NFPA 72 compatible fire alarm control panel. A normally-open, dry-contact relay provides the alarm signal. The alarm contacts close for a minimum of ten seconds when a fire is detected and are automatically reset after a fire. The PM-9CBE has an optical built-in-test (BIT) function that tests for fiber optic cable continuity and excessive window contamination. An internal supervision relay closes when the sensor powers up and opens if a sensor fault, such as loss of power, power supply voltage outside of the specified operating range, or an optical BIT malfunction, is detected. The sensor continues to provide a fire alarm output during a BIT trouble condition. In NFPA class A or B circuits, such a fault condition is indicated at the control panel as a trouble signal.

A calibrated, through-the-lens, BIT check is performed at power up and approximately every 2 seconds to verify proper sensor operation. The BIT test provides a calibrated optical stimulus to completely check the Optic Assembly, P/N 411301, and Fiber Optic Cable, P/N 411288. If the sensor fails the BIT then the supervision relay will open, generating a trouble signal. A trouble condition also lights the yellow LED on top of the cover sensor electronics. The BIT logic requires at least 20 consecutive individual BIT faults (approximately 40 seconds) before initiating a BIT trouble output. If the obstruction clears and the sensor passed BIT for sufficient time (≤ 1 minute), which varies with the time of the obstruction, the supervision relay will close ending the trouble signal.

Supply voltage:	20 to 28 VDC (Observe Polarity) Including line drops and ripple

NOTE: A low or high supply voltage condition is indicated by a trouble output and the yellow LED on sensor electronics.

Input Current:	100 milliamps at +28 VDC maximum

Alarm Output:	Relay contacts close for ten seconds minimum.
Trouble Output:	Opening of normally-closed relay contacts. Yellow LED on sensor electronics lights.
Relay Contact Ratings:	1 Amp, 30 VDC; 0.5 Amp, 125 VAC
Reset:	Automatic after 10 seconds.
Stabilization Time:	Approximately 0.5 seconds after power up.

TABLE I. PM-9CBE Terminal Block Identification

Terminal A Terminal B	Dual Dual	+24 VDC DC return
Terminal C Terminal D	Single Single	Supervision Relay Contact, Trouble Signal
Terminal E Terminal F	Dual Dual	Alarm Relay Contact

ENVIRONMENTAL CHARACTERISTICS

TEMPERATURE AND HUMIDITY

Sensor Electronics:
Operating and Storage Temperature Range: -40° F to +158° F, -40° C to +70° C

Relative Humidity: 0% to 100%

Enclosure Rating: NEMA 4X

Fiber Optic Assembly:
Operating and Storage Temperature Range: -40° F to +185° F, -40° C to +85° C

Relative Humidity: 0% to 100%

VIBRATION

The PM-9CBE is designed to withstand severe vibration and shock as defined in FM Approval Standard 3260.

ELECTROMAGNETIC INTERFERENCE

The PM-9CBE is designed to be highly immune to radiated and conducted Electromagnetic Interference (EMI). The Sensor Electronics is immune to radiated fields of five volts per meter including amplitude modulated (AM) signals in the frequency range of 20 MHz to 900 MHz. The sensor can operate in the presence of pulsed conducted noise levels up to 20.0 volts peak to peak 15 msec bursts, in the frequency range of 200 kHz to 20 MHz.

SENSOR PERFORMANCE

DETECTION RANGE AND RESPONSE TIME

The PM-9CBE is designed for indoor applications. Best performance of the PM-9CBE sensor is achieved when the sensor is mounted so that the protected area is within the range, or detection-threshold distance, given in Table II for various flammable hazards, and within the 60° field-of-view of the Optic Assembly. The step-response time of the PM-9CBE to the threats shown in Table II is typically 0.5 seconds. The PM-9CBE responds most quickly to closer or larger fires and more slowly to smaller fires or fires that are further away.

TABLE II. PM-9CBE Detection-Threshold Distances For Half Second Typical Response Time.

Flame Fuel	Range (ft)
1 sq. ft. Gasoline	5 ft.
1 sq. ft. Lacquer Thinner	4 ft.
1 sq. ft. Isopropyl Alcohol	4 ft.

The range is smaller for sources when they are close to the edge of the field-of-view of the sensor. At the edge of the ±30° field-of-view the range is reduced no more than 50%.

Mounting sensors so that they do not view very brightly illuminated areas will help ensure optimum sensitivity. For example, indoor mounting locations where the sensors look out doors or windows should be avoided where possible.

NOTE: The sensor range to fires not listed in Table II will vary and should be verified by fire tests using the fuel in question. Please contact Dual Spectrum® for further information.

FALSE-ALARM IMMUNITY

The PM-9CBE is very false-alarm immune. However a fire-alarm output due to non-fire stimuli is possible. Table III lists common sources and the false-alarm immunity distance for those sources.

TABLE III. PM-9CBE False-Alarm Immunity Distances.

Stimulus (Chopped or Unchopped)	Range (ft)
Sunlight	No Response
Brightly Colored Clothing	No Response
Flash Light (3 D-Cell Maglite)	No Response
Fluorescent Light (40 W)	No Response
Vehicle Head Lights	No Response
Incandescent Light (100 W Frosted)	No Response
Electronic Flash (Sunpak 411)	No Response
Flood Light (Sungun-II, 650 W)	No Response
Sodium -Vapor (70 W)	No Response
Radiation Heater (1500 W)	No Response
Lighted Cigar Or Cigarette	No Response
Large Wooden Match Flare-Up	<1/2
Arc Welding (5/32" dia steel, 140A)	3

To ensure optimum performance, sensors should be mounted so that they do not view very brightly illuminated areas. For example, indoor mounting locations where the sensors look out doors or windows should be avoided where possible.

SENSOR INSTALLATION

PHYSICAL MOUNTING

The PM-9CBE sensor must be installed in conformance with the proper Installation Diagram, as described in the next section, NFPA 72, the NEC, and all local codes for the hazard classification of the location to be protected.

The PM-9CBE Sensor Electronics can be mounted on an optional bracket assembly (P/N 409000; Appendix E), or equivalent, mounted to any solid surface. The bracket assembly can be adjusted on two axes and, once correctly positioned, can be locked in place.

The PM-9CBE Sensor Electronics has three 3/4 inch conduit ports which can be used to connect to rigid or flexible conduit. Torque conduit connectors between 70 and 80 inch pounds. Two ports are plugged with the supplied conduit plugs using Teflon tape on the threads. The rear junction-box cover can be removed to connect the wiring to the terminal block.

CAUTION

THE FACTORY SEALED FRONT COVER IS ESSENTIAL TO THE CORRECT OPERATION OF THE SENSOR. REMOVING THIS COVER WILL COMPROMISE THE PERFORMANCE OF THE SENSOR.

The rear cover has a built-in gasket which provides a seal for the rear-junction box. Make sure the gasket is undamaged when re-installing the cover. Hand tighten all six cover screws to 8 in-lb to insure a good seal.

FIBER OPTIC CABLE AND OPTIC ASSEMBLY

The Optic Assembly, P/N 411301 can be installed on any solid surface with two #6 screws. Install the Fiber Optic Cable, P/N 411288 between the Optic Assembly and the Sensor. The cable must be installed in the correct orientation. At the Optic Assembly end of the cable the SMA connectors are offset to correspond to the Optic Assembly connections. The Sensor end of cables have a red dot on the sensing fiber connector which correspond to the red dot on the Sensor mating connector. The SMA connectors must be clean and dry when they are installed on the sensor electronic and Optic Assembly.

CAUTION

Reversing the Fiber Optic Cable connections will render the sensor inoperative.

The Fiber Optic Cable is rugged but must be installed correctly to insure long term reliability. The Fiber Optic Cable must not be installed with a bend radius less than 3 inches. Do not install the cable in such a way that it will be subject to tensile loads. If cable ties are used to secure the cable they should be hand tightened and observe the minimum bend radius. In installations on moving equipment, avoid securing the cable in such a way that it will be mechanically crushed, cut or pulled. See Fiber Optic Cable, Interface Control Drawing 411288, Appendix C for further information.

CAUTION

FIBER OPTIC CABLE CONTAINS GLASS MATERIAL. CARE SHOULD BE TAKEN TO AVOID PRESSURE AGAINST SHARP OBJECTS, HEAVY LOADS, AND SMALL BENDS.

