MODEL 10K Integrated Fire and Gas Alarm System

Instruction Manual

Part No. **MANMODEL10K**
Revision **0**

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1.0 Safety Product Warnings and Liability Disclaimer

1.1 Warranty

MODEL 10K Local Panel and Central Station Equipment

MSA warrants the MODEL 10K Local Panel and Central Station Equipment to be free from defects in workmanship or material under normal use and service within one (1) year from the date of shipment. MSA will repair or replace without charge any such defective equipment found to be defective during the warranty period. MSA's personnel will make full determination of the nature of, and responsibility for defective equipment. Defective or damaged equipment must be shipped prepaid to MSA's plant or representative from which shipment was made. In all cases, this warranty is limited to the cost of the equipment supplied by MSA. The customer will assume all liability for the misuse of this equipment by its employees or other personnel.

MSA Flame and Gas Detection Equipment

MSA warrants all Flame and Gas Detection Equipment to be free from defects in workmanship or material under normal use and service within two (2) years from the date of shipment. MSA will repair or replace without charge any such defective equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for, defective equipment will be made by MSA's personnel. Defective or damaged equipment must be shipped prepaid to MSA's plant or representative from which shipment was made. In all cases this warranty is limited to the cost of the equipment supplied by MSA. The customer will assume all liability for the misuse of this equipment by its employees or other personnel

NOTE - The MODEL 10K System is straightforward to install; however, this manual should be read and understood before attempting to install or operate the system.

All warranties are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without MSA's approval or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

EXCEPT FOR THE EXPRESS WARRANTY STATED ABOVE, MSA DISCLAIMS ALL WARRANTIES WITH REGARD TO THE PRODUCTS SOLD, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS AND THE EXPRESS WARRANTY STATED HEREIN ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF MSA FOR DAMAGES INCLUDING, BUT NOT LIMITED TO, CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT.

1.2 System Integrity Verification

MSA's mission is to see to it that men and women may work in safety and that they, their families and their communities may live in health throughout the world. The safety products you have purchased should be handled carefully and installed, calibrated and maintained in accordance with the respective product instruction manual. Remember, these products are for your safety. To ensure operation at optimum performance, MSA recommends that certain maintenance items be performed.

1.3 Commissioning Safety Systems

Before power up, verify wiring, terminal connections and stability of mounting for all integral safety equipment including, but not limited to:

- **Power supplies**
- **Control modules**
- **Field detection devices**
- **Signaling / output devices**
- **Accessories connected to field and signaling devices**
- **Communication Systems**

After the initial application of power and any factory specified warm-up period to the safety system, verify that all signal outputs, to and from devices and modules, are within the manufacturers' specifications. Initial calibration / calibration checking / testing should be performed according to the manufacturers' recommendations and instructions. Proper system operation should be verified by performing a full, functional test of all component devices of the safety system, ensuring that the proper levels of alarming occur. Fault/Malfunction circuit operation should be verified

1.4 Periodic Testing/Calibration of Field Devices

Periodic testing/calibrating should be performed per the manufacturers' recommendations and instructions. Testing/Calibrating procedures should include, but not be limited to:

- **Verify zero reading**
- **Apply a known concentration of gas, or a simulated test device provided by the manufacturer**
- **Verify integrity of all optical surfaces and devices**

When testing produces results outside of the manufacturers' specifications, re-calibration or repair/replacement of the suspect device(s) should be performed as necessary. Calibration intervals should be independently established through a documented procedure, including a calibration log maintained by plant personnel, or third party testing services.

1.5 Periodic System Verification

The following system verifications should be performed at least annually. Verify wiring, terminal connections and stability of mounting for all integral safety equipment including, but not limited to:

- **Power supplies**
- **Control modules**
- **Field detection devices**
- **Signaling / output devices**
- **Communication equipment**
- **Operator interface devices**

2.0 Introduction

The MODEL 10K Fire and Gas Detection System is a modular system build using state-of-the-art industrial automation control equipment to perform the functional requirements of a NFPA 72 (2002) Fire and Gas Alarm Panel. The system has been tested and certified by Factory Mutual to comply with the following standards:

2.1 Applicable Standards and Approvals

FM Certified--NFPA 72 (2002) Compliant Fire Alarm Monitoring System tested in accordance with FM Standard 3110

FM Certified--NFPA 72 (2002) Compliant Special Hazards Releasing Panel tested in accordance with FM Standard 3110

FM Certified--Combustible Gas and Toxic Gas Controller tested in accordance with FM Standard 6310 and 6340

FM Certified—NFPA 72 (2002) Compliant Proprietary Central Station Monitoring Computer tested in accordance with FM Standard 3111

FM Certified--NFPA 72 (2002) Compliant Fault -tolerant Fire Alarm Communication Network tested in accordance with FM Standard 3110

Figure 1: System Block Diagram

2.2 The principle elements of the MODEL 10K System include:

- One or more MODEL 10K local panels complete with Touch Screen operator interface, local power supply and nominal 24-hour battery backup system. The local panel is NFPA 72 (2002) compliant as a stand-alone fire and gas detection panel. The panel incorporates touch screen GUI interface to display alarm status, fault status,

communication status and user customized plot plan graphics of detector location. Local interface records alarm and fault history and displays and supports gas detector trend display. Local interface is capable of inhibiting input and output devices and adjusting alarm set points of gas detectors (subject to password access limitations). Each MODEL 10K panel supports a large number of fire and gas detection system devices. Total local panel capacity is based on quantity and type of devices with total connected system power capacity of up to 150 amps per power supply. A typical MODEL 10K panel can support more than 100 gas or flame detectors. Each device or alarm circuit is directly hardwired to the local panel using home-run cables.

- Optional Computer based **MODEL 10K View** Proprietary Central Station Monitoring workstation with touch screen interface and 24 hour UPS power supply. Proprietary Central Station monitors alarm and fault status of all MODEL 10K local panels. A Central Station computer is capable of displaying user customized plot plan graphics indicating alarm status and physical location of fire and gas detection devices. The Central Station computer maintains alarm logs, history and operated alarm/fault printer recorder. It also monitors and displays status of all network communication equipment for the system. The Central Station computer can record and store gas detector trend information and alarm histories and calibration logs.

- Central Station workstation can be used to modify programming and setup of MODEL 10K local panel software via the Controlnet communication network.

- Controlnet--a dual media (coaxial cable or fiber optic) fault tolerant communication network supports highly reliable communication between the local MODEL 10K panels to the MODEL 10K Proprietary Central Station.

- Coaxial cable supports node-to-node distance of up to 1000 meters and is FM certified for up to 25 MODEL 10K nodes

- 1300 nanometer Multimode fiber optic cable provides node-to-node distances up to 4 miles and is FM certified for up to 25 MODEL 10K nodes.

- Single mode fiber optic cable provides node-to-node distances up to 15.5 miles and is FM certified for up to 25 MODEL 10K nodes.

- Network communication uses Controlnet--an industrial, fault tolerant, high speed, SIL 2 qualified packet-based communication protocol operating at 5 megabits per second.

- Fire and gas detection input and output devices associated with the system include MSA's combustible and toxic gas detection equipment, MSA's optical flame detection equipment and a variety of third part smoke detection, thermal fire detector, manual fire alarm and RTD equipment. The system is listed for use with a variety of audible and visual devices and special hazard releasing solenoids.

2.3 Local Panel Architectures

MODEL 10K can be provided in a variety of processor and I/O configurations as detailed below

- Single rack
- Single processor multiple I/O rack
- Dual processor multiple I/O rack
- Remote display and/or I/O rack

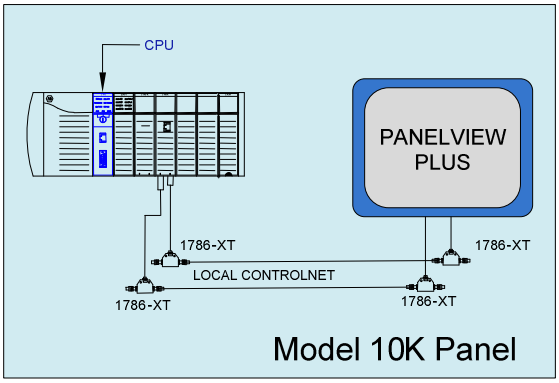


Figure 2: Single Rack Configuration

Single rack configuration consists of a single I/O rack which contains CPU and I/O along with a Controlnet Bridge to handle communication with the Panelview Plus display. This configuration reflects the minimum system requirement and is suitable for small to medium sized MODEL 10K systems.

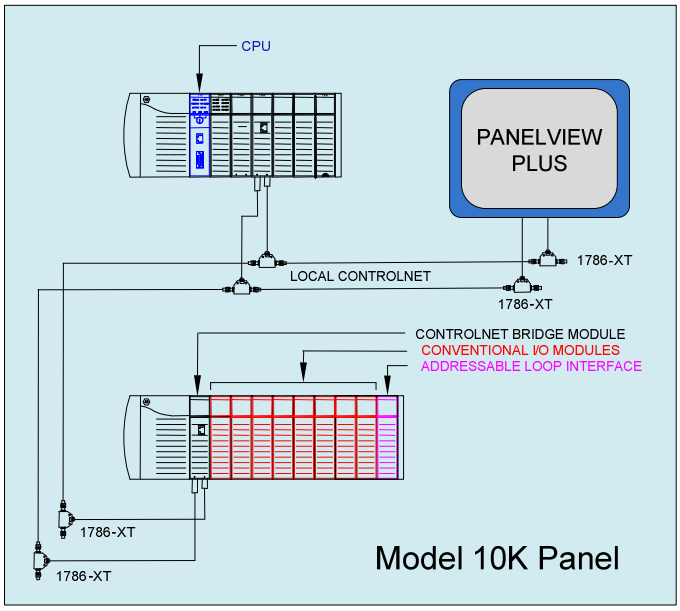


Figure 3: Single Processor Multiple Rack Configuration

Single processor multiple rack configuration consists of a more than one I/O rack. Rack number one contains the CPU along with local I/O modules. Second rack contains additional I/O modules. Both racks contain Control Net Bridge modules which handle communication between racks and between the CPU rack and the Panelview Plus. This configuration is suitable for medium to large MODEL 10K systems.

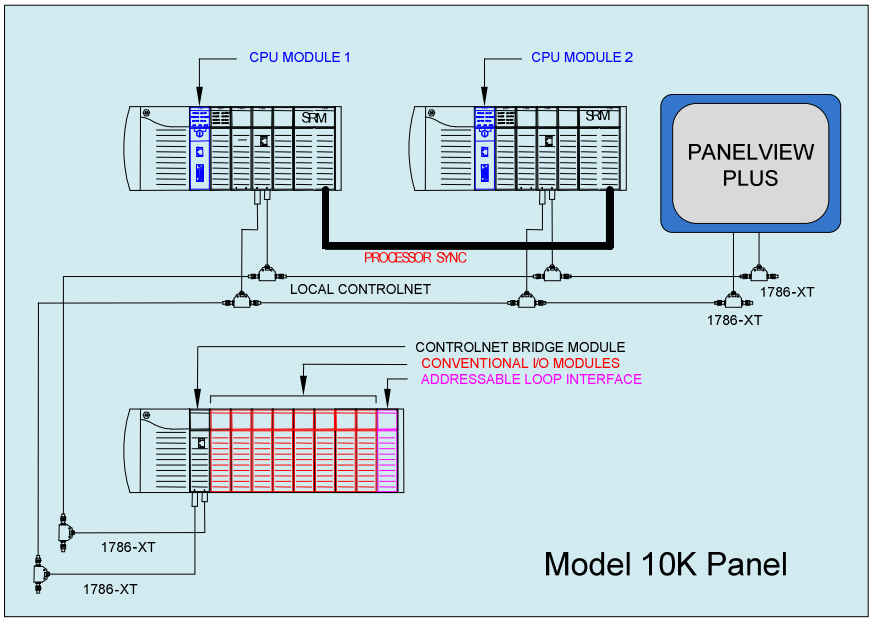


Figure 4: Multiple Processor Multi Rack Configuration

Dual processor configuration requires a minimum (3) I/O racks. Two racks are fitted with CPU's and System Redundancy Modules. I/O modules are typically installed in the 3rd rack. Communications between all racks and the Panelview Plus display is handled using Controlnet Bridge Modules over Controlnet. Redundant processors are synchronized using a high speed fiber optic communication link between the two processors processor via System Redundancy (SRM) Modules installed in each CPU rack. This "redundant processor" configuration provides automatic control transfer from Primary Processor to Secondary Processor in the event of a failure of the Primary Processor. Transfer takes place without loss of logic solver system availability and is "bump less".

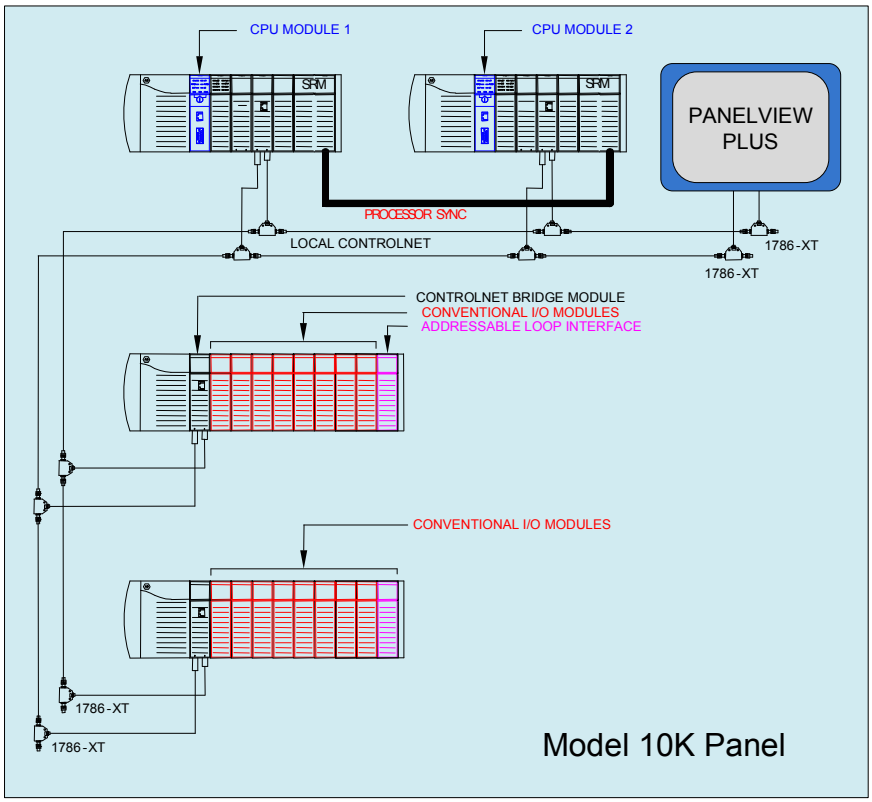


Figure 5: Remote I/O or Remote Display Configuration

The diagram above reflects allowed variations in typical MODEL 10K configuration to support special application requirements:

1. MODEL 10K can be fitted with a second “Remote Display” Panelview unit which serves as a “remote annunciator” for the MODEL 10K panel. This display can be provided with a complete copy of all information available at the MODEL 10K panel display or if required only a subset of the information available at the main panel. Second display communication with the main MODEL 10K CPU uses Controlnet. The Controlnet link is typically redundant coaxial cable for short runs (less than 1000 meters) or fault tolerant fiber optic loop for longer distances. Remote Display should be powered from an approved 24 hours battery backed up power source

2. MODEL 10K can be fitted with remote I/O racks mounted in locations remote from the main MODEL 10K. Remote I/O communication is handled using Controlnet. The Controlnet link is typically redundant coaxial cable for short runs (less than 1000 meters) or fault tolerant fiber optic loop for longer distances. Remote I/O should be powered from the main MODEL 10K power system or provided with an independent source of power meeting the same specifications as the primary MODEL 10K power supply.

3.0 Installation

3.1 MODEL 10K Local Panel

3.1.1 Generalized Local Panel Equipment Description

Free Standing MODEL 10K Panel

Wall Mounted MODEL 10K Panel

The local panel is a modular system consisting of a Nema 12 rated steel enclosure, custom selected to accommodate the desired system I/O configuration and houses the local panel components, which include:

- Industrial Touchscreen Terminal with 10.4” diagonal measured TFT Color Touchscreen. The screen resolution is 640 x 400 pixels
- Panel-mounted piezoelectric panel sounder
- Allen Bradley Contrologix Programmable Logic Controller fitted with up to (2) rack-mounted processors, communication modules and input/output modules installed in one or more I/O racks as required for the specific design system configuration
- Expansion local I/O racks containing redundant Controlnet communications (either coaxial or fiber media are supported
- Controlnet Taps for communication connections to the system
- Phoenix Digital fiber optic converter when using fiber communication media
- DC to DC power converter to isolate Panelview DC power input (which must be grounded) from the floating 24 VDC power system utilized in the panel
- Signal conditioning components, including fuse blocks and swing-link terminal blocks, for distributing power in the panel and to allow customer connection of field circuits to the local panel.
- Panel is fitted with a duplex 120 VAC receptacle for sourcing laptop computer power
- Primary Power inputs for the system are 120/220 VAC to supply power to the remote mounted 24VDC Power Supply/Gel Cell Battery System and the panel mounted receptacle and 24VDC which is supplied from the 24VDC Power Supply/Gel Cell Battery System

Fire Alarm Functions

Fire alarm functions performed by the local panel include the following:

- Supervision dry contact IDC (Input Device Circuit) devices (manual fire alarm stations, thermal detectors, etc)
- Supervision of loop powered smoke and thermal detectors
- Supervision of C-Lib based addressable fire alarm equipment including smoke detectors, thermal detectors, general purpose manual fire alarm stations on up to (2) addressable loops handling a total of 110 addressable devices using CLIP protocol
- Supervision of Optical Flame Detectors
- Supervision/actuation of NAC (Notification Appliance Circuit) devices including horns, bells, strobes and warning lights
- Supervision/actuation of Special Hazard fire extinguishing equipment including solenoids, main/reserve switches, abort controls, blocking valve monitors, cylinder pressure monitors, selector valves and discharge pressure switches
- Local display of all alarm, supervisory and fault conditions
- Alarm logging of alarm, supervisory and fault conditions
- Logic solving requirements such as zoning, timer, counters, cross-zone, coincident zone, test and inhibit functions required for system operation
- Ground fault detection
- Monitoring of 24VDC Power Supply/Gel Cell Battery System
- Monitoring of communication network functionality

Gas Controller Functions

Gas controller functions performed by the local panel include the following

- Monitoring of combustible gas, toxic gas detectors including
- MSA's catalytic type point gas detectors using smart (4-20 ma) transmitters
- MSA's IR type point gas detectors
- MSA's Open Path IR gas detectors
- MSA's H2S gas detectors using smart (4-20ma) transmitters
- MSA's toxic gas detectors
- Activation of alarm outputs as required for fault, low alarm and high alarm
- Maintenance display screen showing individual sensor readings, alarm/fault status and alarm set points for each individual detector
- Changing of individual gas alarm set points when operating local display in administrator mode.
- Inhibit operation of gas detector alarms when operating local display in administrator mode.
- Gas detector functional logic solving requirements such as zoning, voting using a highly flexible programming system based on ladder logic instructions
- Supervision and actuation of gas detector related Notification Alarm devices including horns, strobes and warning lights

3.1.2 Local Panel Interface Description

All operator information display and controls for the fire and gas alarm system are available from an industrially hardened touch screen graphic terminal. This primary operator interface is the MODEL 10K local terminal (Figure 6). The terminal features the default alarm status screen with menu driven touch keys to select secondary display screens.

Current Alarm/Supervisory/Fault Summary screen is the default alarm status screen and is designed around the requirements for the “Standard Fire Service Interface” as outlined in NFPA 72 Section A7-10. Additionally the default screen has “go to” touch keys allowing navigation to additional screens as described below:

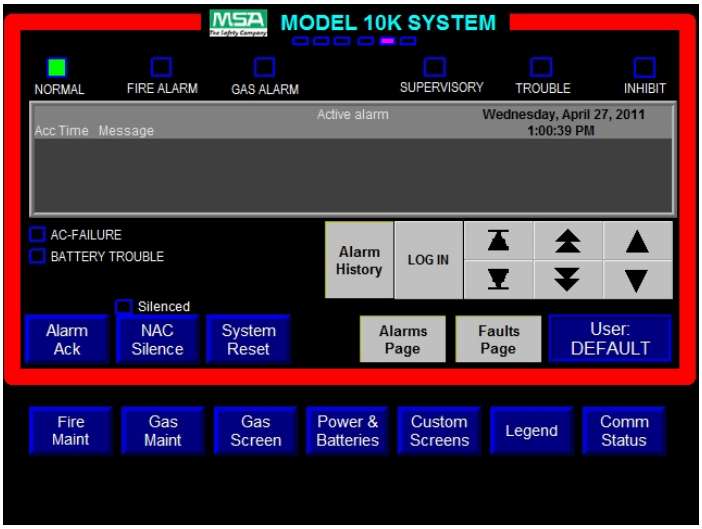


Figure 6 Local Panel Main Alarm Screen—Normal

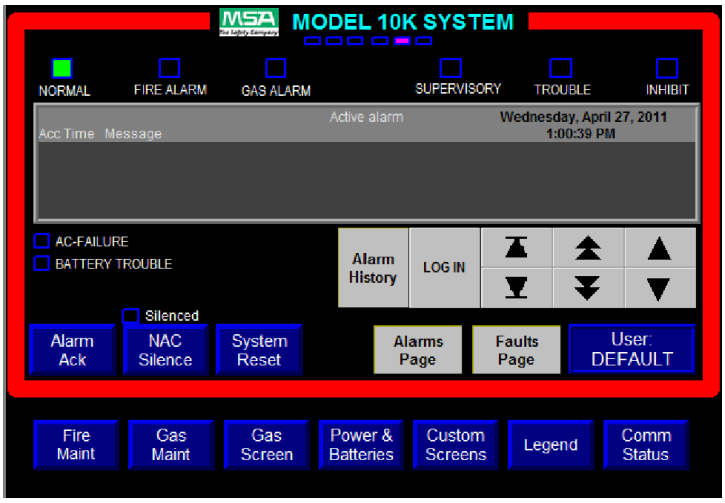


Figure 7: Local Panel Main Alarm Screen—Alarm or Trouble Condition

Alarm/Supervisory/Fault History screen (Figure 8) displays historical record of all alarms of the system. Time and date are indicated for each event. Total number of events to be stored is 500 events. Additional history storage is available when Central Monitoring Station is used

Figure 8: Alarm History Screen

Gas Detector Status Maintenance screen (Figure 9) is used to view alarm status of a particular gas detector, adjust the gas detector set point, and/or inhibit alarms from the device. The set point change and inhibit functions are password protected to prevent unauthorized system configuration changes

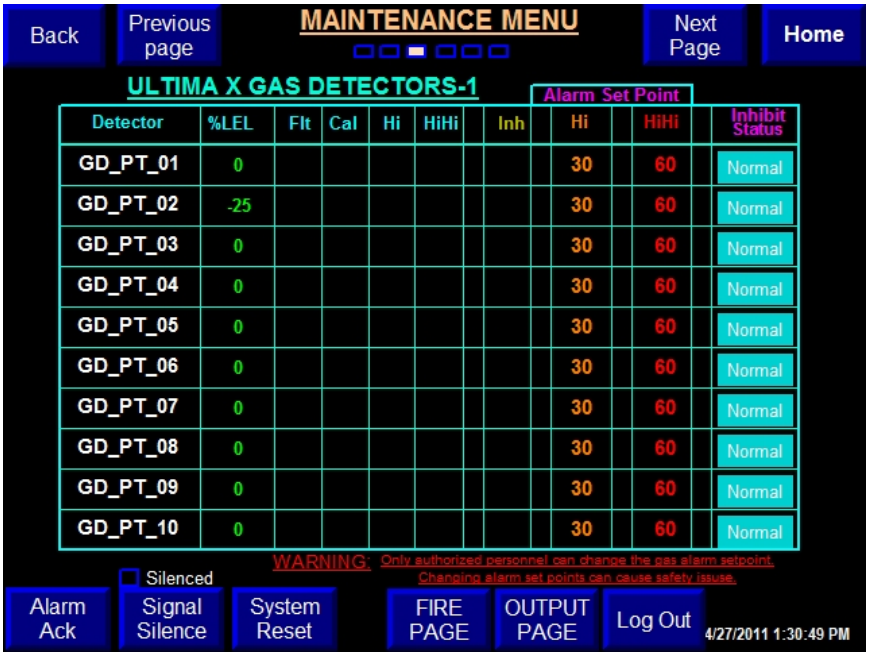


Figure 9: Gas Detector Status Maintenance Screen

The Fire Alarm Device Maintenance screen (Figure 10 & 11) is used to monitor the operating status of fire alarm input and output devices. Fire alarm device functions can be inhibited using this screen. Access to the device disable feature is controlled with password protection to prevent unauthorized system changes.

Figure 10: Fire Alarm Maintenance Screen

Navigation keys are located on all screens to allow easy return to the Main Screen Display, acknowledgement of new alarms, and audible device silence controls. System reset and silence operations are password protected to prevent unauthorized access to these panel functions in accordance with NFPA 72 requirements

Figure 11: Secondary Fire Alarm Maintenance Screen

Addressable loop detector maintenance screens are provided to inquiry of status of individual addressable devices and to inhibit the action of these same devices. Softkey for Device Tag No. takes the user to the graphic screen depicting sensor location. Softkey for the alarm status of each device takes the user to the addressable loop detailed maintenance screen shown in Figure 13.

Detector tag No. is followed by the Addressable loop address to facilitate system maintenance operations. Inhibit function key is accessible to "administrator" level user only. Inhibits, once placed, remain in effect until they are removed by the "administrator".

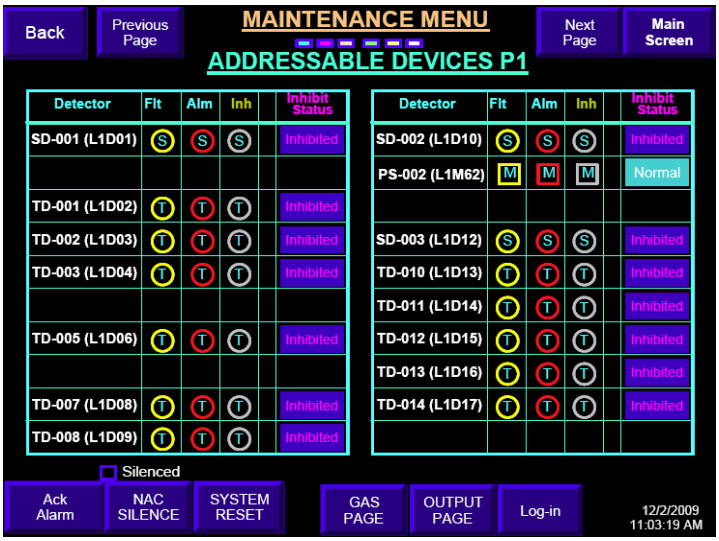


Figure 12: Addressable Detector Maintenance Screen

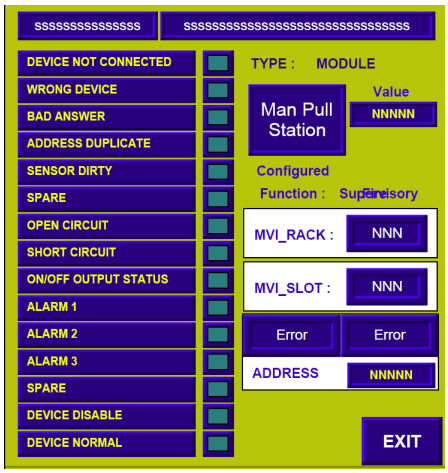


Figure 13: Secondary Pop-Up Fire Alarm Maintenance Screen

Local MODEL 10K interface is user friendly with a help screen (Figure 8) to explain symbols and display conventions employed in the system.

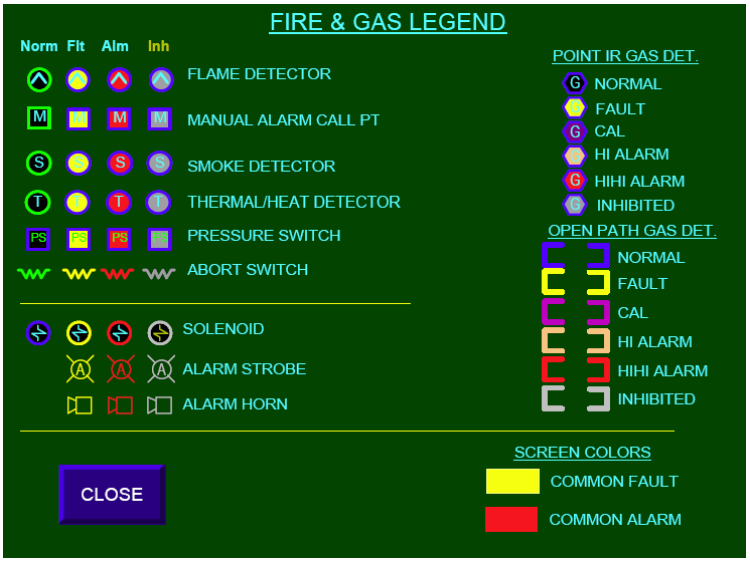


Figure 14: Help Screen

MODEL 10K system includes full diagnostic capabilities to monitor status of input power supply and battery status.

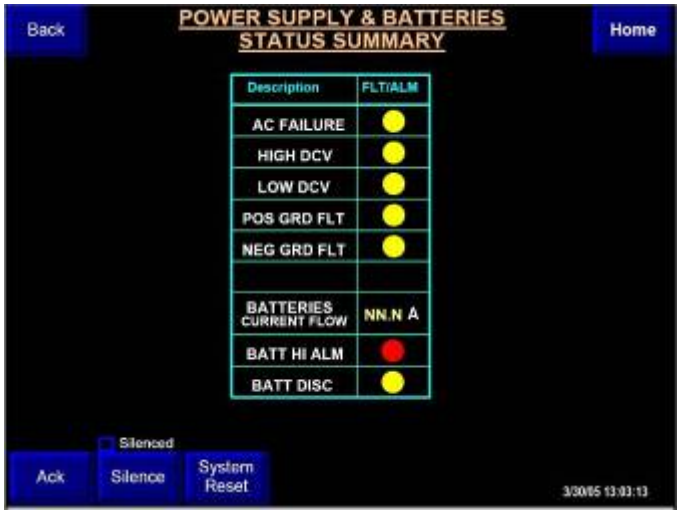


Figure 15: Power Monitoring Screen

MODEL 10K can be equipped with customized screens capable of displaying plant Plot Plan Graphics depicting the alarm status of detectors shown against a plant equipment arrangement background. Other custom screens include device trending and calibration record screens.

