



ZGARD™ C 485

Controllers

Instruction Manual

WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING OR SERVICING THIS PRODUCT. Like any piece of complex equipment, this product will perform as designed only if installed, used and serviced in accordance with the manufacturer's instructions. OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to these Products are voided if the products are not installed, used and serviced in accordance with the instructions in this user guide. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repair.

Instrument Division 1-800-MSA-INST or FAX (412) 776-9783

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MINE SAFETY APPLIANCES COMPANY
PITTSBURGH, PENNSYLVANIA 15230

MSA Permanent Instrument Warranty

1. Warranty- Seller warrants that this product will be free from mechanical defect or faulty workmanship for a period of eighteen (18) months from date of shipment or one (1) year from installation, whichever occurs first, provided it is maintained and used in accordance with Seller's instructions and/or recommendations. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year such as, but not limited to, non-rechargeable batteries, filament units, filter, lamps, fuses etc. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning the product. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER**

SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

2. Exclusive Remedy- It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and/or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.

3. Exclusion of Consequential Damage- Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of non operation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

General Warnings

WARNING

1. The ZGARD C 485 controllers described in this manual must be installed, operated, and maintained in strict accordance with the labels, cautions, warnings, instructions, and within the limitations stated.
2. The ZGARD C 485 controllers must not be installed in outdoor areas or in locations where explosive concentrations of combustible gases or vapors might occur in the atmosphere: Class 1, Group A, B, C, and D areas as defined by the NEC. Because the controller is not explosion-proof, it must be located in non-hazardous areas.
3. Do not paint the ZGARD C 485 controllers.
4. The only absolute method to assure the proper overall operation of a gas detection instrument is to check it with a known concentration of the gas for which it has been calibrated. Consequently, a calibration check must be included as part of the installation and as a routine inspection of the system.
5. Use only genuine MSA replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the ZGARD C 485 controllers, beyond the scope of these maintenance instructions or by anyone other than authorized MSA service personnel, could cause the product to fail to perform as designed, and persons who rely on this product for their safety could sustain serious personal injury or death.
6. The ZGARD C 485 controllers must be installed, located and operated in accordance to all applicable codes. These codes include, but are not limited to, the National Fire Prevention Code and National Electric Code.
7. Do not exceed the relay contact ratings listed in this manual. Otherwise, the relay operation may fail, which can result in personal injury or death.

Failure to comply with the above warnings can result in serious personal injury or death.

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Section 1
ZGARD C 485 Controllers
General Information

The ZGARD C 485 Controllers are microprocessor-based monitoring systems designed to interface with remote gas sensors and perform user configured control functions for surveillance, activate ventilation equipment, personnel alert or alarm indication. The controllers feature audible and visual status indicators with relay outputs. MSA ZGARD S or GS sensor-transmitters are available to detect a wide variety of gases including Carbon Monoxide, Carbon Dioxide, Nitrogen Dioxide and Refrigerants.

The table below provides the distinctive features of the ZGARD C 485 Controllers. This is a quick guide for determining the functionality, capability and configuration of each controller.

ZGARD C 485 CONTROLLER MODEL	8 CHANNEL 1-ZONE	16 CHANNEL 1-ZONE	16 CHANNEL 2-ZONE	24 CHANNEL 2-ZONE
Power LED (Green)	Yes	Yes	None	None
Digital Readout	1 + 3 digits	2 + 3 digits	2 + 3 digits	2 + 3 digits
Audible Alarm	Solid ON / Variable, (Jumper H1-6)	Solid ON only	Solid ON only	Solid ON only
Relay Mode, Energized De-Energized	NO	NO	YES (Jumper H1-7)	YES (Jumper H2-1)
Time Delay	5 min. ON/OFF (Jumper H1-5 IN) OR 0-10 min., Pots (H1-5 OUT)	5 min. ON/OFF (Jumper H1-6 IN) OR 0-10 min., Pots (H1-6 OUT)	5 min. ON/OFF (Jumper H1-8 IN) OR NO Delay (H1-8 OUT)	5 min. ON/OFF (Jumper H1-9 IN) OR NO Delay (H1-9 OUT)
Warning Set Points	Pot (H1-7 IN) OR 35% FS (H1-7 OUT)	Pot (H1-7 IN) OR 35% FS (H1-7 OUT)	0-100% FS By Pot ONLY	0-100% FS By Pot ONLY
Alarm Set Points	Pot (H1-8 IN) OR 50% FS (H1-8 OUT)	Pot (H1-8 IN) OR 50% FS (H1-8 OUT)	0-100% FS By Pot ONLY	0-100% FS By Pot ONLY
Alarm Relay Latching	YES	YES	YES	YES
Analogue Output	4-20mA (Hi-Select)	4-20mA (Hi-Select)	4-20mA (Hi-Select)	4-20mA (Hi-Select)

Section 2

ZGARD C 485 Controllers Installation Guidelines

The performance of ZGARD C 485 Controllers are dependent on the appropriate employment of the associated remote gas sensors. The remote gas sensors should be strategically placed closest to the areas where the target gases or vapors might occur in the atmosphere. Follow the recommended guidelines listed below.

Mounting:

- Do not mount the controller to structures subject to vibration and shock, such as piping and piping supports.
- Do not locate the controller near excessive heat source or in wet and damp locations.
- For proper cooling, allow at least five inches of clearance around all surfaces except for the mounting surface. Also consider mounting the controller so it can be easily accessed for service and routine testing.
- Make sure the controller is not blocked; otherwise front panel lights and controls will be obscured from view.
- The controller has four mounting lugs; securely mount the instrument to a wall or support using appropriate hardware.

Wiring Connections:

Before putting a ZGARD C 485 controller into operation, determine the capacity, designation and number of remote gas sensors, and configure the controller according to the required application. Also refer to the ZGARD C 485 controllers Installation Outline drawings located in the back of this manual, which provides important information regarding;

- Operating power.
- Number and type of remote sensors.
- Required conductors and wire size.
- Relay wiring connection.
- 4-20mA Output wiring connection.

CAUTION

1. When wiring the controller, disconnect the main power to prevent bodily harm.
2. Do not use the controller power when connecting any external devices to the relay contacts.
3. Use shielded cable for wiring installation. Do not install low voltage signal cable in the same conduit as the controllers operating power and or relay wiring.
4. Do not exceed the contact ratings marked on the relays.
5. Make sure that each sensor is given a unique address (Jumper selected), or the ZGARD C 485 controller may not be able to communicate appropriately.
6. When connecting the remote sensors, make sure that all wiring is correct and the four leads of the RS485 bus are not interchanged, or permanent damage to the sensor may result.
7. Perform all wiring and conduit installation in accordance to the National Electrical Code.
8. The fuse at the input is a SloBlo type fuse and REPLACE FUSE ONLY WITH A FUSE WITH THE SAME RATING.

Failure to follow the above cautions can result in injury or property damage.

Section 3
ZGARD C 485 8-Channel, 1-Zone Controller
General Information

OPERATING SPECIFICATIONS

Remote Sensor Input	RS485 digital data bus, 4-wire connection
Remote Sensor Power	24Vdc at 100mA / Input
Network Capacity	8 Remote Gas Sensors
Power Requirements	Standard 110Vac, 50/60 Hz \pm 10% at 0.5 Amps
(Optional)	220Vac, 50/60 Hz \pm 10% at 0.25 Amps; 24Vdc \pm 10% at 1.0 Amps
Temperature	Operating: -10° to 40°C (14° to 104°F); Storage: -20° to 50°C (4° to 122°F)
LED Readout	1 + 3 Digit LED display exhibits the channel number and gas level, at 2 second intervals
Status LED Indicators	Power, Warning, Alarm and Sensor OK
Audible Alarm	Electronic device, 93 dB @ 0.3 meters with variable sound selection
Pushbutton	Alarm reset and Silence function
Alarm & Warning Set points	Factory set at 35% and 50% Full-Scale, unless otherwise specified (Field Adjustable)
Sensor Fail Set point	Non-adjustable
Time Delays	Fixed 5 minutes ON delay for Alarm and 5 minutes OFF delay for Warning or manually adjusted from 0 to 10 minutes
Relay Outputs	Warning Relay, Alarm Relay and Sensor Fail Relay: Form C - SPDT
Relay Action	Alarm Relay Latching or Non-Latching, jumper selected
Relay Contacts Rating	10 Amps 1/8 H.P., 125Vac, 5 Amps, 30Vdc, 6 Amps 1/8 H.P., 277Vac
Signal Output	4-20mA, high select analogue output
Enclosure	Metal NEMA 1
(Optional)	Fiberglass NEMA 4X design
Dimensions	11.5" H (292 mm) x 10" W (254 mm) x 3.75" D (95 mm)
Weight	4.5kg (10 lbs.)
Certification	ENTECLA (to CSA Standards)

Sensor Inputs: The ZGARD C 485 controller accepts up to 8 remote gas sensors. The MSA ZGARD S or GS, RS485 serial communication sensors are automatically recognized by the controller and establish the sensor range and gas code type.

Readout: LED display exhibits the active channel number and the corresponding sensor gas concentration level. The display scans through all of the active channels at 2-second intervals.

Warning and Alarm Set Points: The Warning and Alarm threshold levels are independently adjustable on the controller and can be set to any value between 0 and 100% Full-Scale (FS).

Delay Function: There are two user jumper selected methods for setting the ZGARD C 485 8-Channel controller warning and alarm delays. The first uses pre-programmed, fixed delays of 5 minutes OFF delay for warning and 5 minutes ON delay for alarm. The second allows adjusting of the delays from 0 to 10 minutes using potentiometers.

Warning and Alarm Scheme: During a Warning event, the associated Warning (Amber) LED will turn on and the warning relay will be activated. No audible alarm is set off at this time. Once a warning occurrence has been



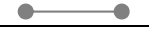
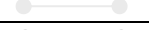
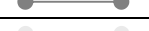


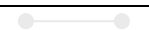

abated, the associated warning LED will turn off and the warning relay will be deactivated. If the 5 minute delay feature is selected, then this action takes place after a 5 minute delay period. During an Alarm event, the associated Alarm (Red) LED will turn on and the alarm relay will be activated. If the 5 minute delay feature is selected and the alarm event has prolonged for a period of 5 minutes, then the alarm relay will be activated and the audible device will sound. Pressing the reset button on the front panel will silence the audible device. Once the alarm occurrence has been abated, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated. If any other active channels reach the alarm state, the audible device will sound with every new alarm event. Once all of the active channels have been cleared of alarm events, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated.