OPTICAL SENSOR SYSTEM DESIGN CRITERIA

The number of sensors required to protect a given area will depend upon the size of the area, the distance from the sensor, unavoidable obstructions and the size and type of the threat fire. Certain factors need to be considered when designing an installation:

1. The fiber optic assemblies should be mounted so that objects do not block their field-of-view.
2. Whenever possible, fiber optic assemblies should be mounted so their ranges and fields-of-view overlap.

3. Fiber optic assemblies should be mounted so the protected area will not be blocked by moving machinery or human operators during normal operations within the area.

4. To ensure optimum sensitivity and performance, fiber optic assemblies should be mounted so they do not look at brightly illuminated areas.

5. The fiber optic assemblies should be mounted so that they are easily and safely accessible for inspection and maintenance. The BIT tube must not be deformed.

CAUTION

DO NOT ALLOW THE BIT TUBE ON OPTIC ASSEMBLY TO BE DEFORMED OR HANDLED. DEFORMATION WILL CAUSE THE BIT SIGNAL TO LOSE CALIBRATION POSSIBLY CAUSING BIT FAILURE.

6. If mechanical, high-temperature damage, or lens contamination is likely in the installed location, then the fiber optic assemblies should be protected. However, the protection method cannot obstruct the fiber optic assemblies field-of-view.

7. The sensors can be mounted in any orientation, so long as the manufactured mounting point is the point of support.

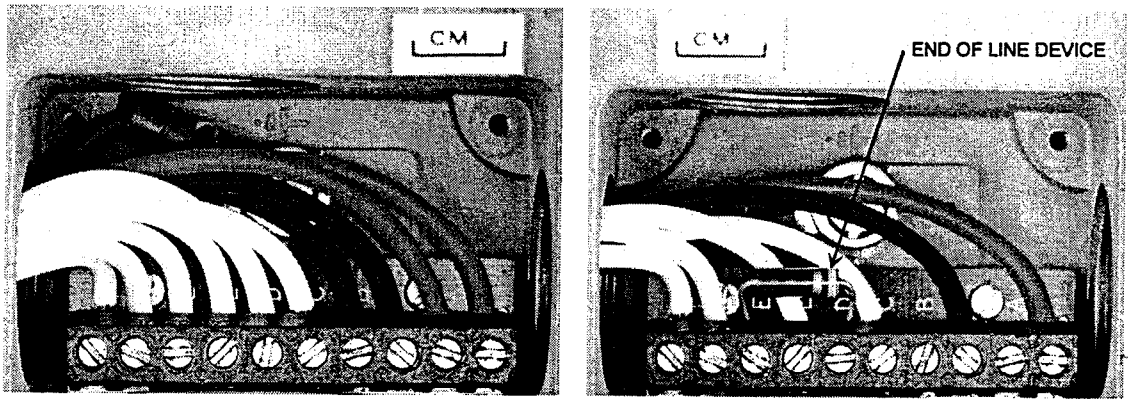
8. Mounting the fiber optic assemblies so that they point below horizontal is recommended as this normally results in minimized lens contamination.

ELECTRICAL WIRING CONNECTION

The installation of the PM-9CBE fire sensor should be in accordance with the Dual Spectrum® Installation Diagrams included as appendices to this manual. Sensors may be wired in a standard NFPA 72 class B, style B configuration or in a class A, style D configuration. The initiating device circuits are nonincendive. Proper wiring connections for the PM-9CBE are illustrated in figure 2.

WARNING

DO NOT REMOVE THE PM-9CBE JUNCTION BOX COVER WHILE THE CIRCUIT IS ALIVE UNLESS THE AREA IS KNOWN TO BE NON-HAZARDOUS



a) Photo No. 95-11-84 b) Photo No. 95-11-85

Figure 2. PM-9CBE Junction Box Connections. a) Connections with another sensor in parallel. b) Connection with end of line device.

CIRCUITS WITH NONINCENDIVE SENSORS

The PM-9CBE fire sensor P/N 411265 is nonincendive and, where allowed by the NEC and local code, may be installed in otherwise incendive circuits in the following hazardous (classified) locations: Class I, Division 2 Group A-D, Class II, Division 2, Group F-G, or Class III, Division 1 & 2 hazardous (classified) or non-hazardous. Installations require the use of an approved fire alarm control panel that is compatible with the Class B, Style B or Class A, Style D initiating device circuits. The Optic Assembly and Fiber Optic Cable can be installed in any hazardous (classified) location.

SYSTEM TEST

After the fire protection system is installed it should be tested for correct operation. The PM-9CBE Fiber Optic Fire Sensor System performs optical BIT testing with a calibrated signal so no installation testing is required for this portion of the system. The wiring to the fire alarm control panel must be tested at installation to confirm wiring integrity. A full optical test with alarm output is required to verify full operational status. The sensors may be tested with live fires or by using the hand-held PSS-F Test Set (Drawing 411833; Appendix H).

WARNING

A FULL SYSTEM TEST RESULTS IN AN ALARM OUTPUT. THIS WILL RESULT IN THE AUTOMATIC SUPPRESSION SYSTEM BEING ACTIVATED IF IT IS NOT DISABLED PRIOR TO PROCEEDING.

1. Suppression system. Disable the suppression system if its activation is not desired during this test.

2. Interconnection Wiring. Correct interconnection wiring should be checked by removing any wire attached to the sensor terminal block. The result, in a supervised NFPA wiring scheme, should be a trouble-signal indication at the control panel.

3. Fire Response Test. The PSS-F Source Simulator is an external infrared source that can be used to initiate a sensor alarm. To test the sensor turn the PSS-F off, then align it along the optical axis of the Optic Assembly. The face of the test set must be 1.5 to 2.5 inches from the lens the Optic Assembly (Figure 3). Holding the PSS-F steady in this position turn on the Test Set — the sensor should go into alarm within 1 second. See Appendix H, drawing number 411833, for more detailed information.

WARNING

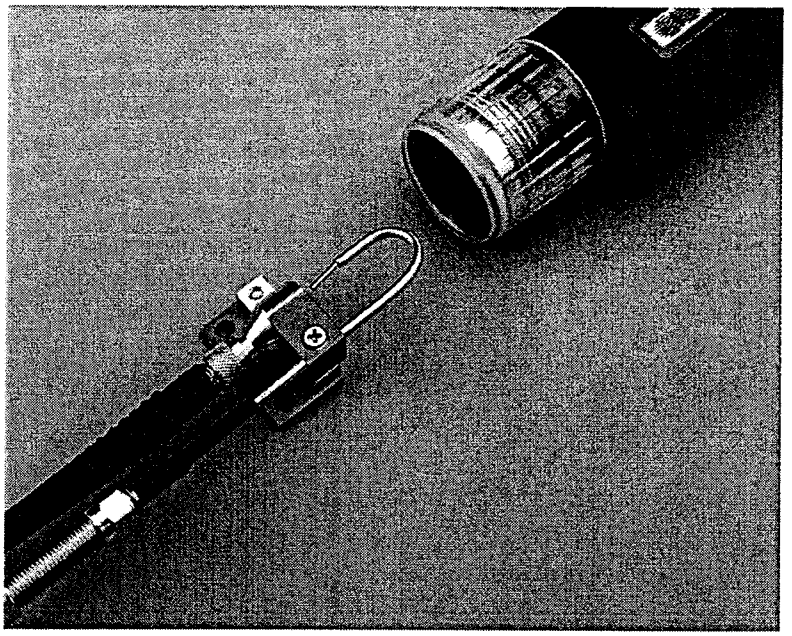
DO NOT USE THE PSS-F TEST SET UNLESS THE AREA IS KNOW TO BE NON-HAZARDOUS.

4. Test Faults. Abnormal results in the preceding tests can be due to incorrect wiring, or a sensor fault. Check the circuits for faults and the PSS-F Test Set for normal operation. If the integrity of the circuit is certain the sensor electronics, Fiber Optic Cable or Optic Assembly may be tested using the Fiber Optic Test Jumper, Appendix I, P/N 411821. See Figures 4 and 5 and Table IV, Trouble Shooting Guide for detailed procedures.