All customized screens are equipped with an easy “one-touch” return to the default alarm status screen

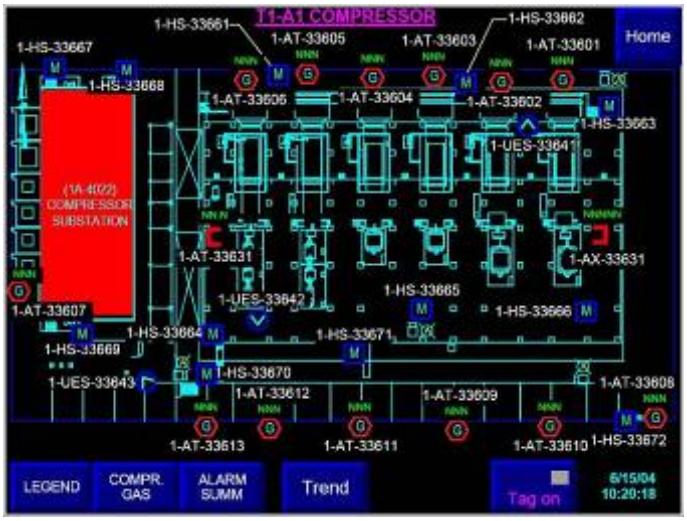


Figure 16: Typical Plot Plan Graphic Display Screen

The MODEL 10K touch screen user interface allows plant operators and maintenance personnel to quickly and easily get vital information about the status of fire and gas system devices in the plant

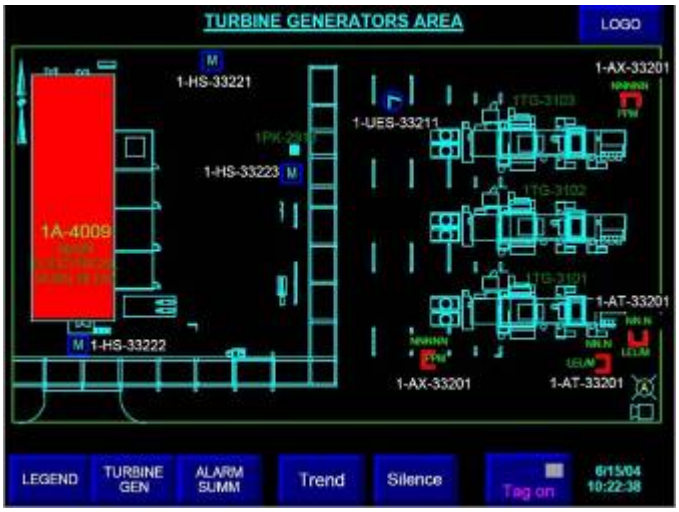


Figure 17: Typical Plot Plan Graphic Display Screen

3.1.3 Circuit Types

Supervised Circuits

IDC1—Input Device Circuit
IDC1 IS—Input Device Circuit Intrinsically Safe
IDC2—Loop Powered Smoke Detector Circuits
IDC2 IS—Loop Powered Smoke Detector Circuit Intrinsically Safe
IDC3—Input Device Circuit with Short Circuit Fault Detection
AIDC---Addressable Input Device Loop Circuits
NAC1—Notification Appliance Circuits
NAC2—High Power Notification Appliance Circuits
SOC---Supervised Output Circuits
SLC (Coax)—Signaling Line Circuit—Coaxial Cable
SLC (Fiber)—Signaling Line Circuit—Fiber Optic
4-20 In—4-20 milliamp input circuits (gas, fire, RTD)
4-20 In HART—4-20 milliamp input circuits (Gas, Fire, RTD) HART Transmitters

3.1.4 Circuit Details and Wiring Guidelines

IDC1-Input Device Circuit:

IDC circuits are used to monitor field located shorting contact type devices which are normally open in the circuit normal condition and close in the abnormal circuit condition. Examples of this type of input are:

- Manual Fire Alarm Stations
- Contact type thermal detectors
- Special Hazard releasing discharge pressure switches
- Special Hazard releasing Abort or Main/Reserve selector switches
- Water flow switches
- Special Hazard discharge pressure switches
- Status of Supervisory signals such as firewater valve monitoring, firewater pump status, tamper switches etc.

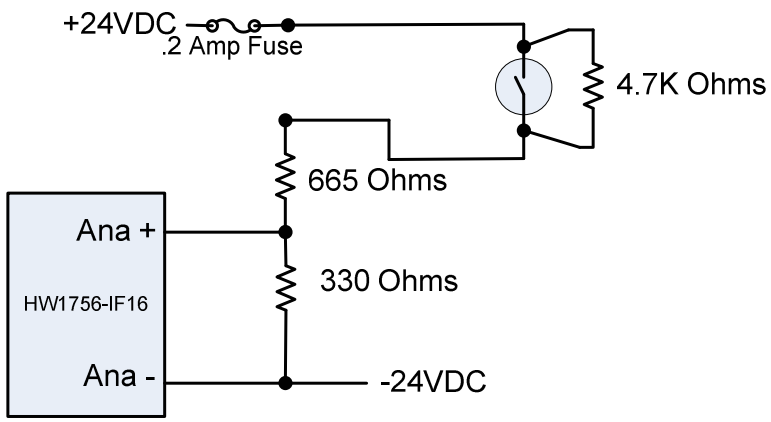


Figure 18:IDC1 Circuit Diagram

Maximum distance between the IDC1 terminals and switch, with one-way resistance of 40-Ohms (80-Ohm loop):

AWG	FEET	METERS
12	21000	6400
14	14800	4500
16	9300	2830
18	6000	1820
20	3800	1160

Table 1: ICD1 Wire Length versus Wire Gauge

This circuit is a two-wire type Class B supervised circuit with wiring distances as detailed in Table 1. Shielded cabling is not required. Circuit is fitted with an End of Line Resistor value of 4.7K Ohm (5%, 1/4 watt minimum) on the last device in multiple device circuits. T-taping is not allowed with this circuit.

This circuit will support multiple normally open dry contact devices wired in parallel across the two circuit legs but, in most cases, the circuit will be used to monitor a single device. This circuit is supervised for opens and ground faults and is classified as **NFPA 72 Class B (Style B)**. A short circuit across the two circuit conductors will indicate an alarm. An open circuit across the two circuit conductors will indicate a fault.

Activation of an IDC circuit may be classified as a fire alarm or supervisory alarm. Circuit classification is selected during MODEL 10K custom software configuration. IDC circuit alarms are latched in at the panel and persist until the field device is restored to normal open status and the local MODEL 10K panel is reset.

IDC1 IS—Input Device Circuit--Intrinsically Safe:

IDC1 IS circuits are used to monitor field located shorting contact type devices which are normally open in the circuit normal condition and close in the abnormal circuit condition. Examples of this type of input are:

- Manual Fire Alarm Stations
- Contact type thermal detectors
- Linear Overheat Detectors (Protectowire)
- Releasing discharge pressure switches
- Releasing Abort or Main/Reserve selector switches
- Water flow switches
- Special Hazard discharge pressure switches
- Deluge Valve monitoring switches
- Supervisory signals such as firewater valve monitoring, firewater pump status etc.

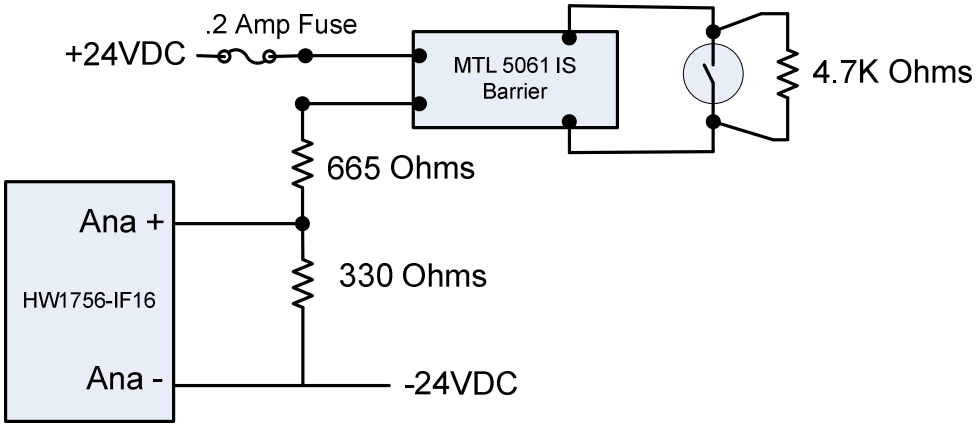


Figure 19 IDC1 IS Input Circuit Diagram—Intrinsic Safe

Maximum distance between the MODEL 10K panel and contact is limited by the one-way resistance of 40-Ohms (80-Ohm loop):

AWG	FEET	METERS
12	21000	6400
14	14800	4500
16	9300	2830
18	6000	1820
20	3800	1160

Table 2: IDC1-IS Circuit Wiring Length versus Wire Gauge

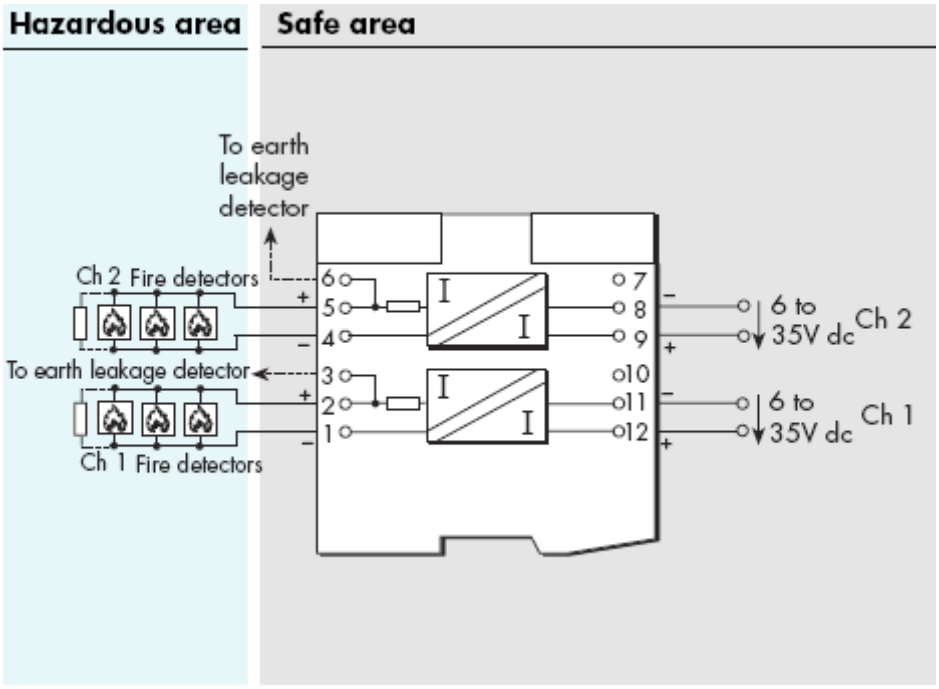
This circuit is a two-wire type Class B supervised circuit with wiring distances as detailed in Table 2. Shielded cabling is not required. Circuit is fitted with an End of Line Resistor value of 4.7K Ohm (5%, 1/4 watt minimum) on the last device in multiple device circuits. T-taping is not allowed with this circuit.

This circuit will support multiple normally open dry contact devices wired in parallel across the two circuit legs but, in most cases, the circuit will be used to monitor a single device. This circuit

is supervised for opens and ground faults and is classified as **NFPA 72 Class B (Style B)**. A short circuit across the two circuit conductors will indicate an alarm. An open circuit across the two circuit conductors will indicate a fault.

Activation of an IDC1-IS circuit may be classified as a fire alarm or supervisory alarm. Circuit classification is selected during MODEL 10K custom software configuration. IDC1-IS circuit alarms are latched in at the panel and persist until the field device is restored to normal open status and reset at the local MODEL 10K panel.

Intrinsic Safe barrier information for this circuit is shown below:



IDC2—Loop Powered Smoke Detector Circuit

IDC2 Circuit is normally used for loop powered ionization and photoelectric smoke detectors.

Smoke detectors and mounting bases to be used with MODEL 10K must be listed for use with the MODEL 10K system. Use of other loop-powered smoke detectors may be electrically compatible for use but will not be covered under the Factory Mutual approval of the MODEL 10K system.

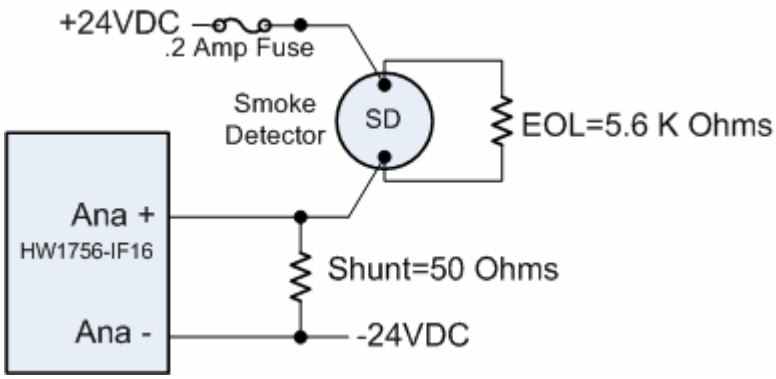


Figure 20: IDC2 Loop Powered Smoke Detector Circuit

Smoke detector units are placement supervised such that removal of a detector from the base generates a fault condition. Circuit supervision monitors for open circuits and ground faults. Alarms on LPSDC are latched in at the control panel until reset at the local MODEL 10K panel. Loop powered smoke detectors are reset by momentary interruption of power to the circuit. Smoke detector reset is accomplished using the Panelview located reset pushbutton on MODEL 10K

The circuit is a two wire Class B input circuit with wiring distances as detailed in Table 2. Shielded cabling is not required. This circuit is fitted with an End of Line Resistor value of 2.2K Ohm (5%, ¼ watt minimum) installed on the last device in multiple device circuits.

The quantity of smoke detector devices allowed per circuit is shown on Table 2. T-taping is not allowed with this circuit. LPSDC circuit is fused at 0.2 amps per circuit. When multiple smoke detectors are wired on a single circuit only asingle alarm activation can be assured. If individual activation for smoke detectors is required (e.g. for voting) each detector must be on a separate IDC2 (Loop powered Smoke/Thermal Detector) circuit..

DEVICES	20.4VDC			22VDC			24VDC		
	AWG	FEET	METERS	AWG	FEET	METERS	AWG	FEET	METERS
Siemens DI-3, DI-A3 Ionization Smoke Detector	12	1300	400	12	6500	2000	12	13000	4000
	14	850	255	14	4265	1300	14	8530	2600
	16	575	175	16	2900	880	16	5800	1760
	18	375	115	18	1850	560	18	3700	1120
	20	235	70	20	1190	360	20	2380	720
	Loop resistance = 5 ohms			Loop resistance = 25 ohms			Loop resistance = 50 ohms		

Siemens PE-11 PE-11T Photoelectric Smoke Detector

AWG	FEET	METERS
12	15700	4800
14	11000	3350
16	6900	2100
18	4500	1350
20	2800	850

Loop resistance = 60 ohms

AWG	FEET	METERS
12	26000	7900
14	17000	5100
16	11600	3500
18	7400	2250
20	4760	1450

Loop resistance = 100 ohms

AWG	FEET	METERS
12	39000	12000
14	27000	8200
16	17000	5100
18	11000	3300
20	7000	2100

Loop resistance = 150 ohms

Apollo Series 60 Ionization Smoke Detector

AWG	FEET	METERS
12	13000	4000
14	9200	2800
16	5800	1760
18	3700	1120
20	2300	700

Loop resistance = 50 ohms

AWG	FEET	METERS
12	21000	6400
14	14800	4500
16	9300	2830
18	6000	1820
20	3800	1160

Loop resistance = 80 ohms

AWG	FEET	METERS
12	28000	8800
14	20000	6000
16	12700	3800
18	8300	2500
20	5200	1580

Loop resistance = 110 ohms

Apollo Series 60 Optical Smoke Detector

AWG	FEET	METERS
12	3600	1100
14	2580	780
16	1625	495
18	1050	320
20	650	195

Loop resistance = 14 ohms

AWG	FEET	METERS
12	10500	3200
14	7400	2250
16	4650	1415
18	3000	910
20	1900	580

Loop resistance = 40 ohms

AWG	FEET	METERS
12	21000	6400
14	14800	4500
16	9300	2830
18	6000	1820
20	3800	1160

Loop resistance = 80 ohms

Table 3: IDC2 Wire Length versus Wire Gauge

IDC2 IS—Loop Powered Smoke Detector Circuit Intrinsically Safe

IDC2 IS is used for Intrinsically Safe loop-powered ionization detector (Siemen's Pyrotronics DI-3 IS). Use of this circuit with any other loop powered detector is not FM approved.

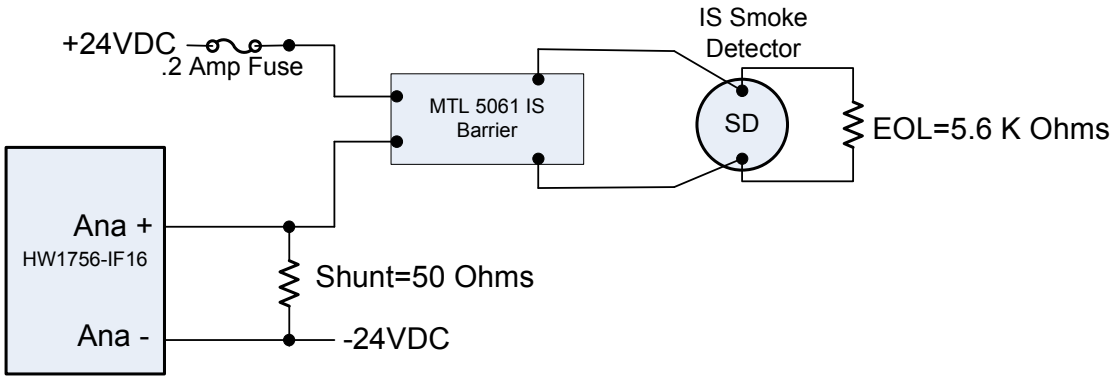


Figure 21: Intrinsic Safe Smoke Detection Circuit

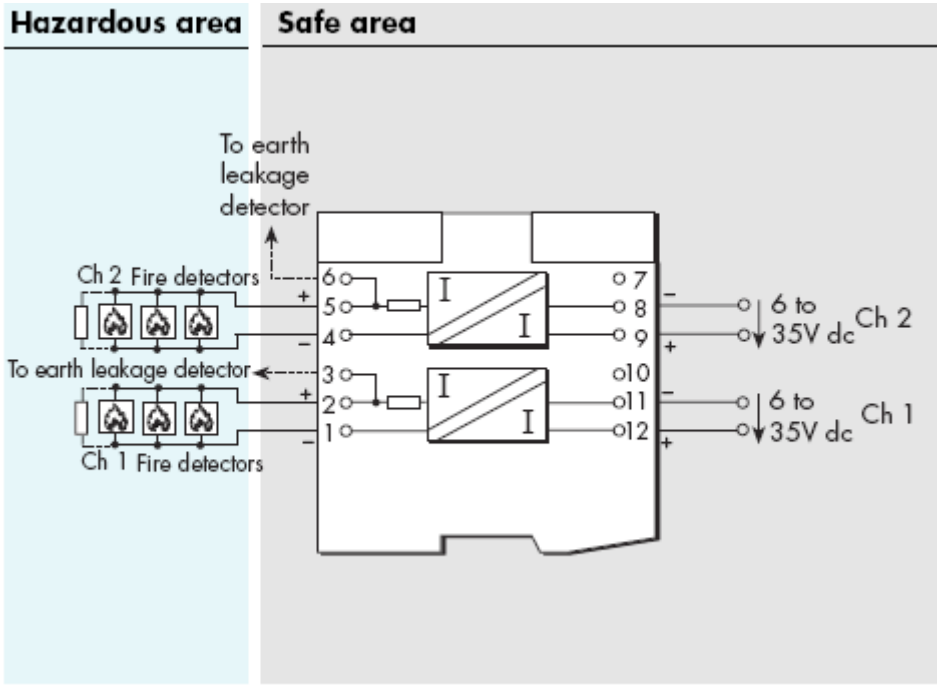
Smoke detector units are placement supervised. Circuit supervision monitors for open circuits and ground faults. Alarms on LPSDC are latched in at the control panel until reset at the local MODEL 10K panel. Loop powered smoke detectors are reset by momentary interruption of power to the circuit. Smoke detector reset is accomplished using the reset pushbutton on the MODEL 10K

The circuit is a two wire Class B input circuit with wiring distances as detailed in Table 2. Shielded cabling is not required. This circuit is fitted with an End of Line Resistor value of 5.6K Ohm (5%, ¼ watt minimum) installed on the last device in multiple device circuits.

The quantity of DI-3 IS smoke detector devices allowed per circuit is 4. T-taping is not allowed with this circuit. The IDC2 IS circuit is fused at 0.2 amps per circuit. When multiple smoke detectors are wired on a single circuit only a single alarm activation can be assured. If individual activation for smoke detectors is required (e.g. for voting) each detector must be on a separate IDC2 IS (Loop powered Smoke/Thermal Detector) circuit will be required.

Do not use remote relays or remote lamps on Intrinsic Safe loop powered smoke detector circuits.

Intrinsic Safe barrier information for this circuit is show below:



DEVICE	20.4VDC			22VDC			24VDC		
Siemens DI-3IS, Smoke Detector	AWG	FEET	METERS	AWG	FEET	METERS	AWG	FEET	METERS
	12	1300	400	12	6500	2000	12	13000	4000
	14	850	255	14	4265	1300	14	8530	2600
	16	575	175	16	2900	880	16	5800	1760
	18	375	115	18	1850	560	18	3700	1120
	20	235	70	20	1190	360	20	2380	720
	Loop resistance = 5 ohms			Loop resistance = 25 ohms			Loop resistance = 50 ohms		

Table 4: Intrinsic Smoke Detector Wiring Length versus Wire Gauge

IDC3--Input Device Circuit with Short Circuit Fault Detection

IDC3 circuits are used to monitor field located shorting contact type devices which are normally open in the circuit normal condition and close in the abnormal circuit condition. Examples of this type of input are:

- Manual Fire Alarm Stations
- Contact type thermal detectors
- Releasing discharge pressure switches
- Releasing Abort or Main/Reserve selector switches
- Water flow switches
- Special Hazard discharge pressure switches
- Deluge Valve monitoring switches
- Status of supervisory signals such as firewater valve monitoring, firewater pump status

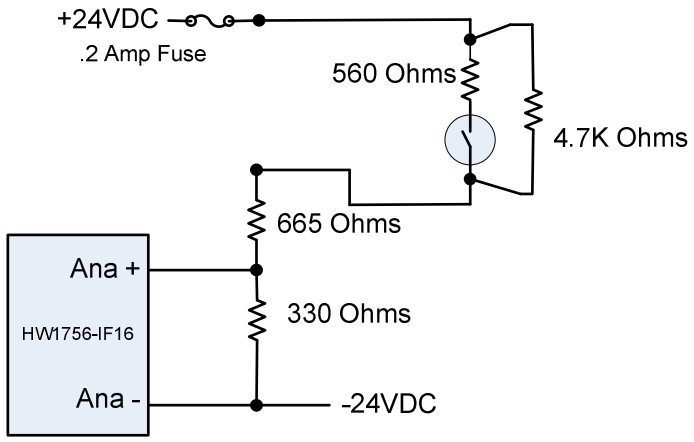


Figure 22: IDC3 Shorting Contact Input Circuit with Short Circuit Detection

Maximum distance between the MODEL 10K panel and field contact is a one-way resistance of 40-Ohms (80-Ohm loop):

AWG	FEET	METERS
12	21000	6400
14	14800	4500
16	9300	2830
18	6000	1820
20	3800	1160

Table 5: IDC3 Circuit Wiring Length versus Wire Gauge

This circuit is a two-wire type Class B supervised circuit with wiring distances as detailed in Table 1. Shielded cabling is not required. Circuit is fitted with an End of Line Resistor value of 4.7K Ohm (5%, 1/4 watt minimum) on the single field contact device. T-taping is not allowed with this circuit.

This circuit will support a single normally open dry contact devices wired in parallel across the two circuit legs but, in most cases, the circuit should be used to monitor a single device. This circuit is supervised for opens, shorts and ground faults and is classified as **NFPA 72 Class B (Style B)**. A short circuit across the two circuit conductors will indicate a fault. An open circuit across the two circuit conductors will indicate a fault. A contact field contact closure will indicate an alarm condition

Activation of an IDC3 circuit may be classified as a fire alarm or supervisory alarm. Circuit classification is selected during MODEL 10K custom software configuration. IDC3 circuit alarms are latched in at the panel and persist until the field device is restored to normal open status and reset at the local MODEL 10K panel.

AIDC—Addressable Input Device Circuit using C-Lib

AIDC (SLC) circuits are used to monitor Addressable Loop Powered Fire Alarm Devices. MODEL 10K utilizes C-Lib interface card manufactured by SAFCO to monitor dual addressable loops capable of handling up to 110 devices (total for both loops). The addressable loop operates using CLIP protocol typically using NFPA Style 6 Topology and supports the following Notifer addressable devices:

- FSD-751 PL Addressable Duct Mounted Photoelectric Smoke Detector
- FSI-851 Addressable Ionization Smoke Detector

- FST-851 Addressable Thermal Detector
- FSP-851 Addressable Photoelectric Smoke Detector
- NBG-12LX Addressable Manual Fire Alarm Station
- FMM-1 Addressable Monitor Module (subject to 3 foot rule)
- FMM-101 Addressable Mini Monitor Module (subject to 3 foot rule)
- FRM-1 Addressable Relay Module
- Notifier Model ISO-X Isolation Module

Addressable loop wiring must meet the following specifications:

Circuit Type	Circuit Function	Wire Requirements	Distance (feet/meters)	Typical Wire Type
SLC (power limited)	Connects to intelligent and addressable modules.	Twisted-unshielded pair, 12 to 18 AWG (3.31 to 0.82 mm^2). 50 ohms maximum per length of Style 6 & 7 loops. 50 ohms per branch maximum for Style 4 loop.	12,500 ft. (3,810 m) 9,500 ft. (2,895.6 m) 6,000 ft. (1,828.8 m) 3,700 ft. (1,127.76 m)	12 AWG (3.31 mm^2) 14 AWG (2.08 mm^2) 16 AWG (1.31 mm^2) 18 AWG (0.82 mm^2)
	or	Untwisted, unshielded wire, in conduit or outside of conduit. **Note:** Maximum total capacitance of **all** SLC wiring (both between conductors and from any conductor to ground) should not exceed 0.5 microfarads.	1,000 ft. (304.8 m)	12 to 18 AWG (3.31 to 0.82 mm^2)

NOTE: Lightning arresters required on circuits extending between buildings; 999 meter length maximum to meet UL 60950.

Wiring topology for Addressable Loop Style 6 is as shown below:

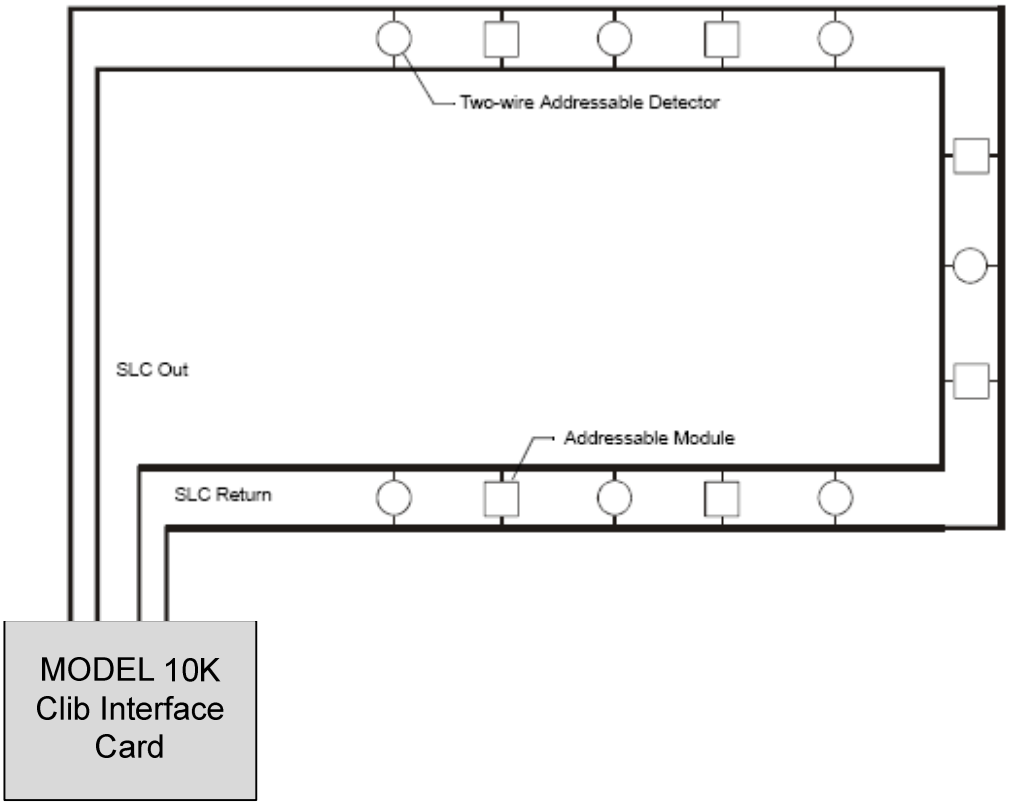


Figure 23: NFPA Style 6 Wiring Topology

The following Table lists the fault diagnosis characteristics of the Addressable Loop when it is configured in NFPA 72 Style 6:

Type of Fault	Style 6
Single Open	Alarm, Trouble
Short	Alarm, Trouble, (ground)
Short and Open	Trouble
Short and ground	Trouble
Open and ground	Alarm, Trouble
Communication Loss	Trouble

Table 6: NFPA 72 Style 6 Addressable Loop Circuit Characteristics

Trouble—MODEL 10K panel will indicate trouble condition for this Type of Fault
Alarm—MODEL 10K panel must be able to process an alarm input signal in the presence of this type of fault

NFPA Style 6 SLC Using ISO-X Modules

A variation of Style 6 operation using isolator modules to protect each section of the SLC. By flanking each group of devices with an ISO-X fault isolator module each group is protected from faults that may occur in the other groups. For example, a fault in Section B will not affect Sections A & C. The isolator modules on either side of Section B will open the loop. Section A will still operate from power on the SLC Outside and Section C will operate from the SLC Return side.

- T-tapping is NOT allowed within the Style 6 configuration.
- ISO-X modules shall be within 20 feet (6.1 meters) of device and use metal conduit.
- If the Addressable Loop runs between buildings Lightning Suppressors must be used.

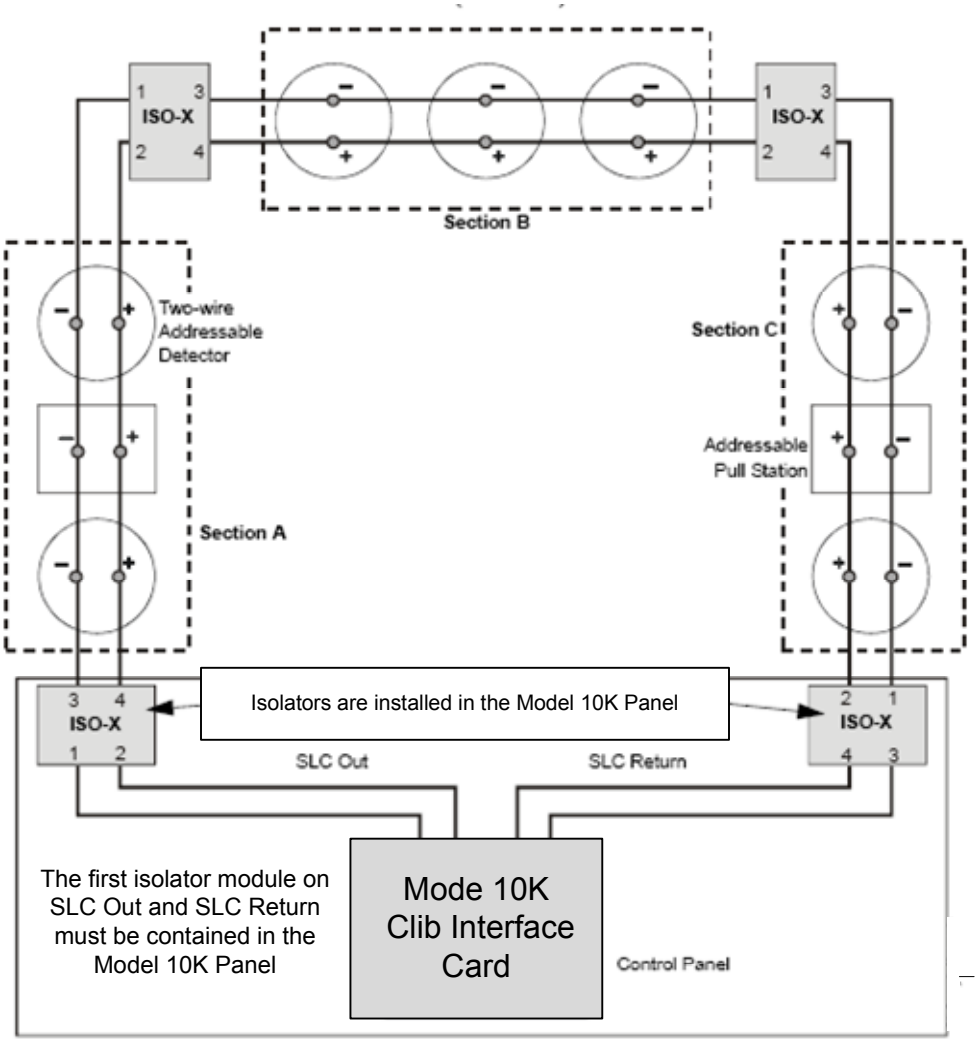


Figure 24: Use of Isolation Module with NFPA Style 6 Wiring Topology

Addressable Loop NFPA 72 Style 7 SLC

NFPA Style 7 configuration is possible using the Addressable Loop input circuit. This configuration requires an ISO-X unit be installed between each Addressable device and / or detector in the loop. Consult factory for additional details about this configuration option.