Sensor Fail: If there is a lose of communication between the controller and the remote gas sensors residing on the RS485 network, the Sensor Fail Relay will be activated and the Sensor OK LED will turn off.

4-20mA Output: The analogue output continuously represents the highest signal generated by all of the active channel inputs.

Section 3

ZGARD C 485 8-Channel, 1-Zone Controller Installation and Setup

H1		PARAMETER SETUP	
	1	1	Number of Active Points 1 + (0 -7)
	2	2	(OUT = 0) (IN = 1)
	3	4	(set By Binary Code)
	4		NOT USED
	5		DELAY 5MIN. / POT (IN/ OUT)
	6		HORN SOLID / VAR (IN / OUT)
	7		WARNING POT / 35% (IN / OUT)
	8		ALARM POT / 50% (IN / OUT)
	9		ALARM LATCH (IN)

On the main circuit of every ZGARD C 485 Controller is a series of user configurable components for setting, adjustment and selecting the required functionality and operation of the instrument. **Refer to the associated controller, Installation Outline Drawing, 106923A for further details.**

Remote RS485 Digital Sensor Inputs:

The number of active remote sensors is set by arranging the user selection jumpers shown on H1-1, H1-2 and H1-3. Care must be taken to represent the number of remote sensors connected for each application. Insert the jumpers such that the decimal equivalent of the binary code on H1-1, H1-2 and H1-3 plus one equals the number of active sensors to be scanned.

Connect a 4-conductor serial bus electrical cable between the devices. The connection terminal labeled Data 1 and Data 2 are for communication while the +24Vdc and COM are for power, supplied by the ZGARD C 485 controller. **Refer to the associated controller, Installation Outline Drawing 106923A for further details.**

Setting-up the Warning & Alarm Delays:

There are two methods for setting the warning and alarm delays. The first uses pre-programmed, fixed delays of 5 minutes OFF delay for warning and 5 minutes ON delay for alarm. To select the fixed delay, jumper H1-5 must be inserted.

The second allows adjusting of the delays from 0 to 10 minutes via two potentiometers (labeled: Warning Delay, Alarm Delay). To select the adjustable delay, jumper H1-5 is NOT inserted. Removing the jumper activates the associated potentiometer and test points (TP3 for warning delay and TP4 for alarm delay). The test points show a voltage of 0-5Vdc for a delay of 0 - 10 minutes.

$$TP = \text{Delay (minutes)} / 10 \times 5Vdc$$

Example: To set up a Warning delay of 4 minutes and an Alarm delay of 6 minutes,

Warning Delay **TP3 and TPCOM should read:** Warning Delay $(4/10) \times 5 = 2.0Vdc$

Alarm delay **TP4 and TPCOM should read:** Alarm Delay $(6/10) \times 5 = 3.0Vdc$

Section 3
**ZGARD C 485 8-Channel, 1-Zone Controller
 Installation and Setup**

H1		PARAMETER SETUP	
● — ●	1	1	Number of Active Points 1 + (0 -7)
● — ●	2	2	(OUT = 0) (IN = 1)
● — ●	3	4	(set By Binary Code)
● — ●	4		NOT USED
● — ●	5		DELAY 5MIN. / POT (IN/ OUT)
● — ●	6		HORN SOLID / VAR (IN / OUT)
● — ●	7		WARNING POT / 35% (IN / OUT)
● — ●	8		ALARM POT / 50% (IN / OUT)
● — ●	9		ALARM LATCH (IN)

Audible Alarm Device Setting:

There are two audible alarm modes. The first is a Solid-ON mode that sounds the audible alarm continuously while the ZGARD C 485 controller is in an alarm state. The second is a Variable-ON mode that sounds the audible alarm in an eight second interval pulsed fashion. The time between pulses is fixed, but the on-time of the audible alarm is determined by the amount that the alarming sensor is exceeding the alarm set point. For example, if the set point is at 50% and an alarm comes in at 55%, the audible alarm would give short beeps every eight seconds. As the alarm level increases from 55% to 100%, the beeps become longer in duration until a solid tone appears at 100%.

To select the Solid-ON audible alarm mode, jumper H1-6 must be inserted. To select the variable-ON audible alarm mode, jumper H1-6 must be removed. In both modes, pressing the reset button will silence the audible alarm, but will not have any effect on the alarm LED on the front panel or the alarm relay.

Warning and Alarm Set-Points:

There are two methods for setting the warning and alarm set points. The first uses pre-programmed, fixed set points of 35% for warning and 50% for alarm.

The second allows for adjusting the set points anywhere from 0% to 100% via two potentiometers (labeled: WARNING, ALARM). To select the fixed set points, jumpers H1-7 (warning) and/or H1-8 (alarm) must NOT be inserted. Inserting a jumper activates the associated potentiometer and test point (TP1 for warning and TP2 for alarm). The test points show a voltage of 0 - 5Vdc for a set point of 0 - 100%.

TP = Set point (% full-scale)/100 x 5Vdc.










Example: To set up a Warning threshold of 25% FS and an Alarm threshold of 60% FS.

Warning Set-Point **TP1 and TPCOM should read:** Warning (25/100) x 5 = **1.25Vdc**

Alarm Set-Point **TP2 and TPCOM should read:** Alarm (60/100) x 5 = **3.0Vdc**

Section 3

ZGARD C 485 8-Channel, 1-Zone Controller Installation and Setup

H1		PARAMETER SETUP	
	1	1	Number of Active Points 1 + (0 -7)
	2	2	(OUT = 0) (IN = 1)
	3	4	(set By Binary Code)
	4		NOT USED
	5		DELAY 5MIN. / POT (IN/ OUT)
	6		HORN SOLID / VAR (IN / OUT)
	7		WARNING POT / 35% (IN / OUT)
	8		ALARM POT / 50% (IN / OUT)
	9		ALARM LATCH (IN)

Alarm Relay Latch Set-up:

Normally all relays return to their inactive state once an Alarm event has cleared. The alarm relay can be made to latch in the activated position even after all alarms have cleared. Inserting jumper H1-9 (IN) will lock in the alarm relay so it will remain latched after all alarms clear until the reset button is pressed. Note that the Alarm LED on the front panel will not follow this action.

Analog Output Adjustment:

The analog output (4-20mA) is factory calibrated, and should not require adjustment. It does not drift because it is digitally controlled by the microprocessor. If adjustments are required, a ZERO and SPAN potentiometer can be used to perform these.

To adjust the output to 4-20mA for 0-100% input (factory setting) when using RS485 type sensors, a 0% and 100% input can be obtained by making sure the sensor is not exposed to any gas or ideally by disconnecting the sensor (the Sensor Fail will then activate - ignore it) for a 0% signal, and by inserting the 100% jumper on the back of the sensor board for a 100% signal.

Section 4
ZGARD C 485 16-Channel, 1-Zone Controller
General Information

OPERATING SPECIFICATIONS

Remote Sensor Input	RS485 digital data bus, 4-wire connection
Remote Sensor Power	24Vdc at 100mA / Input
Network Capacity	16 Remote Gas Sensors
Power Requirements	Standard 110Vac, 50/60 Hz \pm 10% at 0.5 Amps
(Optional)	220Vac, 50/60 Hz \pm 10% at 0.25 Amps; 24Vdc \pm 10% at 2.0 Amps
Temperature	Operating: -10° to 40°C (14° to 104°F); Storage: -20° to 50°C (4° to 122°F)
LED Readout	2 + 3 Digit LED display exhibits the channel number and gas level, at 2 second intervals
Status LED Indicators	Power, Warning, Alarm and Sensor OK
Audible Alarm	Electronic device, 93 dB @ 0.3 meters
Pushbutton	Alarm reset and Silence function
Alarm & Warning Set points	Factory set at 35% and 50% Full-Scale, unless otherwise specified (Field Adjustable)
Sensor Fail Set point	Non-adjustable
Time Delays	Fixed 5 minutes ON delay for Alarm and 5 minutes OFF delay for Warning or manually adjusted from 0 to 10 minutes
Relay Outputs	Warning Relay, Alarm Relay and Sensor Fail Relay: Form C - SPDT
Relay Action	Alarm Relay Latching or Non-Latching, jumper selected
Relay Contacts Rating	10 Amps 1/8 H.P., 125Vac, 5 Amps, 30Vdc, 6 Amps 1/8 H.P., 277Vac
Signal Output	4-20mA, high select analogue output
Enclosure	Metal NEMA 1
(Optional)	Fiberglass NEMA 4X design
Dimensions	11.5" H (292 mm) x 10" W (254 mm) x 3.75" D (95 mm)
Weight	4.5kg (10 lbs.)
Certification	ENTECLA (to CSA Standards)

Sensor Inputs: The ZGARD C 485 controller accepts up to 16 remote gas sensors. The MSA ZGARD S or GS, RS485 serial communication sensors are automatically recognized by the controller and establish the sensor range and gas code type.

Readout: LED display exhibits the active channel number and the corresponding sensor gas concentration level. The display scans through all of the active channels at 2-second intervals.

Warning and Alarm Set Points: The Warning and Alarm threshold levels are independently adjustable on the controller and can be set to any value between 0 and 100% Full-Scale (FS).

Delay Function: There are two user jumper selected methods for setting the ZGARD C 485 16-Channel controller warning and alarm delays. The first uses pre-programmed, fixed delays of 5 minutes OFF delay for warning and 5 minutes ON delay for alarm. The second allows adjusting of the delays from 0 to 10 minutes using potentiometers.

Warning and Alarm Scheme: During a Warning event, the associated Warning (Amber) LED will turn on and the warning relay will be activated. No audible alarm is set off at this time. Once a warning occurrence has been abated, the associated warning LED will turn off and the

warning relay will be deactivated. If the 5 minute delay feature is selected, then this action takes place after a 5 minute delay period.