5. Restore fire protection system. Restore the system to an operational condition after all tests have been completed.

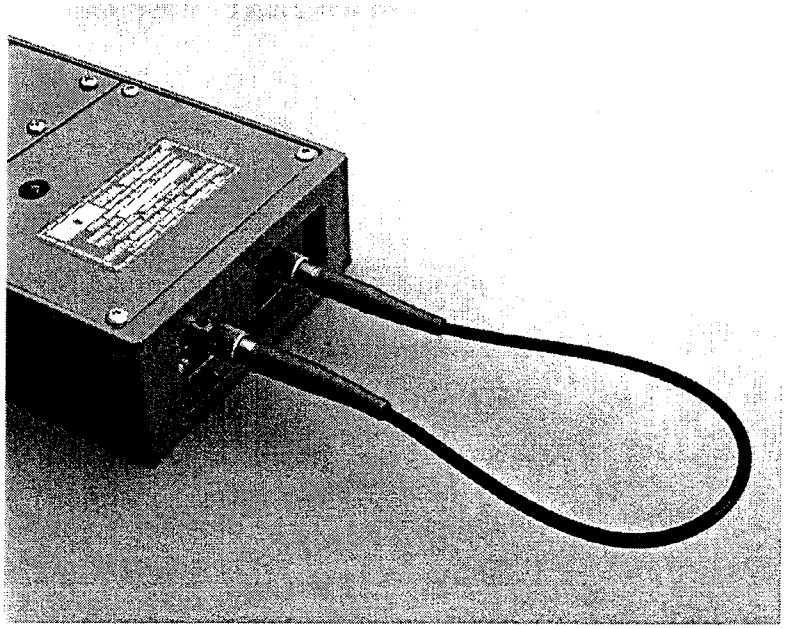
Optional Test Method:

To check the installation with a live fire situation the following tests can be done. False-alarm immunity can be checked using stimuli and distances shown in Table III. Fire response can be check by exposing the sensor under test to a live fire source. The alarm output will reset 10 seconds after the fire source is removed. Follow all required precautions when testing in this manner.



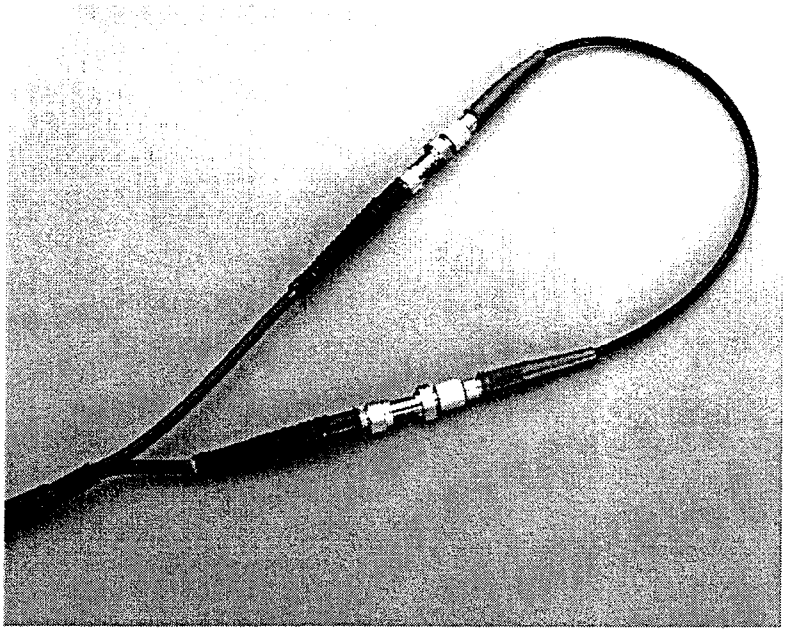
96-6-008

Figure 3. Correct alignment of PSS-F with PM-9CBE



96-6-010

Figure 4. Fiber Optic Test Jumper installed on sensor electronics.



96-6-009

Figure 5. Fiber Optic Test Jumper installed on Fiber Optic Cable.

TABLE IV, TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Trouble light on at fire alarm control panel.	Incorrect wiring.	Check circuit installation.
	Low or no voltage to sensor	Check voltage between Pins A and B. Should be 20-28 VDC.
	Sensor fails BIT test.	Check Optic Assembly for contamination, deformation, or loose Fiber Optic Cable connections. Isolate problem using Fiber Optic Test Jumper, P/N 411821
Sensor fails to alarm during optical test with PSS-F Test Set.	Reversed fiber optic connectors.	Confirm Fiber Optic Cable is correctly installed. Red dots match at the sensor electronics.
	Incorrect wiring.	Check circuit installation.
	PSS-F battery low or malfunction.	Check PSS-F Test Set, batteries and bulb.
	Possible sensor malfunction.	Replace sensor and repeat test.
FIBER OPTIC JUMPER TESTS	**RESULT**	**CORRECTIVE ACTION**
Connect jumper between detector and test SMA connectors on fire sensor electronics.	Trouble light stays on.	Probable sensor malfunction. Replace sensor and repeat test.
	Trouble light clears.	Perform next test.
Connect Fiber Optic Cable to sensor electronics. Disconnect Fiber Optic Cable from Optic Assembly. Using SMA jack-jack couplers, connect jumper to SMA connectors on Fiber Optic Cable	Trouble light stays on.	Replace Fiber Optic Cable.
	Trouble light clears.	Replace Optic Assembly.

MAINTENANCE

ROUTINE VISUAL INSPECTION

A properly installed Dual Spectrum® sensor system is highly resistant to being blinded by contamination build-up on the Optic Assembly lens. However, a thick enough build-up will begin to reduce the performance of the sensor. This can be prevented by periodically inspecting installed sensors visually for contamination build-up on the lens front face. If such a build-up is observed, it should be removed by cleaning the lens front face windows with a soft cloth or lens tissue. The minimum inspection period should be compatible with appropriate regulating agency requirements.

CAUTION

DO NOT ALLOW THE BIT TUBE ON OPTIC ASSEMBLY TO BE DEFORMED OR HANDLED. DEFORMATION WILL CAUSE THE BIT SIGNAL TO LOSE CALIBRATION POSSIBLY CAUSING BIT FAILURE.

PERIODIC SYSTEM TEST

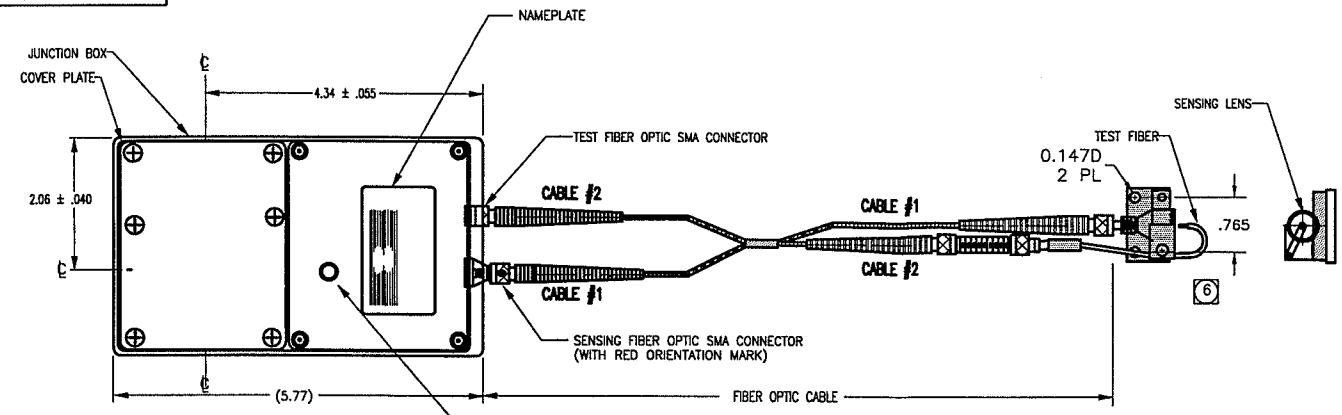
The authority having jurisdiction and internal facility requirements generally call for routine testing of safety systems at defined intervals, which, at a minimum, should conform to the requirements of NFPA 72. These tests should include visual inspections and the steps listed in the System Test section above.