NAC1—Notification Appliance Circuit

NAC circuits are normally used to supervise and operate Notification Appliance devices including fire alarm bells, horns, warning lights, strobe lights. Notification Appliance Circuits may not be used for extinguishing system release service.

The NAC circuit is a two-wire, Class B supervised circuit with wiring distances as detailed in Table 3. NAC circuit is a “polarity reversing” circuit with the supervision of devices accomplished with current flow in one direction through an End of Line Resistor and device actuation accomplished with current flow in the reverse direction. NAC circuit may support multiple devices across the two circuit legs but each device must be polarized to prevent current flow in the “supervision mode”. Total circuit current capacity is 2.0 amps at 24 VDC. Be sure to consider circuit “inrush current” in determination of how many devices may be handled on the circuit. MODEL 10K documentation indicates NAC circuit polarity in the “supervision” mode.

NAC circuit is a two-wire circuit with “polarized” devices installed across the circuit legs with the final device fitted with a 2.2K-Ohm ¼ watt 5% resistor. Unshielded wire may be used for NAC circuits. NAC is supervised for open circuit, short circuit and ground fault and is classified as **NFPA 72 Class B (Style Y).**

NAC/Horn/Warning light circuit is shown below:

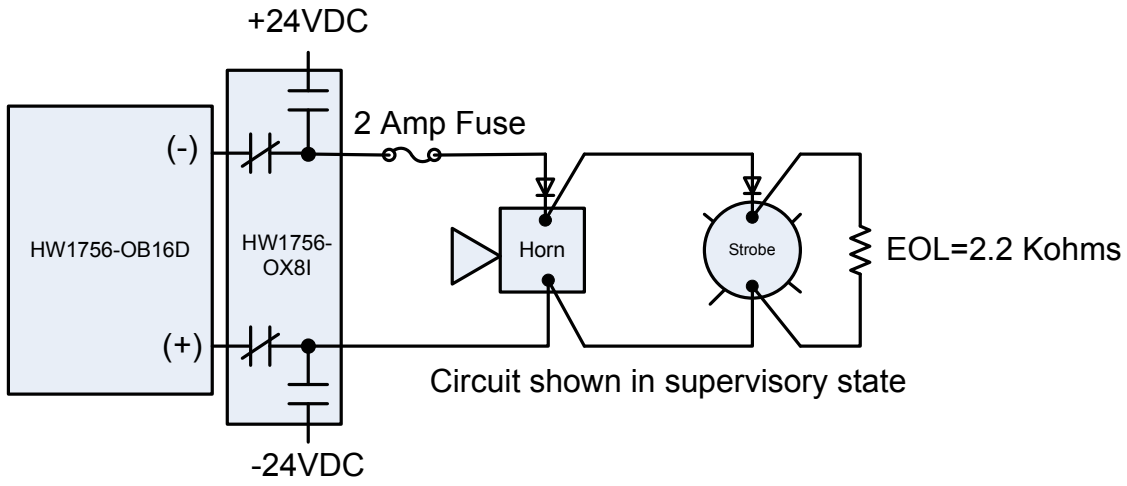


Figure 25: NAC1 Circuit Diagram

NAC circuits can be silence able or non-silence able depending on application requirements.

NAC2—High Power Notification Appliance Circuit

NAC2 circuits are normally used to supervise and operate Notification Appliance devices including fire alarm bells, horns, warning lights, strobe lights. Notification Appliance Circuits may not be used for extinguishing system release service.

The NAC2 circuit is a two-wire, Class B supervised circuit with wiring distances as detailed in Table 3. NAC circuit is a “polarity reversing” circuit with the supervision of devices accomplished with current flow in one direction through an End of Line Resistor and device actuation accomplished with current flow in the reverse direction. NAC circuit may support multiple devices across the two circuit legs but each device must be polarized to prevent current flow in the “supervision mode”.

NAC2 utilizes a HW17560OB16D supervised output card to accomplish NAC2 circuit supervision. The circuit utilizes a HW1756-OW16I activation relay which operates the external relay as shown in the circuit diagram below. The activation of the external relay disconnects the supervision circuit and applies activation power in the reverse polarity to activate the field device. Both general purpose and hermetically sealed relays are available for use as the external relay.

Total circuit current capacity is 5.0 amps at 24 VDC. Be sure to consider circuit “inrush current” in determination of how many devices may be handled on the circuit. MODEL 10K documentation indicates NAC circuit polarity in the “supervision” mode.

NAC circuit is a two-wire circuit with “polarized” devices installed across the circuit legs with the final device fitted with a 2.2K-Ohm ¼ watt 5% resistor. Unshielded wire may be used for NAC circuits. NAC is supervised for open circuit, short circuit and ground fault and is classified as **NFPA 72 Class B (Style Y).**

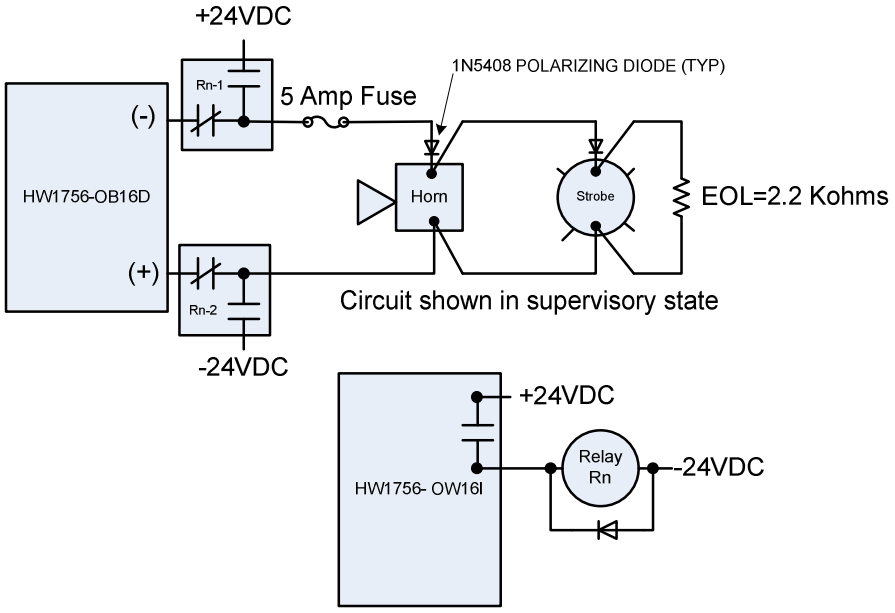


Figure 26: NAC2 Circuit Diagram

<table>
<tr><th>DEVICES</th><th>20.4VDC</th><th>22VDC</th><th>24VDC</th></tr>
<tr><td>Federal Signaling 300GCX Horn</td><td>Device operates at short distance</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>1815</td><td>555</td></tr>
<tr><td>12</td><td>1050</td><td>320</td></tr>
<tr><td>14</td><td>740</td><td>220</td></tr>
<tr><td>16</td><td>460</td><td>140</td></tr>
<tr><td>18</td><td>300</td><td>90</td></tr>
</table>
Loop resistance = 4 ohms</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>3181</td><td>965</td></tr>
<tr><td>12</td><td>1840</td><td>560</td></tr>
<tr><td>14</td><td>1290</td><td>390</td></tr>
<tr><td>16</td><td>810</td><td>245</td></tr>
<tr><td>18</td><td>530</td><td>160</td></tr>
</table>
Loop resistance = 7 ohms</td></tr>
<tr><td>Federal Signaling 151XST Warning light</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>1815</td><td>555</td></tr>
<tr><td>12</td><td>1050</td><td>320</td></tr>
<tr><td>14</td><td>740</td><td>220</td></tr>
<tr><td>16</td><td>460</td><td>140</td></tr>
<tr><td>18</td><td>300</td><td>90</td></tr>
</table>
Loop resistance = 4 ohms</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>2725</td><td>830</td></tr>
<tr><td>12</td><td>1570</td><td>475</td></tr>
<tr><td>14</td><td>1000</td><td>300</td></tr>
<tr><td>16</td><td>695</td><td>210</td></tr>
<tr><td>18</td><td>450</td><td>135</td></tr>
</table>
Loop resistance = 6 ohms</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>3635</td><td>1105</td></tr>
<tr><td>12</td><td>2100</td><td>640</td></tr>
<tr><td>14</td><td>1475</td><td>445</td></tr>
<tr><td>16</td><td>930</td><td>280</td></tr>
<tr><td>18</td><td>600</td><td>180</td></tr>
</table>
Loop resistance = 8 ohms</td></tr>
<tr><td>Federal Signaling 27XST Warning light</td><td>Device operates at short distance

Note: Nominal operating current is 1.9A @24VDC</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>725</td><td>220</td></tr>
<tr><td>12</td><td>420</td><td>130</td></tr>
<tr><td>14</td><td>295</td><td>90</td></tr>
<tr><td>16</td><td>185</td><td>55</td></tr>
<tr><td>18</td><td>120</td><td>35</td></tr>
</table>
Loop resistance = 1.6 ohms</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>1135</td><td>345</td></tr>
<tr><td>12</td><td>655</td><td>200</td></tr>
<tr><td>14</td><td>450</td><td>135</td></tr>
<tr><td>16</td><td>290</td><td>85</td></tr>
<tr><td>18</td><td>185</td><td>55</td></tr>
</table>
Loop resistance = 2.5 ohms</td></tr>
<tr><td>System Sensor P24110 Horn/Strobe</td><td>Device operates out of the manufacturer’s spec.</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>1840</td><td>560</td></tr>
<tr><td>12</td><td>1290</td><td>390</td></tr>
<tr><td>14</td><td>810</td><td>245</td></tr>
<tr><td>16</td><td>530</td><td>160</td></tr>
<tr><td>18</td><td>330</td><td>100</td></tr>
</table>
Loop resistance = 7 ohms</td><td>
<table>
<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>10</td><td>5200</td><td>1600</td></tr>
<tr><td>12</td><td>3700</td><td>1120</td></tr>
<tr><td>14</td><td>2300</td><td>700</td></tr>
<tr><td>16</td><td>1500</td><td>450</td></tr>
<tr><td>18</td><td>950</td><td>285</td></tr>
</table>
Loop resistance = 20 ohms</td></tr>
</table>

Table 7: NAC1 and NAC 2 Wiring Length for Typical Warning Lights and Horns

Fire alarm bells and horns are normally silenced by operating the silence pushbutton of the MODEL 10K panel. Silence function is allowed for “Operator” and “Administrator” users only

Warning lights and strobe lights are normally not silenced until the alarm condition initiating the warning or strobe activation is cleared and/or reset. Silence logic and audible visual zoning is configured in the MODEL 10K processor during system configuration.

SOC—Supervised Output Circuit

Supervised Output Circuits are used to supervise and operate extinguishing system releasing circuits, water deluge release or any other 24VDC output, which needs to be driven via a supervised output from the MODEL 10K system.

The SOC circuit is a two Wire; Class B supervised output circuit with wiring distances as detailed in Table 5. The SOC circuit is a simple coil supervision type with no polarization and no End of Line Device required. Circuit load must be 24VDC. Total circuit capacity is 2.0 amps. SOC circuit is designed to support a single 24 VDC coil across the two circuit legs. Two 12VDC releasing coils may be supervised provided they are wired in series and the total current rating of the circuit is observed.

SOC circuits are supervised for open circuit, short circuit and ground fault. Activation power for these circuits is monitored for power loss by the MODEL 10K control panel. The circuit is fused at 2.0 amps.

Inductive solenoid loads should be “clamped” using a reverse polarity diode installed across the coil. Motorola IN4004 or equal diodes are sufficient for this purpose.

The most common use for SOC is for special hazard extinguishing or deluge water system activation. In these cases when a pre-determined alarm condition is present, the extinguishing operation is actuated.

MODEL 10K supports a variety of voting schemes including cross zoning and coincident zoning of detection inputs. MODEL 10K supports pre-discharge delay and “dead-man type” abort functionality for releasing systems. MODEL 10K also supports extinguishing solenoid “soak timers” or time delay off timers to remove actuation power from releasing solenoids after a preset time following solenoid actuation.

Releasing systems, voting, discharge timers, abort functionality and soak timers are configured in the MODEL 10K processor during custom software configuration.

Discrete output / 1756-OB16D Solenoid valve circuit

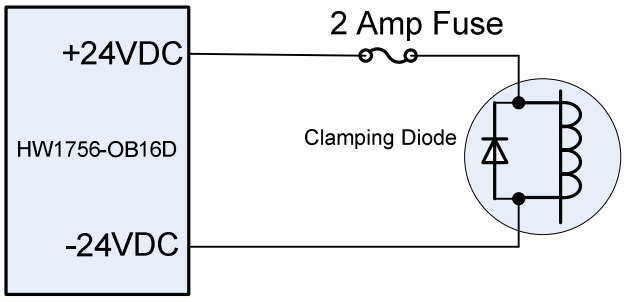


Figure 27: Solenoid Output (SOC) Circuit Diagram

<table>
<tr><th>DEVICES</th><th>20.4VDC</th><th>22VDC</th><th>24VDC</th></tr>
<tr><td>36W 24VDC Solenoid</td><td>Device operates at short distance</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>10</td><td>455</td><td>135</td></tr><tr><td>12</td><td>265</td><td>80</td></tr><tr><td>14</td><td>185</td><td>55</td></tr><tr><td>16</td><td>115</td><td>35</td></tr><tr><td>18</td><td>75</td><td>20</td></tr></table>Loop resistance = 1 ohms</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>10</td><td>1135</td><td>345</td></tr><tr><td>12</td><td>655</td><td>200</td></tr><tr><td>14</td><td>450</td><td>135</td></tr><tr><td>16</td><td>290</td><td>85</td></tr><tr><td>18</td><td>185</td><td>55</td></tr></table>Loop resistance = 2.5 ohms</td></tr>
<tr><td>20W 24VDC Solenoid</td><td>Device operates at short distance</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>10</td><td>905</td><td>275</td></tr><tr><td>12</td><td>525</td><td>160</td></tr><tr><td>14</td><td>370</td><td>110</td></tr><tr><td>16</td><td>230</td><td>70</td></tr><tr><td>18</td><td>150</td><td>45</td></tr></table>Loop resistance = 2 ohms</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>10</td><td>1815</td><td>555</td></tr><tr><td>12</td><td>1050</td><td>320</td></tr><tr><td>14</td><td>740</td><td>220</td></tr><tr><td>16</td><td>460</td><td>140</td></tr><tr><td>18</td><td>300</td><td>90</td></tr></table>Loop resistance = 4 ohms</td></tr>
<tr><td>10W 24VDC Solenoid</td><td>Device operates at short distance</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>10</td><td>1815</td><td>555</td></tr><tr><td>12</td><td>1050</td><td>320</td></tr><tr><td>14</td><td>740</td><td>220</td></tr><tr><td>16</td><td>460</td><td>140</td></tr><tr><td>18</td><td>300</td><td>90</td></tr></table>Loop resistance = 4 ohms</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>10</td><td>3635</td><td>1105</td></tr><tr><td>12</td><td>2100</td><td>640</td></tr><tr><td>14</td><td>1475</td><td>445</td></tr><tr><td>16</td><td>930</td><td>280</td></tr><tr><td>18</td><td>600</td><td>180</td></tr></table>Loop resistance = 8 ohms</td></tr>
</table>

Table 8: SOC Circuit Wiring Length versus Wire Gauge

SLC Circuit—Signal Line Circuit

MODEL 10K SLC circuits are used to support communication Local MODEL 10K panels and the Proprietary Central Station Computer (HMI) or between a Local MODEL 10K panel and remote I/O associated with that Local MODEL 10K panel. This circuit can be implemented using redundant coaxial copper cables or using redundant fiber optic cables.

Coaxial Cable for SLC Circuit

The network topology for redundant copper coaxial cable (RG-6) is shown below. The MODEL 10K communicates via Controlnet through a redundant control net bridge. Each network is of bus topology and maximum node to node distances as shown in **Table 6.** Bus connections must be made through a t-tap device and buss endpoints must be fitted with 75 ohm terminating resistors. MODEL 10K can handle 12 Local Panels with Touchscreen Displays and (1) Central Station Computer on each Controlnet network.

The total allowable length of a segment containing standard RG-6 quad shield cable depends upon the number of taps in your segment. There is no minimum trunk-cables section length

Using Fiber Optic Cables for SLC Circuit

Because the practical limit for coaxial cable communication between MODEL 10K nodes is approximately 1000M (3000 ft).

MODEL 10K can be provided with dual redundant fiber optic communications extending the practical distance for node-to-node communications to approximately 6000M or 3.7 miles using Multimode fiber. **Multi mode** Fiber media is 62.5 micron and operates multimode at 1300nm wavelength.

For even greater distances MODEL 10K can be provided with dual redundant fiber modems to support **Single mode** fiber optic cables for node-to-node distances of up to 25000M or 15.5 Miles. Fiber media is 9 micron and operates at

The fiber optic communication network is based on Controlnet and features a dual ring topology as shown in the diagram below:

Figure 28: Fiber Optic Network

Each MODEL 10K node is serviced by dual fiber pairs (total 4 fibers). Channel A pair has both transmit and receive fibers as does the Channel B pair. In normal industrial installation, the A pair of fibers is routed differently through the facility so an interrupting event at a single location of the plant does not damage both fiber communication pairs.

Fault Management

Phoenix Digital's fiber optic modules provide fault tolerant, self healing communications through diagnostic monitoring of the communication signal waveforms at each node on the network, and ultra-high speed detection and isolation of points of communication failure anywhere on the network. The fiber optic modules self heal around communication failures in ring, bus, star, tree, or point-to-point network configurations. They automatically redirect network traffic around points of failure until the failure conditions are corrected and then automatically restore the communication network to its original traffic patterns. Communication continuity is unconditionally maintained by the fiber modules in the event of either node or media failure.

This feature enables maintenance personnel to splice/terminate/replace fiber media, add/delete nodes, etc. on-line, without disrupting network communications.

Fiber Optic Modules Specifications are as follows:

Specifications:

Fiber Optic Cable Type:	Multimode or Singlemode
Mating Connector:	ST or SMA
Transmit Launch Power:	-15dbm (Typical, Multimode); -18dbm (Singlemode)
Receive Sensitivity:	-32dbm

Power Supply

Plug-In Modules:	+5 VDC, 1.8 Amps (Typical
Standalone Panel mount Modules:	120/220 VAC, 24 VDC, or 125 VDC – 10 Watts

Environmental

Operating Temperature:	0 to 60 C (32 to 140 F)
Storage Temperature:	-40 to 85 C (-40 to 185 F)
Relative Humidity:	0 to 95% RH, non-condensing

Dimensions

1771 Plug-In Modules:	Single Slot, 1771 Chassis Installation
1746 Plug-In Modules:	Single Slot, 1746 Chassis Installation
1756 Plug-In Modules:	Single Slot, 1756 Chassis Installation
Standalone, Panel mount Modules:	10.38in H x 1.76in W* x 6.14in D (26.336cm H x 4.47cm W* x 15.60 cm D) * Add 1.00in (2.54cm) for real panel flange

Table 9: Fiber Optic Module Specifications

4-20 Analog Input Circuits Flame, Gas, RTD Circuits and Misc Analog Input Circuits

Flame detectors, Gas detectors, Acoustic Leak detectors RTDs are connected to MODEL 10K using 4-20 ma dc input channels. The Analog inputs are single ended and share DC1. The circuits are typically 3 wire overall shielded cable. Miscellaneous analog input circuits may be 2 wire or 4 wire depending on field device involved.

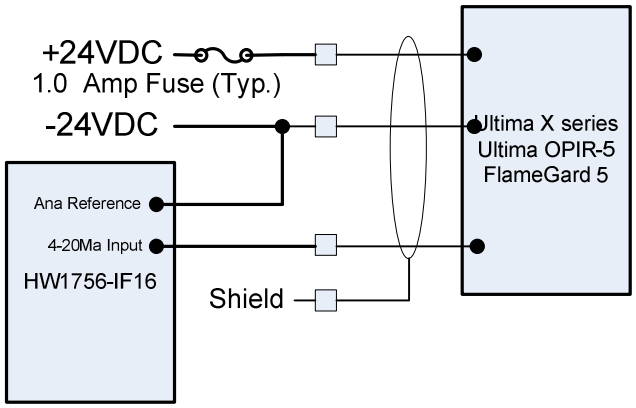


Figure 29: Analog Input Devices (Non-HART Implementation)

Wiring distances versus wire gauge for various minimum MODEL 10K panel operating voltages are listed as follows:

DEVICES	22VDC (Power cable)			24VDC (Power cable)		
ULTIMA MOS-5	AWG	FEET	METERS	AWG	FEET	METERS
	14	1000	305	14	2000	610
	16	775	205	16	1550	410
	18	525	160	18	1050	320
	20	325	100	20	650	200
Ultima XE, XEH Combustible Catalytic	AWG	FEET	METERS	AWG	FEET	METERS
	14	4100	1250	14	4700	1433
	16	2600	793	16	3000	915
	18	1600	488	18	1900	580
	20	1000	305	20	1200	366
Ultima XE, XEH Toxic, Oxygen	AWG	FEET	METERS	AWG	FEET	METERS
	14	11100	3385	14	12700	3873
	16	7000	2135	16	8000	2440
	18	4400	1342	18	5000	1525
	20	2800	854	20	3200	976
ULTIMA XE, XEH XIR	AWG	FEET	METERS	AWG	FEET	METERS
	14	2900	885	14	3300	1006
	16	1800	549	16	2000	610
	18	1100	335	18	1300	396
	20	700	213	20	800	244
Ultima XL XT Combustible Catalytic	AWG	FEET	METERS	AWG	FEET	METERS
	14	5800	1770	14	6700	2045
	16	3700	1129	16	4200	1282
	18	2300	702	18	2600	793
	20	1500	458	20	1700	519
Ultima XL XT Toxic, Oxygen	AWG	FEET	METERS	AWG	FEET	METERS
	22	8800	2685	22	10000	3050
Ultima XL XT XIR	AWG	FEET	METERS	AWG	FEET	METERS
	14	4700	1434	14	5300	1617
	16	2900	885	16	3400	1038
	18	1900	580	18	2100	641
	20	1200	366	20	1300	397
Ultima OPIR-5	Cable Lengths for Receiver:			Cable Lengths for Receiver:		
	AWG	FEET	METERS	AWG	FEET	METERS
	10	1135	348	10	2270	695
	12	770	235	12	1540	470
	14	500	152	14	1000	305
	16	290	90	16	580	180
	18	185	55	18	370	110
	Cable Lengths for Source:			Cable Lengths for Source:		
	AWG	FEET	METERS	AWG	FEET	METERS
	10	982	300	10	1965	598
	12	617	187	12	1235	375
	14	375	115	14	750	230
	16	218	67	16	436	135
	18	140	42	18	280	85

Table 10: Gas Detector Wire Length versus Wire Gauge

<table>
<tr>
<td>FlameGard 5 UV/IR</td>
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<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>14</td><td>2250</td><td>685</td></tr>
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<tr><td>20</td><td>970</td><td>300</td></tr>
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Loop resistance = 20ohms
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<tr>
<td>FlameGard 5 MSIR</td>
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<tr><th>AWG</th><th>FEET</th><th>METERS</th></tr>
<tr><td>14</td><td>2250</td><td>685</td></tr>
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<tr><td>20</td><td>970</td><td>300</td></tr>
</table>
Loop resistance = 20ohms
</td>
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</table>

Table 11: Flame Wire Length versus Wire Gauge

HART 4-20 Analog Input Circuits Flame, Gas, RTD Circuits and Misc Analog Input Circuits

HART Flame detectors, Gas detectors, RTDs are connected to MODEL 10K using HART 4-20 ma dc input channels. The circuits are typically 3 wire overall shielded cable. Miscellaneous analog input circuits may be 2 wire or 4 wire depending on field device involved.

Flame and Gas transmitters manufactured by MSA are designed to provide status information regarding

- Fault
- Sensor in calibration
- Optical status

The current levels for the above status signals are changed from the nominal values to implement HART protocol. Consult factory for the detailed information HART current levels.

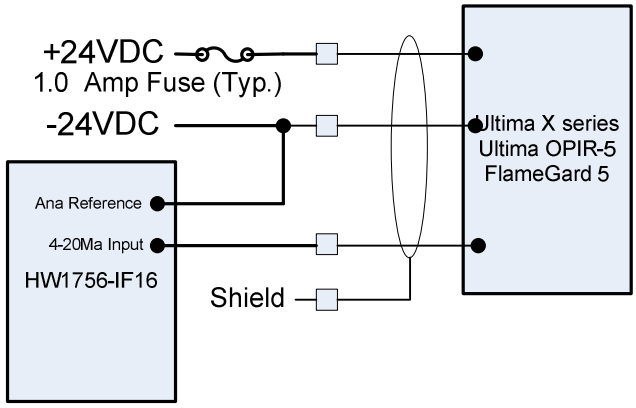

Figure 30: Typical HART Flame, Gas and RTD Detector Circuit

<table>
<tr><th>DEVICES</th><th>22VDC (Power cable)</th><th>24VDC (Power cable)</th></tr>
<tr><td>Ultima MOS-5</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>14</td><td>1000</td><td>305</td></tr><tr><td>16</td><td>775</td><td>205</td></tr><tr><td>18</td><td>525</td><td>160</td></tr><tr><td>20</td><td>325</td><td>100</td></tr></table></td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>14</td><td>2000</td><td>610</td></tr><tr><td>16</td><td>1550</td><td>410</td></tr><tr><td>18</td><td>1050</td><td>320</td></tr><tr><td>20</td><td>650</td><td>200</td></tr></table></td></tr>
<tr><td>Ultima XE, XEH Combustible Catalytic</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>14</td><td>4100</td><td>1250</td></tr><tr><td>16</td><td>2600</td><td>793</td></tr><tr><td>18</td><td>1600</td><td>488</td></tr><tr><td>20</td><td>1000</td><td>305</td></tr></table></td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>14</td><td>4700</td><td>1433</td></tr><tr><td>16</td><td>3000</td><td>915</td></tr><tr><td>18</td><td>1900</td><td>580</td></tr><tr><td>20</td><td>1200</td><td>366</td></tr></table></td></tr>
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<tr><td>Ultima XL XT Combustible Catalytic</td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>14</td><td>5800</td><td>1770</td></tr><tr><td>16</td><td>3700</td><td>1129</td></tr><tr><td>18</td><td>2300</td><td>702</td></tr><tr><td>20</td><td>1500</td><td>458</td></tr></table></td><td><table><tr><th>AWG</th><th>FEET</th><th>METERS</th></tr><tr><td>14</td><td>6700</td><td>2045</td></tr><tr><td>16</td><td>4200</td><td>1282</td></tr><tr><td>18</td><td>2600</td><td>793</td></tr><tr><td>20</td><td>1700</td><td>519</td></tr></table></td></tr>
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Table 12: HART Gas Detector Wir

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<td>FlameGard UV/IR 5</td>
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Loop resistance = 20ohms
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<td>FlameGard MSIR 5</td>
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Loop resistance = 20ohms
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Table 13: HART Gas Detector Wire Length versus Wire Gauge

3.1.5 Power Supply Installation Details

MODEL 10K Local Panel 24 Volt DC power is provided by a LaMarche A12B Power Supply provided with the LaMarche Digital Combined Accessory package. A typical block diagram for AC and DC power distribution for MODEL 10K is shown below. See project specific drawings for precise details.

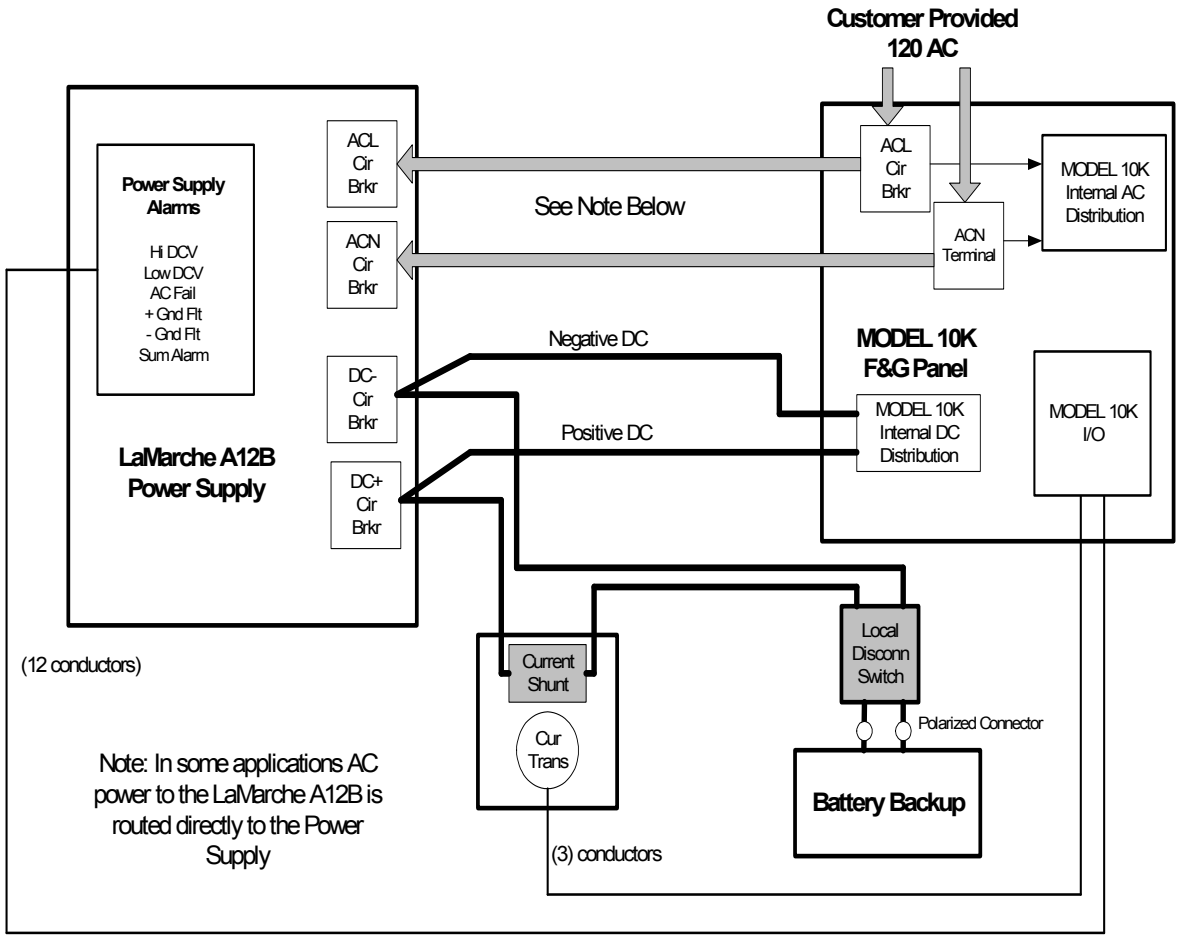

Figure 31: MODEL 10K Main Power Supply Wiring Diagram

Typically the battery backup system, Local Disconnect Switch and current monitor enclosure are fitted in the same location (usually a battery storage area). The LaMarche charger is typically located in a room with other power supplies and/or motor control equipment. The MODEL 10K panel will be typically installed in a normally occupied operator control room. DC power cabling from the batteries/charger to the MODEL 10K panel must be designed for minimal voltage (normally .5 VDC). This constraint can result in large power cable gauges if the batteries/charger is installed more than 10-20 feet from the MODEL 10K panel. Interposing terminations may be required to connect very large DC cables in the charger and current shunt transmitter enclosure. See distance versus wire size table below for typical installation parameters:

DC Load	Distance	Wire Size
20 amp Load	25ft	6AWG
	50 ft	3AWG
	100ft	1/0
50 amp Load	25ft	2 AWG
	50 ft	2/0
	100ft	250kcmil
100 amp Load	25ft	2/0
	50 ft	250kcmil
	100ft	500kcmil

Table 14: Power Supply Wire Distance versus Cable Gauge

3.1.6 Power Supply and Battery Sizing

MODEL 10K power supply selection and backup battery sizing is done based on results from a detailed system load calculation. This calculation takes into account all of the connected devices and generates sizing information based on the following guidelines

Power supply sizing selected to supply maximum load (full alarm) or normal (non-alarm) load plus sufficient excess capacity to fully re-charge battery backup system from full discharged condition within 48 hours.