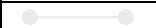
During an Alarm event, the associated Alarm (Red) LED will turn on and the alarm relay will be activated. If the 5 minute delay feature is selected and the alarm event has prolonged for a period of 5 minutes, then the alarm relay will be activated and the audible device will sound. Pressing the reset button on the front panel will silence the audible device. Once the alarm occurrence has been abated, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated. If any other active channels reach the alarm state, the audible device will sound with every new alarm event. Once all of the active channels have been cleared of alarm events, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated.

Sensor Fail: If there is a lose of communication between the controller and the remote gas sensors residing on the RS485 network, the Sensor Fail Relay will be activated and the Sensor OK LED will turn off.

4-20mA Output: The analogue output continuously represents the highest signal generated by all of the active channel inputs.

Section 4

ZGARD C 485 16-Channel, 1-Zone Controller Installation and Setup

H1		PARAMETER SETUP	
	1	1	Number of Active Points
	2	2	1 + (0 -15)
	3	4	(OUT = 0) (IN = 1)
	4	8	(Set By Binary Code)
	5		NOT USED
	6		DELAY 5MIN. / POT (IN/ OUT)
	7		WARNING POT / 35% (IN / OUT)
	8		ALARM POT / 50% (IN / OUT)
	9		ALARM LATCH (IN)

On the main circuit of every ZGARD C 485 Controller is a series of user configurable components for setting, adjustment and selecting the required functionality and operation of the instrument. **Refer to the associated controller, Installation Outline Drawing, 106926A for further details.**

Remote RS485 Digital Sensor Inputs:

The number of active remote sensors is set by arranging the user selection jumpers shown on H1-1, H1-2, H1-3 and H1-4. Care must be taken to represent the number of remote sensors connected for each application. Insert the jumpers such that the decimal equivalent of the binary code on H1-1, H1-2 H1-3 and H1-4 plus one equals the number of active sensors to be scanned.

Connect a 4-conductor serial bus electrical cable between the devices. The connection terminal labeled Data 1 and Data 2 are for communication while the +24Vdc and COM are for power, supplied by the ZGARD C 485 controller. **Refer to the associated controller, Installation Outline Drawing 106926A for further details.**

Setting-up the Warning & Alarm Delays:

There are two methods for setting the warning and alarm delays. The first uses pre-programmed, fixed delays of 5 minutes OFF delay for warning and 5 minutes ON delay for alarm. To select the fixed delay, jumper H1-6 must be inserted.

The second allows adjusting of the delays from 0 to 10 minutes via two potentiometers (labeled: Warning Delay, Alarm Delay). To select the adjustable delay, jumper H1-6 is NOT inserted. Removing the jumper activates the associated potentiometer and test points (TP3 for warning delay and TP4 for alarm delay). The test points show a voltage of 0-5Vdc for a delay of 0 - 10 minutes.

$$TP = \text{Delay (minutes)} / 10 \times 5Vdc$$

Example: To set up a Warning delay of 4 minutes and an Alarm delay of 6 minutes,

Warning Delay **TP3 and TPCOM should read:** Warning Delay (4/10) x 5 = **2.0Vdc**

Alarm delay **TP4 and TPCOM should read:** Alarm Delay (6/10) x 5 = **3.0Vdc**

Section 4
**ZGARD C 485 16-Channel, 1-Zone Controller
 Installation and Setup**

H1		PARAMETER SETUP	
●——●	1	1	Number of Active Points
●——●	2	2	(1 + (0 -15)
●——●	3	4	(OUT = 0) (IN = 1)
●——●	4	8	(Set By Binary Code)
●——●	5	NOT USED	
●——●	6	DELAY 5MIN. / POT (IN/ OUT)	
●——●	7	WARNING POT / 35% (IN / OUT)	
●——●	8	ALARM POT / 50% (IN / OUT)	
●——●	9	ALARM LATCH (IN)	

Warning and Alarm Set-Points:

There are two methods for setting the warning and alarm set points. The first uses pre-programmed, fixed set points of 35% for warning and 50% for alarm.

The second allows for adjusting the set points anywhere from 0% to 100% via two potentiometers (labeled: WARNING, ALARM). To select the fixed set points, jumpers H1-7 (warning) and/or H1-8 (alarm) must NOT be inserted. Inserting a jumper activates the associated potentiometer and test point (TP1 for warning and TP2 for alarm). The test points show a voltage of 0 - 5Vdc for a set point of 0 - 100%.

TP = Set point (% full-scale)/100 x 5Vdc.

Example: To set up a Warning threshold of 25% FS and an Alarm threshold of 60% FS.

Warning Set-Point **TP1 and TPCOM should read:** Warning $(25/100) \times 5 = 1.25Vdc$

Alarm Set-Point **TP2 and TPCOM should read:** Alarm $(60/100) \times 5 = 3.0Vdc$

Alarm Relay Latch Set-up:

Normally all relays return to their inactive state once an Alarm event has cleared. The alarm relay can be made to latch in the activated position even after all alarms have cleared. Inserting jumper H1-9 (IN) will lock in the alarm relay so it will remain latched after all alarms clear until the reset button is pressed. Note that the Alarm LED on the front panel will not follow this action.

Analog Output Adjustment:

The analog output (4-20mA) is factory calibrated, and should not require adjustment. It does not drift because it is digitally controlled by the microprocessor. If adjustments are required, a ZERO and SPAN potentiometer can be used to perform these.

To adjust the output to 4-20mA for 0-100% input (factory setting) when using RS485 type sensors, a 0% and 100% input can be obtained by making sure the sensor is not exposed to any gas or ideally by disconnecting the sensor (the Sensor Fail will then activate - ignore it) for a 0% signal, and by inserting the 100% jumper on the back of the sensor board for a 100% signal.

Section 5

ZGARD C 485 16-Channel, 2-Zone Controller

General Information

OPERATING SPECIFICATIONS

Remote Sensor Input	RS485 digital data bus, 4-wire connection
Remote Sensor Power	24Vdc at 100mA / Input
Network Capacity	16 Remote Gas Sensors
Power Requirements	Standard 110Vac, 50/60 Hz \pm 10% at 0.5 Amps
(Optional)	220Vac, 50/60 Hz \pm 10% at 0.25 Amps; 24Vdc \pm 10% at 2.0 Amps
Temperature	Operating: -10° to 40°C (14° to 104°F); Storage: -20° to 50°C (4° to 122°F)
LED Readout	2 + 3 Digit LED display exhibits the channel number and gas level, at 2 second intervals
Status LED Indicators	Warning, Alarm and Sensor OK
Audible Alarm	Electronic device, 93 dB @ 0.3 meters
Pushbutton	Alarm reset and Silence function
Alarm & Warning Set points	Factory set at 35% and 50% Full-Scale, unless otherwise specified (Field Adjustable)
Sensor Fail Set point	Non-adjustable
Time Delays	Fixed 5 minutes ON delay for Alarm and 5 minutes OFF delay for Warning or No Delay
Relay Outputs	ZONE 1: Warning Relay, Alarm Relay and Sensor Fail Relay: Form C - SPDT ZONE 2: Warning Relay, Alarm Relay and Sensor Fail Relay: Form C - SPDT
Relay Action	Alarm relay Latching or Non-Latching, jumper selected All relays Normally Energized or Normally De-Energized, jumper selected
Relay Contacts Rating	10 Amps 1/8 H.P., 125Vac, 5 Amps, 30Vdc, 6 Amps 1/8 H.P., 277Vac
Signal Output	4-20mA, high select analogue output
Enclosure	Metal NEMA 1
(Optional)	Fiberglass NEMA 4X design
Dimensions	15" H (381 mm) x 12" W (305 mm) x 3.75" D (95 mm)
Weight	6.8kg (15 lbs.)
Certification	ENTECLA (to CSA Standards)

Sensor Inputs: The ZGARD C 485 controller accepts up to 16 remote gas sensors. The MSA ZGARD S or GS, RS485 serial communication sensors are automatically recognized by the controller and establish the sensor range and gas code type.

Relay Outputs: The controller provides a Warning, Alarm and a Sensor Fail relay for each Zone. All relays are normally de-energized. The warning relay is non-latching and will return to inactive state once the condition has cleared. The alarm relay can be made to act in a non-latching or latching mode, which will stay in the activated position even after an alarm condition has been cleared. Pressing the reset button after an alarm has been cleared will de-energize and unlatches the alarm relay. Each relay has an LED indicating the relay is energized.

Zone Assignment: The controller is capable of managing a collection of sensor inputs in two groups; Zone 1 from points 1 to 8 and Zone 2 from points 9 to 16. The number of active scanning points for each zone can be configured using the appropriate user selection jumpers.

Delay Function: The ZGARD C 485 16-Channel controller can be configured to provide a 0 or 5 minute warning OFF delay and a 0 or 5 minute alarm ON delay. The warning and alarm delays are factory set at 0 minutes.










Warning and Alarm Scheme: During a Warning event, the associated Warning (Amber) LED of the active

channel will turn on and the warning relay will be activated. No audible alarm is set off at this time. Once a warning occurrence has been abated, the associated warning LED will turn off and the warning relay will be deactivated. If the 5 minute delay feature is selected, then this action takes place after a 5 minute delay period. During an Alarm event, the associated Alarm (Red) LED will turn on and the alarm relay will be activated. If the 5 minute delay feature is selected and the alarm event has prolonged for a period of 5 minutes, then the alarm relay will be activated and the audible device will sound. Pressing the reset button on the front panel will silence the audible device. Once the alarm occurrence has been abated, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated. If any other active channels reach the alarm state, the audible device will sound with every new alarm event. Once all of the active channels have been cleared of alarm events, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated.

Sensor Fail: The controller provides two separate sensor fail relays, one for each zone. If there is a lose of communication between the controller and the remote gas sensors residing on the RS485 network within the associated zone, the Sensor Fail Relay will be activated and the Sensor OK LED will turn off.

4-20mA Output: The analogue output continuously represents the highest signal generated by all of the active channel inputs.

