MAXXNET OVERVIEW

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1. Introduction

MAXXNET is a distributed control system. Its purpose is to control operations located throughout a facility or family of facilities. MAXXNET monitors these operations and presents information to the operators in an organized way. It also stores the information for use in reports or for reconstructing events. MAXXNET typical applications include:

Access control, including: badging authorized persons; maintaining a database of card holder information; authorizing and de-authorizing card holders' Access to devices; controlling doors, gates, turnstiles, and elevators; and generating alarms for Access violations.

Security monitoring, including: directly monitoring alarm devices and generating alarm and status information, controlling video and audio systems, and interfacing with fire alarm and other systems.

Building management, including: smart lighting and other lighting control, HVAC and other control through scheduling and occupancy information.

Prison control, including door control, intercom, cameras, lights, take-over and other prison control functions.

All these functions can be combined into the same system allowing each system to use a common set of what would be redundant information such as time schedules or card access functions to control other processes.

MAXXNET includes computer workstations and field controllers whose hardware and software development have been carefully coordinated. The workstations are used for operator and administrator actions. The field controllers, called Intelligent Device Controllers (IDC2015's) and Programmable Logic Controllers (PLC2015's) interface with field devices.

The workstations use powerful, personal computers with the Windows operating system or Window Virtual Machine (VM).

The PLCs and IDCs are programmable controllers with interfaces for card readers, PIN key pads, both discrete and analog input and output (I/O) signals, and serial communication devices. The **PLCs and IDCs** are capable of stand-alone operation.

The IDCs for Access control can use internal programs for standard Access control functions or custom relay ladder programs. The PLCs generally use custom relay ladder programs. Both the **PLCs and the IDCs** can interface with smart lighting boards. Sample programs are available for implementing smart lighting applications.

MAXXNET workstations, IDCs and PLCs can all communicate over the network.

2. MAXXNET Software Applications

There are several applications available in the MAXXNET system to provide configuration, monitoring, control and maintenance. These are listed below with a brief explanation of their function. The system will support multiple workstations of each type. In smaller applications, some computer functions can be combined on a single workstation or server.

The Area Control Computers, ACCs, function as a bridge between the computer applications and the IDCs and PLCs. They are connected on the network and send transaction information received from the IDCs and PLCs to the AWSs and GWSs. The ACCs also send configuration information from the MWS.

The Area Control Computer (ACC) is an application that runs on a workstation. If the system is a single computer system, this application can run concurrently with the Alarm (AWS) and Management (MWS) and Graphic (GWS) Work Station applications. AWSs, MWSs and GWSs communicate with the ACC using a network connection.

The Alarm Work Station, AWS, is used by an operator to monitor and control the system. Alarm and event transactions are displayed and acknowledged from the AWS applications. Comments are entered by the operator, and card holder access and historical information is displayed.

The Management Work Station, MWS, is used by personnel who configure and administer the system.

The Graphics Work Station, GWS, is used by an operator to monitor and control the system using a graphical representation of the system.

The Graphic Object Builder, GOB, is used to develop the graphical displays and add icons for control and monitoring functions.

The Domain Controller and Database Server, such as Microsoft Server 2012 or later and Microsoft SQL Server 2012 or later are typically used.

The IDC Utilities and **Network IDC Utilities** applications are used for maintenance and troubleshooting.

3. MAXXNET Hardware

The Processor Assembly for the IDCs and PLCs is two versions of the same board. This IDC/PLC2015 processor module has an embedded Network Interface Card (NIC) and runs the Microsoft Windows CE operating system which supports the native network communication.

The PLC version is configured to mount into a Master I/O Unit (MIOU) card cage along with Input and Output I/O boards. The I/O boards connect to interface boards which have removable terminal blocks for field wiring.

The IDC version mounts to a back plane and interfaces with RIM2 access control hardware modules and RIN and RIO discrete input and output modules.

The RIM2 boards interfaces with card readers and access control door inputs and outputs. Both the IDC and PLC versions can interface with the Smart Lighting SI420 and SLC32 hardware modules.