Battery sizing is normally based on 24 hours of normal (non-alarm) operation followed by 5 minutes of maximum load (full alarm with all devices operating). We apply a safety factor (normally 10-20 percent) to compensate for battery aging.

A typical MODEL 10K Power Sizing Calculation is shown in the following spreadsheet.

PROJECT : NFPA 72 APPROVAL			DOC. No. : XXX-XXXX-XXXX		Page no. : 1		
CLIENT/OWNER : MSA			DOC TITLE : MAXIMUM CASE MAIN F&G DETECTION PANEL POWER CONSUMPTION, HEAT DISSIPATION AND BATTERY BACK UP CALCULATION.				
CONTRACT NO. : 9401			REV No. : A		Sht no. :1 of 1		
		quiescent (Watt)		alarm (Watt)		EST HEAT REJECTION(Watt)	
PANEL COMPONENT	QTY	UNIT LOAD	LOAD	UNIT LOAD	LOAD	MIN	MAX
Allen Bradley							
PANEL PLUS 1000	1	22.8	22.8	22.8	22.8	3.42	3.42
CONTROL NET PLC SYSTEM	1	54.72	54.72	59.28	59.28	8.208	8.892
TOTAL HEAT DISSIPATION						11.628	12.312
FIELD DEVICES							
							Amp
ULTIMA XIR GAS DETECTOR	20	9.6	192	9.6	192		0.40
ULTIMA XE LEL GAS DETECTOR	8	6	48	6	48		0.25
ULTIMA XE TOXIC GAS DETECTOR	8	8.4	67.2	8.4	67.2		0.35
ULTIMA MOS-5 OPEN PATH DET	8	55	440	55	440		2.29
FLAMEGARD 5 FLAME DETECTOR	20	3.6	72	3.6	72		0.15
SMOKE DET DI-3	64	0.0024	0.1536	1.92	122.88		0.08
FED SIG 300GCX HORN	10	1.44	14.4	13.2	132		0.55
FED SIG 151XST STROBE LIGHT	10	1.44	14.4	14.4	144		0.60
STANDARD 24VDC SOLENOID	4	0	0	12	48		0.50
TOTAL SYSTEM DC CONSUMPTION (W)			925.67	W	1348.16	W	
MAXIMUM CURRENT AT 24 VDC (A)			38.57	A	56.17	A	
POWER SUPPLY PROVIDED					100	A	
AMP HOURS CALCULATION BASED ON 24 HRS QUIESCENT OPERATION AND 5 MINUTES FULL ALARM PLUS 10% SAFETY FACTOR			1023.39				
BATTERY PROVIDED AMP/HOURS			1040		16 OF 130A/H		

3.2 MODEL 10K Central Station Equipment

3.2.1 Equipment Details and Specifications

Hardware Description:

The MODEL 10K Proprietary Central Station equipment is used to remotely monitor the operation of one or more local fire and gas alarm panels and can be additionally used to monitor fire alarm dry contact signals from other fire alarm panels. The equipment consists of a workstation with touch screen interface certified to UL Standard 864 with a Controlnet communication interface. UL864 is the UL standard for fire alarm equipment

Computer Equipment:

The Proprietary Central Station monitoring computer is a UL 864 Industrially Hardened PC fitted with 19" high resolution Touchscreen.

Figure 32: Touchscreen Monitor

Figure 33: UL-864 Certified Hardened Computer

Equipment Specifications:

Pentium Core 2 Duo 2.0 GHz, 1GB DIMM Memory, SATA Hard Drive, CD-RW Drive, 10/100 BTX Ethernet Card with 19" (1280x1024) Capacitive Touchscreen with Windows XP Pro Operating System.

The computer will be running Allen Bradley RSView32 HMI Software on a dedicated basis. The computer can be equipped with an optional parallel port interfaced dot matrix line printer for logging of alarm/supervisory and fault history and management reports

Communication Equipment:

The MODEL 10K Proprietary Central Station workstation is equipped to communicate with the MODEL 10K local panels via Controlnet. Controlnet is a 5 MBit, redundant media high-level communication protocol supported by all PLC and HMI equipment used in the MODEL 10K system

Controlnet media can be RG6 Quad Shield Coaxial cable and can handle node-to-node distances of up to 1000 meters.

Controlnet media can be multi-mode or single mode fiber optic when using the appropriate Phoenix Digital fiber optic modem. FM has validated both the redundant coaxial and the redundant fiber communication media in accordance with NFPA 72 requirements for Signal Line Circuits.

3.2.2 User Interface and Screen Navigation of Central Station Computer

Normal Operating Mode

The primary Central Station Terminal interface is the UL864 listed computer. This terminal features default alarm status screen with menu driven touchkeys to select secondary display screens. Color TFT LCD Touchscreen resolution is 1280x 1024 pixels.

Figure 34: Main Central Station Screen

The Main Central Station screen contains Standard Fire Service Interface, along with alarm banner field, plot plan navigation screens (lower left), communication status display, and short cut keys.

The typical custom plot plan screen depicts alarm status of all fire and gas detection devices shown against a plant plot plan display. Devices in alarm are indicated with symbol color change and digital reading of analog value where appropriate.

All Central Station screens include plot plan navigation screens, communication status, and short cuts to other screens.

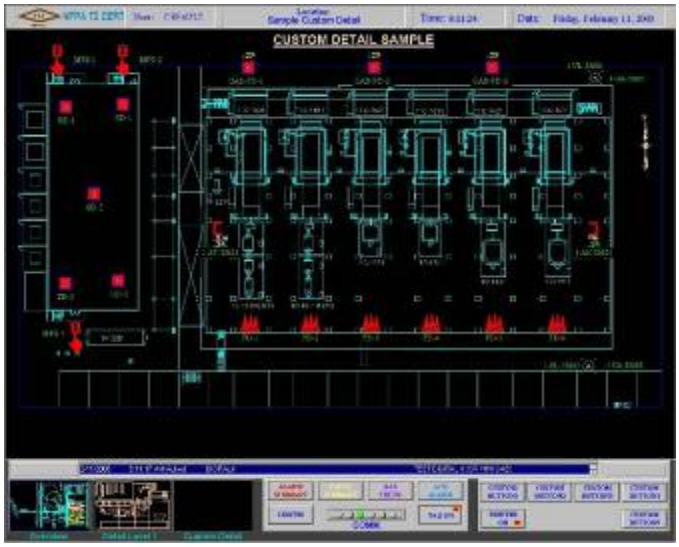

Figure 35: Central Station Plot Plan Graphic Screen

The current alarm summary screen shows all current alarms by sensor tag number with a 40-character text field to describe the location of the alarm or the recommended operator response. All alarms and fault conditions are time stamped by the computer and stored on the computer hard drive. The screen can store up to 1000 events. Events are automatically archived daily. Maximum days of event log storage is 999 days (Hard drive space permitting)

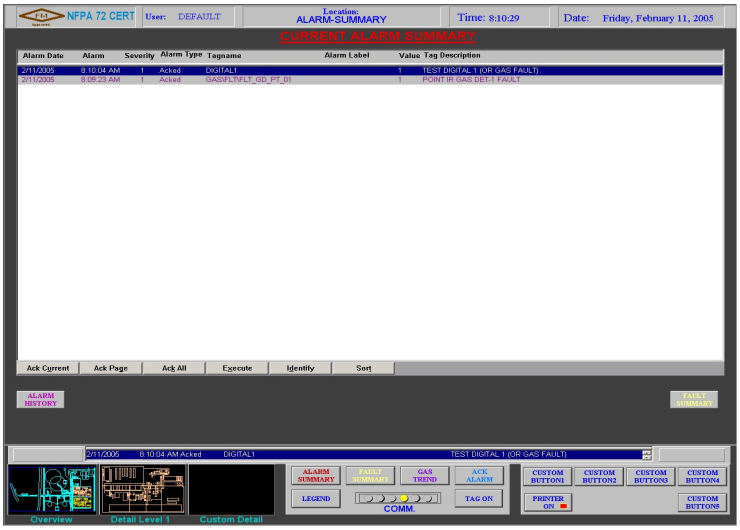

Figure 36: Alarm Summary Screen

MODEL 10K Network (Controlnet) communications are dual path fault tolerant. Any single failure will not interrupt communications for the network. The status of the communications network is continuously monitored by the MODEL 10K system. The communication system status indication is present on all Central Station screens. This detailed screen has active screen elements, which assist the Central Station operator to locate and diagnose communication problems

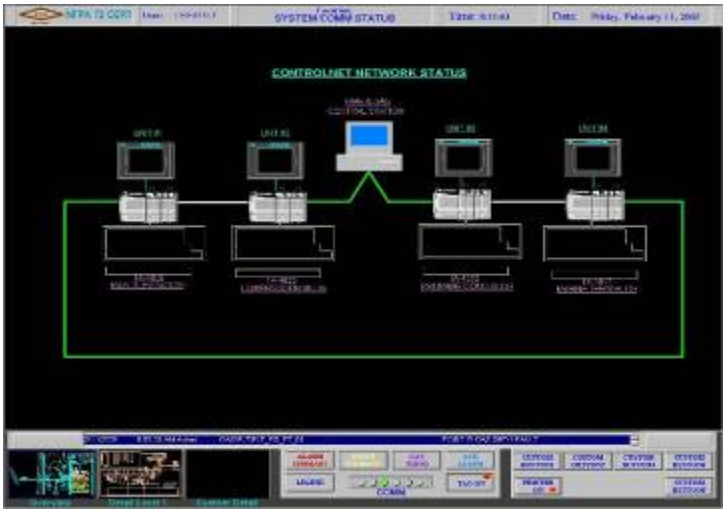

Figure 37: Network Communication Diagnostic Screen

Offline Programming Modes

The MODEL 10K Proprietary Central Station computer workstation is capable of providing software updates and editing to the Contrologix and Panelview Plus equipment located in each MODEL 10K Fire and Gas Alarm Panel over Controlnet. Local panel program changes may also be done using a laptop at the field panel location.

Editing of all programmable equipment will be subject to multi-level password protection to prevent unauthorized changes to the programming of the equipment. Editing of operating software must be done on an “off-line basis” by factory trained and authorized personnel.

Programming tools used for MODEL 10K are Allen Bradley RSLogix5000 for the PLC, Allen Bradley RSView32 for the Central Station computer and RSView Studio for the MODEL 10K Local Panel Touchscreen terminal.

3.2.3 Power Supply Details and Specifications

The MODEL 10K Central Station Computer is backed up for 24 hours upon failure of primary AC, just like the MODEL 10K panels.

An APS Smart UPS XL 750VA fitted with (2) UXBP24 battery packs provides up to 300 watts of power backup to the MODEL 10K Proprietary Central Station equipment for a period of 24 hours in event of primary AC power interruption.

Ensure that all components of the Central Station including, the PC terminal, touch screen monitor, alarm printer and all Control-Net/Fiber Optic modules are connected to the UPS system.

The UPS XL 750 VA is provided with an AP9610 Relay I/O Module provides a signal to the MODEL 10K Central Station Computer when the AC power source to the APS UPS is not operating and the system is on batteries

Figure 38: AC UPS Equipment

Central Station wiring connections are shown on the connection diagram below:

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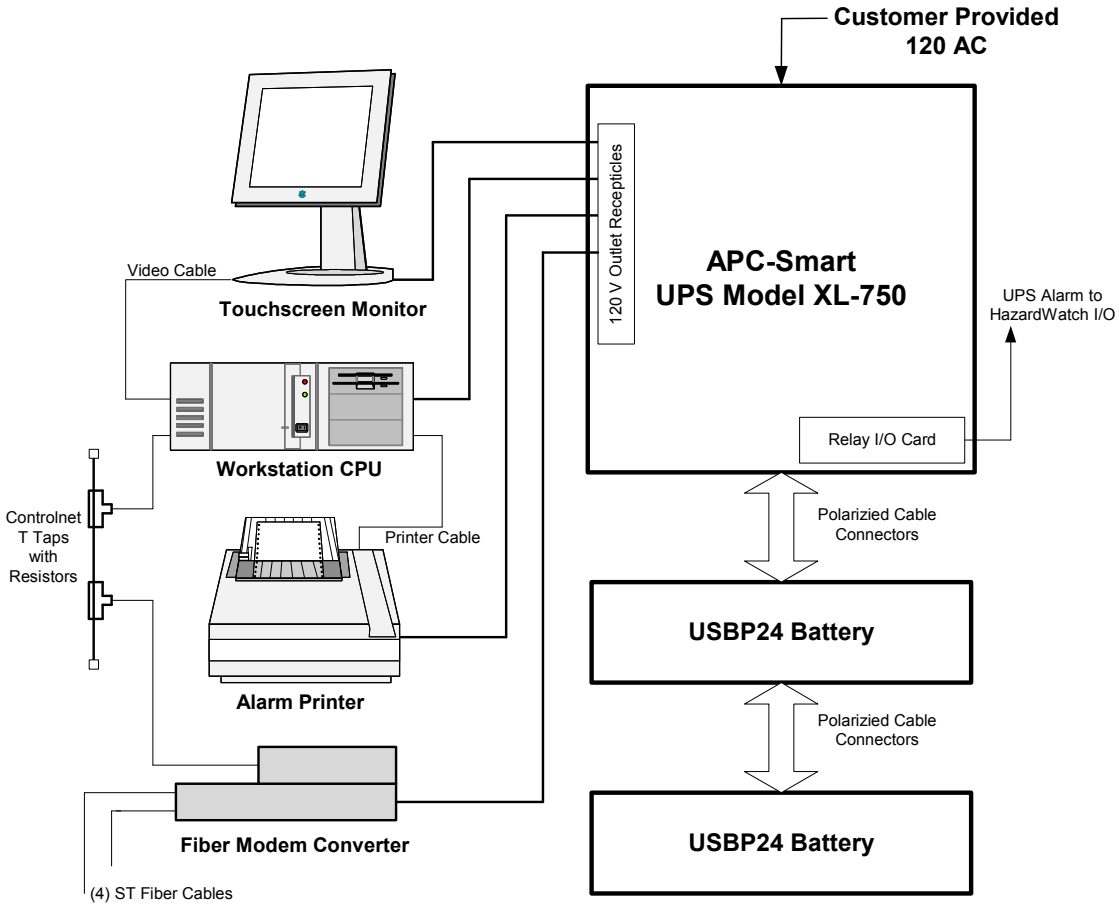

Figure 39: Simplified Central Station Connection Diagram

The APC UPS Control Unit includes a number of controls and indications detailed below

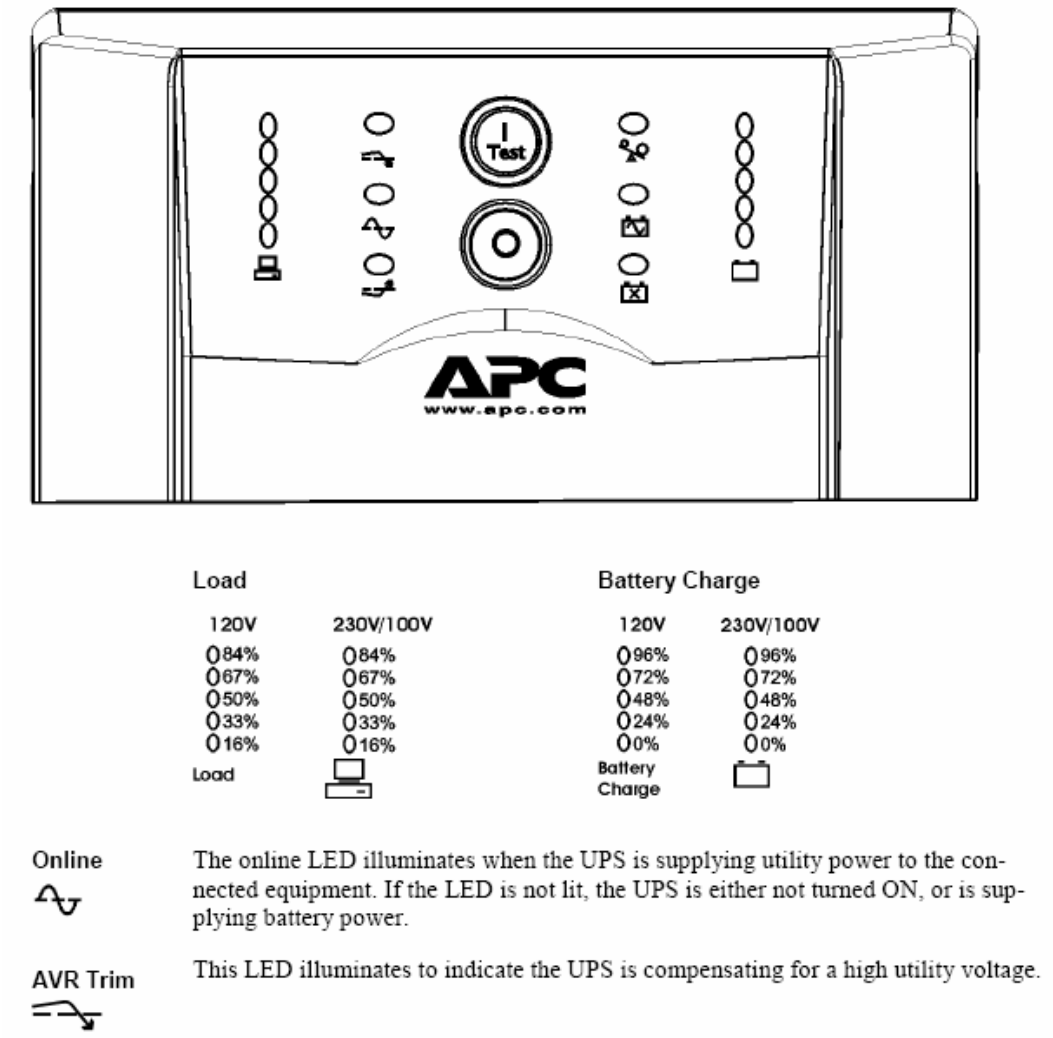

Figure 40: AC UPS Controls

AVR Boost	This LED illuminates to indicate the UPS is compensating for a low utility voltage.
On Battery	When the *on battery power* LED is lit the UPS is supplying battery power to the connected equipment. When on battery, the UPS sounds an alarm—four beeps every 30 seconds.
Overload	The LED illuminates and the UPS emits a sustained alarm tone when an overload condition occurs.
Replace Battery	Failure of a battery self-test causes the UPS to emit short beeps for one minute and the *replace battery* LED illuminates. Refer to *Troubleshooting* in this manual.
Battery Disconnected	The *replace battery* LED flashes and short beep is emitted every two seconds to indicate the battery is disconnected.
Automatic Self-Test	The UPS performs a self-test automatically when turned on, and every two weeks thereafter (by default). During the self-test, the UPS briefly operates the connected equipment on battery. If the UPS fails the self-test, the *replace battery* LED lights and immediately returns to online operation. The connected equipment is not affected by a failed test. Recharge the battery for 24 hours and perform another self-test. If it fails, the battery must be replaced.
Manual Self-Test	Press and hold the Test button for a few seconds to initiate the self-test.

Figure 41: APC Diagnostic and Testing Functions

3.3 MODEL 10K Communication Network

SLC loop communications between all MODEL 10K panels and the Central Station Computer is accomplished using Allen-Bradley's Controlnet protocol. Controlnet is a 5M-bit deterministic and redundant industrial communication protocol that offers repeatable transfers of all critical control data.

Depending on the distances Controlnet can utilize one of three different medias:

	Media	Max Dist (metric)	Max Dist
Coaxial Cable	RG-6 Quad Shield Coax Cable	1000 m	3280 ft
Multimode Fiber Optic	62.5/125 micron fiber	6 km	3.7 miles
Single Mode Fiber Optic	9/125 micron fiber	25 km	15.5 miles

3.3.1 Coaxial Cable Network

The MODEL 10K system is approved for up to 27 Nodes. Each of the following devices utilizes a Node on the Controlnet network:

- MODEL 10K panel PLC Processor
- MODEL 10K Local Touch Screen Interface (PanelView)
- Central Station Computer

An example of a fully utilized network would include (13) MODEL 10K panels and (1) Central Station Computer. Each Node on the Controlnet network must connect to the communication buss using a T-Tap (Figure 25). These T-Taps are located inside the MODEL 10K panel and are the connection point for the Controlnet coaxial cable.

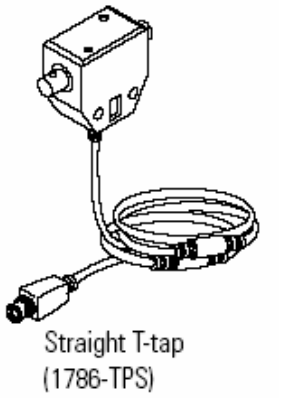

Figure 42: Controlnet T-Tap

Coaxial Network Topology

Wiring from node to node is accomplished by coaxial connections between the T-Taps (Figure 44).

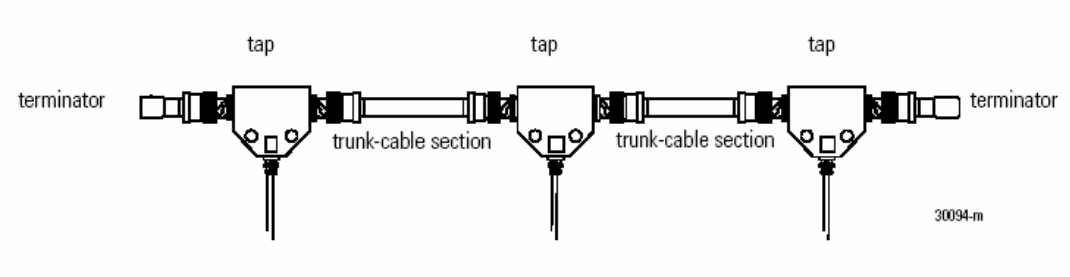

Figure 43: Coaxial Cable Topology

A redundant Controlnet network (using 1756-CNBR module) requires two T-Taps per node (Figure 45).

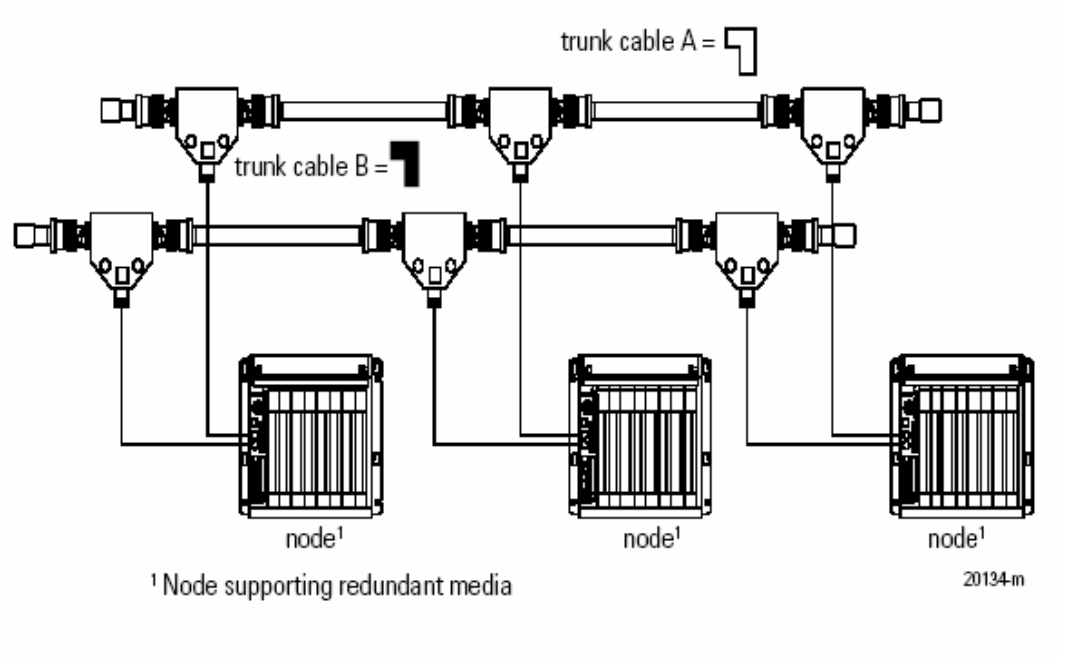

Figure 44: Redundant Coaxial Cable Topology

A 75-Ohm Terminator (p/n: 1786-XT) must be used at the end of each Controlnet cable system for the network to work properly.

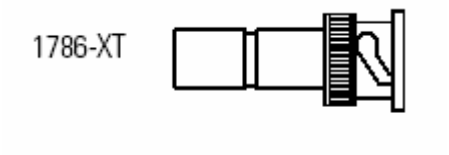

Figure 45 1786-XT Coaxial Cable Termination Resistors

3.3.1.1 Distance Versus Quantity of Nodes

A Controlnet segment is comprised of several sections of Coaxial cable separated by taps. The total cable length of a segment is equal to the sum of all the trunk cable connections.

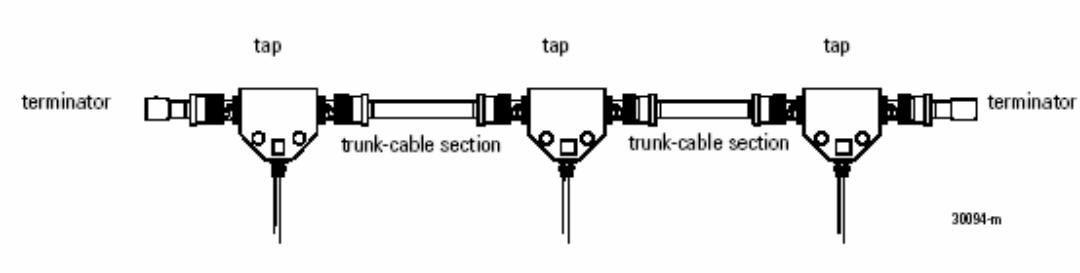

Figure 46: Multi-Tap with Termination Resistors

The total allowable length of a segment containing a standard RG-6 quad shield cable depends on the number of T-Taps in the cable run. The maximum allowable total length of a segment is 1,000m (3,870 feet) with two taps connected. Each additional tap decreases the maximum length of the segment by 16.3m (53 feet). This relationship is depicted below:

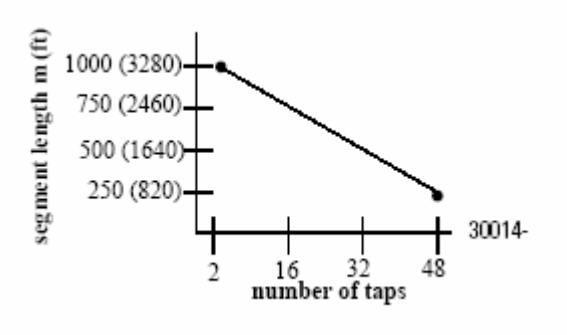

Figure 47: Controlnet Coaxial Cable Distance versus Quantity of Taps

For Example: If a segment requires 11 taps, the maximum segment length would be calculated as follows:

1000m – 16.3m x [11 taps – 2 taps]

Result = 853.3m maximum allowable distance for the entire network segment with 11 T-Taps.

3.3.1.2 Cable Specifications, Termination Instructions

There are several types of RG-6 quad shield cable that may be appropriate for installation. Choose the appropriate cable with environmental factors appropriate for your installation.

Application	Cable Type
Light industrial applications	Standard-PVC CM-CL2
Heavy industrial applications	Lay-on Armored and Interlocking Armor
High and low temperature applications, as well as, corrosive areas (harsh chemicals)	Plenum-FEP CMP CL2P
Festooning or flexing applications	High Flex
Moisture resistant applications; direct burial, with flooding compound, fungus resistant	Flood Burial

Table 15: Coaxial Cable Specifications

Controlnet Coax Terminations should be made using a BNC Type Male Connector. The details for stripping the Coax Cable are detailed below.

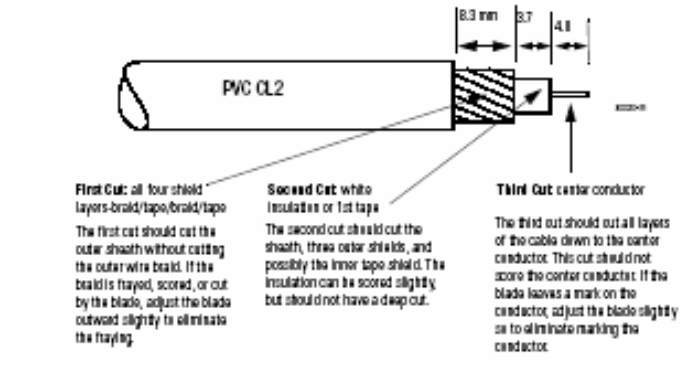

Figure 48: Coaxial Cable Strip Specifications

3.3.1.3 Cable Installation and Routing Guidelines

Follow these guidelines for routing of all Controlnet coaxial cables:

- If cable must cross power feed lines, it should do so at right angles.
- Route at least 1.5M (5 feet) away from high-voltage enclosures or sources of RF/microwave radiation.
- If the conductor is in a metal wire way or conduit, each section of the wire way or conduit must be bonded to each adjacent section so that it has electrical continuity along its entire length, and it must be bonded to the enclosure at the entry point.

- When using redundant coaxial media (using a 1756-CNBR module) both coaxial cables should be routed using different paths to reduce the chances of both cables being damaged in a fire, explosion or other interruption.

3.3.1.4 Cable Troubleshooting

Using the NetLinx Media Checker (p/n: 1788-MCHKR) is the preferred method for continuity testing. Attach the connector end of the cable to the port on top of the media checker as per attached Figure 49.

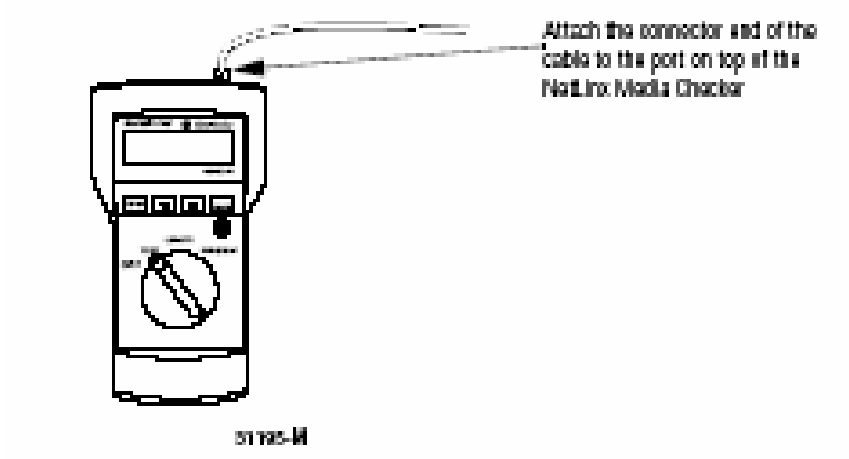

Figure 49: 1788-MCHKR Coaxial Cable Test Instrument

As a secondary method you can use an ohmmeter or continuity tester to test for a short between the connector body and the pin. Use a shorting clip to connect a temporary short between the pin and connector pin and connector body at one end of the cable. At the other end of the cable, use an ohmmeter or continuity tester to test for electrical continuity.

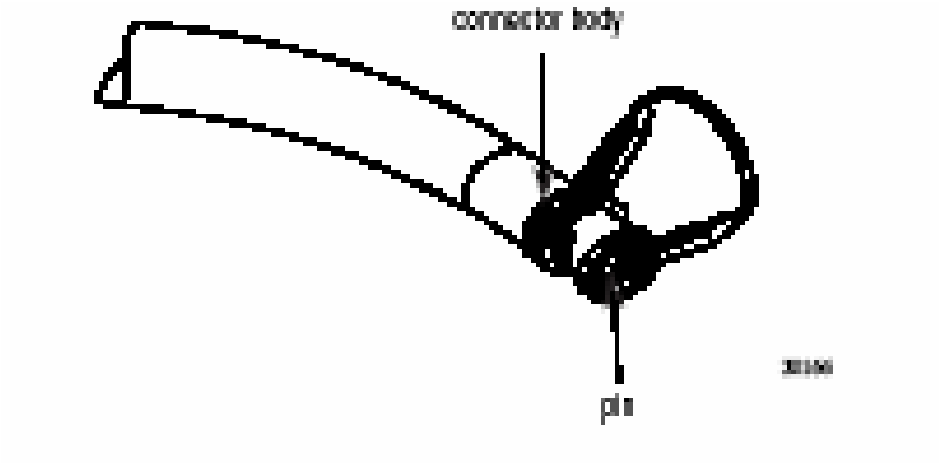

Figure 50: Coaxial Cable Continuity Tester

3.3.2 Fiber Optic Cable Network

For longer distance communications MODEL 10K is approved for either single mode or multi-mode fiber optic Controlnet communications. This fiber optic communications utilizes a Phoenix Digital fiber optic communication module that fits inside the Allen-Bradley Contrologix chassis.