ZGARD C 485 16-Channel, 2-Zone Controller Installation and Setup

H1		PARAMETER SETUP	
	1	1	ZONE 1 Active Points
	2	2	1 + (0 -7) (OUT = 0) (IN = 1)
	3	4	(Set By Binary Code)
	4	1	ZONE 2 Active Points
	5	2	1 + (0 -7) (OUT = 0) (IN = 1)
	6	4	(Set By Binary Code)
	7		REL NORM EN / DE-EN (IN / OUT)
	8		5MIN. WARN / ALARM DELAY (IN)
	9		ALARM LATCH (IN)

On the main circuit of every ZGARD C 485 Controller is a series of user configurable components for setting, adjustment and selecting the required functionality and operation of the instrument. **Refer to the associated controller, Installation Outline Drawing, 106929A for further details.**

Remote RS485 Digital Sensor Inputs:

The number of active remote sensors for Zone 1 is set by arranging the user selection jumpers shown on H1-1, H1-2 and H1-3. The number of active remote sensors for Zone 2 is set by arranging the user selection jumpers shown on H1-4, H1-5 and H1-6.

Care must be taken to represent the number of remote sensors connected for each application. Insert the jumpers such that the decimal equivalent of the binary code for Zone 1 and Zone 2 plus one equals the number of active sensors to be scanned.

Connect a 4-conductor serial bus electrical cable between the devices. The connection terminal labeled Data 1 and Data 2 are for communication while the +24Vdc and COM are for power, supplied by the ZGARD C 485 controller. **Refer to the associated controller, Installation Outline Drawing 106929A for further details.**

Setting-up Relay Functions:

When jumper H1-7 is not inserted (OUT), all relays are normally de-energized when inactive and energized when activated. If jumper H1-7 is inserted (IN), then all relays are normally energized when inactive and de-energized when activated.

Setting-up the Warning & Alarm Delays:

There is one method for setting the warning and alarm delays. This is preprogrammed (Jumper HI-8); if jumper HI-8 is (IN), the delay is fixed for 5 minutes. If jumper HI-8 is (OUT), there are no delays.

Alarm Relay Latch Set-up:

Normally all relays return to their inactive state once an Alarm event has cleared. The alarm relay can be made to latch in the activated position even after all alarms have cleared. Inserting jumper H1-9 will lock in the alarm relay so it will remain latched after all alarms clear until the reset button is pressed. Note that the Alarm LED's on the front panel will not follow this action.

Section 5

ZGARD C 485 16-Channel, 2-Zone Controller Installation and Setup

Warning and Alarm Set-Points:

The warning and alarm set points are adjustable from 0% to 100% FS (Full-Scale) via four potentiometers (labeled: WARNING 1, ALARM 1, WARNING 2 and ALARM 2). This is accomplished by inserting a voltage test Meter in the associated potentiometer test points (TP1, TP2, TP3 and TP4) shown below. The test points represent a voltage of 0-5Vdc for each set point form 0-100% FS.

Warning 1:	0-100% = 0-5Vdc at TP1	(Warning Zone 1)
Alarm 1:	0-100% = 0-5Vdc at TP2	(Alarm Zone 1)
Warning 2:	0-100% = 0-5Vdc at TP3	(Warning Zone 2)
Alarm 2:	0-100% = 0-5Vdc at TP4	(Alarm Zone 2)

TP = Set point (% full-scale)/100 x 5Vdc.

Example: To set up a Warning threshold of 25% FS and an Alarm threshold of 60% FS.

Warning Set-Point **TP1 and TPCOM should read:** Warning $(25/100) \times 5 = 1.25\text{Vdc}$

Alarm Set-Point **TP2 and TPCOM should read:** Alarm $(60/100) \times 5 = 3.0\text{Vdc}$

Analog Output Adjustment:

The analog output (4-20mA) is factory calibrated, and should not require adjustment. It does not drift because it is digitally controlled by the microprocessor. If adjustments are required, a ZERO and SPAN potentiometer can be used to perform these.

To adjust the output to 4-20mA for 0-100% input (factory setting) when using RS485 type sensors, a 0% and 100% input can be obtained by making sure the sensor is not exposed to any gas or ideally by disconnecting the sensor (the Sensor Fail will then activate - ignore it) for a 0% signal, and by inserting the 100% jumper on the back of the sensor board for a 100% signal.

Section 6
ZGARD C 485 24-Channel, 2-Zone Controller
General Information

OPERATING SPECIFICATIONS

Remote Sensor Input	RS485 digital data bus, 4-wire connection
Remote Sensor Power	24Vdc at 100mA / Input
Network Capacity	24 Remote Gas Sensors
Power Requirements	Standard 110Vac, 50/60 Hz \pm 10% at 1.0 Amps
(Optional)	220Vac, 50/60 Hz \pm 10% at 0.5 Amps; 24Vdc \pm 10% at 3.0 Amps
Temperature	Operating: -10° to 40°C (14° to 104°F); Storage: -20° to 50°C (4° to 122°F)
LED Readout	2 + 3 Digit LED display exhibits the channel number and gas level, at 2 second intervals
Status LED Indicators	Warning, Alarm and Sensor OK
Audible Alarm	Electronic device, 93 dB @ 0.3 meters
Pushbutton	Alarm reset and Silence function
Alarm & Warning Set points	Factory set at 35% and 50% Full-Scale, unless otherwise specified (Field Adjustable)
Sensor Fail Set point	Non-adjustable
Time Delays	Fixed 5 minutes ON delay for Alarm and 5 minutes OFF delay for Warning or No Delay
Relay Outputs	ZONE 1: Warning Relay, Alarm Relay and Sensor Fail Relay: Form C - SPDT ZONE 2: Warning Relay, Alarm Relay and Sensor Fail Relay: Form C - SPDT
Relay Action	Alarm relay Latching or Non-Latching, jumper selected All relays Normally Energized or Normally De-Energized, jumper selected
Relay Contacts Rating	10 Amps 1/8 H.P., 125Vac, 5 Amps, 30Vdc, 6 Amps 1/8 H.P., 277Vac
Signal Output	4-20mA, high select analogue output
Enclosure	Metal NEMA 1
(Optional)	Fiberglass NEMA 4X design
Dimensions	15" H (381 mm) x 12" W (305 mm) x 3.75" D (95 mm)
Weight	6.8kg (15 lbs.)
Certification	ENTECLA (to CSA Standards)

Sensor Inputs: The ZGARD C 485 controller accepts up to 24 remote gas sensors. The MSA ZGARD S or GS, RS485 serial communication sensors are automatically recognized by the controller and establish the sensor range and gas code type.

Relay Outputs: The controller provides a common Warning, Alarm and a Sensor Fail relay. All relays are normally de-energized. The warning relay is non-latching and will return to inactive state once the condition has cleared. The alarm relay can be made to act in a non-latching or latching mode, which will stay in the activated position even after an alarm condition has been cleared. Pressing the reset button after an alarm has been cleared will de-energize and unlatches the alarm relay. Each relay has an LED indicating the relay is energized.

Delay Function: The ZGARD C 485 24-Channel controller can be configured to provide a 0 or 5 minute warning OFF delay and a 0 or 5 minute alarm ON delay. The warning and alarm delays are factory set at 0 minutes.

Zone Assignment: The controller is capable of managing a collection of sensor inputs in two groups; Zone 1 from points 1 to 12 and Zone 2 from points 13 to 24. The number of active scanning points for each zone can be configured using the appropriate user selection jumpers.

Warning and Alarm Scheme: During a Warning event, the associated Warning (Amber) LED of the active


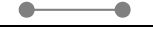
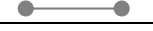
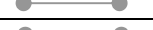
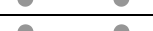
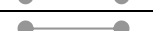
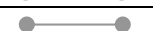
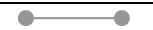

channel will turn on and the warning relay will be activated. No audible alarm is set off at this time. Once a warning occurrence has been abated, the associated warning LED will turn off and the discrete warning relay will be deactivated. If the 5 minute delay feature is selected, then this action takes place after a 5 minute delay period. During an Alarm event, the associated Alarm (Red) LED will turn on and the alarm relay will be activated. If the 5 minute delay feature is selected and the alarm event has prolonged for a period of 5 minutes, then the alarm relay will be activated and the audible device will sound. Pressing the reset button on the front panel will silence the audible device. Once the alarm occurrence has been abated, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated. If any other active channels reach the alarm state, the audible device will sound with every new alarm event. Once all of the active channels have been cleared of alarm events, the audible device will silence (if not silenced already by reset button) and the alarm relay will be deactivated.

Sensor Fail: The controller provides two separate sensor fail relays, one for each zone. If there is a lose of communication between the controller and the remote gas sensors residing on the RS485 network within the associated zone, the Sensor Fail Relay will be activated and the Sensor OK LED will turn off.

4-20mA Output: The analogue output continuously represents the highest signal generated by all of the active channel inputs.

Section 6

ZGARD C 485 24-Channel, 2-Zone Controller Installation and Setup

H1		PARAMETER SETUP	
	1	1	ZONE 1 Active Points
	2	2	1 + (0 -11) (Maximum 12 points)
	3	4	(OUT = 0) (IN = 1)
	4	8	(Set By Binary Code)
	5	1	ZONE 2 Active Points
	6	2	1 + (0 -11) (Maximum 12 points)
	7	4	(OUT = 0) (IN = 1)
	8	8	(Set By Binary Code)
	9		5MIN. WARN / ALARM DELAY (IN)

On the main circuit of every ZGARD C 485 Controller is a series of user configurable components for setting, adjustment and selecting the required functionality and operation of the instrument. **Refer to the associated controller, Installation Outline Drawing, 106932A for further details.**

Remote RS485 Digital Sensor Inputs:



The number of active remote sensors for Zone 1 is set by arranging the user selection jumpers shown on H1-1, H1-2, H1-3 and H1-4. The number of active remote sensors for Zone 2 is set by arranging the user selection jumpers shown on H1-5, H1-6, H1-7 and H1-8.

Care must be taken to represent the number of remote sensors connected for each application. Insert the jumpers such that the decimal equivalent of the binary code for Zone 1 and Zone 2 plus one equals the number of active sensors to be scanned.