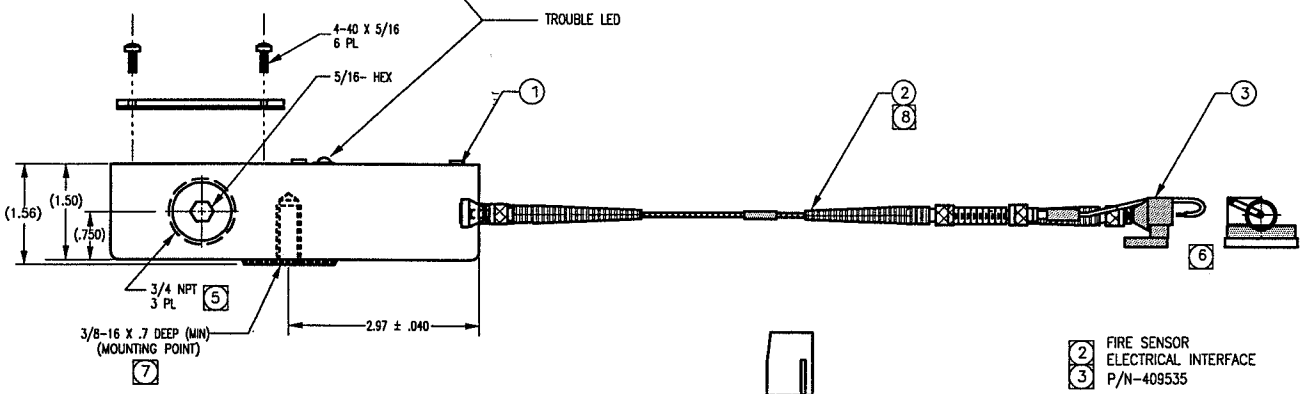
WARNING

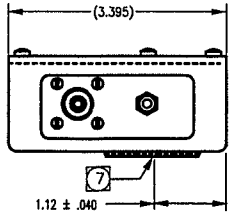
A FULL SYSTEM TEST RESULTS IN AN ALARM OUTPUT. THIS WILL RESULT IN THE SUPPRESSION SYSTEM BEING ACTIVATED IF IT IS NOT DISABLED PRIOR TO TESTING.

APPENDIX A

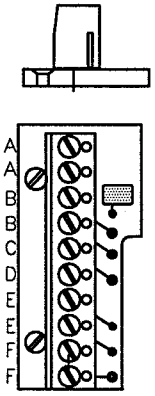
PM-9CBE FIBER OPTIC FIRE SENSOR SYSTEM







FRONT VIEW OF THE SENSOR WITH THE FIBER OPTIC CABLE REMOVED



TERMINAL BLOCK
INTERCONNECTION BOARD ASSEMBLY
DETAIL A [3][2]

SCALE: NONE

[2][3] FIRE SENSOR ELECTRICAL INTERFACE P/N-409535

A	V+
A	V+
B	POWER_RTN
B	POWER_RTN
C	TROUBLE +
D	TROUBLE –
E	ALARM+
E	ALARM+
F	ALARM–
F	ALARM–

[8] TABULATION

DASH	LENGTH (NOMINAL)
–01	30 FT
–02	45 FT
–03	100 FT
–04	10 FT

[8] SEE TABULATION FOR OPTIONAL CABLE LENGTHS.

[7] MOUNT SENSOR ONLY AT THE MOUNTING POINT.

[6] OPTICAL HEAD. THE ASSEMBLY CONFIGURATION OF THE OPTICAL HEAD MAY VARY WITH DIFFERENT APPLICATIONS (WITH NO EFFECT ON OPTICAL PERFORMANCE). CONTACT SBDS FOR CUSTOM CONFIGURATIONS.

[5] APPLY TWO TURNS (MIN.) OF TEFLON TAPE AROUND THE PLUG(S) AND/OR CONDUIT CONNECTOR(S) BEFORE INSTALLING. TORQUE TO 70 – 80 IN-LBS.

4. PERFORMANCE RATINGS:
PERFORMANCE RATINGS ARE DEFINED IN THE PM-9CBE INSTALLATION MANUAL (SBDS DOCUMENT 411503)

[3] SEE TABULATION AND DETAIL A FOR ELECTRICAL INTERFACE.

[2] INDICATED PART NUMBER IS A TERMINAL BLOCK INTERCONNECTION BOARD ASSEMBLY (P/N 409535) LOCATED IN THE JUNCTION BOX.

1. INTERPRET DRAWING IAW ANSI Y14.5.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTE: NO REVISIONS SHALL BE MADE WITHOUT PRIOR FACTORY MUTUAL APPROVAL

CAD PREPARED DRAWING USING AUTOCAD R13
NOT TO BE MANUALLY ALTERED.

INTERFACE CONTROL DRAWING

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
3	1		411301	OPTIC ASSEMBLY
2	1		411288-XX	FIBER OPTIC CABLE
1	1		411265	FIRE SENSOR, PM-9CBE

LIST OF MATERIAL

PART NO.	NEXT ASSY	USED ON
		PM-9CBE

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M – 1982
X ± .03 | XXX ± .010 | ANGLES ± 2°
MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM A DIVISION OF KIDDE Technologies, Inc.

R.L. MAYER 7/19/96

PM-9CBE FIBER OPTIC FIRE SENSOR SYSTEM

SIZE D | CAGE CODE 05BU0 | NUMBER 411266

SCALE: —— | SHEET

FSS-PPL

REVISIONS

SYM	DESCRIPTION	DATE	APPROVED

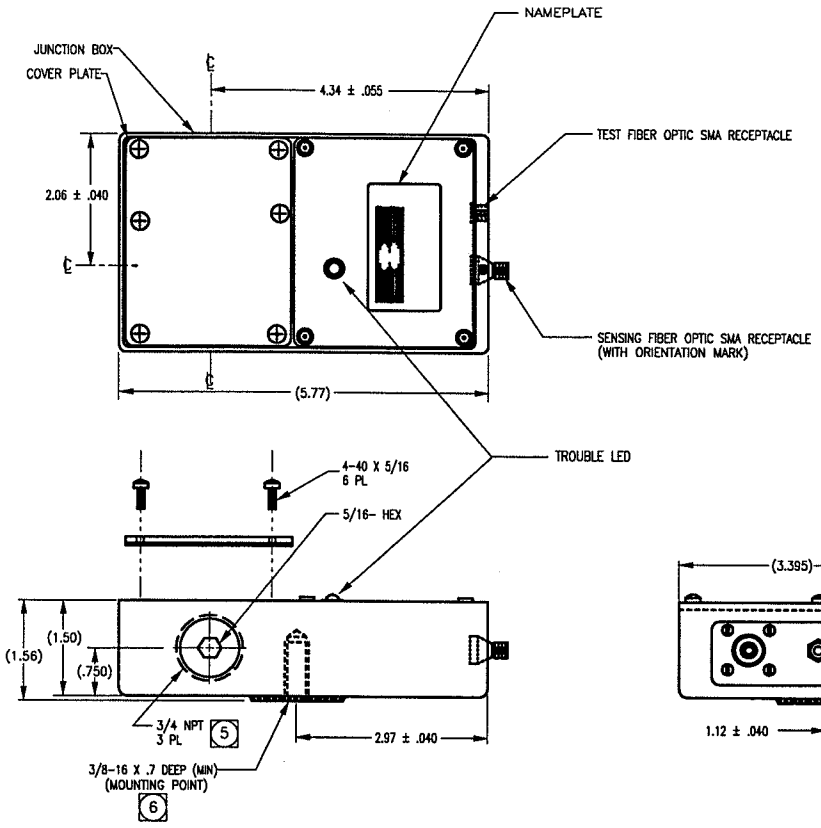
WARNING

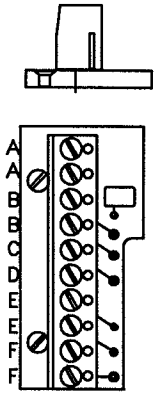
THIS DRAWING IS A PRELIMINARY PRINT
DO NOT USE FOR PRODUCTION
UNLESS YOUR ORDER OR INSTRUCTIONS
SPECIFY THE REVISION LEVEL.
COPIES ISSUED PRIOR TO
JUNE 7, 1996 ARE OBSOLETE.

411266

APPENDIX B

FIRE SENSOR PM-9CBE





TERMINAL BLOCK
INTERCONNECTION BOARD ASSEMBLY
DETAIL A [2] [3]
SCALE: NONE

[2] FIRE SENSOR
ELECTRICAL INTERFACE
[3] P/N-409535

A	V+
A	V+
B	POWER_RTN
B	POWER_RTN
C	TROUBLE +
D	TROUBLE –
E	ALARM+
E	ALARM+
F	ALARM–
F	ALARM–

REVISIONS				
MODEL DESIGNATION	SYM	DESCRIPTION	DATE	APPROVED

[6] MOUNT SENSOR ONLY AT THE MOUNTING POINT.