The Phoenix Digital fiber optic modem provides a fault tolerant communication, with interactive diagnostics in a dual redundant fiber configuration. The ultra-high speed, self-healing communication technology on each fiber optic module will automatically redirect network traffic around points of failure. In a failed condition the fiber optic communication will self-heal around a fault by redirecting data communications around the point of failure.

Fiber Network Topology

The fiber optic communication network features a fault tolerant ring topology. Network consists to two fiber pairs configured to operate in opposite directions in a ring.

For secure fiber network operation the cable physical routing path for each fiber pair should be different so that a fire, explosion or other interruption in a single location of the plant will not damage both fiber pairs and disrupt communication network operation.

3.3.2.1 Fiber Distance Limits

For most fiber optic applications the Multimode fiber will be more than sufficient, but the Single Mode fiber will support longer node to node run distances. See Table 9 for maximum run distances.

	Media	Max Dist (metric)	Max Dist
Multi-Mode Fiber Optic	62.5/125 micron fiber	6 km	3.7 miles
Single-Mode Fiber Optic	9/125 micron fiber	25km	15.5 miles

Table 16: Fiber Optic Cable Maximum Run Distances

3.3.2.2 Fiber Cable and Fiber Connector Specifications

MODEL 10K fiber optic communication can be configured with either a single mode or multi-mode fiber optic cable. Both single mode and multimode fiber for MODEL 10K operates at 1300 nm wavelength. The specifications on each type of cable are as follows:

Fiber Type (size Microns)	Fiber Mode	Max Attenuation (dB/km) at 1300nm	Min Bandwidth (MHz.km) at 1300 nm	Numerical Aperture
9/125	Single-Mode	.4	N/A	N/A
62.5/125	Multi-Mode	1.50	500	.275

Table 17: Single-Mode, Multi-Mode Fiber Optic Cable Characteristics

Both the Multimode and Single Mode Fiber Optic cables use type ST connectors.

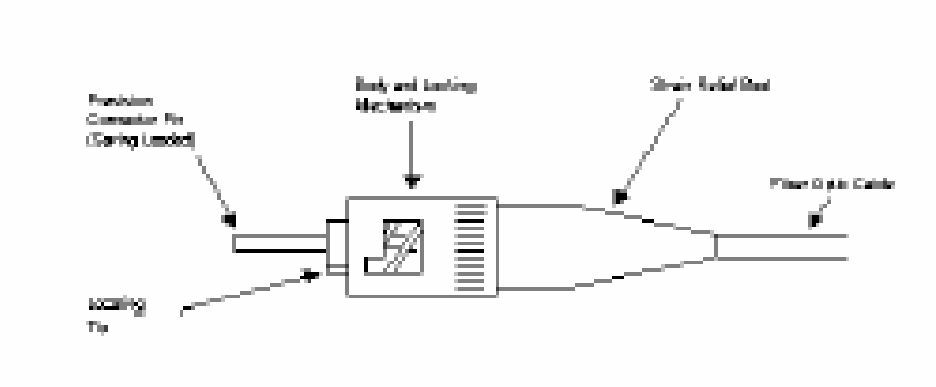

Figure 51: Fiber Optic ST Connectors

3.3.2.3 Fiber Cable Installation and Troubleshooting

Some customers are qualified to plan and install their own fiber optic networks. If your company does not have qualified staff to install fiber media you will need to contract a specialist. **Fiber media installation should be certified,** so it is important to select a fiber optic installation specialist who can help you with cable selection and will perform the installation for you.

Once fiber cable is installed, check fiber cable sections for power loss. This is accomplished with an optical power meter to verify attenuation. Optical power source meters transmit a light source at one end of the cable with an optical power meter at the end of the cable. The attenuation or power from the power meter can be read to confirm the attenuation of the fiber section being tested. The Phoenix digital fiber modems used in MODEL 10K have a built in power meter feature. Consult the Phoenix instruction manual for details.

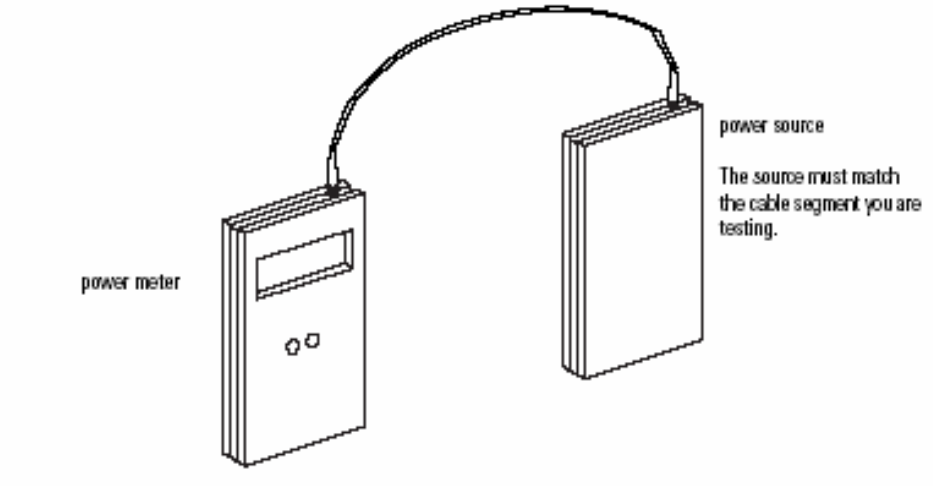

Figure 52: Fiber Optic Cable Attenuation Measurement

The attenuation tables for both Single Mode and Multimode fiber optic communications are as follows:

Parameter	Test Condition	Sym.	Minimum	Maximum	Units
Fiber Coupled Power	62.5/125 micron Graded .28NA	Poc	50/-13.0		microwatts/dBm
Wavelength		λp	1290	1350	Nm
Spectral Width		λw		160	Nm

Table 18: Electro-Optical Characteristics (Multimode 1300nm)

Parameter	Test Condition	Sym.	Minimum	Maximum	Units
Fiber Coupled Power	9/125 micron	Poc	16/-18.0		microwatts/dBm
Wavelength		λp	1270	1340	Nm
Spectral Width		λw	70	90	Nm

Table 19: Electro-Optical Characteristics (Single Mode 1300nm)

4.0 Operation

4.1 Initial Startup of MODEL 10K Local Panel

The MODEL 10K integrated fire and gas detection system should be installed in accordance with the requirements of NFPA 70 (National Electric Code) and NFPA 72 National Fire Alarm Code (2002)

4.1.1 Verification of Field Circuits

Before connecting power to any field circuits, field wiring should be verified against provided system drawings for the following:

- Proper wire gauge
- Correct field terminations for field devices
- Correct communication cable wiring

Gas Detectors Checklist:

- Verify power connection of +24 VDC and –24 VDC is in accordance with the drawings.

- Verify analog signal (4-20mA) output connection.
- Verify cable shield is cut and taped at detectors and only terminated to isolated ground bus inside the panel.

Typical MODEL 10K Gas Detector terminations for MSA's sensors should be as follows:

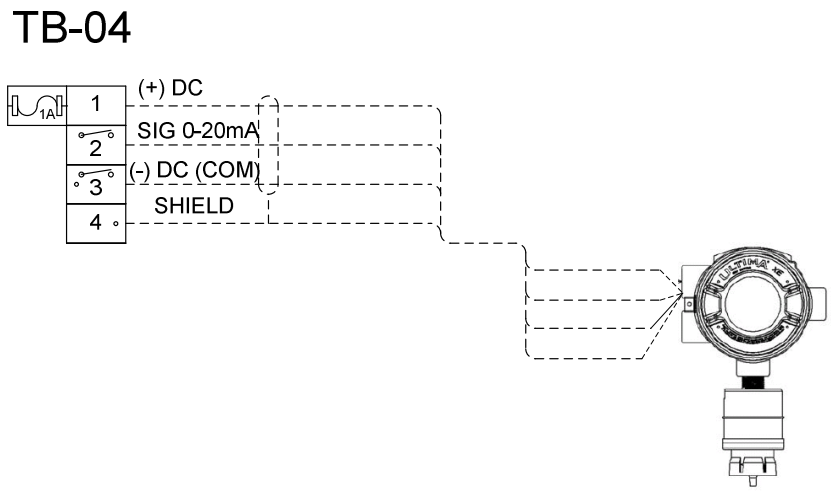

Figure 53: Field Termination of UltimaX

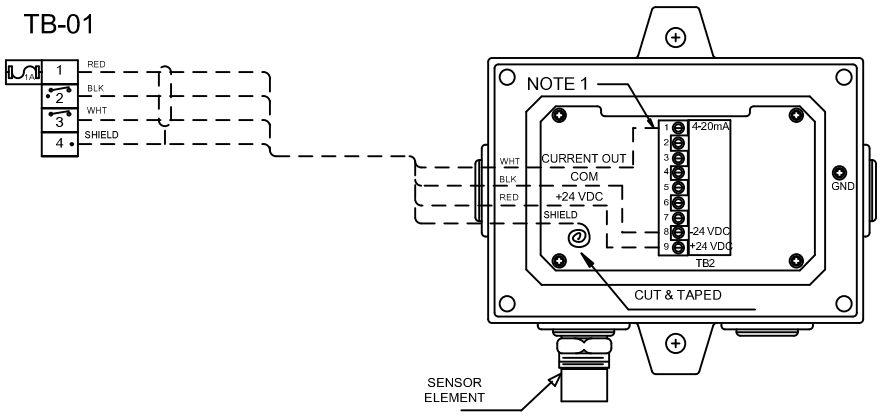

Figure 54: Field Termination of Ultima MOS-5

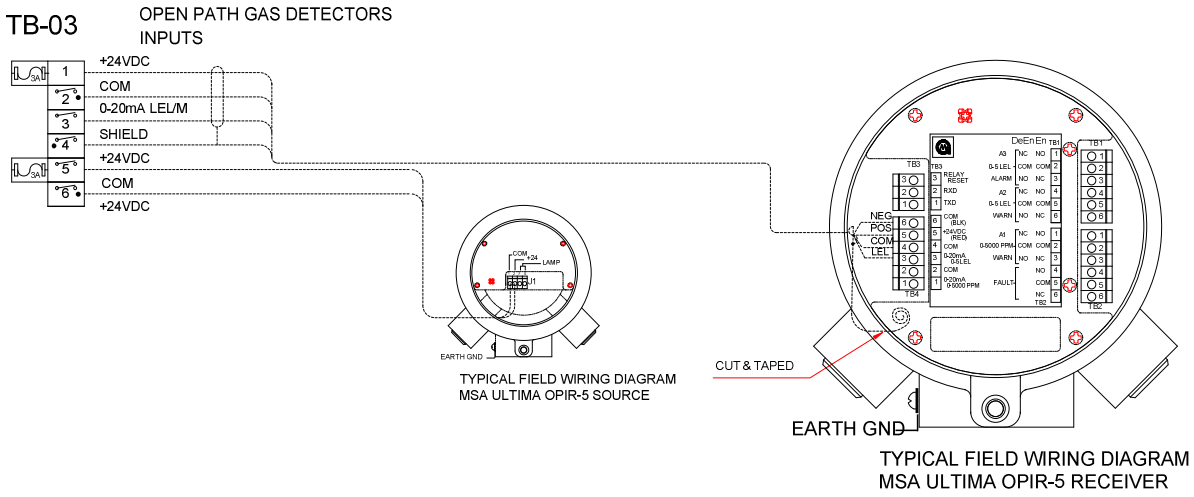

Figure 55: Field Termination Details for Ultima OPIR-5 Receiver and Source

Flame Detector Checklist:

- Verify power connection of +24 VDC and –24 VDC is in accordance with the drawings.
- Verify analog signal (4-20mA) output connection.
- Verify cable shield is cut and taped at detectors and only terminated to isolated ground buss inside the panel.
- Verify dipswitch settings on flame detector are correct (set for non-latching mode).

Typical MODEL 10K terminations for MSA Flame Detectors should be as follows:

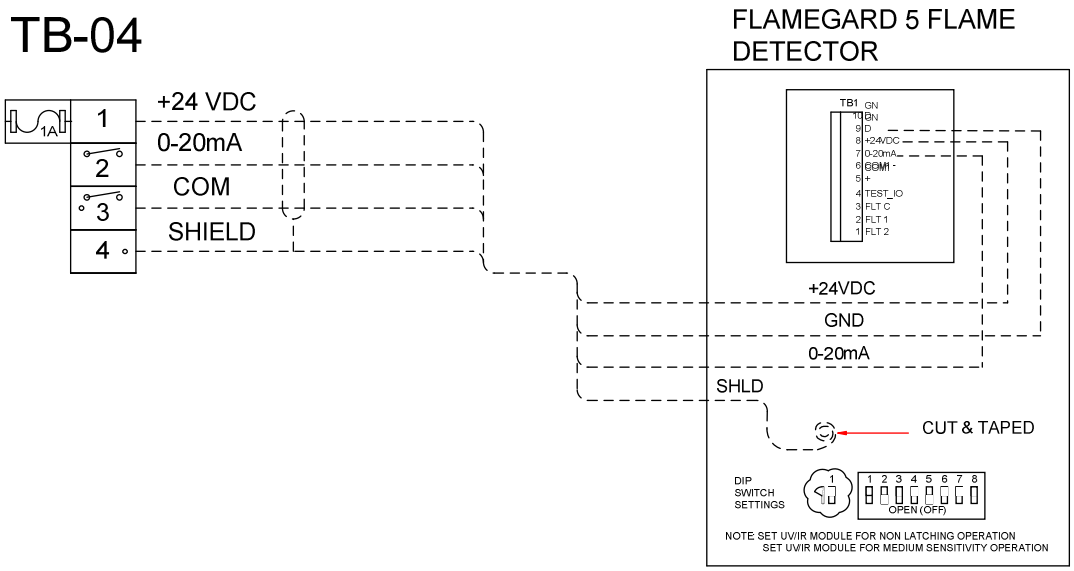

Figure 56: Field Termination Details for Flamegard 5 UV/IR

Smoke Detector Check List:

- Verify loop power connection of +24 VDC and –24 VDC according with drawings.

- Verify end of line resistor (EOL) is installed at the last device on the loop. Smoke Detector EOL is 5.6K Ohm, ½ watt.

Typical MODEL 10K terminations for smoke detectors should be as follows:

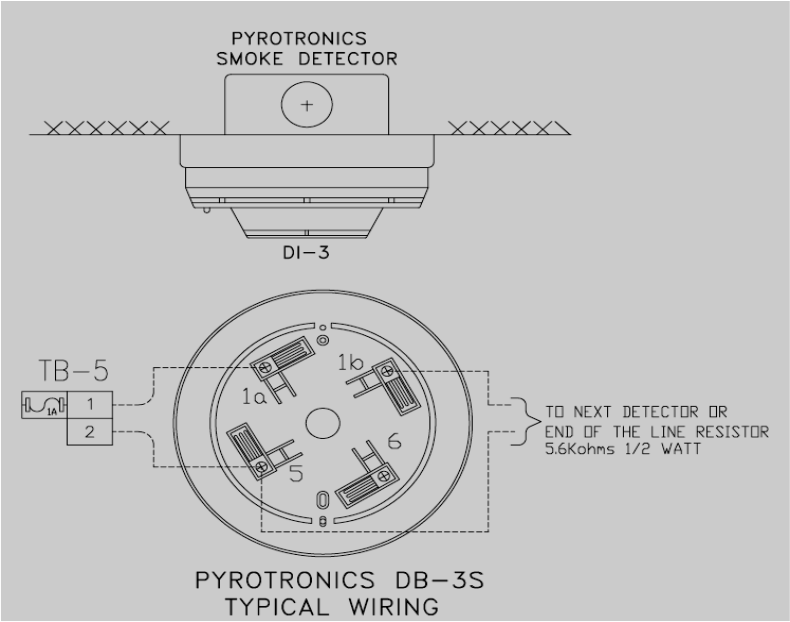

Figure 57: Termination Details for DI-3 Smoke Detector

Dry Contact Supervised Inputs Checklist:

- Check for correct installation of end of line resistor (EOL). Dry Contact Input EOL is 4.7K Ohm, ½ watt.
- Check for correct wiring connections according with drawings.

Typical MODEL 10K terminations for supervised dry contact inputs should be as follows:

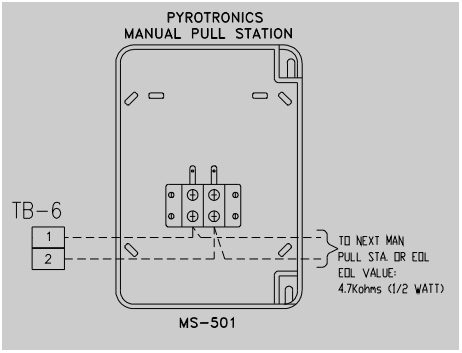

Figure 58: Termination Detail for Manual Fire Alarm Station

NAC Circuits Checklist:

- Verify horn and strobe light are polarized, if not, proper diode must be installed.
- Check for correct connection of +24 VDC and –24 VDC against drawings.
- Check for correct installation of end of line resistor (EOL). NAC EOL is 2.2K Ohm, ½ watt.

Solenoid Circuit Checklist:

- Verifying wiring and terminations against the project drawings.
- No EOL resistor is required for solenoid circuits.
- **Caution: Verify that solenoid valves are removed from any installed extinguishing equipment so accidental release/discharge of extinguishing equipment will not occur.**

4.1.2 Verification of Power Supply, Battery System and Power Wiring

Prior to application of system power, verify and check proper wire sizing and verify terminations for the power system and batteries are in accordance with the system drawings.

Verify all fused terminal blocks in TB-DC are open (i.e. no load feeding from power supply) before applying power up the power supply system.

Verify all jumpers and connections of the batteries to the power supply.

Energize the power supply by turning on the LaMarche chargers AC. breaker. Let the LaMarche charger run for approximately one (1) minute; then turn off Lamarche charger by disconnecting the AC breaker, and connect the remaining cables.

Again turn on the LaMarche power supply's AC breaker, wait until the display stabilizes; next, turn on the LaMarche DC breaker to start charging the batteries and feeding the load to the MODEL 10K panel.

Close the TB-DC fused terminal blocks, one at a time until the entire system is energized

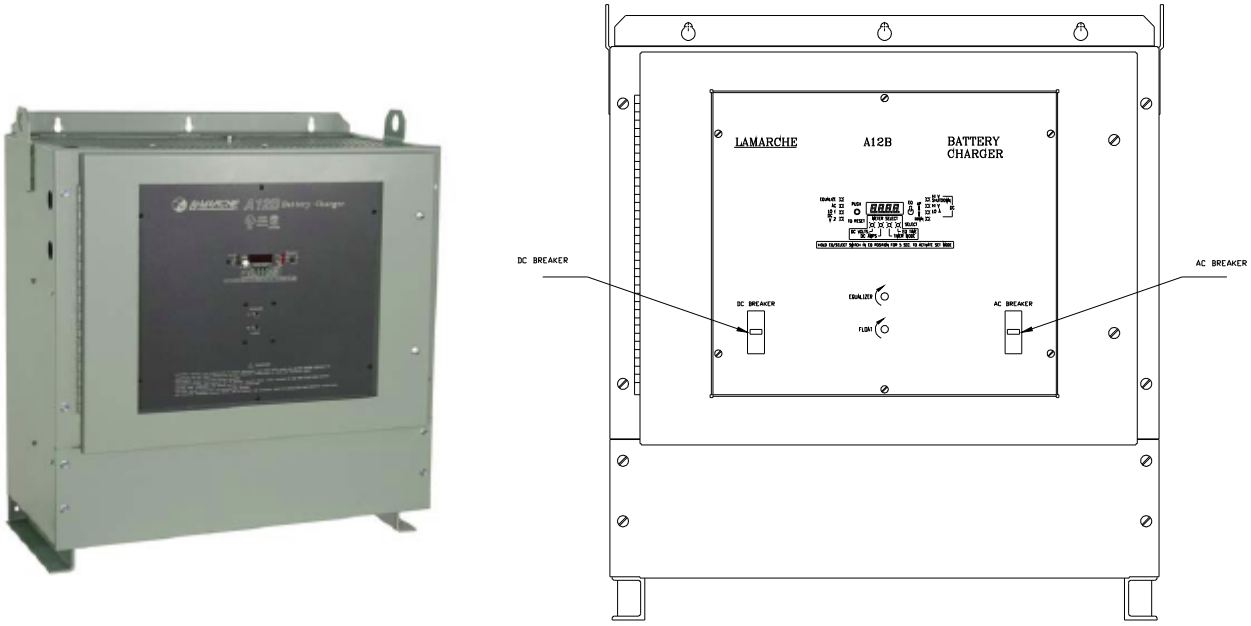

Figure 59: LaMarche Power Supply

4.1.3 Startup of Local MODEL 10K Panel Processor

Ensure the Contrologix PLC processor is in run mode. To start the PLC Processor, turn on the power switch of the Controlnet power supply (located in the power supply unit, on the left hand side of the PLC rack).

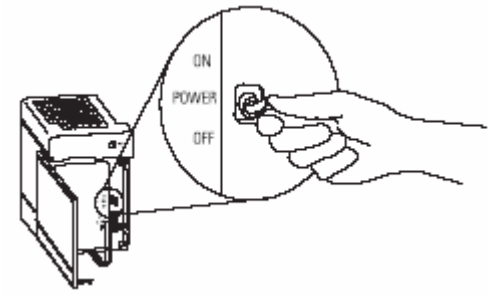

Figure 60: Power Switch for Contrologix PLC Chassis

4.1.4 Local HMI Startup, Configuration, and Testing

The MODEL 10K local touch screen display will be automatically start up and communicate with Controlnet Network by itself after proper power start up in Sections 4.1.2. and 4.1.3.

For other local touch screen adjustments like screen brightness, enable/disable screen saver, please see section 5.1 of this manual.

4.2 Initial Startup of MODEL 10K Central Station Equipment

4.2.1 Inspection and Startup of Network Communication Circuits

Verify correct connection of the coax cable between the back of computer to the Phoenix Stand-alone fiber optic converter (if using fiber network), or to the Controlnet CNBR module if using Controlnet coax network.

4.2.2 Inspection and Startup of Central Station Computer UPS

Verify the connections of the central station computer to its UPS, and correct connections of the UPS batteries. Turn on the central station UPS power.

On Battery Operation

The Smart-UPS switches to battery operation automatically if the utility power fails.
While running on battery, an alarm beeps four times every 30 seconds.
Press the button (front panel) to silence the UPS alarm (for the current alarm only. If the utility power does not return, the UPS continues to supply power to the connected equipment until the battery is exhausted.

4.2.3 Inspection and Startup of Central Station Computer

Verify all the cables are connected correctly between the CPU, Monitor, Keyboard, Mouse and Printer. Also verify that central station computer is properly connected to its dedicated UPS system. Next, turn on the power to the central station computer and monitor. The computer will automatically boot to the MODEL 10K HMI without any user action.

4.2.4 Initialization of Network Communications

After the Central Station Computer is started up, it should run the HMI package and start to establish communication with other nodes on the network automatically. This process of establishing network communication should take less than 5 minutes.

4.2.5 Synchronization of Real Time Clocks

MODEL 10K allows you to synchronize all real time clocks on your network. To accomplish this, enter the Communication Screen of the central station computer and set the current date and time. Once the current time and date are set in the central station, MODEL 10K will automatic synchronize all the nodes on the MODEL 10K network to the time and date you have entered. As part of its network diagnostics, the MODEL 10K central station computer will automatically synchronize all MODEL 10K panels on the network once a day with the correct time and date. Synchronization with a plant time server is possible using NTP (Network Time Protocol)—consult factory for details

4.3 Acceptance Testing of MODEL 10K Systems

All MODEL 10K Acceptance Testing is to be conducted in accordance with the requirements of NFPA 72 (2002) Chapter 10.

MODEL 10K systems are generally subjected to complete functional testing during the Factory Acceptance Testing (FAT) prior to shipment. A factory acceptance test report is issued containing a written testing procedure and testing matrices outlining the input and output functionality of the system being tested.

Once the MODEL 10K system is installed at the customer's location, Site Acceptance Testing is conducted. The SAT testing documentation includes a written testing and calibration procedure and cause-and-effect check sheet summarizing the functional performance of the fire and gas detection system.

4.3.1 Factory/Site Acceptance Testing

Both FAT and SAT testing include the verification of the delivered system against the following criteria

- Verify MODEL 10K panel mechanical arrangement against manufacturer's mechanical drawings. Verify panel dimensions, component contents, equipment locations and installation specifics against drawings
- Verify correct panel terminations of field devices against manufacturer's termination connection diagrams and panel wiring schematics.
- Verify correct field device is installed at each field location based on manufacturer's data sheets, devices specifications or related information
- Verify installation and field wiring details of field devices against manufacturer's mechanical and electrical drawings.
- Verify that physical location and tag numbers of field devices is in accordance with the device location drawings for the project.
- Verify that Local MODEL 10K Touchscreen graphics match sensor location drawings and actual field locations. Verify device tag numbers as shown on the local display match system field device location drawings.
- Verify that Central Station graphics displays match sensor location drawings and actual field locations. Verify device tag numbers as shown on the local display match system field device location drawings
- Verify proper function of field devices. Perform field calibration or adjust alarm set points if required.
- Verify relationship between cause and effect for various system sub-systems against the project Cause and Effect Matrices.

4.3.2 Qualifications of Testing Personnel

MODEL 10K installation and testing should be performed by qualified personnel with experience and/or factory training on General Monitor's fire alarm and gas detection equipment. Typical evidence of proper qualification shall be as outlined in NFPA 72 (2002) Section 4.3.2

4.3.3 Testing or Inspection Forms

MODEL 10K FAT and Site Acceptance testing documentation and records should be in accordance with the requirements of NFPA 72 (2002). A Test and Inspection document of the form shown in NFPA 72 (2002) figure 10.6.2.3 should be completed following site acceptance testing or any inspection and/or testing of the system. A sample of this form is contained in Appendix 1 to this manual

4.3.4 Testing and calibration equipment

Testing of MODEL 10K equipment shall be done with MSA recommended testing equipment. Use of testing equipment or calibration methods different from those recommended by MSA can result in equipment damage or improper operation.

4.4 Routine Operation of MODEL 10K Local Panel

4.4.1 User Levels and Password Administration

MODEL 10K maintains three password protected user levels:

Default User Level can access all MODEL 10K screens, but only to view and monitor the MODEL 10K system status. The default user cannot silence or reset the MODEL 10K system, and cannot change system parameters.

Operator User Level has all the functionality of the default user, with the additional capability to silence and reset the alarms on the MODEL 10K system.

Admin User Level is the highest-level authority for the MODEL 10K system. The Admin user is enabled to activate all functions in the MODEL 10K system including the following: changing the alarm set points, inhibiting channels, silence and reset of the system, shutdown of the MODEL 10K.

Upon start up of the MODEL 10K local touch screen, the display is always started with Default user level authorization.

The authorization level password distribution should be managed so that only appropriately trained and authorized persons have access to higher-level passwords.

The default passwords are as follows:

User Level	Password
Default	No Password Required
Operator	1111
Admin	9999

Table 20: Default Passwords

User defined passwords are available, but they must be implemented by the factory

MODEL 10K will prompt the user to log in at a higher user level if the function attempting to be accessed is not available to that user status. This login process is depicted below:

Figure 61: Panelview Login Screen

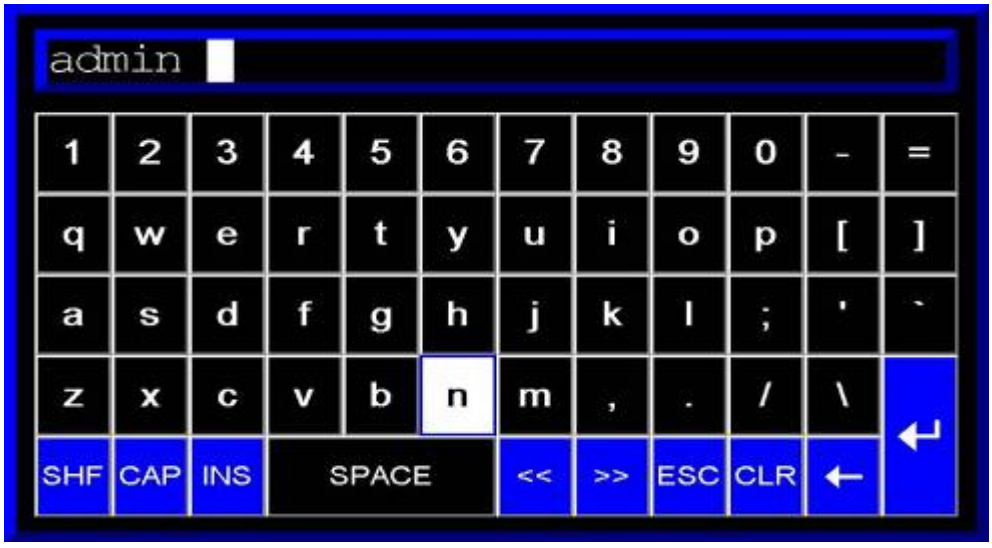

Figure 62: Panelview Keyboard for Login Operation

4.4.2 Local HMI Routine Use and Screens Navigation

The MODEL 10K Fire and Gas Alarm System utilizes a graphical user interface based on Allen Bradley Panelview Plus. The screen diagonal measurement is 10.4 inches and screen resolution is 640 x 480 pixels.

The Graphic User Interface (GUI) features a series of screens when are designed to allow the system user to easily determine the current status and alarm/fault status of the system.

MODEL 10K Local Panel Main Screen

The MODEL 10K Main Screen is designed in accordance with the Recommended Fire Service Interface standard, detailed in Appendix section A.10 of the NFPA 72 (2002) Standard. The requirements of the NFPA 72 Recommended Standard Fire Service Interface have been modified to allow incorporation of fire alarm and gas detectors alarms on the same main screen.

Any alarm or trouble condition on MODEL 10K will automatically bring the user back to the Main Display screen (Figure 49), where the user can access the condition and take appropriate action.

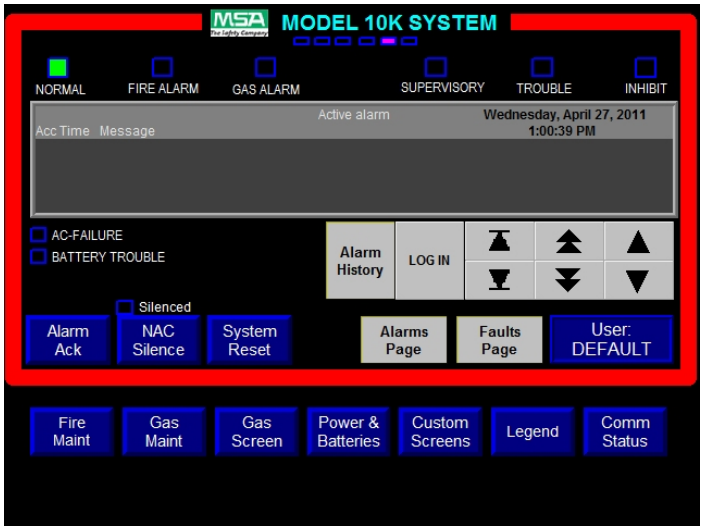

Figure 63: MODEL 10K Main Display Screen (Normal Status)

Communication Status Indicator

Just below the MODEL 10K Title text is a multiple segment indicator display made up of six (6) segments. This animated multiple indicator array indicates the communication status of the local Panelview Screen. If the communications are functioning normally then the segments will illuminate sequentially from left to right in a cyclic pattern. If the animation ceases then the communication between the PLC and GUI has interrupted.

Normal Indicator

The Normal Indicator light is a status indicator located below the communication status array and about the current alarm status window. The normal status of this indicator is green. In the event of any type of fire alarm, gas alarm, fault, supervisory, or inhibit status condition, this status indicator will be turned off.