Connect a 4-conductor serial bus electrical cable between the devices. The connection terminal labeled Data 1 and Data 2 are for communication while the +24Vdc and COM are for power, supplied by the ZGARD C 485 controller. **Refer to the associated controller, Installation Outline Drawing 106932A for further details.**

Setting-up the Warning & Alarm Delays:

There is one method for setting the warning and alarm delays. This is preprogrammed (Jumper HI-9); if HI-9 jumper is IN the delay is fixed for 5 minutes. If HI-9 jumper is out there are no delays.

H2		PARAMETER SETUP	
	1	1	Relays Normally Energized / De-Energized (IN/OUT)
	2	2	Alarm Latch (IN)

Relay Functions:

All relays are normally de-energized when inactive and energized when activated (Jumper H2-1 OUT). When jumper H2-1 is (IN), all relays are normally energized when inactive and de-energized when activated. This provides fail-safe operation of the controller. Each relay has an LED associated with it that shows if the relay is energized.

Alarm Latch:

Normally all relays return to their inactive state once their condition has cleared. The alarm relay can be made to latch in the activated position even after all alarms have cleared. By inserting jumper H2-2 the alarm relay (not the LED on the front panel) will remain latched after all alarms clear until the reset button is pressed.

Section 6
**ZGARD C 485 24-Channel, 2-Zone Controller
Installation and Setup**

Warning and Alarm Set-Points:

The warning and alarm set points are adjustable from 0% to 100% FS (Full-Scale) via four potentiometers (labeled: WARNING 1, ALARM 1, WARNING 2 and ALARM 2). This is accomplished by inserting a voltage test Meter in the associated potentiometer test points (TP1, TP2, TP3 and TP4) shown below. The test points represent a voltage of 0-5Vdc for each set point form 0-100% FS.

Warning 1:	0-100% = 0-5Vdc at TP1	(Warning Zone 1)
Alarm 1:	0-100% = 0-5Vdc at TP2	(Alarm Zone 1)
Warning 2:	0-100% = 0-5Vdc at TP3	(Warning Zone 2)
Alarm 2:	0-100% = 0-5Vdc at TP4	(Alarm Zone 2)

TP = Set point (% full-scale)/100 x 5Vdc.

Example: To set up a Warning threshold of 25% FS and an Alarm threshold of 60% FS.

Warning Set-Point **TP1 and TPCOM should read: Warning (25/100) x 5 = 1.25Vdc**

Alarm Set-Point **TP2 and TPCOM should read: Alarm (60/100) x 5 = 3.0Vdc**

Analog Output Adjustment:

The analog output (4-20mA) is factory calibrated, and should not require adjustment. It does not drift because it is digitally controlled by the microprocessor. If adjustments are required, a ZERO and SPAN potentiometer can be used to perform these.

To adjust the output to 4-20mA for 0-100% input (factory setting) when using RS485 type sensors, a 0% and 100% input can be obtained by making sure the sensor is not exposed to any gas or ideally by disconnecting the sensor (the Sensor Fail will then activate - ignore it) for a 0% signal, and by inserting the 100% jumper on the back of the sensor board for a 100% signal.

Section 7

ZGARD C 485 Controllers

Start-Up Procedure

When wiring, checking or working within a ZGARD C 485 Controller, always disconnect the main power to prevent bodily harm.

1. Loosen the locking screws on front of the controller and open the door.
2. Locate the power switch on main circuit board inside controller enclosure.
3. Check all wiring connections are correct and secure.
4. Confirm that the selection jumpers are appropriately inserted to reflect binary code for the number of remote sensors associated with the corresponding controller.
5. Confirm that each controller's active RS485 digital remote sensor(s) are appropriately assigned a unique binary address code. **Refer to the appropriate gas sensor manual for further details.**
6. Power up the controller and observe the behavior of the following indicators;
Green LED (POWER) Indicator on front panel should be ON. **(On 8 and 16-Channel Controllers only)**
Green LED (Sensor OK) Indicator(s) on front panel should be ON. **(Discrete on the 2-Zone Controllers)**
Amber LED (WARNING) Indicator(s) on front panel should be OFF. **(Discrete on the 2-Zone Controllers)**
Red LED (ALARM) Indicator(s) on front panel should be OFF. **(Discrete on the 2-Zone Controllers)**

During initial power up of the controller, the local audible alarm may be activated, press RESET button to silence.

7. Allow the associated remote gas sensors to stabilize. **Refer to the appropriate gas sensor manual for further details.**

Depending on the controller's warning, alarm and delay settings, the display status and the relay action of the controller may vary. Refer to the installation sections of the associated ZGARD C 485 Controller.

8. Confirm the functionality of the controller and that is operating according to the designed or pre-set configuration settings.
9. Apply a representative sample (at least 60% of the operating range) of the target gas to each of the associated remote gas sensors. This simple test should drive the gas sensors upscale and simulate a warning and or an alarm condition on the controller. **Refer to the appropriate gas sensor manual for further details.**

During this procedure, the audible device may be activated, press RESET button to silence.

The warning and alarm indicators and the corresponding relays may be activated.

Depending on the controller's warning and alarm set-points and delay feature settings, the Warning and Alarm relays may be activated.

Any remote equipment, which may be connected to the controller relay contacts, should now be activated.

10. Remove any test equipment from the sensor and controller.
11. Secure the locking screws on the front door of the ZGARD C 485 Controller.
12. Secure the locking screws on cover or front door of the associated remote gas sensors.
 - ✓ The initial function test of the ZGARD C 485 Controller is now completed.

Section 8
ZGARD C 485 Controllers
Parts List

Item	Part Number
8-Channel, 1-Zone Controller Mother Board (110Vac Version)	10090499
8-Channel, 1-Zone LED Display Board	10090652
8-Channel, 1-Zone Ribbon Cable Assembly	10090653

Item	Part Number
16-Channel, 1-Zone Controller Mother Board (110Vac Version)	10090498
16-Channel, 1-Zone LED Display Board	10097985
16-Channel, 1-Zone Ribbon Cable Assembly	10090653

Item	Part Number
16-Channel, 2-Zone Controller Mother Board (110Vac Version)	10090500
16-Channel, 2-Zone LED Display Board	10097982
16-Channel, 2-Zone Ribbon Cable Assembly	10097988

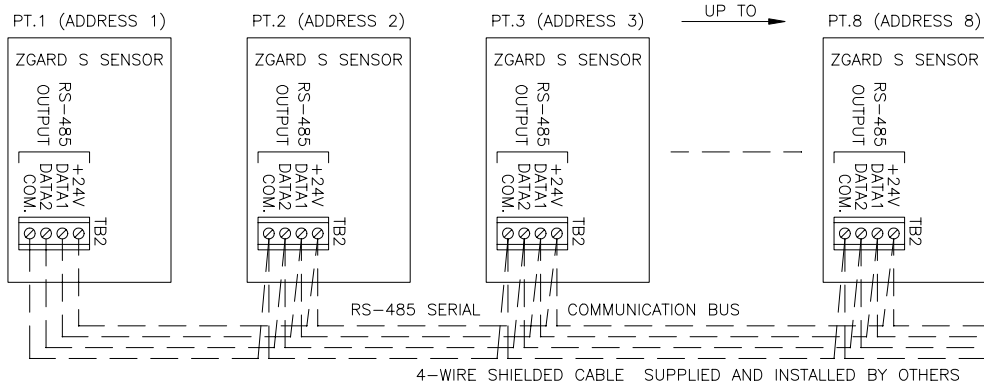
Item	Part Number
24-Channel, 2-Zone Controller Mother Board (110Vac Version)	10090651
24-Channel, 2-Zone LED Display Board	10097982
24-Channel, 2-Zone Ribbon Cable Assembly	10097988

*** When ordering replacement parts, please state the MSA P/N and S/N of unit.**

 WARNING

Use only genuine MSA replacement parts when performing any maintenance on the ZGARD C 485 Controllers. Failure to do so may seriously impair instrument performance. Repair or alteration of the ZGARD C 485 controllers, beyond the scope of these maintenance instructions or by anyone other than authorized MSA service personnel, could cause the product to fail to perform as designed, and persons who rely on this product for their safety could sustain serious personal injury or death.

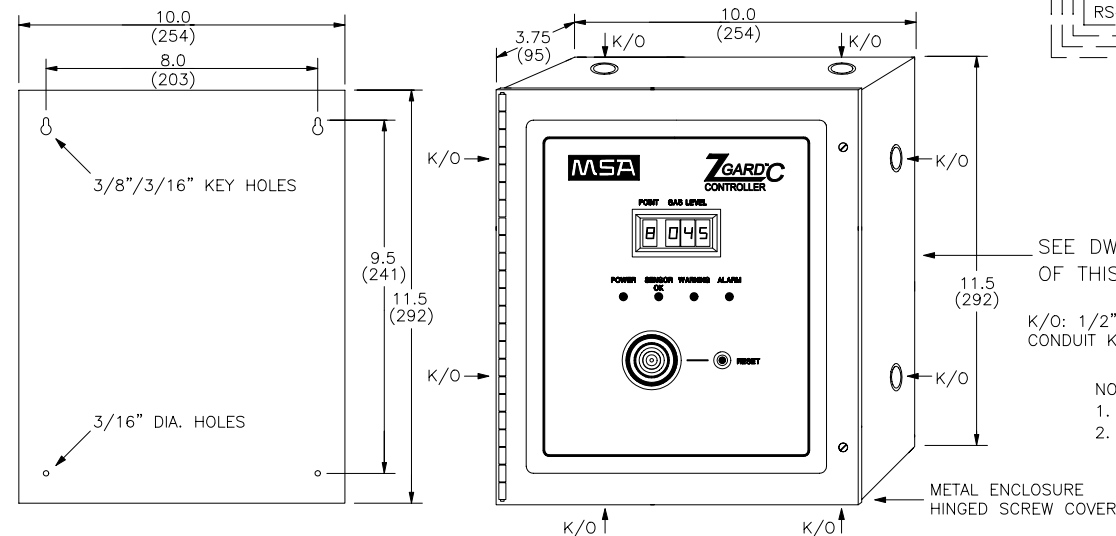
Disconnect all power source(s) to the ZGARD C 485 Controllers before removing or changing any components.