The SI420 has analog inputs and outputs and interfaces with LED lighting, ambient light sensors and potentiometers to control the light level to a user programmed foot candle set point. Using the relay ladder programming capability, these set points can be changed by time schedule for day and night settings.

The SLC32 has 32 outputs to control latch, unlatch contactors for on/off lighting. Standard relay ladder programs are available for doing lighting sweeps for control of when lights are shut off.

3.1. IDC2015/PLC2015 Processor Board

The IDC/PLC2015 processor assembly takes advantage of the features of the embedded Microsoft CE operating system. These include a flash file system using 2 Gbytes of flash memory, CE's EDB enhanced database and native network support that are all imbedded into the IDC/PLC2015. The IDC/PLC2015 supports relay ladder programming for custom applications.

IDC/PLC2015 processor board:

- Microsoft CE operating system.
- Downloadable firmware through the network to connected IDC/PLC2015 assemblies.
- 10/100 Ethernet, RJ45 connector.
- Network or serial communications to Access Control Head End software.
- 2Gbyte flash memory.
- 512Mbyte DDR2 System Memory.
- Two USB ports.
- Gas tube surge suppressor to AC ground for optimum transient protection.
- Printed circuit board ground and power layers to minimize electrical emissions.
- Interfaces with up to eight card readers using RIM2 boards.
- 12 or 24 Volt power input, 4 watts
- 6" x 4" circuit board footprint.

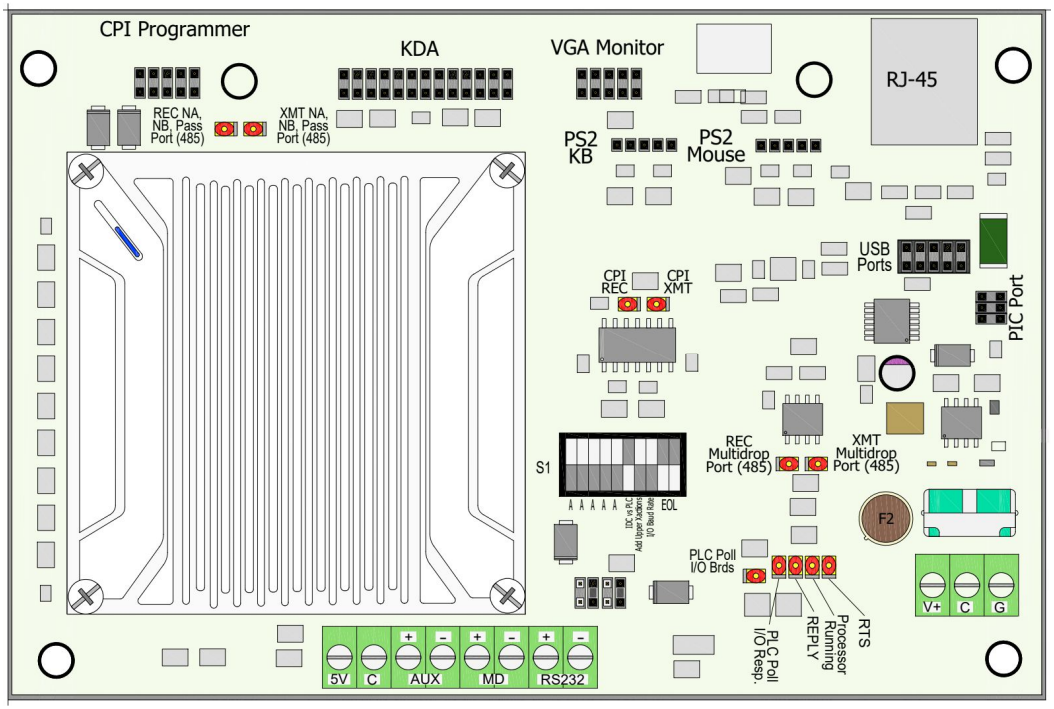


FIGURE 1
IDC/PLC2015 Processor Assembly

3.2. The IDC2015

The IDC2015 version of the Processor board is used for access control and smart lighting applications. The AWS main screen shown below is used to display alarm and event activity.