Fire Alarm Indicator

The Fire Alarm indicator light is a status indicator located immediately to the right of the normal indicator. In the normal condition, this indicator lamp is off. In event of a fire alarm, this indicator is illuminated red. Once illuminated, this fire alarm indicator will remain activated until the fire alarm condition has cleared and the panel is reset

Gas Alarm Indicator

The Gas Alarm indicator light is a status indicator located immediately to the right of the Fire Alarm indicator. In normal condition, this indicator lamp is off. In the event of a high or high-high gas alarm this indicator is illuminated amber. High gas alarm signals are normally non-latching (ie will reset when the input condition returned to normal). High-high gas alarm conditions will normally be latching and can be reset using the panel-reset button only after the high-high gas alarm condition has cleared.

Supervisory Alarm Indicator

The Supervisory Alarm indicator is a status indicator located immediately to the right of the Gas Alarm Indicator. In normal condition, this indicator lamp is turned off. In the event of a Supervisory Alarm, this indicator light will be illuminated white. Supervisory Alarms are normally non-latching and will reset automatically when the supervisory alarm condition has cleared.

Trouble Status Indicator

The Trouble Status indicator is located immediately to the right of the Supervisory indicator and is activated (turns yellow) when the system has a trouble condition. Trouble conditions can be related to fire alarm devices, gas alarm devices, supervisory alarm devices, or panel trouble conditions, and are normally non-latching. This indicator will self-restore when the trouble condition is cleared

Inhibit Status Indicator

The Inhibit Status indicator is located immediately to the right of the Trouble Status indicator. The Inhibit status indicator will be illuminated light grey whenever an input device or output device for the system is placed in the Inhibit mode.

Active Alarm Status List

The Active Alarm Status List displays up to four current alarms, faults or inhibit conditions. The list displays accumulated time that the alarm condition has existed along with a 50 character alarm message identifying type of alarm, sensor tag number and senor location. This screen displays the 4 current alarms but the list can be scrolled using the scroll controls located to the right below the Active Alarm List area. A total of up to 500 alarms can be stacked in this list and scroll keys (located below list on right hand side) can be used to access any of the current status events.

AC Failure Indicator

The AC Failure indicator is located immediately below the Active Alarm list and is normally not illuminated. In the event of primary AC failure to the MODEL 10K Power Supply, the status indicator will illuminate red. The indication is to advise the operator that the AC power to the system has been interrupted and the MODEL 10K is running on its battery backup. This status

indication is non-latching and will self restore when AC power is restored to the LaMarche power supply

Battery Trouble Indicator

The Battery Trouble indicator is located immediately below the AC Failure indicator and is normally not illuminated. If backup batteries are not connected to the power supply for MODEL 10K or if there is a charging problem with the battery sub-system this indicator lamp will illuminate. The status indication is non-latching and will self restore when batteries are properly connected and charging normally.

Alarm History Button

The Alarm History Button is located immediately below the Active Alarm list block. This button will take user to the Alarm History Screen, detailing all past and current alarm conditions

Log In Button

The Log In Button brings up the login screen, which allows users to log in with their username and password. See Section 4.4.1 for more details about login functions.

Alarm Ack Button

The Alarm Acknowledge button will acknowledge receipt of any new alarm and silence the local sounder located at the MODEL 10K panel. Current alarms can also be acknowledged using the Acknowledge key built into the “pop-up” alarm banner located at the bottom of the Main MODEL 10K system display screen.

NAC Silence Button (Notification Appliance Circuit)

The NAC Silence button is used to silence field audible devices. MODEL 10K audible and visual devices are configured so that audible alarm devices can be silenced, but visual alarm devices remain active until the system is reset.

Access to the NAC Silence function is managed by MODEL 10K’s multi level user authority system (Section 4.4.1). Only MODEL 10K Operator level and Administrator level users have permission to silence the NAC circuits. The Default user is not permitted to silence NAC devices.

When NAC silence is activated, the audible devices for the system will be deactivated, but the visual signals will continue to run. A silenced indicator lamp will be illuminated directly above the NAC Silence button.

System Reset Button

The System Reset button is used to reset fire alarms and latching gas detection alarms.

Access to the System Reset function is managed by MODEL 10K’s multi level user authority system (Section 4.4.1). Only MODEL 10K Operator level and Administrator level users have permission to reset the panel. The Default user is not permitted to reset the panel.

If a fire or gas alarm field device is still in alarm (i.e.: gas is still present or a fire condition still exists) the reset button will not restore the panel to normal. Instead, the alarms will re-flash and will continue to be displayed on MODEL 10K display.

Alarms Page Button

The Alarms Page button takes user to the MODEL 10K Current Alarm Summary Screen, detailing all currently active alarm conditions

Faults Page Button

The Faults Page button takes user to the MODEL 10K Current Fault Summary Screen, detailing all currently active fault conditions

User Indicator

User Indicator will display the MODEL 10K Multi-level User Authority level currently enabled. The three possible levels are Default, Operator and Administrator (Section 4.4.1).

Miscellaneous Go-To Buttons

The bottom row of Touchscreen buttons (**Fire Maint**, **Gas Maint**, **Gas Screen**) are navigation keys to allow MODEL 10K user to access other system screens. Each of these screens is fitted with a **Home** button, which allows a user to return to the main screen at any time. Any new alarm will automatically switch back to the main screen.

Fire Device Maintenance Screen

The Fire Alarm Device Maintenance Screen provides the operator a tabular view of the alarm status of each of the fire alarm input devices or circuits in the MODEL 10K system. Each maintenance screen typically will display fault, alarm and inhibit status for (20) fire devices or circuits. This screen is fitted with **Next Page** and **Previous Page** buttons to allow navigation to multiple screens when sensor or circuit counts exceed 20.

The Fire Maintenance screen is fitted with a **Home** button, which immediately returns a user to the Main MODEL 10K Main GUI Screen.

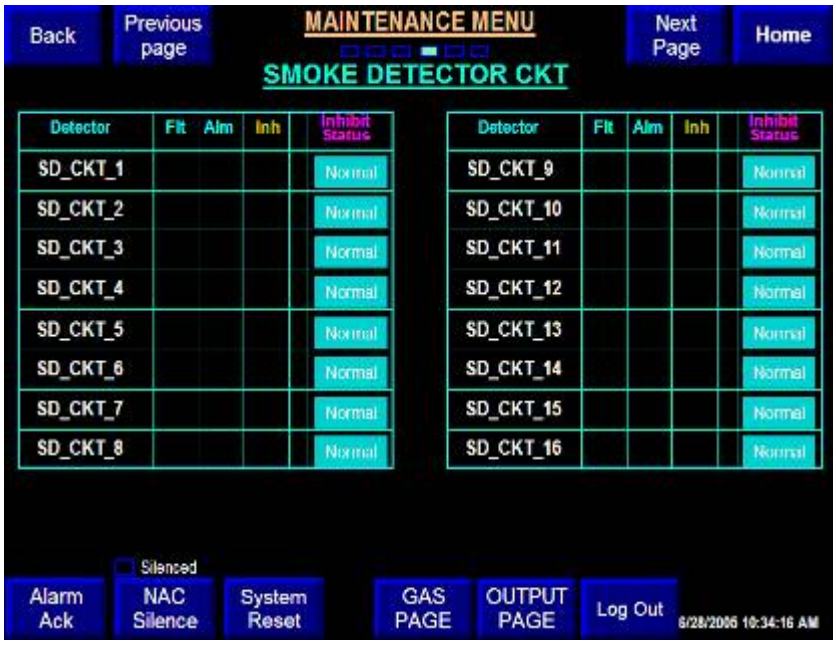

Figure 64: Fire Alarm Maintenance Screen

The Fire Maintenance screen is fitted with Alarm ACK, NAC Silence and System Reset buttons as found on the Main GUI Screen. The Fire Maint screens are also fitted with shortcut keys to Gas Maint screens and Supervised Output Maint Screens

The Fire Maintenance screen has individual circuit indicator lamps for fault condition, alarm condition and device (or circuit) inhibit. These indicator fields are normally not illuminated but illuminate to display current device/circuit status.

The **Normal** pushbuttons associated with each device/circuit are used to inhibit the operation of this device. Only users who have logged onto the MODEL 10K System with Administrator rights can inhibit devices or circuits (Section 4.4.1). Pushing the button for a device or circuit will toggle the device to Inhibit status. The Inhibit indicator will illuminate and the Normal pushbutton color will change from button text to Inhibit. This pushbutton is a toggle and can be switched back and forth from normal to inhibit.

When a device or circuit is inhibited the Inhibit Indicator illuminates on the Main GUI Screen and a text message is entered into the current fault alarm displays. This inhibit condition will persist until the inhibit condition is removed.

While a device or circuit is in Inhibit mode, MODEL 10K will not execute the normal control logic associated with that device or circuit. MODEL 10K will not record any alarms or fault conditions from that device/circuit. The Alarm and Fault status for an inhibited device/circuit will be displayed on the corresponding Maintenance Screen.

Special precautions must be taken to insure that when device inhibits are removed that the status of these devices is normal. If a device/circuit is in alarm mode while it is inhibited and the inhibit condition is removed, the normal alarm control action of this device will be immediately executed by MODEL 10K.

CAUTION: Careless operation of the Inhibit functionality of MODEL 10K can result in accidental equipment shutdown and even extinguishing system activation. You must be certain the device/circuit being removed from Inhibit status is operating in the normal or fault mode before removing the inhibit function on that device/circuit.

Gas Maintenance Screen

The Gas Maintenance Screen provides the operator a tabular view of the alarm status of each of the gas detectors connected to the MODEL 10K system. Each maintenance screen typically will display fault, alarm and inhibit status for 10 fire devices or circuits. This screen is fitted with **Next Page** and **Previous Page** buttons to allow navigation to multiple screens when sensor or circuit counts exceed 10. If several types of gas detectors (catalytic, IR, Open Path, Acoustic or Toxic Gas) are connected to MODEL 10K, separate screens will be provided for each type of device

The Gas Maintenance screen displays the current value of the gas detector reading and has alarm indications for fault, calibration mode, Hi alarm, Hi-Hi alarms, and inhibit status for the detector. The Gas Maintenance screen displays current alarm set points for the detector. These set point indicators are pushbuttons and when operated in Administrator mode allow the alarm set points to be changed to any of the allowable values provided in the system.

NOTE: FM standard prohibits Hi-Hi alarm set points above 60% LEL.

The MODEL 10K system does not allow Hi alarm set points to be adjusted above 30% LEL and Hi set points cannot be set above the set point for Hi-Hi alarms. If the user attempts to enter alarm set points outside of the acceptable values, the system will not accept the values and MODEL 10K will restore previous accepted alarm levels.

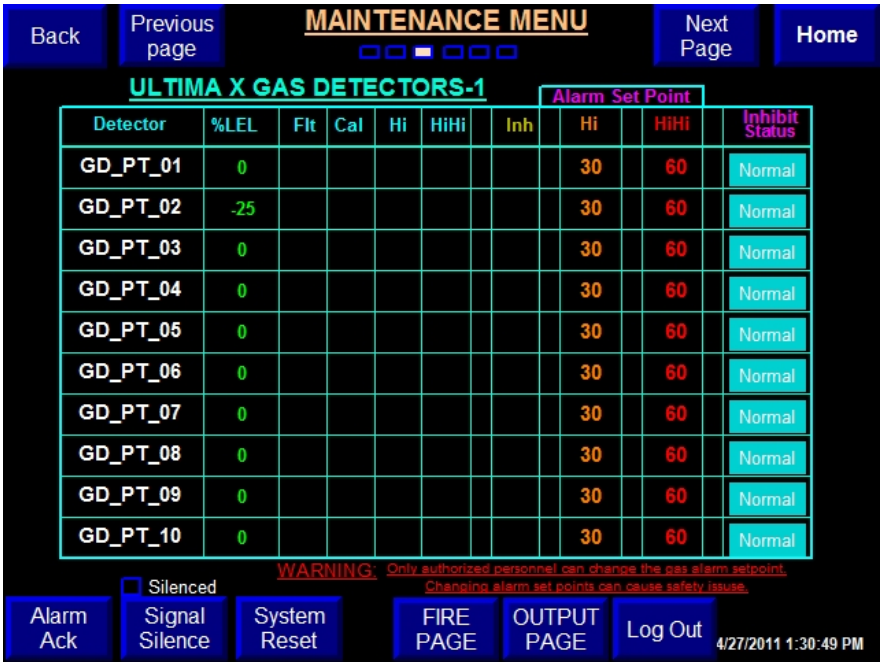

Figure 65: ULTIMA X Combustible Gas Maintenance Screen

The inhibit status indicator is a pushbutton, which will initiate inhibit function for the selected gas detector. Only users with Administrator rights can modify alarm set points or inhibit gas detector functions.

When a gas detector is inhibited the **Inh** indicator will illuminate and the automatic control actions of the detector will be disabled. The alarm status of the inhibited detector will be displayed on the Gas Maintenance screen but audible/visual devices will not be operated. When a gas detector is inhibited a warning message will be listed on the Main GUI Screen Alarm Summary List. This warning will persist until the gas detector inhibit is successfully removed.

Special Precautions must be taken to insure that when gas detector inhibits are removed that the status of the inhibited devices is normal. If a gas detector is in alarm mode while it is inhibited and the inhibit condition is subsequently removed --the normal alarm control action of this device will be immediately executed by MODEL 10K

Power and Battery Screen

The Power and Battery screen summarizes the MODEL 10K power distribution status.

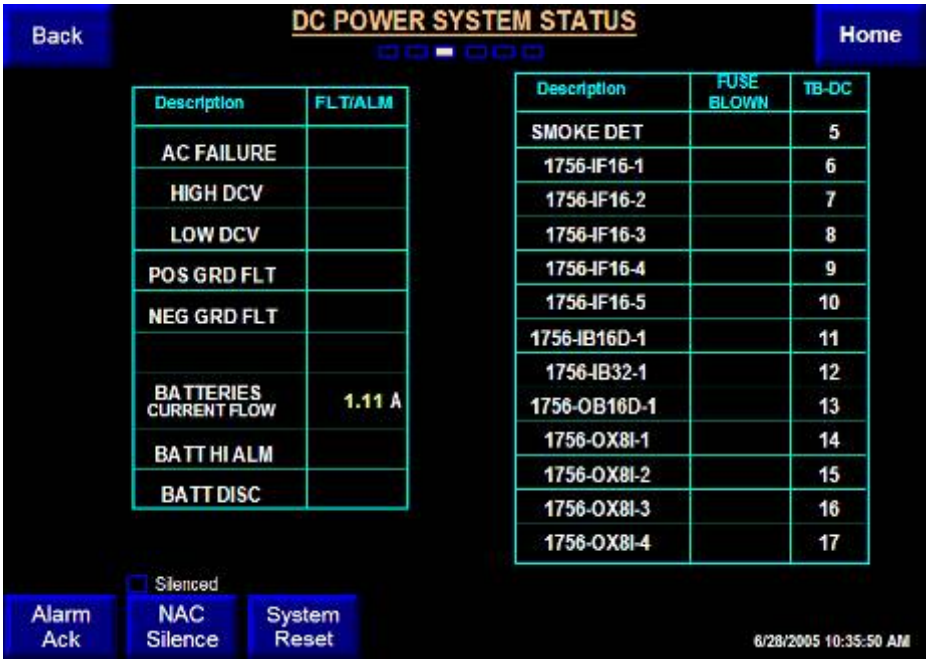

Figure 66: Power Supply and Power Distribution Monitoring Screen

MODEL 10K monitors for power failure in its power distribution system with a series of low voltage alarms, which can be activated by incoming power failure or any supervised power circuit failure.

Alarms for AC Failure to the power supply, high DC voltage from the power supply, low DC voltage from the power supply, positive ground fault, negative ground fault, battery high voltage alarm, and batteries disconnected alarms are displayed on this screen.

Legend Screen

The MODEL 10K Legend screen contains a legend displaying symbols used in the GUI package. The Legend Screen provides operator reference to the symbols and color conventions used in the Local Panel GUI.

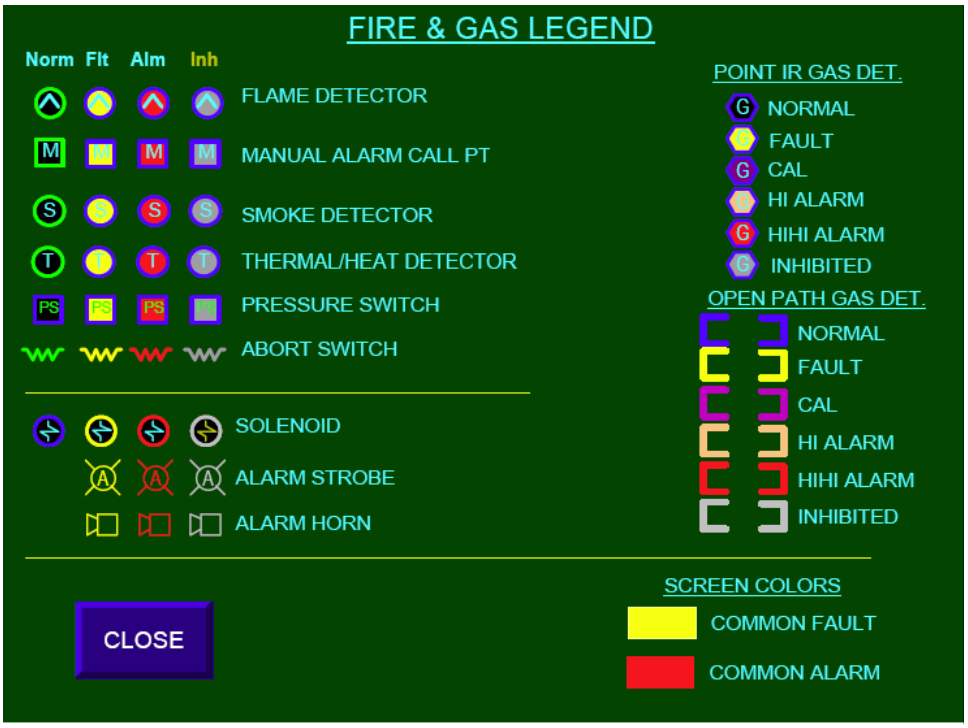

Figure 67: Display Legend Screen

To exit the help screen simply touch anywhere on the screen to return to the Main GUI Screen.

Alarm History Screen

The MODEL 10K Alarm History Screen keeps a log of all alarms, faults and inhibits (fire or gas) recorded by the MODEL 10K system. These events can be sorted by alarm time, or tag number by toggling the sort alarms button on the screen. The Alarm History screen memory has the capability to log up to 500 events.

Figure 68: Alarm History Screen

Current Alarms Screen

The Current Alarms screen provides a list of all alarms that are currently active in the MODEL 10K system. When an alarm condition is no longer active (has been reset) then it will no longer show in the Current Alarms Page. The Current Alarms can be sorted by alarm time, or tag number by toggling the sort alarms button on the screen.

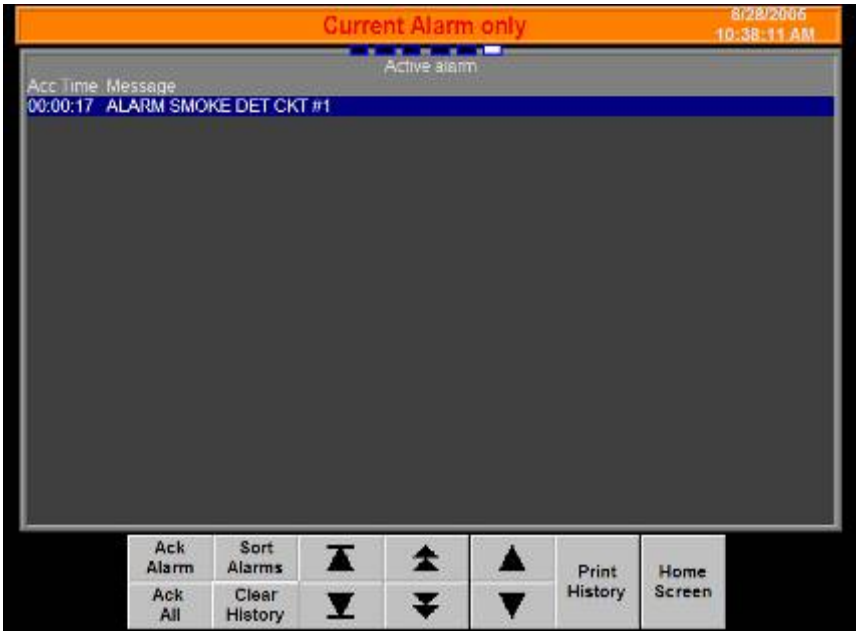

Figure 69: Current Alarm Summary Screen

Current Fault Screen

The Current Fault screen displays all currently active fault conditions in the MODEL 10K system. Since fault conditions are non-latching, MODEL 10K will not require an acknowledgement or reset when a fault condition is cleared. The Current Fault can be sorted by alarm time, or tag number by toggling the sort alarms button on the screen.

Figure 70: Current Fault Summary Screen

Custom Plot Plan Displays

MODEL 10K can support custom plot plan displays specific to your facility. These displays allow you to easily locate and identify detectors that are in alarm or fault. These plot plan displays graphically depict your facility and have all flame detectors, gas detectors, fire detection devices, horns and strobes located on the plot plan. Plot plans show current status of each device, including tag numbers and current gas detector readings.

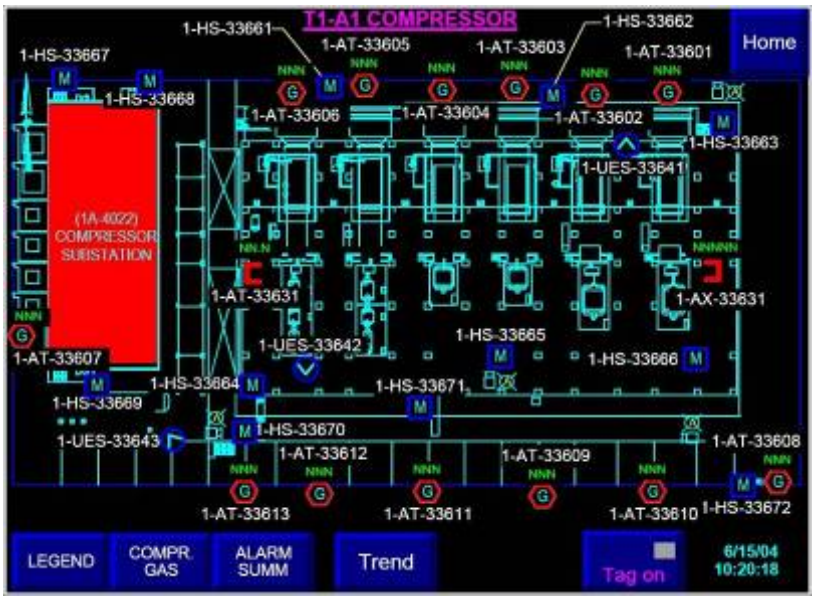

Figure 71: Sample Plot Plan Graphic Screen

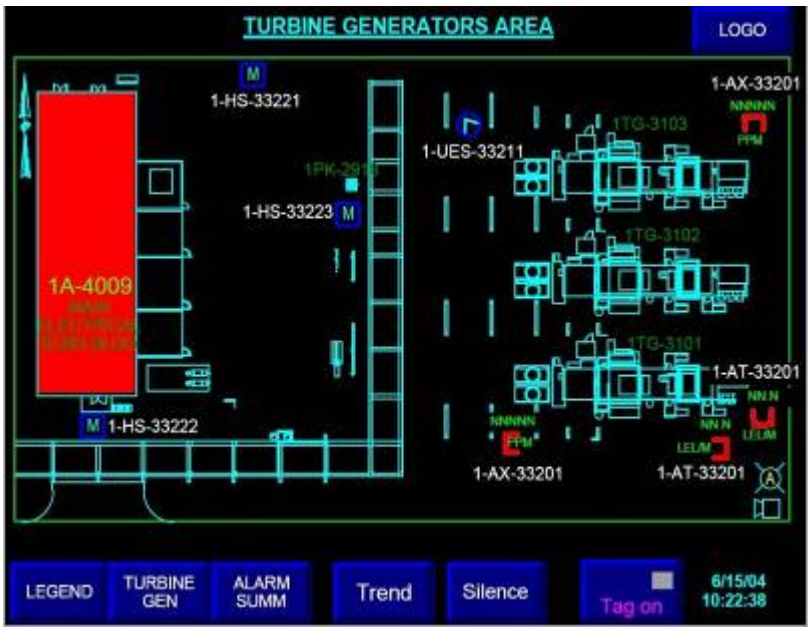

Figure 72: Detailed Plot Plan Graphic Screen

4.4.3 Local Alarms—Operator Actions—Silence and Reset

Any new alarms coming into MODEL 10K will display on the Main Display screen. An alarm banner will also display at the bottom of screen. Users with Operator authority or a level higher can perform the following functions:

- **Acknowledge** the alarm by pressing the “Alarm Ack” button. When the alarm is acknowledged, the alarm banner will disappear and the local sounder will be silenced,

but alarm message will be still display on the Main Display screen and Alarms page screen.

- **Silence the Audible Alarms** by pressing “NAC Silence” button to silence all the alarm horns in the field.

- **System Reset** by pressing the “System Reset” button all the alarm messages will be cleared for those devices that have returned to normal state provided there are no active alarm conditions. Any active alarm conditions will “re-flash” if system reset is attempted without clearing alarm conditions present. System reset will also de-energize all warning strobe lights if no further alarms are active on the MODEL 10K.

4.4.4 Local Fault Conditions—Operator Actions

Any new fault condition registered into MODEL 10K will display on the Main Display screen. An alarm banner will also display at the bottom of screen. Users with Operator authority or higher can acknowledge the fault by pressing the “Alarm Ack” button. When the fault is acknowledged, the Alarm banner will disappear, but the fault message will still be displayed on the Main Display screen and Faults page screen. All fault signals are non-latching, so the fault message will clear by itself when the fault condition is cleared.

4.4.5 Diagnosing and Handling of Power Related Faults

The system monitors status of power supply/charger and all the critical DC fused terminal blocks. If a fault should occur, it will display in the “Power & Batteries” screen shown below:

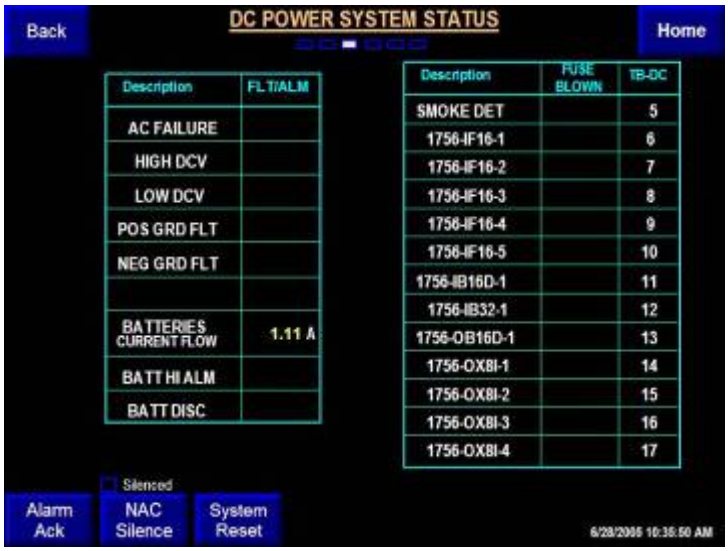

Figure 73: Power Monitoring Screen

If MODEL 10K indicates there is a fault on the LaMarche Power Charger, confirm the connections with the charger against the system drawings and the LaMarche installation manual.

If a critical DC distribution fuse is blown, MODEL 10K will indicate which TB-DC fused terminal block number is blown and the electronics module it is feeding. Refer to the system electrical schematic drawings for further details as to which circuits/devices are supplied from a fuse.

4.4.6 Changing Set Points for Gas Detectors

MODEL 10K allows a user with "**Admin**" user level, privileges to change the alarm set points for any gas detectors.

This is accomplished by entering the Gas Maintenance screen (below). The Gas Maintenance Screen displays current alarm set points for the detector. These set point indicators are pushbuttons and when pressed in Administrator mode, allow the alarm set points to be changed to any of the allowable values provided in the system.

NOTE: FM standard prohibits Hi-Hi alarm set points above 60% LEL.

The MODEL 10K system does not allow Hi alarm set points to be adjusted above 30 % LEL and Hi set points cannot be set above the set point for Hi Hi. If the user attempts to enter alarm set points outside of the acceptable values the system will not accept the values and MODEL 10K will restore for previous alarm levels.

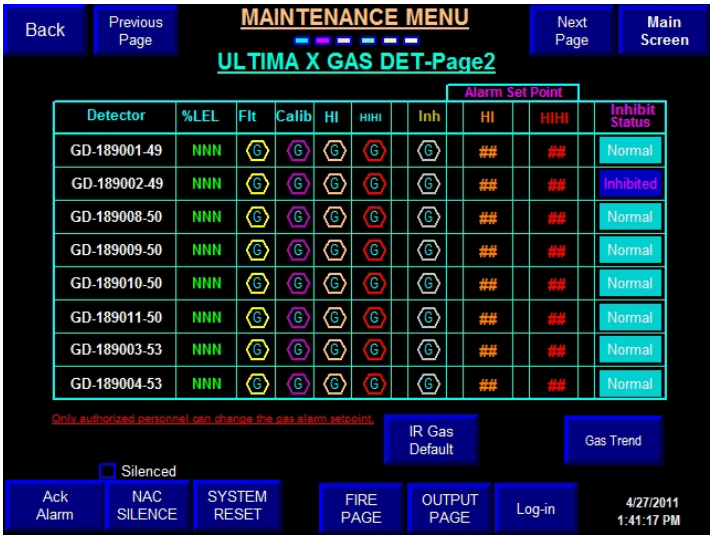

Figure 74: Gas Detector Maintenance Screen

4.4.7 Changing Releasing System Parameters

Users with "Admin" user level authority can change gaseous Extinguishing and Releasing Systems parameters. The two parameters that can be changed are the pre-discharge delay time, and the soak time. These are located in the Maintenance menu for Solenoid circuits (Figure 59).

Figure 75: Special Hazards Releasing Parameters Screen

The pre-discharge delay is adjusted by pressing the value in the delay box. The number of milliseconds required as a pre-discharge delay is then keyed in before the releasing solenoids are released. All times are shown in milliseconds; so if a 30 second pre-discharge delay is desired, enter 30,000 milliseconds.

The soak timer can be adjusted by pressing the value located in the soak box. All times are shown in milliseconds, so if a 10-minute/600 second soak time is needed, enter 600,000 milliseconds.

4.4.8 Invoking Device Inhibit Functions

MODEL 10K has the capability to allow the user to inhibit any flame detector, gas detector, supervised input circuits (smoke, thermals, MCP's), NAC circuit (audible/visual) or solenoid circuits it controls. All inhibit functions require "**Admin**" user level authority.

To inhibit a device, simply press the inhibit status button associated with the device form any maintenance screen. This will change the inhibit status from "Normal" to "Inhibit" and a message will display to confirm which device is currently inhibited.

NOTE: **While a device or circuit is in Inhibit mode, MODEL 10K will not execute the normal control logic associated with that device or circuit.**

MODEL 10K will not record any alarms or fault conditions associated with that device/circuit while the circuit is inhibited.

Special precautions must be taken to insure that before device inhibits are removed that the status of these devices is normal. If a device/circuit is in alarm status while it is inhibited and the inhibit condition is removed the normal alarm control action of this device will be immediately executed by MODEL 10K.

CAUTION: Careless operation of the Inhibit functionality of MODEL 10K can result in accidental equipment shutdown and even extinguishing system activation. You must be certain the device/circuit being removed from Inhibit status is operating in the normal or fault mode before removing the inhibit on that device/circuit.

4.5 Routine Operation of MODEL 10K Central Station Panel

The MODEL 10K Central Station panel is an industrially hardened PC certified to the UL864 standard for computing equipment to be used in Fire Alarm Monitoring Service.

The Computer Workstation consists of a computer fitted with a Controlnet interface adapter, a Touchscreen 19" TFT Monitor, mouse, keyboard and alarm printer.

4.5.1 User Levels and Password Administration

MODEL 10K System Central Station Workstation and HMI software has multiple layers of password protection.