FOR DAISY-CHAIN (SERIES) WIRING OF ZGARD S SENSORS TO THE ZGARD C 485 CONTROLLER AS SHOWN HERE, EACH SENSOR MUST BE UNIQUELY ADDRESSED VIA JUMPERS ON SENSOR CIRCUIT BOARD.

CABLE LENGTH VS. SIZE (AWG#)				
CABLE LENGTH FEET	No. OF SENSORS	4	6	8
1 TO 500	AWG #	22	22	22
501 TO 1,000	AWG #	22	20	20
1,001 TO 1,500	AWG #	20	18	18
1,501 TO 2000	AWG #	18	16	16

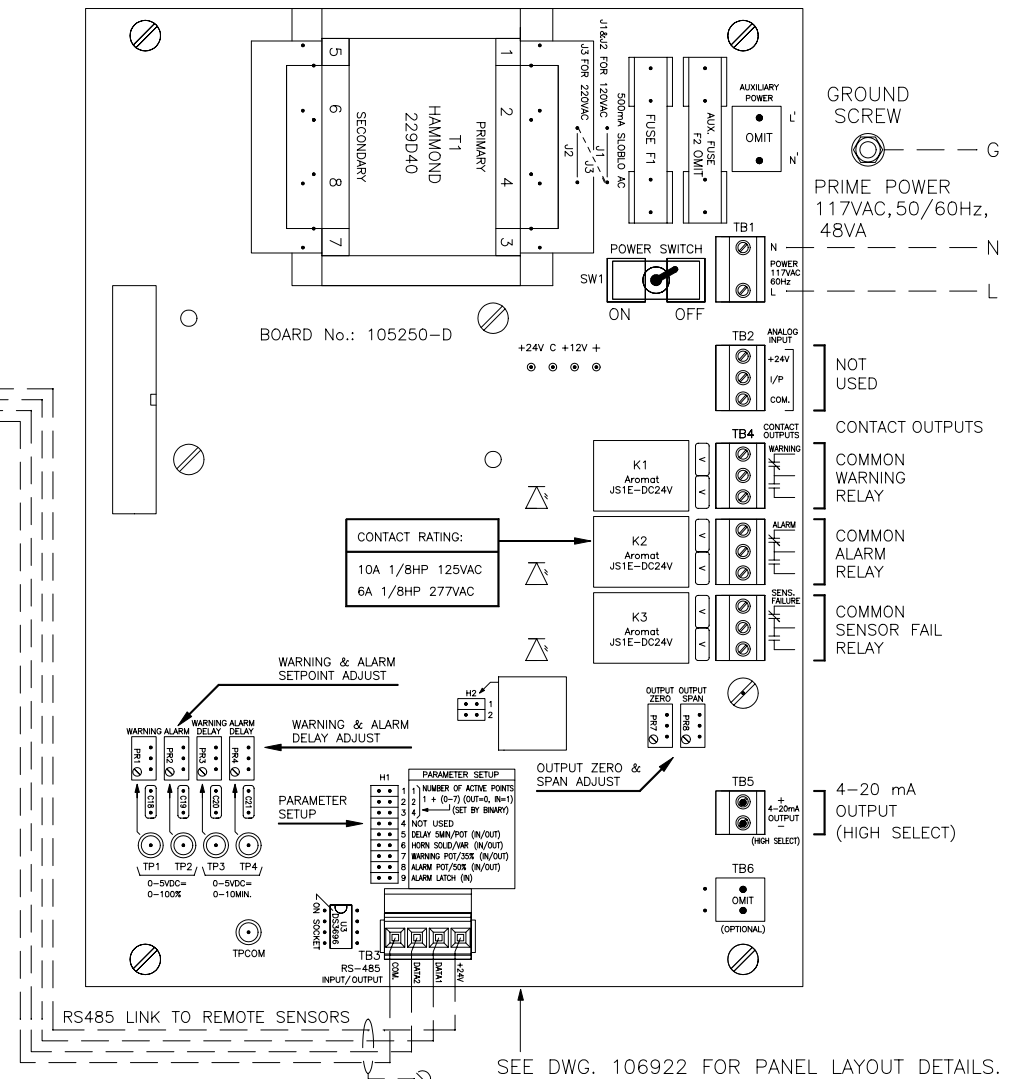
SUGGESTED CABLE	
GAUGE (AWG#)	4-WIRE SHIELDED CABLE
22	ALPHA WIRE 5504
20	ALPHA WIRE 5514
18	ALPHA WIRE 5524
16	ALPHA WIRE 5534



SEE DWG. 106921 FOR CLOSE VIEW OF THIS ENCLOSURE.

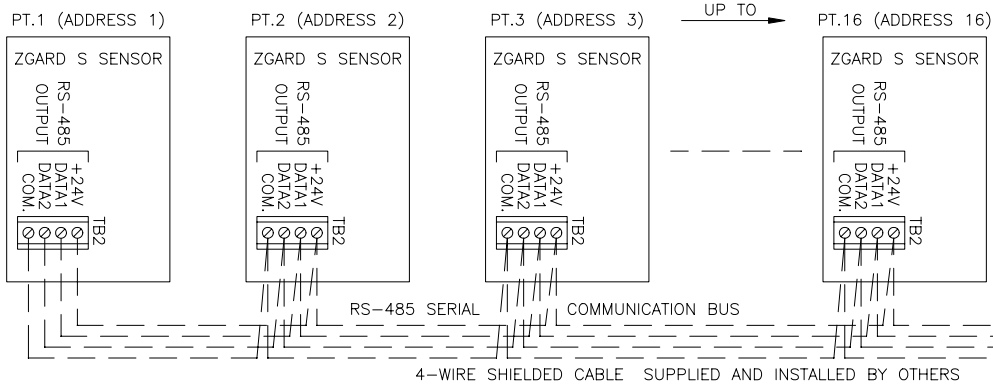
K/O: 1/2"/3/4" CONDUIT KNOCK OUT

- NOTES:
- DIMENSIONS SHOWN IN INCHES (MILLIMETERS).
 - SYSTEM MAY CHANGE TO IMPROVE PERFORMANCE.



SEE DWG. 106922 FOR PANEL LAYOUT DETAILS.

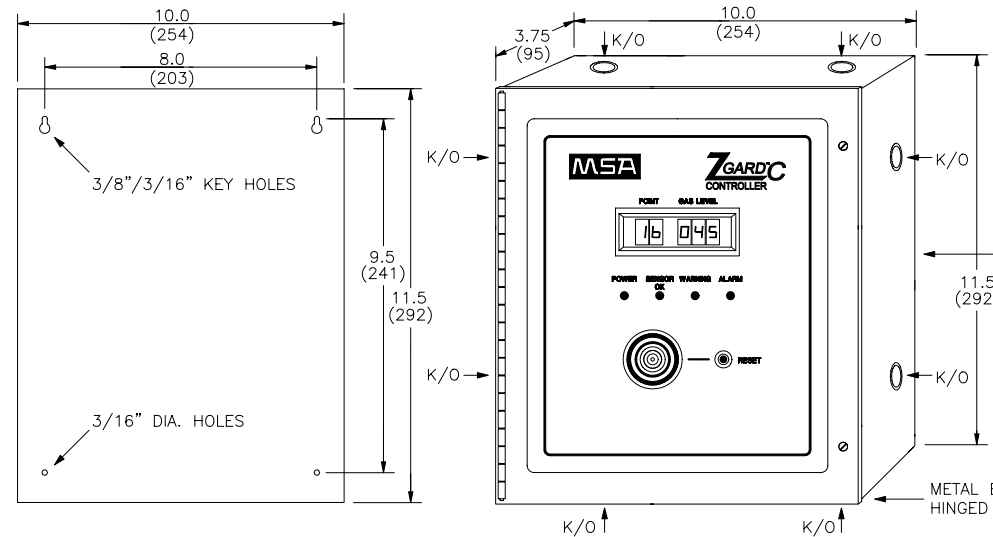
MSA		
CHKD:	DATE: Dec. 22/04	DRN: KS
ZGARD C 485 8-Channel, 1-Zone Controller Installation Outline		
DWG. NO.:	106923	REV. A



FOR DAISY-CHAIN (SERIES) WIRING OF ZGARD S SENSORS TO THE ZGARD C 485 CONTROLLER AS SHOWN HERE, EACH SENSOR MUST BE UNIQUELY ADDRESSED VIA JUMPERS ON SENSOR CIRCUIT BOARD.

CABLE LENGTH VS. SIZE (AWG#)		4	6	8	10	12	14	16
CABLE LENGTH FEET	No. OF SENSORS							
1 TO 500	AWG #	22	22	22	22	22	20	20
501 TO 1,000	AWG #	22	20	20	20	18	18	18
1,001 TO 1,500	AWG #	20	18	18	16	16	16	16
1,501 TO 2000	AWG #	18	16	16	14	14	14	14