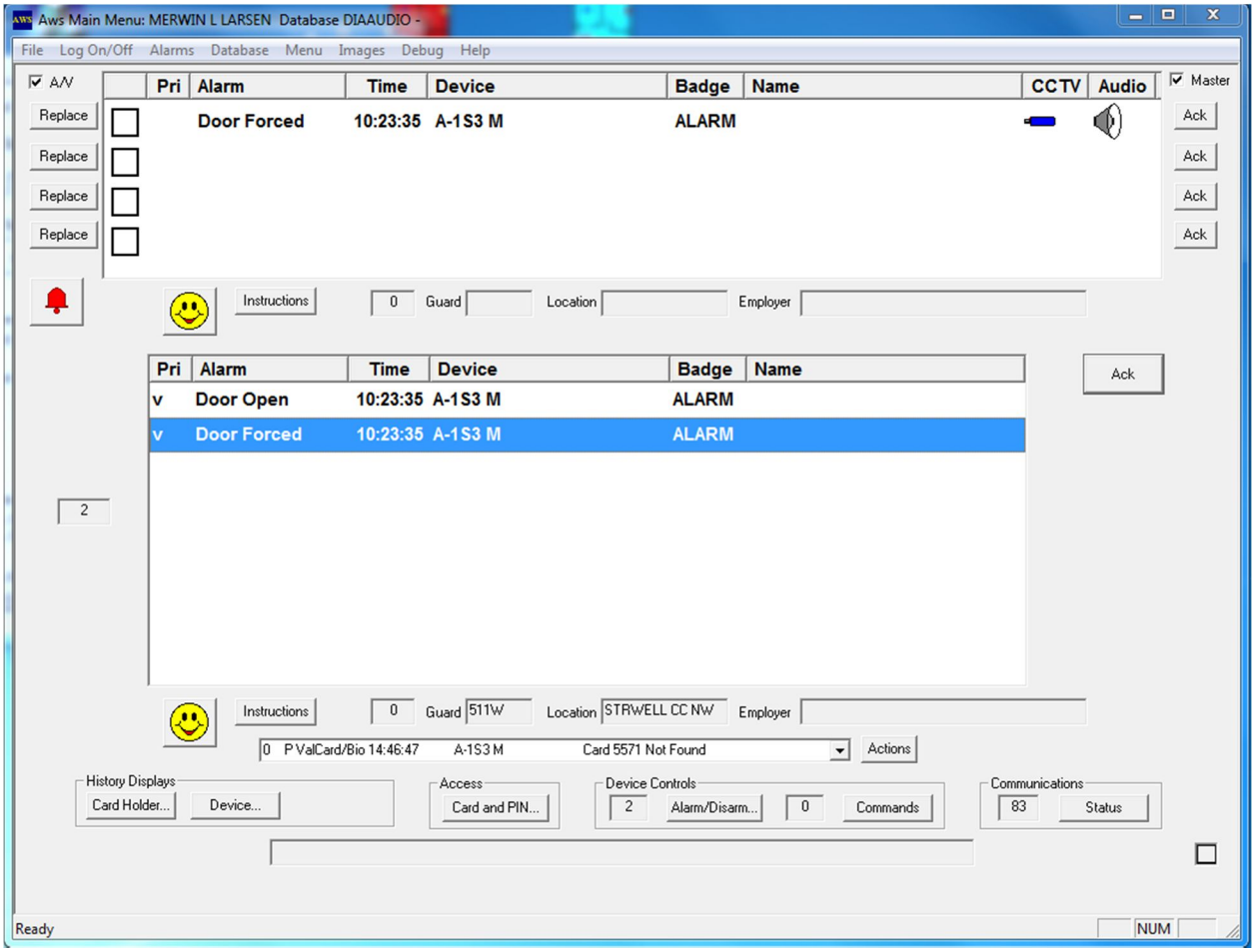


FIGURE 2
AWS Main Screen

The AWS displays alarm and change of status events as they occur if they are configured to be displayed. Video and Audio can also be called up from the AWS for any events.