- The first layer of password protection protects the Windows XP Pro operating system, programs and files. The administrator name and password for the operating system will be factory defined at time of system shipment and will be permanently stored in the GMS project records.

  The computer administrator account is intended for someone who can make system-wide changes to the computer, install programs, and access all files on the computer. Only a user with computer administrator account has full access to other user accounts on the computer. This user:

  1.0 Can create and delete user accounts on the computer
  2.0 Can create account passwords for other user accounts on the computer
  3.0 Can change other people's account names, pictures, passwords and account types.
  4.0 Cannot change his or her own account type to a limited account type unless there is at least one other user with computer administrator account type on the computer.

  The computer administrator name and password can be changed in accordance with the password modification procedures contained in Windows XP Pro.

We highly recommend that the computer administrator account and password not be used for routine system operation of the MODEL 10K system. We recommend that if required administrator rights be extended to a new user with a new password for routine plant use.

- The second layer of password protection is contained in the Allen Bradley RSView32 program. Two user levels are defined:

  1. Default user requires no password. Default user can access all screens and in the MODEL 10K system and silence local audible device associated with the workstation only. Field audible and visual devices cannot generally be silenced from the Central Station HMI

2. HMI Administrator User Password (different from computer administrator password) is required to exit the normal monitoring mode of the HMI Computer for software modification and system maintenance.

- The third layer of password protection is contained in Allen Bradley Contrologix processor. The application software for MODEL 10K is developed using the Rockwell Software RSLogix 5000. This software package is capable of password lock and a copy of RSLogix 5000 is required to access and/or modify the application software.

  The PLC application software (some times referred to as the "ladder logic") is the part of the system programming which determines the functionality of the MODEL 10K system.

  Programming of the PLC logic establishes the fundamental safety logic embedded in the MODEL 10K design. Unauthorized changes to this software are not permitted.

  If a MODEL 10K logic change is desired please consult with MSA and we will arrange to review and implement the desired changes provided they are compliant with the requirements of NFPA 72 and consistent with good engineering practice.

  If the MODEL 10K owner needs to have the in-house capability to change the MODEL 10K PLC programming the MSA can arrange factory training and programming personnel certification.

- A fourth layer of password protection is contained in the RSView Studio HMI package. The program supports password protection to prevent unauthorized changes to the graphic/HMI software. Modification of this application software package requires a copy of RSView Studio.

  Programming of the HMI interface establishes the fundamental safety mechanisms and procedures imbedded in the MODEL 10K design. Unauthorized changes to this software are not allowed.

  If a MODEL 10K HMI display changes or reconfiguration is desired please consult with MSA and we will arrange to review and implement the desired changes provided they are compliant with the requirements of NFPA 72 and consistent with good engineering practice.

  If the MODEL 10K owner needs to have the in-house capability to change the MODEL 10K HMI programming the MSA can arrange factory training and programming personnel certification.

4.5.2 Central HMI Routine Use and Screens Navigation

The Central Station as delivered will automatically boot to the MODEL 10K runtime package with the initial introduction screen as shown below:

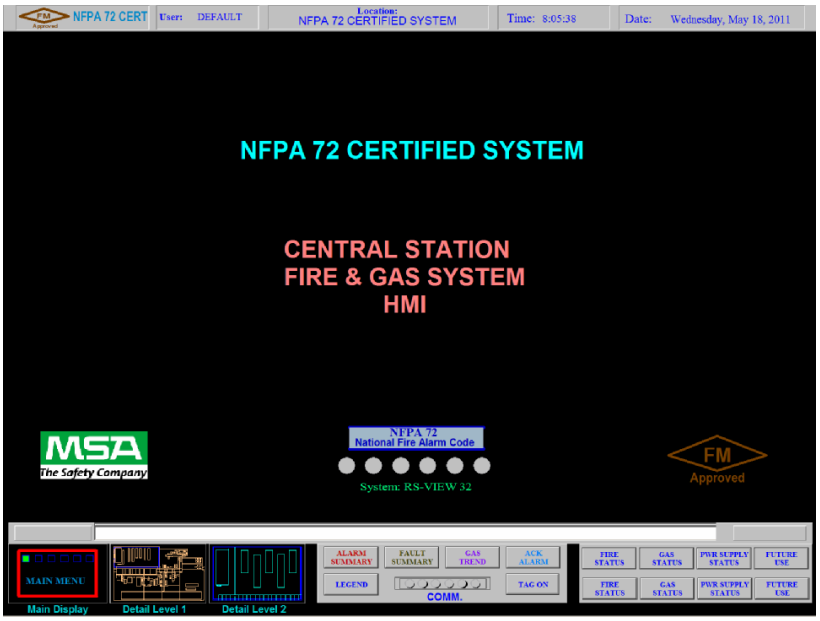

Figure 76: Central Station HMI Main Introduction Screen

When the operator touches any location on this screen is routed automatically to the home screen for a typical Central Station system shown below

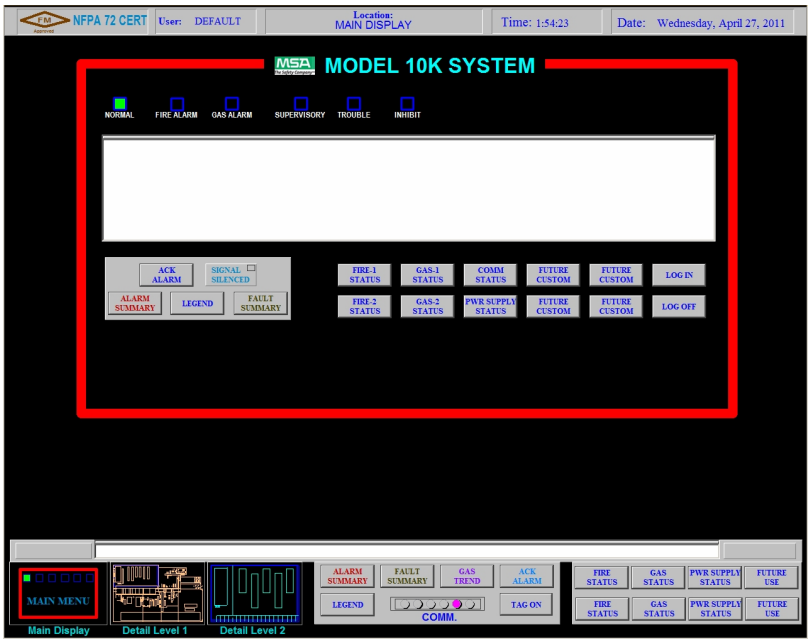

Figure 77: Central Station HMI Main Screen

The Main Screen (or home) screen for the MODEL 10K Central Station is designed in accordance with the Recommended Fire Service Interface standard detailed in Appendix section A.10 of the NFPA 72 (2002) Standard.

The requirements of the NFPA 72 Recommended Standard Fire Service Interface have been modified to allow incorporation of fire alarm and gas detectors alarms on the same main screen.

Any alarm or trouble condition on MODEL 10K will automatically bring the user back to the Main Display screen (below), where the user can access the condition and take appropriate action.

The MODEL 10K main user screen has a variety of “hot keys” which allow direct access to the HMI sub-screens. Also included on the HMI main screen is a series of pushbuttons to:

- Display or suppress device tags from sensor location screens
- Access the Alarm Summary Screen
- Access the Fault Summary Screen
- Access the device legend screen
- Silence local audible devices (field located devices must be silenced from the appropriate local MODEL 10K panel.
- Monitor the communication status of the network

The Lower left section of the Main HMI Screen provide a group of screen navigation short cut screens to facilitate access to the “Plot Plan Graphics” section of the HMI package.

Plot Plan Graphic screens are a graphical view of the protected facility environment with the sensor locations, sensor tag and sensor status shown on the screen.

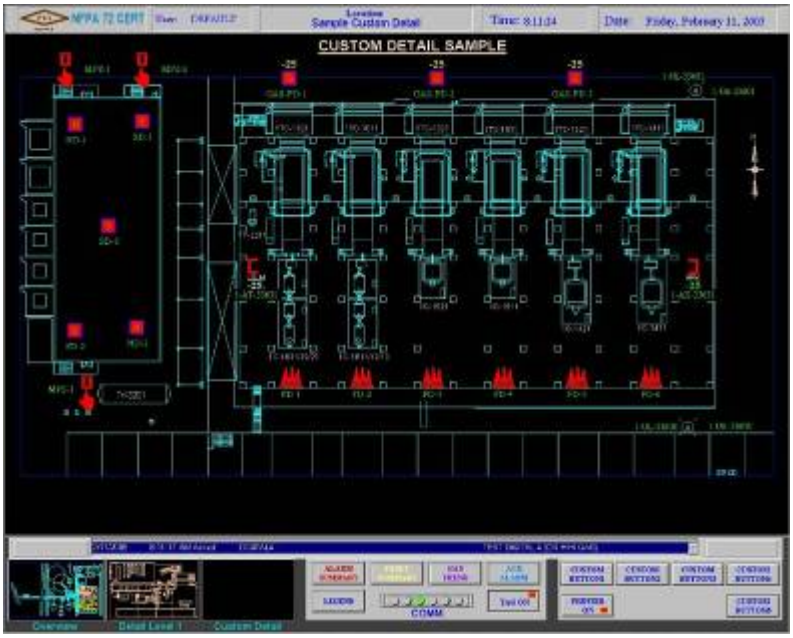

Figure 78: Central Station Plot Plan Graphic Screen

In the case of discrete alarms for example manual fire alarm stations and thermal detectors the graphic symbol changes color in alarm or fault. In the case of analog

devices such as combustible gas detectors and toxic gas detection the device reading is displayed and the graphic symbol changes color with device alarm status

Exiting from any graphical display screen can be done using the touchkey returns the user to the Main HMI Screen.

Selection of the touch key located in the lower middle of the screen will take user to the communication status screen:

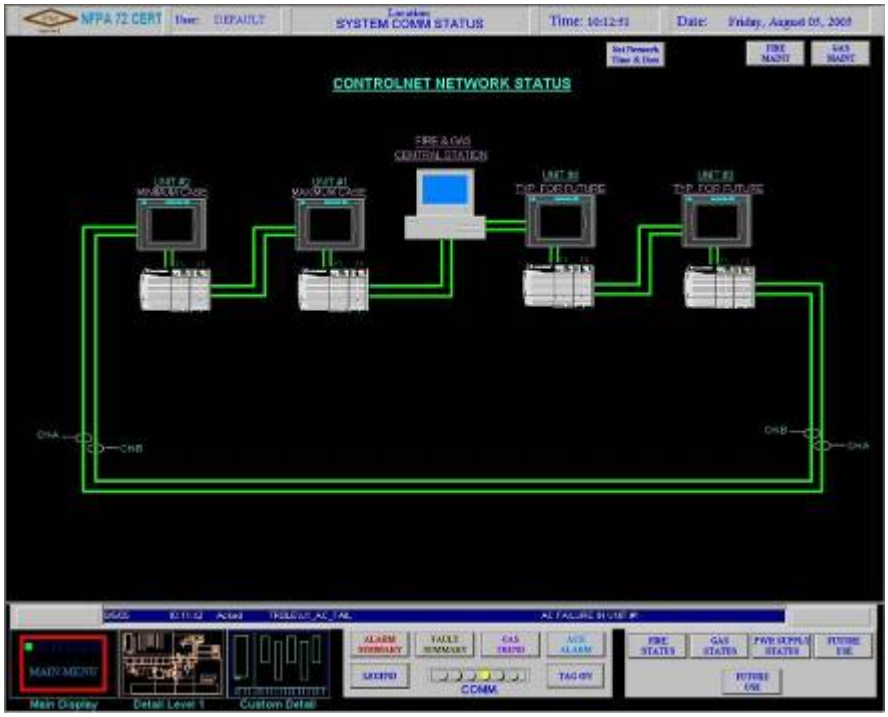

Figure 79: Controlnet Communication Screen

The communication status screen depicts the status of the network connecting the local fire and gas alarm panels to the central station HMI. In the event a communication fault develops in the network the segment of the normally green network connections between the affected nodes will turn red. The Communication Status Screen displays information that can be used by the Central Station operator to direct the repair effort to restore normal network communications.

To exit from communication status screen use the touch key returning user to the Main HMI Screen.

Selection of the Alarm Summary Key in the lower middle section of the main screen will take the user to the Alarm Summary Screen

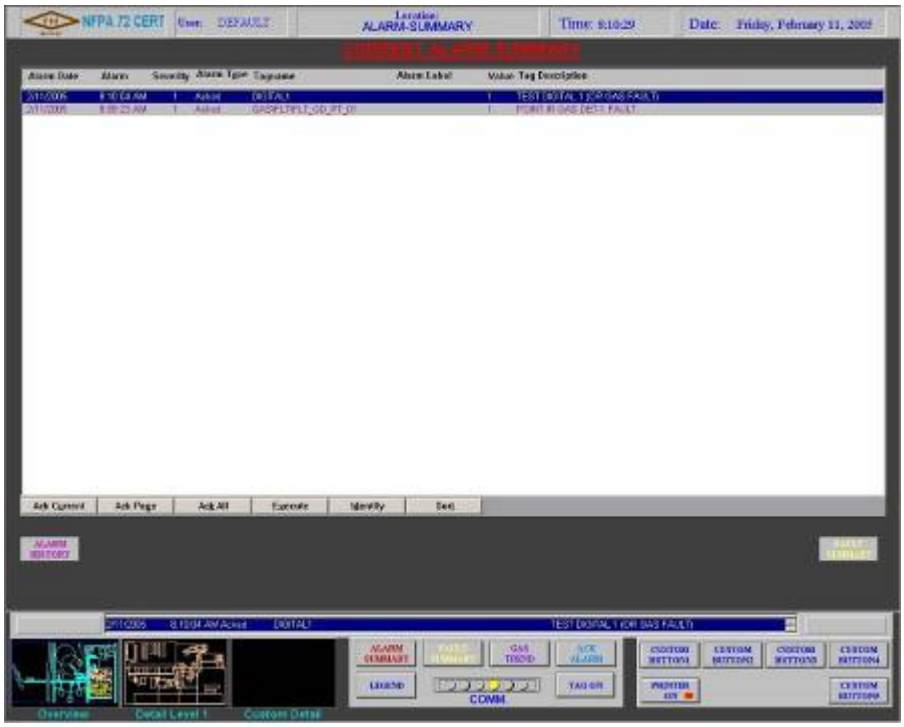

Figure 80: Central Station HMI Current Alarm Summary Screen

The current alarm summary screen lists all current alarm conditions associated with any of the MODEL 10K local fire and gas alarm panels or the associated network communication system connected to the Central Station Computer HMI.

Alarms are identified with alarm date, time, alarm tag identifier and a text description of the alarm condition and location. Fault conditions are not displayed on the Current Alarm Summary Screen. When alarms are reset the automatically are deleted from the Current Alarm Summary Screen

The Alarm Summary Screen has two go to pushbuttons-an Alarm History button on the left and a Fault Summary button on the right.

Selection of the Alarm History button in the lower left takes the user to the Alarm History Screen

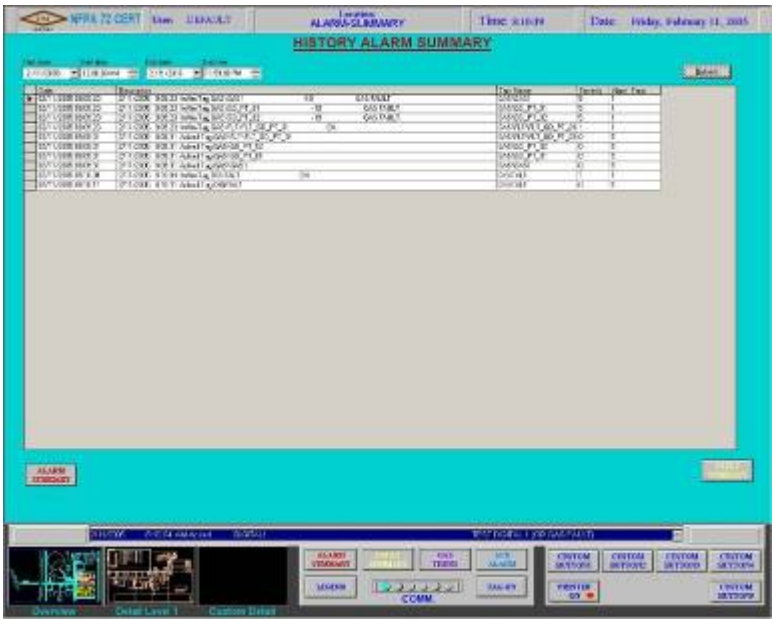

Figure 81: Central Station HMI Alarm History Screen

The Alarm History screen allows the HMI user to sort and examine the history during any user selected time period in the past. This screen is useful for analyzing alarm incidents in the past and/or problems with individual devices. The alarm history screen data can be sorted by date, time, description or tag number for easy analysis of system performance.

The lower right hand pushbutton located on Alarm History screen takes the user to the Current Fault Summary Screen.

Figure 82: Central Station HMI Fault Summary Screen

The current fault summary screen lists all current fault conditions associated with any of the MODEL 10K local fire and gas alarm panels or the associated network communication system connected to the Central Station Computer HMI.

Faults are identified with fault date, time, fault tag identifier and a text description of the fault condition and location. Alarm conditions are not displayed on the Current Fault Summary Screen. When fault conditions are cleared the fault status is automatically restored to normal and are deleted from the Current Fault Summary screen

4.5.3 Local Alarms—Operator Actions

All system alarm conditions will sound the local HMI sounder. The alarm condition can be acknowledged and the HMI audible device can be silenced using the appropriate HMI screen silence pushbutton or keyboard ESC key. Generally the field located NAC (alarm notification appliances) cannot be silenced from the HMI.

Please note that HMI operator can observe alarm conditions from all local MODEL 10K panels but the HMI operator cannot remotely reset MODEL 10K panel alarms, or remotely silence field located audible/ visual devices or remotely silence local panel audible devices. In most cases an alarm condition must be reset at the local panel associated with the alarm. Remote reset of alarm conditions from the HMI is not provided for in a NFPA 72 compliant system.

The HMI screens associated with an alarm including alarm summary and graphic display screens are always available to the HMI operator. HMI Operator may not exit the HMI Monitoring program without appropriate HMI administrator rights.

4.5.4 Local Fault Conditions—Operator Actions

All system fault conditions will sound the local HMI sounder. The fault condition can be acknowledged and the HMI audible device can be silenced using the appropriate HMI screen silence pushbutton or keyboard ESC key.

Please note that HMI operator can observe fault conditions from all local MODEL 10K panels but HMI operator cannot reset remote MODEL 10K panel alarms or faults. Most fault conditions are designed to be self-restoring (no reset required) and will clear automatically on correction of the fault initiating condition

HMI screens associated with the fault conditions including, fault summary, communication diagnostic and graphic display screens are always available to the HMI operator. HMI Operator may not exit the HMI Monitoring program without appropriate HMI administrator rights.

4.5.5 Diagnosing and Handling of Power-Related Faults

MODEL 10K has an extensive set of internal power monitoring capabilities.

Status of the LaMarche Power supply and the associated is shown on the Central Station MODEL 10K Power Monitoring screen associated with the Local Panel affected. Individual

alarm indicators are provided for AC power fail, DC Voltage Low, DC Voltage High, Positive Ground Fault and Negative Ground Fault. In the event of a fault condition the yellow colored indicator lamp will illuminate adjacent to the appropriate indicator label. Additional diagnostic information regarding the LaMarche Charger is shown on the control panel fitted to the front of the battery charger unit. Consult the LaMarche Charger Operation manual for detailed information to diagnose and handle charger related power problems.

Status of the backup battery system is shown on both the Central Station MODEL 10K Power Monitoring Screen and the affected MODEL 10K Local Panel. In the normal operation mode the current meter indicates the trickle charge for the battery. If the batteries are at normal charge status the current flow should be in the .1 to .4 amps range depending on the size of the backup battery system.

When the battery backup system is disconnected the battery current level will go to and remain at zero. . A zero current event (lasting more than 30 seconds) triggers the fault alarm indicating that the batteries are not connected to the charger and the MODEL 10K system is operating from the power supplied directly by the charger.

When AC power has failed to the MODEL 10K power supply the system will automatically and bumplessly transfer to battery. When MODEL 10K is operating on battery power the current flow will become negative. In this case the current meter shown on the Power Monitoring Screen indicates the current flow in amps from the battery to MODEL 10K.

The MODEL 10K Fire and Gas Detection system monitors for power availability for all input and output circuits.

Gas detectors and flame detectors have are monitored using the 4 ma current level indicating normal operation. If the current reading goes to zero than we flag a fault warning for that device. The fault may be either an internal problem with the device, a field wiring open or a blown fuse. Each MODEL 10K gas and flame detector is individually fused at the local panel field terminal strip.

Supervised input circuits are power monitored using the small current signals received from the circuit end of line device. All supervised input circuits are individually fused at the local panel field terminal strip. During open circuit conditions or blown fuse conditions the current reading will drop to zero and initiate a fault on both the Central Station MODEL 10K Power Monitoring Screen and the Local MODEL 10K Power Monitoring Screen

Supervised output circuits are power monitored using the small current signals from the circuit end of line device. All supervised output circuits are individually fused at the local panel field terminal strip

Power availability for supervised output circuits is monitored using individual fuse circuit readings into the directly into PLC as a discrete voltage input. If the power distribution fuse opens the change in input status for the PLC indicates a blown fuse. The status of these internally monitored fuses is shown on both the Central Station MODEL 10K Power Monitoring Screen and the Local MODEL 10K Power Monitoring Screen.

4.5.6 Diagnosing and Handling of Communication Faults

The status of the MODEL 10K Communication Network is continuously monitored and the operating status is shown on the MODEL 10K Central Station Communication Monitoring Screen.

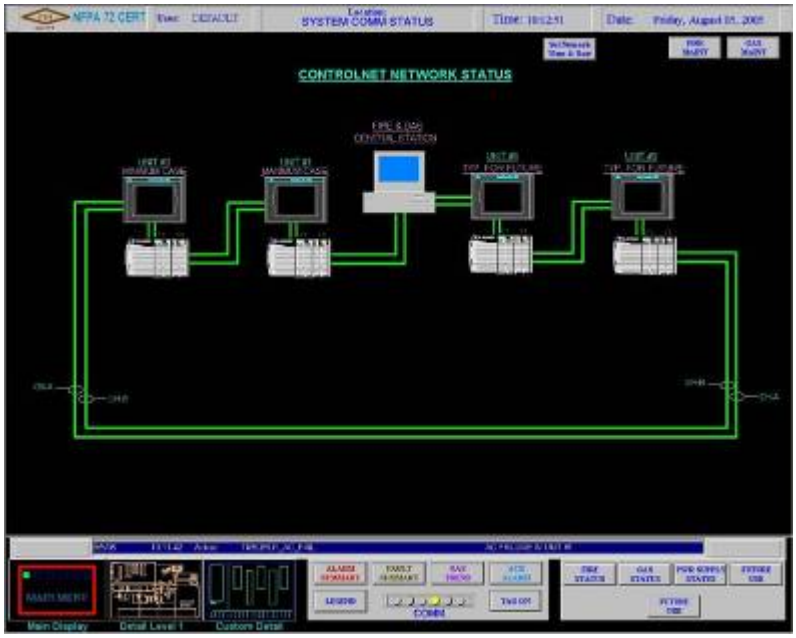

Figure 83: Controlnet Communication Diagnostic Screen

The MODEL 10K Central Station Communication Normal Indicator **(COMM.)** is an animated series of colored circles shown in the center of the lower alarm masthead. This multicolored animation is shown on all Central Station screens. This animation will stop if any MODEL 10K network communication fault is present. In addition to the Communication Status Animation we have provided several levels of enhanced communication diagnostic features with MODEL 10K.

Communication Network Fault

All communication paths operate over redundant media. In the case of the Co-axial communication network there are dual RG-6-coaxial cable systems to facilitate fault tolerance. In the case of single cable failure the communication will automatically (without interruption) switch to the remaining media and a fault alarm will be indicated on the MODEL 10K Central Station Communication Monitoring Screen by a color change in the affected network segment.

In the case of a fiber optic based communication network there are redundant fiber communication pairs (send and receive). If a single fiber break occurs or a complete fiber pair failure occurs the communication network will automatically re-route using the remaining fiber path and a fault alarm will be indicated on the Central Station Communication Monitoring Screen by a color change in the affected network segment. A single media based fault will not interrupt communication on the MODEL 10K Network.

Complete Node Communication Failure

In the event of a complete node failure on the network we will receive a communication failure message along with a color change in the affected network segment. In addition the Central Station computer will no longer received updated information from the affected node. The MODEL 10K indicates this condition by replacing the real time variable indications on the affected HMI screens with empty boxes until node communication is restored.

Complete System Communication Failure

A complete communication network failure will be indicated by a condition where the MODEL 10K Central Station computer no longer receives real-time information from any of the MODEL 10K Local Panels. In this case all of the data fields on all affected displays will be replaced by empty boxes until real time communication can be restored.

4.5.7 Local Printer Operation and Alarm Record Archiving

The MODEL 10K Central Station Computer is fitted with a OKI Data Microline 421 dot wide carriage printer. This printer is connected to the MODEL 10K HMI via parallel printer port and records all alarm and fault conditions in the following printed format

Date	**mm/dd/yyyy**
Alarm Time	**hh:mm:ss**
In Alarm or Out Alarm	**InAlm or OutAl**
Tag	**Alarm Description\Alarm Tag No.**

The printer is designed to use continuous-feed, tractor fed, wide-carriage paper.

The MODEL 10K Central Station HMI saves alarm history on the hard drive of the HMI computer. The operator can printout all alarms and faults over a specified period from the Alarm History Screen or save those alarms to the HMI CDRW. The saved file can be opened and manipulated using Microsoft Excel.

More information on configuration and use of alarm printers and alarm archiving can be found with the Allen Bradley RSView 32 User Manual.

5.0 MODEL 10K System Maintenance

5.1 Local Panel Maintenance Procedures

5.1.1 Care and Cleaning of Local HMI Touch screen

5.1.2 Touch screen adjustments and alignment

5.1.3 LaMarche Charger Inspection and Maintenance

The LaMarche A12B Charger is an industrial quality high reliability charger. The MODEL 10K system monitors status of the charger and displays alarms if any of the charger operating parameters are abnormal. The charger enclosure is fitted with a Combined Accessory Package alarm panel with LED status indicator lights and a selectable digital display to monitor charging voltage and current. Detailed information on the Combined Accessory Package alarm panel is contained in the manufacturer's instruction manual

Periodic inspection of the charger should be done to verify the charging current and float charge voltage. These charger parameters will not normally require adjustment. Details procedures for charger adjustments are contained in the manufacturer's instruction manual.

5.1.4 Battery backup system Inspection and Maintenance

Reliable operation of the battery backup system for a local MODEL 10K panel will require periodic inspection of the battery system and charging equipment. Batteries can be mounted in any orientation but will normally be mounted in a battery rack with connection terminals pointing up.

The batteries provided with MODEL 10K are of the Valve Regulated Lead Acid Batteries. These batteries of the "sealed" "maintenance free" recombinant type and feature:

- Flame-arresting one-way pressure-relief vent for safety and long life.
- Thermally welded case-to-cover bond to eliminate leakage.
- Absorbent Glass Mat (AGM) technology for efficient gas recombination of up to 99% and freedom from electrolyte maintenance.

Routine battery inspection will include verification that

- Battery charging voltage is 27.0 to 27.6 VDC at 20^{O} C. (Factory setting is 27.2 VDC)
- Battery terminals are clean of corrosion and tightly connected
- Battery Rack is free of corrosion and batteries are properly secured
- Battery cables insulation and connectors are in good operating condition

For battery installations at different operating temperature refer to the table below for correct float charging voltages.

AMBIENT TEMPERATURE	CHARGE VOLTAGE PER CELL	
	Cyclic use	Float Use
4 °F(-20 °C)	2.67-2.77V	2.34-2.39V
14 °F(-10 °C)	2.61-2.71V	2.32-2.37V
32 °F(0 °C)	2.55-2.65V	2.30-2.35V
50 °F(+10 °C)	2.49-2.58V	2.28-2.33V
68 °F(+20 °C)	2.43-2.53V	2.26-2.31V
77 °F(+25 °C)	2.40-2.50V	2.25-2.30V
86 °F(+30 °C)	2.37-2.47V	2.24-2.29V
104 °F(+40 °C)	2.31-2.41V	2.22-2.27V
122 °F(+50 °C)	2.25-2.35V	2.20-2.25V

5.1.5 Ground fault detection and troubleshooting guide

The MODEL 10K Fire and Gas Detection System is designed to operate with the DC power system “floating” i.e. not connected to ground. If a grounding of the either side of the DC power system occurs in the panel or in a field circuit then a ground fault alarm will occur. The ground fault detector is resident in the LaMarche power supply and will alarm with resistances between plus or minus 24 VDC and ground of less than approximately 5K ohms.

The MODEL 10K system monitors for positive and negative ground faults. If a ground fault alarm occurs in a system during construction/startup or if a ground fault suddenly appears on a system which was previously free of grounds—the fault is most likely in the field circuits connected to the panel.

MODEL 10K local panel field terminal blocks are fitted with “swing-link” terminal blocks to facilitate the isolation of field device circuits from the system without the need to disconnect the field wiring from the panel termination point.

Typically the best procedure to find a ground fault in the field circuitry is to isolate all of the field device circuits and then reconnect them one at a time until the faulted circuit is identified. Many times ground faulted circuits already has a fault diagnostic condition as reported by MODEL 10K but not always

More than one ground fault may be present so it is important for the technician to start with all field circuits disconnected and then sequentially reconnect the devices one at a time.

If disconnection of all field wiring connections does not isolate the ground fault then the fault condition is most likely located in the DC power supply or the DC power wiring to or inside the MODEL 10K panel.

Once the faulted circuit is isolated inspection of the wiring and field device can be done to identify and correct the problem. Ground faults in the field are most commonly caused by, incomplete installation or termination, nicked or damaged cable insulators, improper shield terminations or water in the field device or its associated conduit.

5.1.6 PLC and HMI Flash Memory Updates and program reloading

5.2 MODEL 10K System Inspection, Testing and Maintenance

5.2.1 Responsibility for Testing

NFPA 72 (2002) Section 10 assigns the responsibility for inspection, testing and maintenance to the owner of the system

10.2.2.1 The owner or the owner's designated representative shall be responsible for inspection, testing, and maintenance of the system and alterations or additions to this system.
10.2.2.2 The delegation of responsibility shall be in writing, with a copy of such delegation provided to the authority having jurisdiction upon request.
10.2.2.3 Inspection, testing, or maintenance shall be permitted to be done by a person or organization other than the owner if conducted under a written contract.
10.2.2.4 Testing and maintenance of central station service systems shall be performed under the contractual arrangements specified in 8.2.3.
10.2.2.5 Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:

(1) Factory trained and certified
(2) National Institute for Certification in Engineering Technologies fire alarm certified
(3) International Municipal Signal Association fire alarm certified
(4) Certified by a state or local authority
(5) Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems

5.2.2 Inspection, Testing and Maintenance of Gas detectors

Periodic Testing/Calibration of Field Devices
Periodic testing/calibrating should be performed per the manufacturers' recommendations and instructions. Testing/Calibrating procedures should include, but not be limited to:

- Verify zero reading
- Apply a known concentration of gas, or a simulated test device provided by the manufacturer
- Verify integrity of all optical surfaces and devices

When testing produces results outside of the manufacturers' specifications, recalibration or repair/replacement of the suspect device(s) should be performed as necessary. Calibration intervals should be independently established through a documented procedure, including a calibration log maintained by plant personnel, or third party testing services.

5.2.3 Inspection, Testing and Maintenance of Optical Flame Detectors

Periodic testing/calibrating should be performed per the manufacturers' recommendations and instructions. Testing/Calibrating procedures should include, but not be limited to:
- Verify integrity of all optical surfaces and devices
- For flame detectors, use the appropriate test lamp

When testing produces results outside of the manufacturers' specifications, replacement of the suspect device(s) should be performed as necessary. Maintenance intervals should be independently established through a documented procedure including a Maintenance log maintained by plant personnel or third party testing service.

5.2.4 Inspection, Testing and Maintenance of Smoke Detectors

Smoke detectors are designed to be as maintenance free as possible. However, dust, dirt, and other foreign matter can accumulate inside a detector's sensing elements and change its sensitivity. They can become either more sensitive, which may cause unwanted alarms, or less sensitive, which could reduce the amount of warning time given in case of a fire. Both are undesirable. Therefore, detectors should be tested periodically and maintained at regular intervals. Follow closely the manufacturer's specific recommended practices for maintenance and testing. Also refer to Appendix B of NFPA 90A and NFPA 72, Chapter 7.