[5] APPLY TWO TURNS (MIN.) OF TEFLON TAPE AROUND THE PLUG(S) AND/OR CONDUIT CONNECTOR(S) BEFORE INSTALLING. TORQUE TO 70 – 80 IN-LBS.

4. PERFORMANCE RATINGS:
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1. INTERPRET DRAWING IAW ANSI Y14.5.

NOTES: UNLESS OTHERWISE SPECIFIED

CAD PREPARED DRAWING USING AUTOCAD R13
NOT TO BE MANUALLY ALTERED.

INTERFACE CONTROL DRAWING

NOTE: NO REVISIONS SHALL BE MADE WITHOUT PRIOR FACTORY MUTUAL APPROVAL

QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.
			LIST OF MATERIAL	

DSC	411266	PM-9CBE
PART NO.	NEXT ASSY	USED ON
APPLICATION		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M – 1982
XX ± .03 | XXX ± .010 | ANGLES ± 2°
MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM A DIVISION OF KIDDE Technologies, Inc.

DRAWN	R.I. MAYER	7/18/95
CHKD		
APVD		

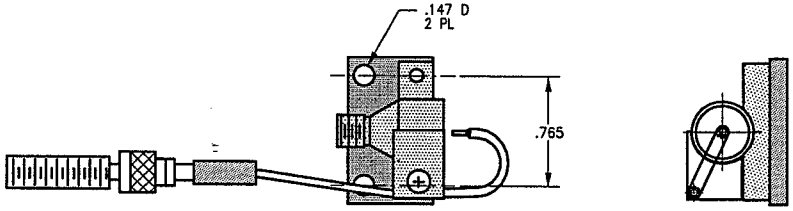
FIRE SENSOR ELECTRONICS
PM-9CBE

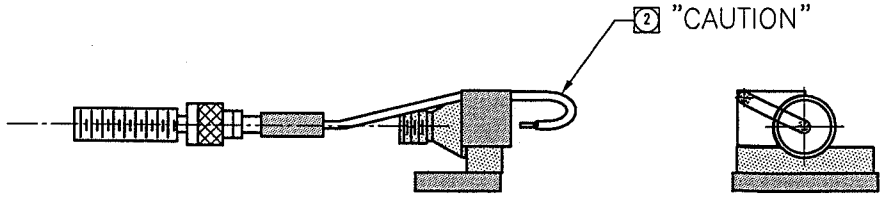
SIZE	CAGE CODE	NUMBER
D	05BU0	411265
SCALE		SHEET

APPENDIX C

OPTIC ASSEMBLY

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED





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INTERFACE CONTROL DRAWING

3. NO USER SERVICEABLE PARTS. REMOVING SCREWS WILL RENDER UNIT INOPERATIVE

2 CAUTION – CARE SHOULD BE TAKEN TO PREVENT BIT TUBE FROM BEING DEFORMED.

1. OPERATING TEMPERATURE RANGE= –40/+185°F.

NOTES: UNLESS OTHERWISE SPECIFIED.

CAD PREPARED DRAWING USING AUTOCAD R13
NOT TO BE MANUALLY ALTERED.

PART NO.	NEXT ASSY	USED ON
	411460	PM-8
	412292	PM-9SBE
BSC	411266	PM-9CBE

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
AND PER ANSI Y14.5M – 1982
XX ±.010 XXX ANGLES ±°
MATERIAL
NOTED

QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.
			LIST OF MATERIAL	

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM
A DIVISION OF KIDDE Technologies, Inc.

DRAWN G.R.HEMPEL
CHKD
APVD
APVD

ICD
OPTIC ASSEMBLY

SIZE	CAGE CODE	NUMBER
D	05BU0	411301

SCALE ____ SHEET

411301

A

APPENDIX D

FIBER OPTIC CABLE

REVISIONS				
MODEL EFFECTIVITY	SYM	DESCRIPTION	DATE	APPROVED

"CAUTION"– FIBER OPTIC CABLE CONTAINS GLASS MATERIAL. CARE SHOULD BE TAKEN TO AVOID PRESSURE AGAINST SHARP OBJECTS, HEAVY LOADS, AND SMALL BENDS. (2) (3)

WARNING
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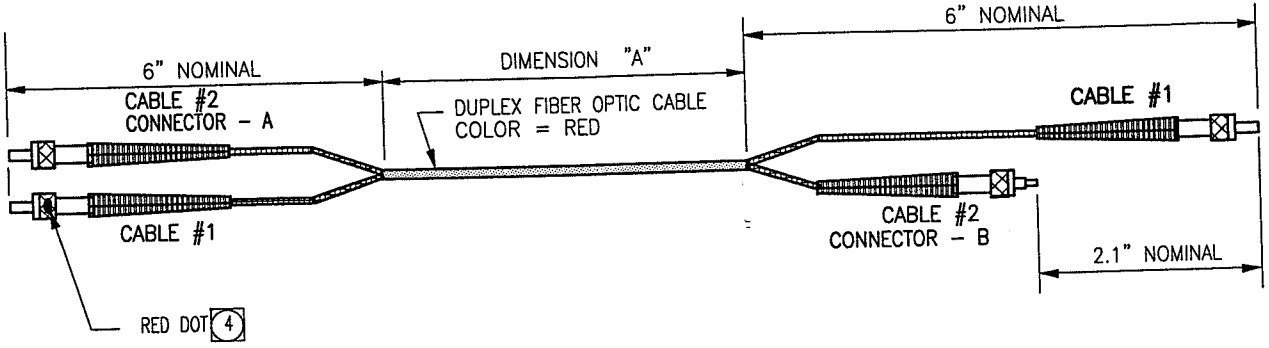


CABLE #1 = 400 µM CORE FIBER OPTIC CABLE
CONNECTOR TO BE 698–DSC A490 AUGAT (OR EQUIV.) 2X.

CABLE #2 = 100 µM CORE FIBER OPTIC CABLE
CONNECTOR –A TO BE 905–150–5002 AMPHENOL (OR EQUIV.)
CONNECTOR –B TO BE 906–122–5000 AMPHENOL (OR EQUIV.)

P.N.	"A" CABLE LENGTH
01	30 FT. +1/–0 FT.
02	45 FT. +1/–0 FT.
03	100 FT. +2/–0 FT.
04	10 FT. +1/–0 FT.

5. CABLE CONNECTORS MUST BE CLEAN AND DRY DURING INSTALLATION. CONNECTORS MAY BE CLEANED WITH ALCOHOL AND COTTON SWAB.

(4) RED DOT ORIENTATION MARK MATCHES RED DOT ON SENSOR ELECTRONICS

(3) FIBER CABLE WHEN PERMANTLY INSTALLED SHALL NOT HAVE A BEND RADIUS SMALLER THAN THREE INCHES (3").

(2) WHILE INSTALLING FIBER CABLE,THE FIBER SHALL NOT BE SUBJECTED TO A BEND RADIUS SMALLER THAN ONE INCH (1").

1. OPERATING TEMPERATURE RANGE= -40/+185°F (-40/+85°C)

NOTES: UNLESS OTHERWISE SPECIFIED

CAD PREPARED DRAWING USING AUTOCAD R13 NOT TO BE MANUALLY ALTERED.

NOTE: NO REVISIONS SHALL BE MADE WITHOUT PRIOR FACTORY MUTUAL APPROVAL

PART NO.	NEXT ASSY	USED ON
	412292	PM-9SBE
	411266	PM-9CBE

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M – 1982
± .XX ± .XXX ± ANGLES
MATERIAL

QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.

LIST OF MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM
A DIVISION OF KIDDE Technologies, Inc.