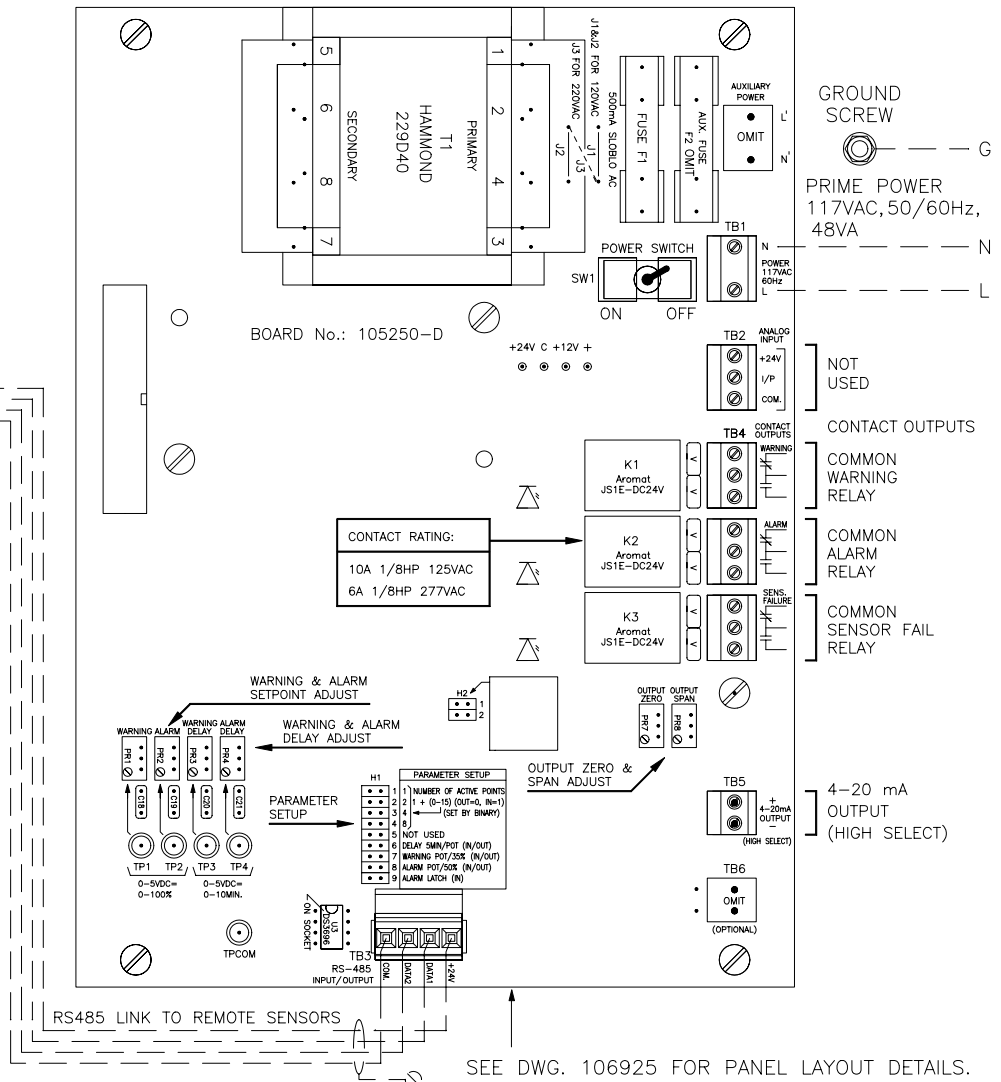
SUGGESTED CABLE	
GAUGE (AWG#)	4-WIRE SHIELDED CABLE
22	ALPHA WIRE 5504
20	ALPHA WIRE 5514
18	ALPHA WIRE 5524
16	ALPHA WIRE 5534
14	ALPHA WIRE 5544



SEE DWG. 106924 FOR CLOSE VIEW OF THIS ENCLOSURE.

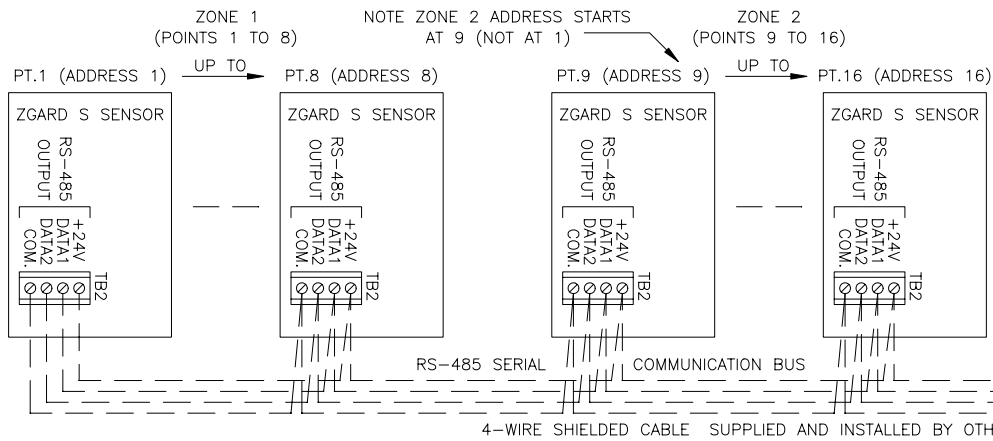
K/O: 1/2\"/>

- NOTES:
1. DIMENSIONS SHOWN IN INCHES (MILLIMETERS).
 2. SYSTEM MAY CHANGE TO IMPROVE PERFORMANCE.



SEE DWG. 106925 FOR PANEL LAYOUT DETAILS.

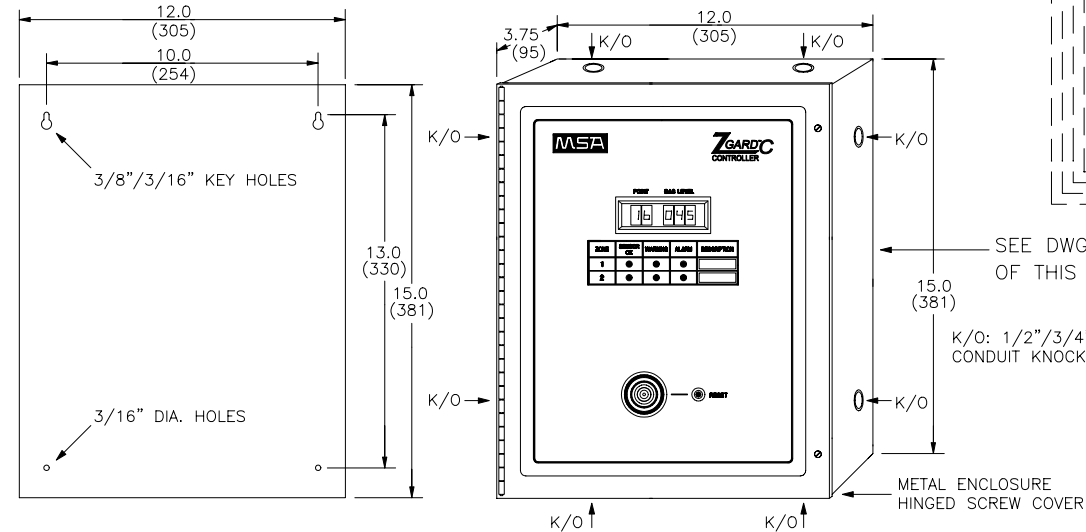
MSA		
CHKD:	DATE: Dec. 22/04	DRN: KS
ZGARD C 485 16-Channel, 1-Zone Controller Installation Outline		
DWG. NO.:	106926	REV. A



FOR DAISY-CHAIN (SERIES) WIRING OF ZGARD S SENSORS TO THE ZGARD C 485 CONTROLLER AS SHOWN HERE, EACH SENSOR MUST BE UNIQUELY ADDRESSED VIA JUMPERS ON SENSOR CIRCUIT BOARD.

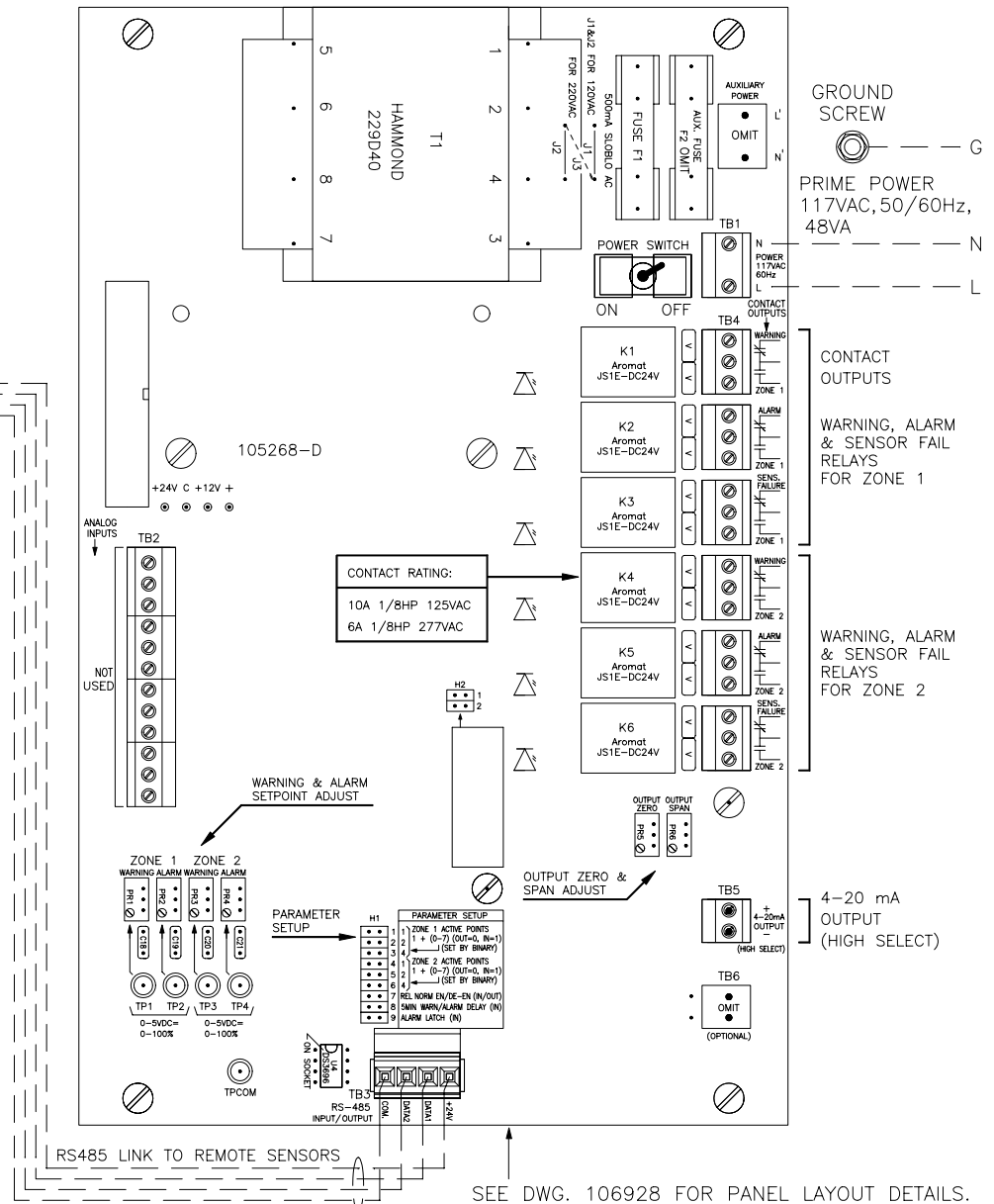
CABLE LENGTH VS. SIZE (AWG#)								
CABLE LENGTH FEET	No. OF SENSORS	4	6	8	10	12	14	16
1 TO 500	AWG #	22	22	22	22	22	20	20
501 TO 1,000	AWG #	22	20	20	20	18	18	18
1,001 TO 1,500	AWG #	20	18	18	16	16	16	16
1,501 TO 2000	AWG #	18	16	16	14	14	14	14