History displays by card holders or access control devices (doors) can be displayed and card holder access information can be displayed. This allows operators to evaluate alarm conditions.

A device display is available to show all devices that are currently in alarm and devices that are disarmed by time schedule. The disarmed devices indicate whether the device is disarmed by time schedule or operator control.

A communication status display is also available to indicate which ACCs and IDC/PLCs are in communication failure. Alarms are also generated for these conditions.

3.2.1.IDC2015 I/O Track and Transaction Configuration

The IDC2015 is divided up into 16 devices. Devices one through eight are dedicated to the eight access control devices that can be controlled by the IDC2015. Each of the eight access control devices can have 16 transactions such as “Door Forced Open” or “Door Held Open”. These transactions can be defined using the MWS.

When using the standard functionality of the internal firmware, each door device has two inputs, the first input point is for the door position switch, DPS, and the second input is for the request to exit, REX, input.

Each door also has two outputs, the first is for the door lock and the second is an alarm output for when the door is in an alarm condition.

If using the relay ladder programming capability to create a custom application, additional inputs, outputs and logic can be implemented.

Each of the device transactions have a time schedule associated with it. These can control when the transactions are active. Time schedules can also control when they are sent to different AWS workstations, when they can be disarmed and control when card plus PIN access is required.

3.2.2.RIM2 Access Control Interface Board

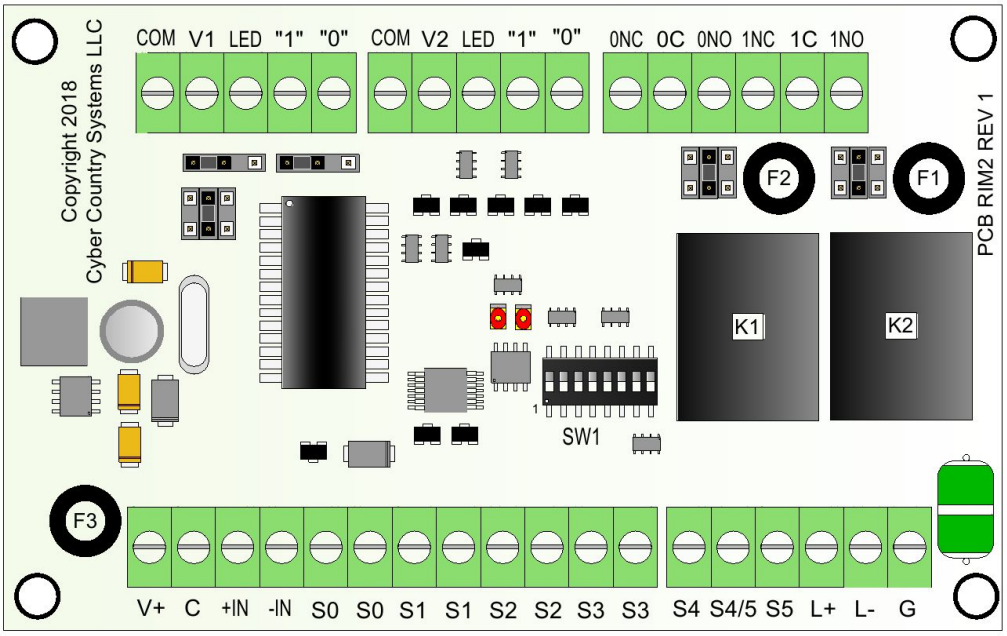


FIGURE 3
RIM2

The RIM2 board interfaces with card readers and door control hardware such as door locks and door position switches. Each RIM2 can connect to two card readers and has I/O for six supervised inputs and two form “C” relay contacts.

3.2.3.PLC I/O Track and Transaction Configuration

The PLC2015 is also divided up into 16 devices. Each device can have 16 transactions for a total of 256 transactions.

The PLC2015 can also be configured to handle 512 transactions and 512 I/O points.

The PLC connects to 32-point Input and 32-point output boards. The PLC processor and the input and output boards mount in an MIOU (Master I/O Unit) card cage which also has a 5-volt power supply to power those boards. The configuration of the PLCs is set up at the MWS by updating the ACC and IDC tables.