PREP G.R.HEMPEL
CHKR
APVD
APVD

INTERFACE CONTROL DRAWING

ICD
FIBER OPTIC CABLE

SIZE	CAGE CODE	NUMBER
C	05BU0	411288

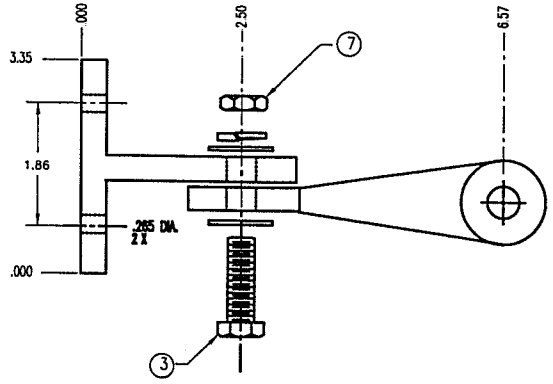
SCALE NONE SHEET

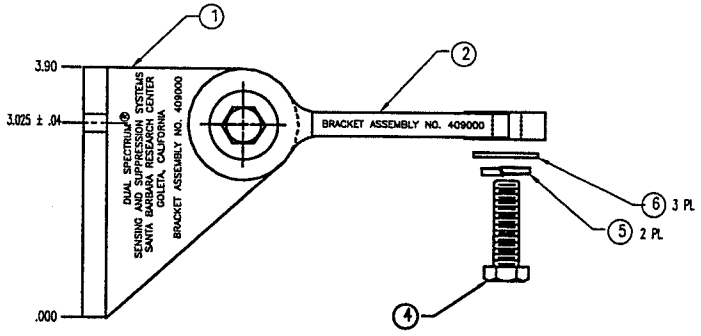
FOLD

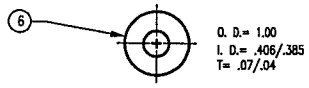
APPENDIX E

BRACKET ASSEMBLY

REVISIONS				
ITEM	DESCRIPTION	DATE	APPROVED	
A	IS: I.D.=.406/.385 T=.07/.04 ITEM NO. 3=1 3/8 LONG DELETE-ITEM NO. 3&6 "SEASTROM OR EQUY" SHOW VERBAGE ON BRACKET ASSY. ECR # 883 — MAS: I.D.=.406 T=.08 ITEM NO. 3=1 1/2 LONG	94-08-29	GRH AH	S C
B	REVISED AND REDRAWN AS REQUESTED BY ECRXXX. INCORPORATED NEW COMPANY FORMAT.		TJB	







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NOTE: NO REVISIONS SHALL BE MADE WITHOUT PRIOR FACTORY MUTUAL APPROVAL

QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
1			NUT, CRES, 3/8-16
3			WASHER, FLAT, CRES
2			WASHER, SPLIT, CRES
1			BOLT, HEX, CRES, 3/8-16 X 1 1/4 LG
1			BLOT, HEX, CRES, 3/8-16 X 1 1/2 LG
1		409417-02	MOUNT, HOUSING
1		409417-01	MOUNT, WALL

LIST OF MATERIAL

PART NO.	NEXT ASSY	USED ON
408858		PM6
408850		PM5-SXJ

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M - 1982
.XX ± .06 .XXX ± .010 ANGLES ±
MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM A DIVISION OF KIDDE Technologies, Inc

DRAWN	G.R.HEMPEL	3/11/94
CHKD	H.SEGAL	4/4/94
APVD	S.E.HODGES	4/5/94
APVD	D.R.LEDBETTER	4/5/94

BRACKET ASSEMBLY

SIZE D | Cage Code 05BU0 | NUMBER 409000

1. INTERPRET DRAWING PER DOD-STD-100

NOTES: UNLESS OTHERWISE SPECIFIED.

CAD PREPARED DRAWING USING AUTOCAD R13
NOT TO BE MANUALLY ALTERED.

FSS-PPL

APPENDIX F

ELECTRICAL INSTALLATION DIAGRAM

CLASS B, STYLE B CONTROL DRAWING

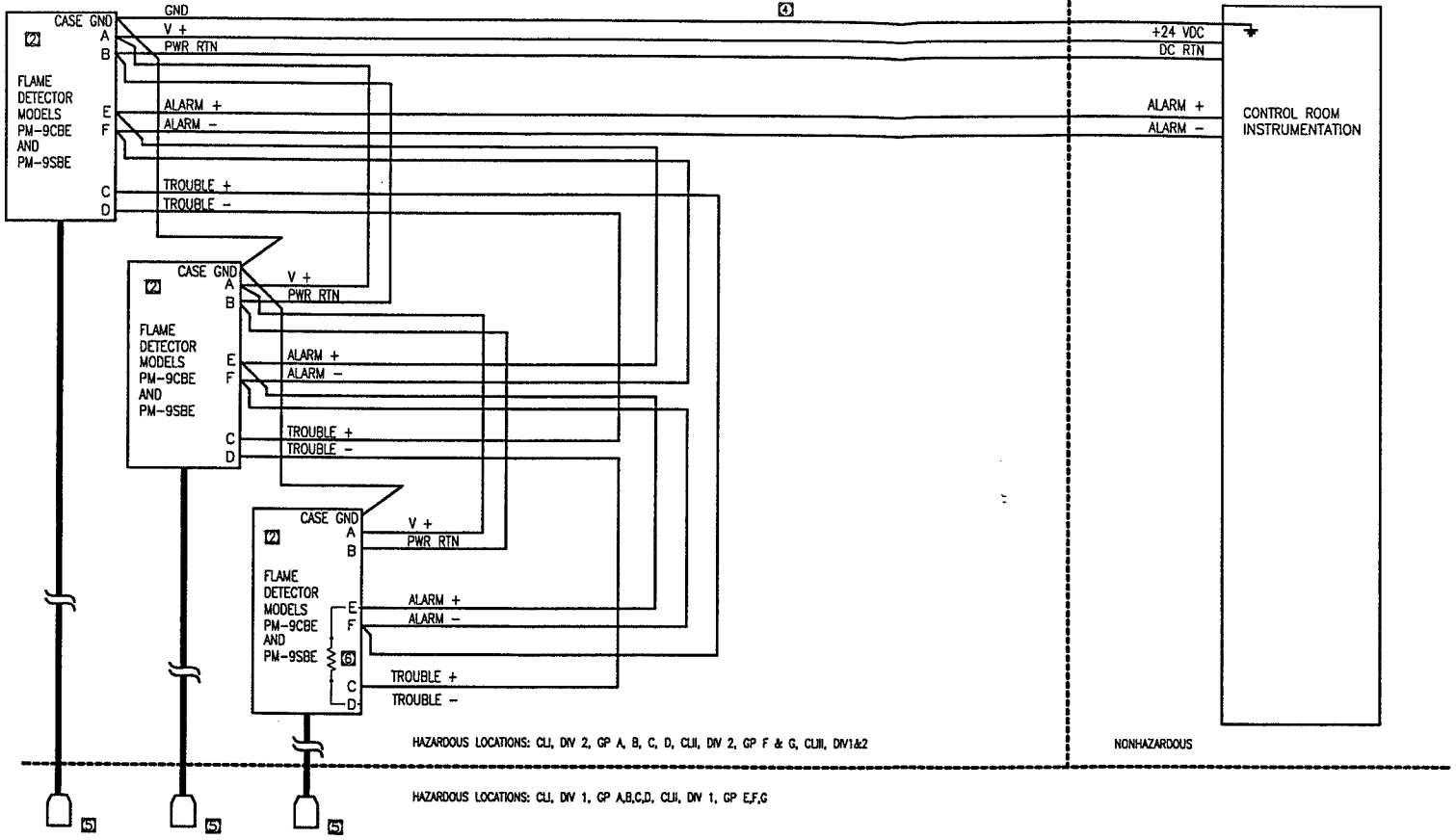
Hazardous (Classified) Locations:

Class I, Division 2, Group A, B, C, D

Class II, Division 2, Group F, G

Class III, Division 1 and 2

Non-hazardous (Non-classified) Locations:



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
A	REVISED AND REDRAWN AS REQUIRED BY ECR 910. INCORPORATED NEW COMPANY FORMAT AND ADDED PM-9SBE REFERENCE.		

7. STRIP 0.2 INCHES OF INSULATION FROM WIRE TO ALLOW INSERTION INTO TERMINAL STRIP.

6 END OF LINE DEVICE, AS REQUIRED BY THE FIRE ALARM CONTROL PANEL, IS USED TO MONITOR LINE CONTINUITY.

5 OPTIC ASSEMBLY MAY BE LOCATED IN ANY HAZARDOUS (CLASSIFIED) LOCATION, THAT DOES NOT EXCEED THE ENVIRONMENTAL SPECIFICATIONS OF THE ASSEMBLY.

4 SENSOR HOUSINGS SHOULD BE TIED TO EARTH GROUND USING THE GROUNDING SCREW IN THE JUNCTION BOX.

3. ELECTRICAL REQUIREMENT; 20 TO 28 VDC AND 65 MILLIAMPS (MAX) PER SENSOR.

2 THIS DRAWING SHOWS THREE SENSORS CONNECTED IN ONE ZONE IN A CLASS B, STYLE B CONFIGURATION PER NFPA 72. ADDITIONAL SENSORS CAN BE ADDED BY PARALLELING ALARM OUTPUTS AND POWER SUPPLY CONNECTIONS.