Detectors should be given a visual inspection at installation and at least twice a year thereafter. This ensures that each detector remains in good physical condition and that there are no changes that would affect detector performance, such as building modifications, occupancy hazards, and environmental effects.

Notify the proper authorities that the smoke detector is undergoing maintenance, and therefore the system will temporarily be out of service. NOTE: Inhibit the zone or system undergoing maintenance to prevent unwanted alarms and possible dispatch of the fire department.

Use a high power vacuum cleaner and remove dust from the detector by placing the nozzle as close as possible to the openings in the outside housing. A nozzle with a brush attachment will assist in dust removal. Some detector's sensing chambers can be removed for more thorough cleaning; refer to the manufacturer's recommended procedure for details.

Test each detector's sensitivity per the manufacturer's recommended procedure within one year after installation and every alternate year thereafter. Test each detector functionally in place annually, as detailed in NFPA 72 2002 (Chapter 10).

If a detector's sensitivity is within specifications, nothing further needs to be done to the detector. If the detector's sensitivity is outside specifications, clean the detector and retest. If that does not place the sensitivity within the unit specified range then follow the manufacturer's recommended procedure.

5.2.5 Inspection, Test and Maintenance of Heat Detectors

Restorable type heat detector shall be tested on system acceptance and once per year thereafter. See NFPA 72 (2002) Section 10 for more guidance on testing requirements for heat detectors.

Heat test shall be performed with a heat source per the manufacturer's recommendations for response within 1 minute. A test method shall be used that is recommended by the manufacturer or other method shall be used that will not damage the non-restorable fixed-temperature element of a combination rate-of-rise/fixed-temperature element detector.

5.2.6 Inspection, Test and Maintenance of Contact Input Devices

Dry contact input devices such as manual fire alarm stations, extinguishing discharge pressure switch and abort station inputs should be tested once per year in accordance with the manufacturers' recommendations. Testing methods are outlined in NFPA 72 (2002) Section 10

5.2.7 Inspection, Test and Maintenance of Notification Appliance Devices

Notification appliances such as fire bells, electronic horns, warning lights and strobe lights should be tested once per year in accordance wit the manufacturer's recommendations. Testing requirements are outlined in NFPA (2002) Section 10

5.2.8 Periodic System Verification

5.2.8.1 Backup Power System Testing

Periodic System Verification
The following system verifications should be performed at least annually:
Verify wiring, terminal connections and stability of mounting for all integral safety equipment including, but not limited to:

- Power supplies including battery capacity test
- Control modules
- Field detection devices
- Signaling / output devices
- Accessories connected to field and signaling devices

Proper system operation should be verified by performing a full, functional test of all component devices of the safety system, ensuring that the alarm activations occur.

Fault/Malfunction circuit operation should be verified.

Periodic System Verification and Calibration intervals should be independently established through a documented procedure, including a calibration log maintained by plant personnel, or third party testing services.

5.3 Central Station Computer Maintenance

5.3.1 Hard drive backup

MODEL 10K configuration is stored on the workstation hard drive. After Site Acceptance Testing a backup copy of the drive contents should be made for use if a drive related failure occurs with the system.

A better method to backup the hard drive of the HMI Workstation is to “clone” a new hard drive of identical size and interface specifications using a hard drive copy program such as Casper.

5.3.2 Central Station Computer—reloading procedure

In the event of a complete MODEL 10K hard drive crash, the system can be reloaded from the backup disks made at completion of Site Acceptance Testing after Windows XP has been re-installed on the new disk. If a “clone” hard drive has been prepared simply remove the existing drive from the HMI computer and replace with the “clone”.

If the operation of the MODEL 10K Central Station HMI is critical to plant operation or computer support capabilities at the jobsite are limited, then we recommend consideration of purchasing a complete spare computer dedicated to this application.

5.3.3 Virus Protection Security Updates and Operating Software Service Packs

The MODEL 10K Central Station computer is a machine with a single dedicated purpose. This workstation should not be used for any other applications such as Web surfing, word processing, playing of games or entertainment media etc.

The central station computer should not normally be included in the facility local area network for security reasons. We strongly recommend that the MODEL 10K computer not be connected to the Internet without suitable system security.—Consult with factory for details

Windows XPPro user levels should be setup to prevent the normal user of the system from being able to install, delete or modify operating programs and software.

If the MODEL 10K workstation is:

- not used for any other application such as word processing, spreadsheets etc.
- is not connected to the Internet except with suitable system security
- has adequate user and password security, physical security and administrator controls
- not used with floppy drives or USB flash memory drives

then we can operate the HMI machine without the requirement to install a virus scan package and the periodic Microsoft Security Updates and Service Packs.

If any of the above security prerequisite conditions are not met then we must implement a full virus scan package with updating service and install Microsoft Security Updates.

Installation of Microsoft Operating System Service Packs

We recommend that customer consult with MSA prior to installing any Microsoft Operating System Service packs to verify that the updates will not interfere with the Allen Bradley RSView32 HMI package.

Installation of Allen Bradley RSView32 Updates

We recommend that customer consult with MSA prior to installing any Allen Bradley RSView 32 software updates. In general Allen Bradley RSView 32 version updates should not be applied to the system without consulting with MSA

5.3.4 Periodic Hard drive de-fragmentation

Continuous use of the MODEL 10K Central Station HMI computer will result in hard drive fragmentation. We recommend that the hard drive be de-fragmented using the Windows XP de-fragmentation utility at least once every 6 months.

5.3.5 Protection of Software from Un-authorized Modification

The operating system (Windows XP) and the application package (the runtime version of the Topic) in RSView32 must be protected from unauthorized changes. Be sure that the administrator password for the workstation is protected. RSView32 features configuration and software security passwords. Be sure that these passwords are protected

5.3.6 Generalized computer workstation maintenance

The MODEL 10K Central Station HMI Workstation operates continuously in an industrial environment. Periodic cleaning of cooling system filters and dust removal from the enclosure is required. Keyboards can be either cleaned or replaced. Touchscreen can be cleaned with a moist non-abrasive cloth using Windex or other approved cleaner.

5.3.7 Central Station UPS Maintenance

The APC Smart UPS 750XL control unit has an automatic Battery Test feature that actuates every two weeks to briefly test condition of the backup batteries. This short duration load test can be activated manually using the Test button located on the front of the UPS enclosure. Consult the UPS Instruction Manual for further details. Expected Gel Cell Operating Life on this Ups unit is listed at 3-5 years.

The APC Smart UPS 750XL control unit has an automatic Battery Test feature which actuates every two weeks to briefly test condition of the backup batteries

5.3.8 Alarm Printer Maintenance

MODEL 10K alarm printer requires no routine maintenance except for replacement of printer ribbon when printed material images are faint.

5.4 Periodic System Functional Testing

5.4.1 NFPA 72 Requirements for Periodic Functional Testing

Initial Acceptance Testing of system

Fire and Gas Alarm systems must be fully functionally tested at initial system acceptance. This testing is normally conducted during Site Acceptance Testing and full function testing is completed to the satisfaction of the owner and/or the "authority having jurisdiction".

Annual Re-Testing of system

NFPA 72 requires that these systems be fully re-tested on an annual basis.

The scope of testing annual re-testing includes:

- Testing of all input devices and output devices of the system including detectors, IDC inputs, SOC circuits and NAC outputs,
- Verification of all cause and effect logic associated with the system functionality
- Testing of backup battery systems including battery load testing
- Verification of communication functionality of the system to Central Station equipment

NFPA 72 (2002) Table 10.4.3 details the testing frequency for NFPA 72 compliant fire and gas alarm systems.

5.4.2 Functional testing documentation and records

Initial Acceptance Testing Records

Test documentation from the initial acceptance testing should include a test record in general accordance with the NFPA 72 (2002) Figure 10.6.2.3. Test documents are to be signed by the Owner, AHJ and testing contractor. Owner is responsible for retention of these testing records. Extent of documentation required for system acceptance is called out in Section 10.6.1 of the standard

10.6.1 Permanent Records. After successful completion of acceptance tests approved by the authority having jurisdiction, the requirements in 10.6.1.1 through 10.6.1.3 shall apply.
10.6.1.1 A set of reproducible as-built installation drawings, operation and maintenance manuals, and a written sequence of operation shall be provided to the building owner or the owner's designated representative.
10.6.1.2 For software-based systems, a copy of the site-specific software shall be provided to the owner or owner's designated representative.
10.6.1.3 The owner shall be responsible for maintaining these records for the life of the system for examination by any authority having jurisdiction. Paper or electronic media shall be permitted.

Annual Re-Testing Records

10.6.2.1 Records shall be retained until the next test and for1 year thereafter.
10.6.2.2 The records shall be on a medium that will survive the retention period. Paper or electronic media shall be permitted.
10.6.2.3 A record of all inspections, testing, and maintenance shall be provided that includes the following information regarding tests and all the applicable information requested in Figure 10.6.2.3:
(1) Date
(2) Test frequency
(3) Name of property
(4) Address
(5) Name of person performing inspection, maintenance, tests, or combination thereof, and affiliation, business address, and telephone number
(6) Name, address, and representative of approving agency (ies)
(7) Designation of the detector(s) tested, for example, “Tests performed in accordance with Section .”
(8) Functional test of detectors
(9) Functional test of required sequence of operations
(10) Check of all smoke detectors
(11) Loop resistance for all fixed-temperature, line-type heat detectors
(12) Other tests as required by equipment manufacturers
(13) Other tests as required by the authority having jurisdiction
(14) Signatures of tester and approved authority representative
(15) Disposition of problems identified during test (e.g., owner notified, problem corrected/successfully retested, device abandoned in place)

5.5 MODEL 10K System Modifications

MODEL 10K system modifications must be performed by qualified personnel. Generally system modifications will be performed by or under the supervision of MSA Systems’ engineering personnel.

In certain circumstances MSA Systems will train and certify owner personnel to make system changes to MODEL 10K. Please consult with factory for information on this subject.

6.0 MODEL 10K Specifications

Note the Specifications contained in this section of the Manual are based on the equipment manufacturer's specifications for the systems component except where specific performance criteria were examined by Factory Mutual, in which case, the Factory Mutual certified results are reported here.

In most cases the component manufacturer's specifications exceed those tested and certified by Factory Mutual. The Instruction Manual Supplement contains the full manufacturer's specifications for each equipment item.

6.1.1 MODEL 10K Local Panel

MODEL 10K Local Panel:

Enclosure Type	Nema 1 Wall Mounted or Free Standing
Enclosure Arrangement	Single or Multiple locking door
Enclosure Materials of Construction	Steel
Enclosure Paint	OSHA Safety Red (#7.5R4.0/14)

Environmental:

Operating Temperature:	0° to 38° C (32° to 100° F)
Storage Temperature:	-35° to 55° C (-31° to 131° F)
Relative Humidity:	0 to 90% RH, non-condensing

Dimensions:

Minimum Enclosure Size	48"H x 36"W x 10"D
Maximum Enclosure Size	Multiple 82"H x 32"W x 32"D Enclosures

Electrical AC Power:

AC Input Voltage	Single Phase 60Hz: 120,208,240, Phase 50Hz: 220/240,
Total AC Power Consumption	Based on system configuration

Electrical DC Power :

Minimum DC Input Voltage	22 VDC
Normal DC Input Voltage	27.2 VDC
Maximum DC Input Voltage	32 VDC
Maximum DC Current	15-150 amps (based on system configuration)

Local Display :

Display Size:	10.4 in
Type:	Color active matrix thin film transistor (TFT)
Resolution:	640 x 480, 24 bit color
Input Method:	Keypad, touch, or combination keypad/touch

6.1.2 MODEL 10K 24 Volt Power Supply

LaMarche Power Supply /Battery Charger Specifications:

Electrical

AC Input Voltages:	Single Phase 50/60Hz: 120,208,240V or 3 Phase 440V
Output Power Protection:	DC Fuse, DC Voltage Regulation and Current Limit Protection
DC Output Current/Voltage:	DC Amps: 15 to 150 amperes DC Volts: 24 Nominal
Output Filtering:	30mV RMS for single phase models and 100mV RMS for three-phase models when connected to a battery with an ampere-hour capacity of four times the output current capacity of the charger.
DC Voltage Regulation:	Plus or minus 0.5% of setting from no load to full load over the specified input voltage, frequency and ambient temperature ranges.

Environmental

Operating Temperature:	0 to 50^{O} C (32 to 122^{O} F) Storage Temperature: -40 to 85^{O} C (-40 to 185^{O} F) Relative Humidity: 0 to 95% (non-condensing)
Dimensions:	See Specific Power Supply Data Sheet
Mounting:	Floor or wall units are available. Mounting flanges are supplied as integral part of cabinet back plate on wall mounted models.
Finish:	Pretreated with three-step iron phosphate wash and de-ionized rinse. Finished with environmentally safe water based ANSI 61 gray baked enamel.

Agency Approvals

U.L. Industrial Battery Charger:	File E 25701,Guide BBHZ Std.No.1564
U.L. Fire Alarm System / Power Supply Application:	File S2768, Guide UTRZ Std.No. 1481 (except for 50Hz versions of the power supply)
CSA Rectifiers:	File LR14209, Std. C22.2 No. 107

Power Supplies are provided with LaMarche Combined Accessory Package No. 16Q which includes

Low DC voltage 2 Alarm Light with (1) set of form “C” contacts utilized for Low Voltage Load Disconnect,
High DC Voltage Alarm Light with (2) sets Form “C”
High DC Voltage Shutdown Alarm with (1) set Form C
Positive Ground Alarm Light with (1) set Form C
Negative Ground Alarm Light with (1) set Form C
Summary Alarm (all listed above) Light with (2) set Form C

Available Power Supply Sizes (MODEL 10K P/N's have "HW-" prefix)

Model Number	DC Amps	DC[1] Fuse Size (Amps)	AC Input Phase	AC Input Current Draw @ 100% Load [2] (Amps)									Std.[5] Case Size	Shipping Weight (Approximate)	
				60Hz Units						50Hz Units [3,4]					
				A 120	D 208	L 220	B 240	C 480	E 575	B L 240 / 220	G 380	J 415		lbs	kgs
A12B-15-24V	15	25	1	7.5	4.3	4.1	3.8	1.9*	1.6*	3.8 / 4.1	2.4*	2.2*	3	100	45.4
A12B-20-24V	20	30	1	10	5.8	5.5	5	2.5*	2.1*	5 / 5.5	3.2*	2.9*	6	155	70.3
A12B-25-24V	25	35	1	13	7.2	6.8	6.3	3.1*	2.6*	6.3 / 6.8	4.0*	3.6*	6	170	77.1
A12B-30-24V	30	40	1	15	8.7	8.2	7.5	3.8*	3.1*	7.5 / 8.2	4.7*	4.3*	6	180	81.7
A12B-35-24V	35	50	1	18	11	9.6	8.8	4.4*	3.7*	8.8 / 9.6	5.5*	5.1*	6	190	86.2
A12B-40-24V	40	60	1	21	12	11	10	5*	3.2*	10 / 11	6.3*	5.8*	6	205	93.0
A12B-50-24V	50	80	1	26	15	14	13	6.3*	5.2*	13 / 14	7.9	7.2	6	240	108.9
A12B-60-24V	60	80	1	31	18	17	15	7.5	6.3*	15 / 17	9.5	8.7	6	265	120.2
A12B-75-24V	75	100	1	38	22	21	19	9.4	7.8	19 / 21	12	11	70	400	181.4
A12B-100-24V	100	150	1	51	29	28	26	13	11	26 / 28	16	15	70	450	204.1
A12B-125-24V	125	200	3	---	19	18	17	8.1	6.8*	17 / 18	11	9.4	70	525	238.1
A12B-150-24V [4]	150	200	3	---	23	22	20	9.8	8.2	20 / 22	13	12	72	630	285.8

Power Supply Case Dimensional Information

Case No.	Overall Dimensions					
	Width		Depth		Height	
	in	mm	in	mm	in	mm
3	15.375	391	11.000	279	23.750	603
6	25.580	650	13.935	354	28.000	711
7	14.250	362	10.625	270	19.875	505
8A	27.200	691	15.250	387	32.500	826
27	27.312	694	25.875	657	56.125	1426
47	38.000	965	39.375	1000	70.000	1778
57	60.000	1524	36.000	914	80.000	2032
70	27.000	686	19.000	483	41.000	1041
72	27.000	686	23.500	597	44.500	1130

6.1.3 MODEL 10K Backup Batteries

HW-UPS12-270 – Specifications: (Nominal 75 AH)

Cells Per Unit	6
Voltage Per Unit	12.84
Weight	57 lbs, 26 kg.
Electrolyte	Absorbed H_2SO SG = 1.300
Max. Discharge Current	800 Amps
Short Circuit Current	3600Amps @ 0.1 sec
Ohms Impedance 60 Hz Ω	0.0040 Ohms
Capacity	282 watts per cell at the 15-minute rate to 1.67 volts per cell at 77°F (25°C). 75Ah @ 20 hr. rate to 1.75 volts per cell @ 77°F (25°C). 66 Ah @ 10 hr. rate to 1.80 volts per cell @ 20°C (68°F).
Operating Temperature Range	Discharge; 32°F (0°C) to +122°F (50°C). Charge; 32°F (0°C) to + 122 (50°C). (with temperature compensation)
Nominal Operating Temperature Range	+74°F (23°C) to +80°F (27°C)
Float Charging Voltage	13.5 to 13.8 VDC/unit Average at 77°F (25°C)
Recommended Maximum Charging Current Limit	C/5 amperes (15 amperes @ 100% depth of discharge) @ 20 hour rate.
Equalization and Cycle Service Charging Voltage	14.4 to 14.8 VDC/unit Average at 77°F (25°C)
Maximum AC Ripple (Charger)	0.5% RMS or 1.5% P-P of float charge voltage recommended for best results Maximum voltage allowed = 1.4% RMS (4% P-P) Maximum current allowed = 3.75 amperes RMS (C/20)
Self Discharge	Dynasty UPS batteries may be stored for up to 6 months at 77°F (25°C) and then a freshening charge is required. For higher temperatures the time interval will be shorter.
Accessories	Inter unit connectors; racks and cabinet systems are available.
Terminal	"L" terminal with 0.28" clearance hole to accept 0.25" (6mm) bolt.
Terminal Hardware Initial Torque	40 in.-lbs. (7.4 N-m).
Terminal Hardware Annual Retorque	32 in.-lbs. (5.88 N-m).

NOTE: Batteries to be mounted with 0.5 in (1.25 cm) spacing minimum and free air ventilation. Specifications are subject to change without notice

HW-UPS12-370 – Specifications: (Nominal 100 AH)

Cells Per Unit	6
Voltage Per Unit	12.84
Weight	74 lbs, 34 kg.
Electrolyte	Absorbed H_2SO SG = 1.300
Max. Discharge Current	800 Amps
Short Circuit Current	5100Amps @ 0.1 sec
Ohms Imped. 60 Hz Ω	0.0025 Ohms
Capacity	391 watts per cell at the 15-minute rate to 1.67 volts per cell at 77°F (25°C). 100 Ah @ 20 hr. rate to 1.75 volts per cell @ 77°F (25°C). 85 Ah @ 10 hr. rate to 1.80 volts per cell @ 20°C (68°F).
Operating Temperature Range	Discharge; 32°F (0°C) to +122°F (50°C). Charge; 32°F (0°C) to + 122 (50°C). (with temperature compensation)
Nominal Operating Temperature Range	+74°F (23°C) to +80°F (27°C)
Float Charging Voltage	13.5 to 13.8 VDC/unit Average at 77°F (25°C)
Recommended Maximum Charging Current Limit	C/5 amperes (20 amperes @ 100% depth of discharge) @ 20 hour rate.
Equalization and Cycle Service Charging Voltage	14.4 to 14.8 VDC/unit Average at 77°F (25°C)
Maximum AC Ripple (Charger)	0.5% RMS or 1.5% P-P of float charge voltage recommended for best results Maximum voltage allowed = 1.4% RMS (4% P-P) Maximum current allowed = 5 amperes RMS (C/20)
Self Discharge	Dynasty UPS batteries may be stored for up to 6 months at 77°F (25°C) and then a freshening charge is required. For higher temperatures the time interval will be shorter.
Accessories	Inter unit connectors; racks and cabinet systems are available.
Terminal	"L" terminal with 0.28" clearance hole to accept 0.25" (6mm) bolt.
Terminal Hardware Initial Torque	65 in.-lbs. (7.4 N-m).
Terminal Hardware Annual Retorque	52 in.-lbs. (5.88 N-m).

NOTE: Batteries to be mounted with 0.5 in (1.25 cm) spacing minimum and free air ventilation. Specifications are subject to change without notice.

HW-UPS12-475 – Specifications: Nominal (130 AH)

Cells Per Unit	6
Voltage Per Unit	12.84
Weight	100 lbs, 45 kg.
Electrolyte	Absorbed H_2S0, SG = 1.300
Max. Discharge Current	800 Amps
Short Circuit Current	5000Amps @ 0.1 sec
Ohms Imped. 60 Hz Ω	0.0023 Ohms
Capacity	475 watts per cell at the 15-minute rate to 1.67 volts per cell at 77°F (25°C).
Operating Temperature Range	Discharge; 32°F (0°C) to +122°F (50°C). Charge; 32°F (0°C) to + 122°F (50°C). (With temperature compensation)
Nominal Operating Temperature Range	+74°F (23°C) to +80°F (27°C)
Float Charging Voltage	13.5 to 13.8 VDC/unit Average at 77°F (25°C)
Recommended Maximum Charging Current Limit	C/5 amperes (27amperes @ 100% depth of discharge)
Equalization and Cycle Service Charging Voltage	14.4 to 14.8 VDC/unit Average at 77°F (25°C)
Maximum AC Ripple (Charger)	0.5% RMS or 1.5% P-P of float charge voltage recommended for best results Maximum voltage allowed = 1.4% RMS (4% P-P) Maximum current allowed = 6.7 amperes RMS (C/20)
Self Discharge	Dynasty UPS batteries may be stored for up to 6 months at 77°F (25°C) and then a freshening charge is required. For higher temperatures the time interval will be shorter.
Accessories	Inter unit connectors; racks and cabinet systems are available.
Terminal	Threaded brass inserts to accept 0.25" (6mm) bolt.
Terminal Hardware Torque	110 in.-lbs. (12.4 N-m)

NOTE: Batteries to be mounted with 0.5 in (1.25 cm) spacing minimum and free air ventilation. Specifications are subject to change without notice.

6.1.4 MODEL 10K Central Station Equipment

6.1.4.1 Central Station Computer Equipment

HW-COMARK Model _51-GMS03-001 Specifications:

Physical

Size:	17.62"W x 6.9"H x 16.87"D (447mm x 175mm x 428mm)
Weight:	38 lbs (17.24kg) Typical

Environmental

Temperature:	0 - 38°C (32° - 100°F)
Shock:	10G, 3 Axis, 11ms
Vibration:	1.5G, 3 Axis, 10-150Hz, .75mm
Humidity:	0 - 90% RHNC
Altitude:	Up to 10000 feet (3 km)
Storage:	-10° to +65°C (14° - 149°F)

Electrical

Power:	300 Watt
Voltage:	115Volts ±10%
Frequency:	50/60Hz

Approval

Underwriters Laboratory to UL864

Equipment Specifications

Pentium Core 2 Duo 2.0 GHz
1GB Dimm Memory
SATA Hard Drive
CD- R/W Drive
10/100 BTX Ethernet Card
19”LCD Capacitive Touchscreen
Serial or USB Touchscreen Controllers
101 Key PS/2 Compact Keyboard
PS/2 Mouse with Scroll Bar
Windows XP Pro Operating System

Central Station Printer—OKI Data Microline 421

Specifications

Technology, Speed and Print Characteristics

- **Printhead: 9-Pin SIDM**
- **Graphics Resolution: 240 (H) x 216 (V) dpi maximum**
- **Feed Rate: 4.5 ips (11.4 cm/sec.)**
- **Print Speed and Character Matrix:**

Mode NLQ Utility HSD SSD
(10 cpi) (10 cpi) (10 cpi) (12 cpi)
Speed (in cps) 95 380 510 570

Emulation, Interface and Memory

- **Emulation: Epson® FX, IBM® ProPrinter®, OKI MICROLINE**
- **Interface: Standard – IEEE Parallel and USB; OkiLAN® 10/100 Base-T Internal Print Server (ML420/n, ML421/n); Optional – RS-232C Serial and Ethernet® via OkiLAN 10/100** Base-T Internal or External Print Servers
- Memory: 128K

Compatibility

- **Operating Systems: Windows® Vista® 32/64, XP, 2000, 98/95, 3.x and NT® 4.0; MS-DOS®**

Paper Handling

- **Paper Input: Single-part, Multi-part, Continuous forms, Cut sheet, Index stock, Envelopes, Labels**
- Number of Copies: 6
- Thickness: 0.017" (0.43 mm) maximum
- **Paper Feeding: Rear Push and Friction Feed**
- **Options: Bottom Push Tractor, Top Pull Tractor, Cut Sheet Feeder, Roll Paper Stand**

Warranty and Reliability

- **Limited Warranty: 3-Year parts and labor, 2-Year printhead**
- **MTBF: 20,000 hours (25% duty cycle /35% page density)**
- **Reliability:**

ML420 – 24,000 pg./mo. duty cycle
ML421 – 17,000 pg./mo. duty cycle

- **Printhead Life: 400 million characters**
- Ribbon Life: 4 million characters

Environmental

- **Size (WxDxH):**

ML421 – 21.7" x 13.6" x 6.0" (55.1 cm x 34.5 cm x 15.2 cm)

- Net Weight:

ML420 – 16.4 lb. (7.43 kg); ML421 – 21.2 lb. (9.6 kg)

- Acoustic Noise: 56 dBA
- Power Requirements: 120V Model: 120 VAC +6%, -15%; 230V Model: 230 VAC +15%, -14%

Ordering Information (Part Number)

Description Part Numbers
MICROLINE 421/Parallel/120V 4 62418801
MICROLINE 421/Parallel/230V 4 62418802

Accessories

Top-Mount Pull Tractor Kit with acoustic cove
ML420 70030501
ML421 70030601
Bottom Push Tractor Kit:
ML421 70030801
ML421 – Black 40804602
Self-inking Ribbon Cartridge 42377801

Fiber Optic Converter

Singlemode

HW-OCX-CTN-12DST-SM (Rack Mounted)
HW-OCM-CTN-13DST-AC-SM (Self Contained)

Multimode

HW-OCX-CTN-12DST (Rack Mounted)
HW-OCM-CTN-13DST-AC (Self Contained)

Phoenix Digital Specifications:

Fiber Optic Cable Type:	Multimode or Singlemode
Mating Connector:	ST or SMA
Transmit Launch Power:	15dbm (Typical, Multimode); -18dbm (Singlemode)
Receive Sensitivity:	-32dbm

Power Supply

Plug-In Modules:	+5 VDC, 1.8 Amps (Typical)
Standalone Panel Mount Modules:	24 VDC, 120/220 VAC, 10 Watts

Environmental

Operating Temperature:	0° to 38° C (32° to 100° F)
Storage Temperature:	0° to 38° C (32° to 100° F)
Relative Humidity:	0 to 90% RH, non-condensing

Dimensions

1756 Plug-In Modules:	Single Slot, 1756 Chassis Installation
Standalone, Panel Mount:	10.38” H x 1.76” W* x 6.14” D
Modules:	(26.36cm H x 4.47cm W* x 15.60cm D
	* Add 1.00” (2.54cm) for rear panel flange

6.1.4.2 Central Station UPS

HW-APC Smart UPS Model XL-750 Specifications:

Technical Specifications

Output

Output power capacity 750 VA
Max Configurable Power 750 VA
Nominal output voltage 120 or 220V (Specify 50 or 60 Hz)
Output Voltage Distortion less than 5% at full load
Output Frequency (sync to mains) 47-53Hz for 50Hz nominal , 57-63Hz for 50 Hz or 60Hz nominal
Crest Factor up to 5 : 1
Waveform type Sinewave
Output Connections (8) NEMA 5-15R

Input

Nominal input voltage 120V
Input frequency 50/60 Hz +/- 3 Hz (auto sensing)
Input Connection Type NEMA 5-15P
Cord Length 6 feet (1.83 meters)
Input voltage range for main
Operation 82 - 144 V
Input voltage adjustable range for
mains operation 75 - 154 V

Batteries & Runtime

Battery type
Maintenance-free sealed Lead-Acid battery with suspended electrolyte leakproof

Surge Protection and Filtering

Surge energy rating 459 Joules
Filtering
Full time multi-pole noise filtering: 0.3%
IEEE surge let-through: zero clamping
Response time: meets UL 1449

Physical

Maximum height 9 inches (21.59 cm)
Maximum width 7 inches (17.02 cm)
Maximum depth 17 inches (43.94 cm)
Net weight 53 lbs. (24.09 kg)
Shipping Weight 58 lbs. (26.36 kg)
Shipping Height 15 inches (38.74 cm)
Shipping Width 13 inches (32.00 cm)
Shipping Depth 23 inches (59.06 cm)
Color Black
Units per Pallet 24

Environmental

Operating Environment 0 - 38 °C (32 - 100 °F)
Operating Relative Humidity 0 - 90 %
Operating Elevation 0-10000 feet (0-3000 meters)
Storage Temperature 0 - 38 °C (32 - 100 °F)

Relay I/O SmartSlot Card Specifications:

Physical:

Net weight	0.30°lbs, (.14°kg)
Maximum height	1.50°in, (38°mm)
Maximum Width:	4.75°in (121°mm)
Maximum Depth	4.25°in (108°mm)
Shipping Weight	1.00lbs, (0.45kg)
Shipping Height	2.86in (73mm)
Shipping Width	6.50in (165mm)
Shipping Depth	9.00in (229mm)
Color	Black
Units per Pallet	672.00

Environmental

Operating Environment	0-38°C (32-100°F)
Storage Temperature	0-38°C (32-100°F)
Operating Relative Humidity	0-90%
Storage Relative Humidity	0-90%
Operating Elevation	0-10000ft (0-3000m)
Storage Elevation	0-50000ft (0-15000m)
Approvals	C-tick, CE, DOC/Industry Canada, EN 55022 Class B. EN 55024, EN 55082, FCC Part 15 Class B, VCCI

7.0 Scope of FM Approval

Factory Mutual Approvals Description per NFPA72-2002

MODEL 10K System Classification Details:

Fire Detection

- National Fire Alarm Code performance verified per ANSI/NFPA 72-2002. Refer to the chart below for supervision characteristics.
- Refer to the system manual for further FM flame performance details.
- Models: FlameGard 5 MSIR and FlameGard 5 UVIR are FM performance approved.

Gas Detection

Combustible Gas Performance verified for 0 to 100% LFL methane-in-air atmospheres per FM 6310/6320. Accuracy: ±3% LFL from 0 to 50% LFL, ±5% LFL from 51% to 100% LFL.

For the UltimaX Models, refer to the associated instrument manuals for further FM gas performance details.

H2S Toxic Gas Performance verified 0 to 20, 50 or 100 ppm per FM requirements. Accuracy: ±2 ppm from 0 to 20 ppm, ±10% of concentration from 21 to 100 ppm. Model Ultima MOS Hydrogen Sulfide (H2S)

Sensors Explosion-proof for Class I, Div. 1, Groups C and D Hazardous (Classified) Locations per FM 3615.

Hydrogen Sulfide (H2S) Sensors Explosion-proof for Class I, Div. 1, Groups B, C and D Hazardous (Classified) Locations per FM 3615. Operating temperature limits are –40°C to +40°C.

MODEL 10K System can be used with any FM Approved 4-20 ma device.

NOTE: FM Approval of the 4-20 ma input does not include or imply approval of the gas detection apparatus such as sensors, transmitters, or devices connected to the system. In order to maintain FM Approval of the system, all 4-20 ma gas detection instruments connected to the input must also be FM Approved.

- FM Solenoid Group Manufacturer Model
- B ASCO T8210A107
- D ASCO 8210G207
- E Skinner 73218BN4UNLVNOC111C2
- F Skinner 73212BN4TNLVNOC322C2

- G Skinner 71395SN2ENJ1NOH111C2
- H Viking HV-274-0601