3.2.3.1. RIM2 Setup

Each IDC2015 can control up to eight card readers and be configured to control up to eight RIM2s. The RIM2s can be configured for either one or two card readers. Therefore, an IDC can control up to four RIM2s with two readers each or eight RIM2s with one reader each or a combination of both until it reaches the eight card readers.

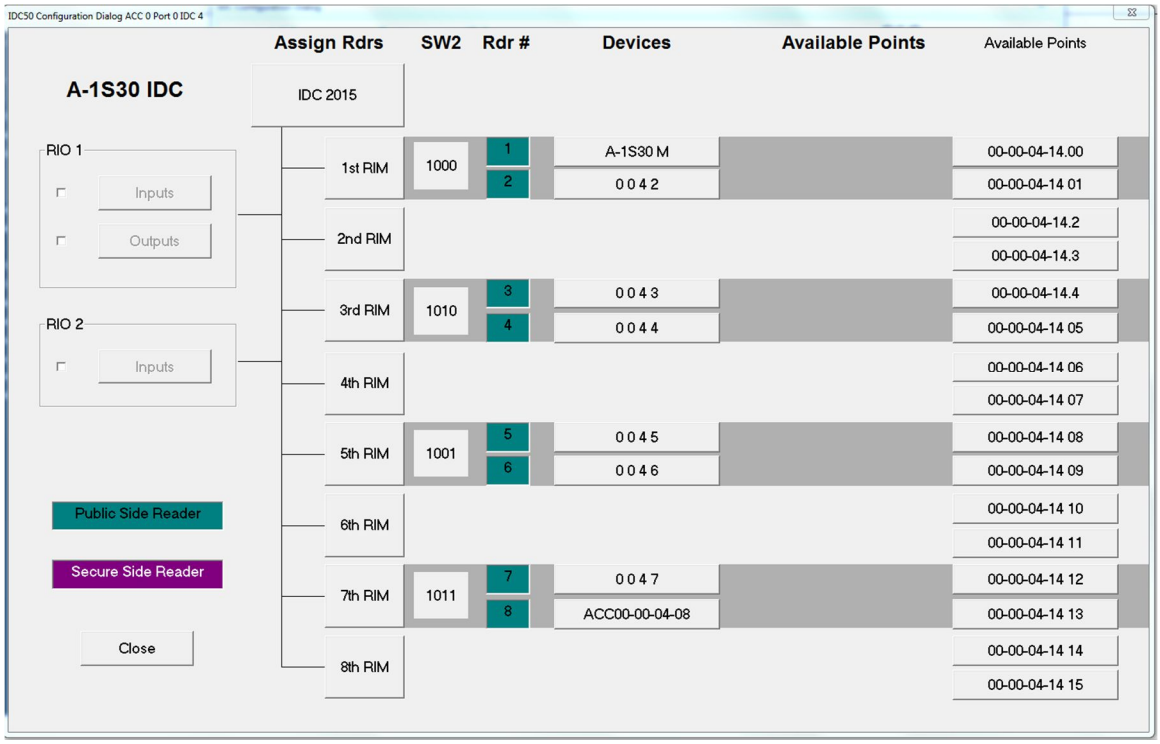


FIGURE 4

Figure 4 shows the setup screen for four RIM2s each configured for two doors with one card reader each. SW2 indicates the first four positions of the RIM2 address switch for this configuration. The next column indicates the card reader numbers.
The devices column shows the user defined Device ID (Door name) for each device. The green color indicates they are all Public Side readers.

There are two relays on the RIM2. In this configuration, the first device on the RIM2 uses relay K1 for the door control output and the second door uses relay K2. In this configuration, there is no alarm relay.

There are six inputs on the RIM2. In this configuration, these inputs are configured as defined below.

S0 Door position switch (DPS) for door "1".
S1 Request to exit (REX) for door "1".
S2 Door position switch (DPS) for door "2".
S3 Request to exit (REX) for door "2".
S4 Aux inputs, Track 14 points defined from second column of available points.
S5 Aux inputs, Track 14 points defined from second column of available points.