1. SENSOR INSTALLATION IN NONINCENDIVE, CLASS I, DIVISION 2, GP. A, B, C & D; CLASS II, DIVISION 2, GP. F & G, OR CLASS III, DIVISION 1 AND 2 HAZARDOUS (CLASSIFIED) LOCATIONS, OR NON-HAZARDOUS LOCATIONS ONLY. WIRING METHODS MUST CONFORM TO THE NEC, NFPA72 AND LOCAL CODES.

NOTES: UNLESS OTHERWISE SPECIFIED

FIRE SENSOR
ELECTRICAL INTERFACE

A	V+
A	V+
B	POWER_RTN
B	POWER_RTN
C	TROUBLE +
D	TROUBLE –
E	ALARM+
E	ALARM+
F	ALARM–
F	ALARM–

CAD PREPARED DRAWING USING AUTOCAD R13
NOT TO BE MANUALLY ALTERED.

PART NO.	NEXT ASSY	USED ON
		PM-9SBE
		PM-9CBE

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
AND PER ANSI Y14.5M – 1982
.XX ± .XXX ± ANGLES ±
MATERIAL

QTY REQD	ORDE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.

LIST OF MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM
A DIVISION OF KIDDE Technologies, Inc.

DRAWN	G.D. SIMPSON	3/8/95
CHECKED	J.M. WETZORK	9/22/95
APPD	S.E. HODGES	9/22/95
APPD		

CLASS B, STYLE B
ELECTRICAL INSTALLATION DIAGRAM
FLAME DETECTOR MODELS
PM-9CBE AND PM-9SBE

SIZE	ORDE CODE	NUMBER
D	05BU0	411322

SCALE —
SHEET

PL FSS-PPL

APPENDIX G

ELECTRICAL INSTALLATION DIAGRAM

CLASS A, STYLE D CONTROL DRAWING

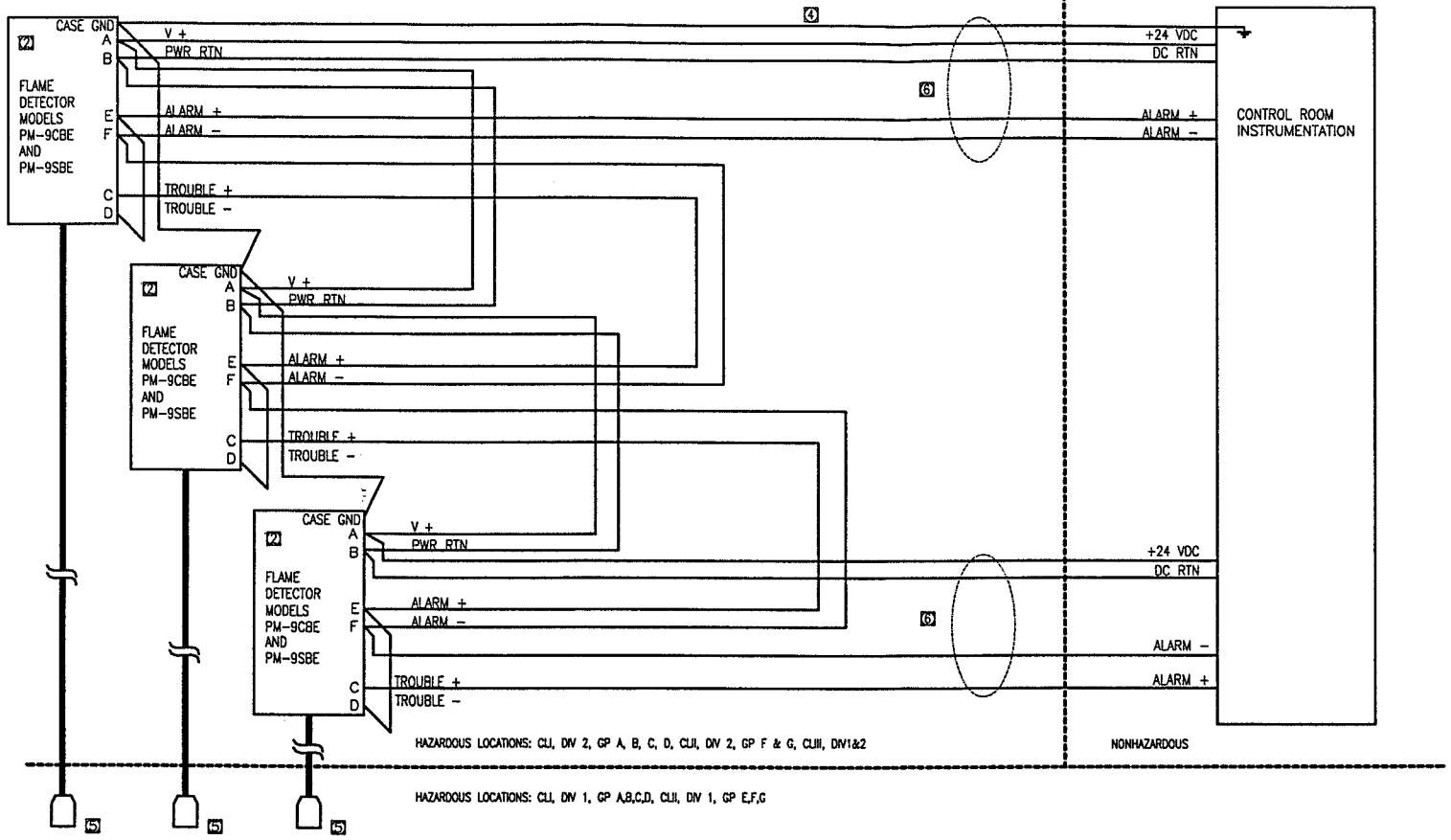
Hazardous (Classified) Locations:

Class I, Division 2, Group A, B, C, D

Class II, Division 2, Group F, G

Class III, Division 1 and 2

Non-hazardous (Non-classified) Locations:



REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
A	REVISED AND REDRAWN AS REQUIRED BY ECR 911. INCORPORATED NEW COMPANY FORMAT AND ADDED PM-9SBE REFERENCE.		

7. STRIP 0.2 INCHES OF INSULATION FROM WIRE TO ALLOW INSERTION INTO TERMINAL STRIP.

[6] THE OUTGOING AND RETURN (REDUNDANT) CIRCUIT CONDUCTORS SHALL NOT BE RUN IN THE SAME CABLE ASSEMBLY, ENCLOSURE, OR RACEWAY PER NFPA 72.

[5] OPTIC ASSEMBLY MAY BE LOCATED IN ANY HAZARDOUS (CLASSIFIED) LOCATION, THAT DOES NOT EXCEED THE ENVIRONMENTAL SPECIFICATIONS OF THE ASSEMBLY.

[4] SENSOR HOUSINGS SHOULD BE TIED TO EARTH GROUND USING THE GROUNDING SCREW IN THE JUNCTION BOX.

3. ELECTRICAL REQUIREMENT; 20 TO 28VDC AND 65 MILLIAMPS (MAX) PER SENSOR.

[2] THIS DRAWING SHOWS THREE SENSORS CONNECTED IN ONE ZONE IN A CLASS A, STYLE D CONFIGURATION PER NFPA 72. ADDITIONAL SENSORS CAN BE ADDED BY PARALLELING ALARM OUTPUTS AND POWER SUPPLY CONNECTIONS.

1. SENSOR INSTALLATION IN NONINCENDIVE, CLASS I, DIVISION 2, GP. A, B, C & D; CLASS II, DIVISION 2, GP. F & G, OR CLASS III, DIVISION 1 AND 2 HAZARDOUS (CLASSIFIED) LOCATIONS, OR NON-HAZARDOUS LOCATIONS ONLY. WIRING METHODS MUST CONFORM TO THE NEC, NFPA72 AND LOCAL CODES.

NOTES: UNLESS OTHERWISE SPECIFIED

FIRE SENSOR
ELECTRICAL INTERFACE

A	V+
A	V+
B	POWER_RTN
B	POWER_RTN
C	TROUBLE +
D	TROUBLE –
E	ALARM+
E	ALARM+
F	ALARM–
F	ALARM–

CAD PREPARED DRAWING USING AUTOCAD R13
NOT TO BE MANUALLY ALTERED.