SUGGESTED CABLE	
GAUGE (AWG#)	4-WIRE SHIELDED CABLE
22	ALPHA WIRE 5504
20	ALPHA WIRE 5514
18	ALPHA WIRE 5524
16	ALPHA WIRE 5534
14	ALPHA WIRE 5544

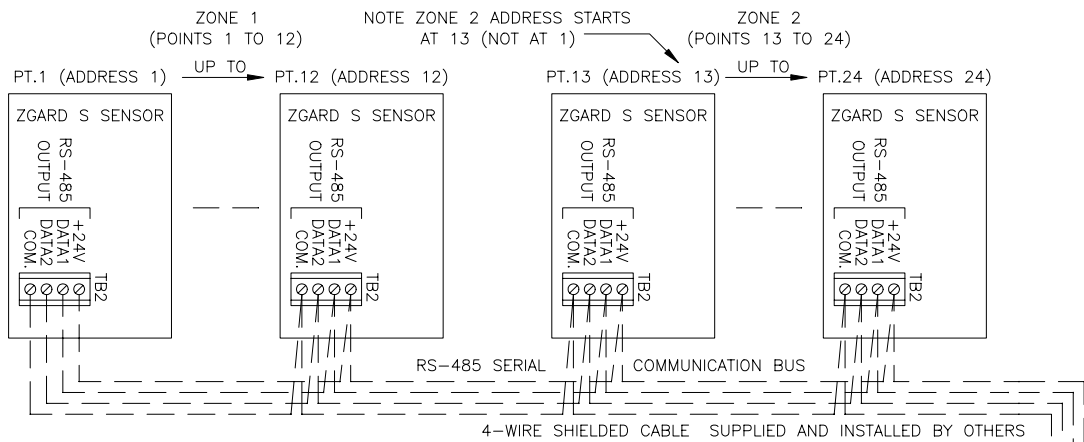


SEE DWG. 106927 FOR CLOSE VIEW OF THIS ENCLOSURE.

- NOTES:
- DIMENSIONS SHOWN IN INCHES (MILLIMETERS).
 - SYSTEM MAY CHANGE TO IMPROVE PERFORMANCE.



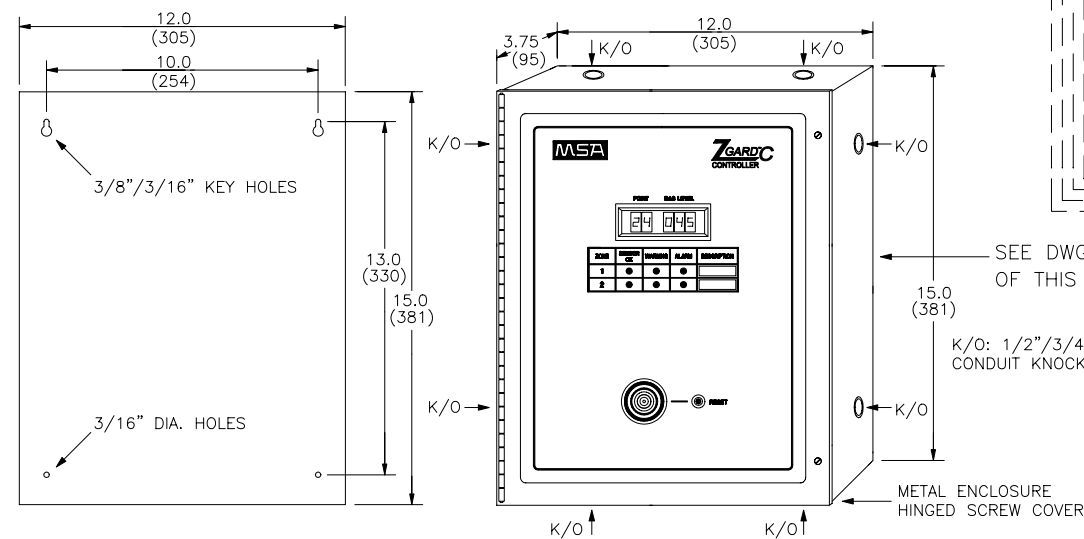
MSA		
CHKD:	DATE: Dec. 22/04	DRN: KS
ZGARD C 485 16-Channel, 2-Zone Controller Installation Outline		
DWG. NO.:	106929	REV. A



FOR DAISY-CHAIN (SERIES) WIRING OF ZGARD S SENSORS TO THE ZGARD C 485 CONTROLLER AS SHOWN HERE, EACH SENSOR MUST BE UNIQUELY ADDRESSED VIA JUMPERS ON SENSOR CIRCUIT BOARD.

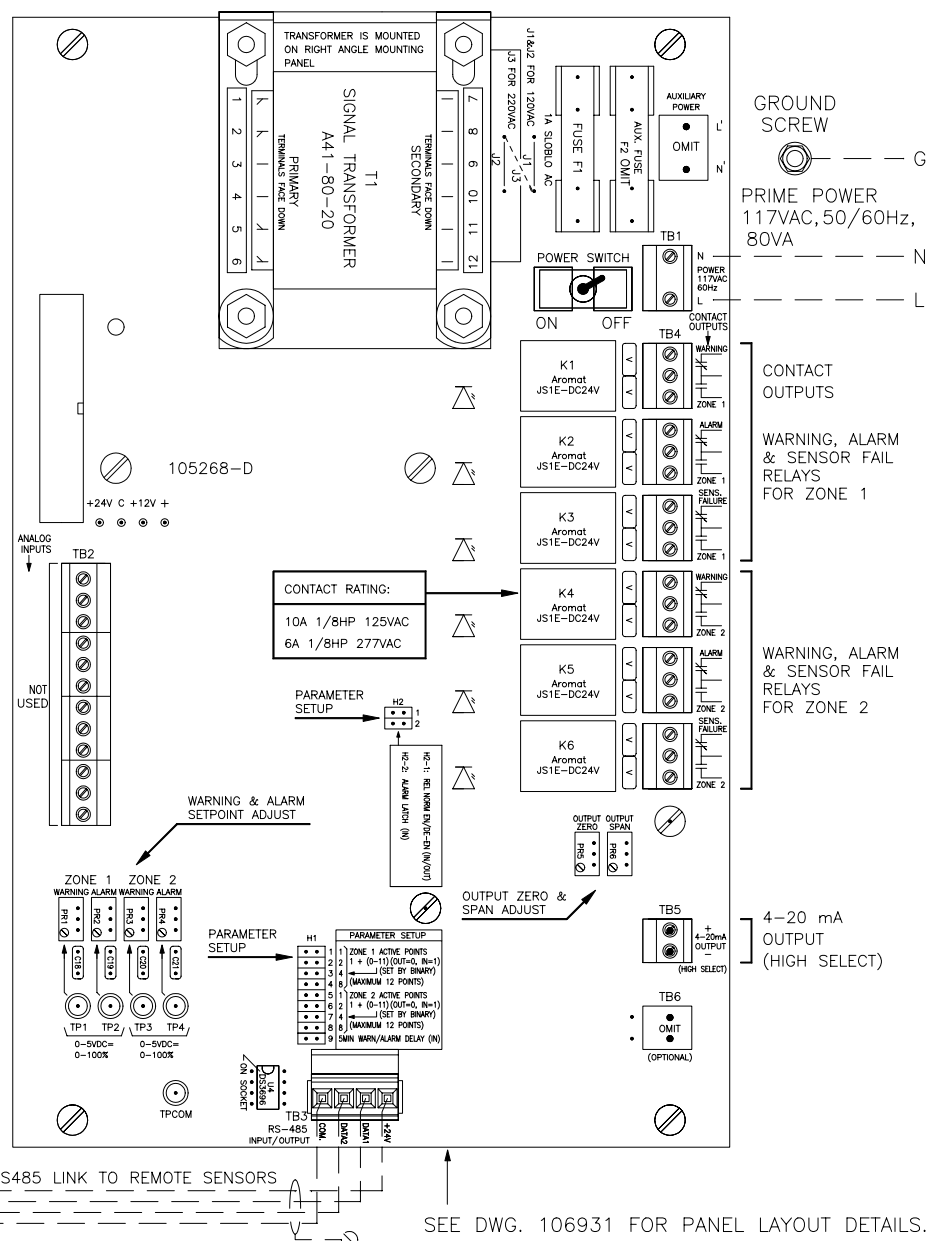
CABLE LENGTH VS. SIZE (AWG#)												
CABLE LENGTH FEET	No. OF SENSORS	4	6	8	10	12	14	16	18	20	22	24
1 TO 500	AWG #	22	22	22	22	22	20	20	20	18	18	18
501 TO 1,000	AWG #	22	20	20	20	18	18	18	18	18	16	16
1,001 TO 1,500	AWG #	20	18	18	16	16	16	16	16	16	14	14
1,501 TO 2000	AWG #	18	16	16	14	14	14	14	14	14	14	14

SUGGESTED CABLE	
GAUGE (AWG#)	4-WIRE SHIELDED CABLE
22	ALPHA WIRE 5504
20	ALPHA WIRE 5514
18	ALPHA WIRE 5524
16	ALPHA WIRE 5534
14	ALPHA WIRE 5544



SEE DWG. 106930 FOR CLOSE VIEW OF THIS ENCLOSURE.

NOTES:
1. DIMENSIONS SHOWN IN INCHES (MILLIMETERS).
2. SYSTEM MAY CHANGE TO IMPROVE PERFORMANCE.



MSA		
CHKD:	DATE: Dec. 22/04	DRN: KS
ZGARD C 485 24-Channel, 2-Zone Controller Installation Outline		
DWG. NO.:	106932	REV. A