PART NO.	NEXT ASSY	USED ON
		PM-9SBE
		PM-9CBE

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M – 1982
XX ± .XXX ± ANGLES ±
MATERIAL

QTY REQD	ONE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.

LIST OF MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM A DIVISION OF KIDDE Technologies, Inc.

DRAWN	G.D. SIMPSON	3/8/95
CHECKED	J.M. WETZORK	9/22/95
APPROVED	S.E. HODGES	9/22/95
APPD		

CLASS A, STYLE D
ELECTRICAL INSTALLATION DIAGRAM
FLAME DETECTOR MODELS
PM-9CBE AND PM-9SBE

SIZE	ONE CODE	NUMBER
D	05BU0	411323

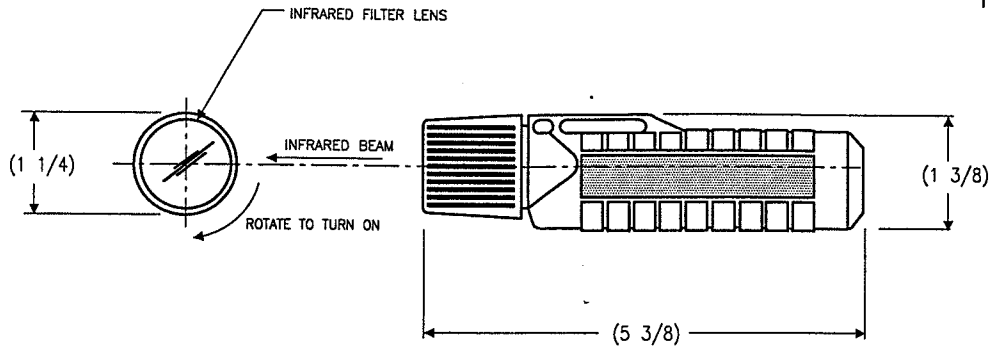
SCALE —— SHEET

PL FSS-PPL

APPENDIX H

PSS-F TEST SET

MODEL EFFECTIVITY	REVISIONS SYM	DESCRIPTION	DATE	APPROVED



WARNING

THIS UNIT IS RATED FOR USE IN CLASS 1, DIVISION 2, GROUP A,B,C,D..

CAUTION

A FULL SYSTEM TEST RESULTS IN AN ALARM OUTPUT. THIS WILL RESULT IN THE AUTOMATIC SUPPRESSION SYSTEM BEING ACTIVATED IF IT IS NOT DISABLED PRIOR TO TESTING.

OPERATION

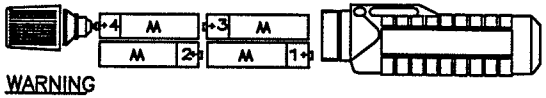
ALIGN THE OPTICAL AXIS OF THE PM-9 OPTIC ASSEMBLY WITH THE INFRARED BEAM OF THE PSS-F AT A DISTANCE OF 1.5 TO 2.5 INCHES. THE DISTANCE IS MEASURED FROM THE LENS OF THE OPTIC ASSEMBLY TO THE LENS OF THE PSS-F SOURCE SIMULATOR. WHILE HOLDING THE PSS-F SOURCE SIMULATOR STEADY IN THE POSITION, TURN ON THE SOURCE SIMULATOR. THE FIRE SENSOR SHOULD GENERATE AN ALARM SIGNAL WITHIN 1 SECOND.

NOTE

FOR VALID TEST RESULTS, THE TEST SET AND THE SENSOR UNDER TEST MUST BE AT APPROXIMATELY THE SAME TEMPERATURE.

BATTERY REPLACEMENT

THE SIMULATOR REQUIRES 4 ALKALINE AA-SIZE BATTERIES. ONLY DURACELL MN1500, ENERGIZER E914 OR FUJI T300 BATTERIES MAY BE USED.



WARNING

CHANGE BATTERY IN NON-HAZARDOUS LOCATION ONLY

NOTES: UNLESS OTHERWISE SPECIFIED

CAD PREPARED DRAWING USING AUTOCAD R13 NOT TO BE MANUALLY ALTERED.

PART NO.	NEXT ASSY	USED ON
BSC	—	PM-9SBE
BSC	—	PM-9CBE

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M - 1982
XX ± | XXX ± | ANGLES ±
MATERIAL

INTERFACE CONTROL DRAWING

QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.

LIST OF MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM
A DIVISION OF KIDDE Technologies, Inc.

PREP	V. MARIN	14 MAY 96
CHKR		
APVD		
APVD		

FIBER OPTIC SENSOR SOURCE SIMULATOR PSS-F TEST SET

SIZE	CAGE CODE	NUMBER
C	05BU0	411833

SCALE NONE SHEET

REV 1
DWG NO 411833

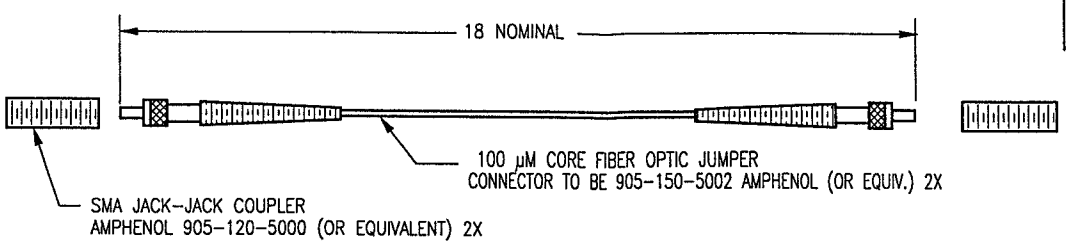
FOLD 1
FOLD 2

APPENDIX I

FIBER OPTIC TEST JUMPER

MODEL EFFECTIVITY	REVISIONS SYM	DESCRIPTION	DATE	APPROVED

"CAUTION"– FIBER OPTIC CABLE CONTAINS GLASS MATERIAL. CARE SHOULD BE TAKEN TO AVOID PRESSURE AGAINST SHARP OBJECTS, HEAVY LOADS, AND SMALL BENDS. (1)



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TROUBLESHOOTING GUIDE
FIBER OPTICALLY COUPLED FIRE SENSORS

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Trouble light on at fire alarm control panel.	Incorrect wiring.	Check circuit installation.
	Low or no voltage to sensor.	Check voltage between Pins A and B. Should be 20-28 VDC.
	Sensor fails built in test.	Check optic assembly for contamination, deformation, or fiber optic cable connections. Isolate problem using Fiber Optic Test Jumper, P/N 411821

FIBER OPTIC JUMPER TESTS	RESULT	CORRECTIVE ACTION
Disconnect fiber optic cable 411288 from fire sensor. Connect jumper between detector and test SMA connectors on fire sensor electronics.	Trouble light stays on.	Probable sensor malfunction. Replace sensor and repeat test.
	Trouble light clears.	Perform next test.
Re-connect fiber optic cable 411288 to fire sensor electronics. Disconnect fiber optic cable 411288 from optic assembly. Using SMA jack-jack couplers, connect jumper to SMA connectors on fiber optic cable (in place of optic assembly).	Trouble light stays on.	Replace fiber optic cable.
	Trouble light clears.	Replace optic assembly.

INTERFACE CONTROL DRAWING

QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	ITEM NO.

LIST OF MATERIAL

(1) WHILE USING FIBER CABLE,THE FIBER SHALL NOT BE SUBJECTED TO A BEND RADIUS SMALLER THAN ONE HALF INCH (1/2").

NOTES: UNLESS OTHERWISE SPECIFIED

CAD PREPARED DRAWING USING AUTOCAD R13 NOT TO BE MANUALLY ALTERED.

PART NO.	NEXT ASSY	USED ON
APPLICATION		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND PER ANSI Y14.5M – 1982
.XX ± .XXX ± ANGLES ±
MATERIAL

DUAL SPECTRUM® SENSING AND SUPPRESSION SYSTEMS
SANTA BARBARA DUAL SPECTRUM A DIVISION OF KIDDE Technologies, Inc.

PREP	W. ELLIOTT	9-21-95
CHKR		
APVD		
APVD		

FIBER OPTIC TEST JUMPER

SIZE	CAGE CODE	NUMBER
C	05BU0	411821

SCALE NTS SHEET

FSS-PPL

DWG NO 411821 REV

FOLD 1 FOLD 2