The auxiliary inputs can be used as inputs to generate alarm inputs such as "Tamper" or "Duress". The descriptions shown in the last column are user configurable.

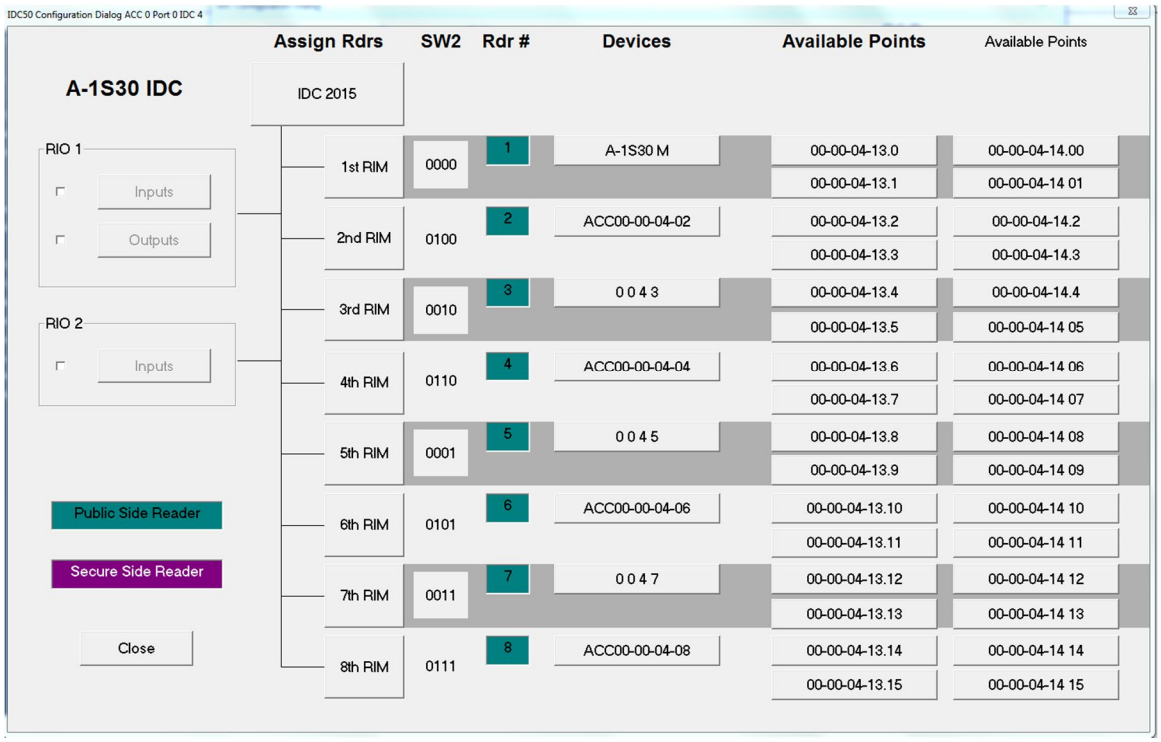


FIGURE 5

Figure 5 shows the setup screen for eight RIM2s each configured for one door with one card reader. SW2 indicates the first four positions of the RIM2 address switch for this configuration. The next column indicates the card reader numbers.

The devices column shows the user defined Device ID (Door name) for each device. The green color indicates they are all Public Side readers.

There are two relays on the RIM2. In this configuration, the first device on the RIM2 uses relay K1 for the door control output and relay K2 is an alarm relay that energizes whenever an alarm condition is present at the door.

The six inputs on the RIM2 in this configuration are defined below.

S0 Door position switch (DPS) for door "1".
S1 Request to exit (REX) for door "1".
S2 Aux inputs, Track 13 points defined from first column of available points.
S3 Aux inputs, Track 13 points defined from first column of available points.
S4 Aux inputs, Track 14 points defined from second column of available points.
S5 Aux inputs, Track 14 points defined from second column of available points.

The auxiliary inputs can be used as inputs to generate alarm inputs such as "Tamper" or "Duress". The descriptions shown in the last column are user configurable.

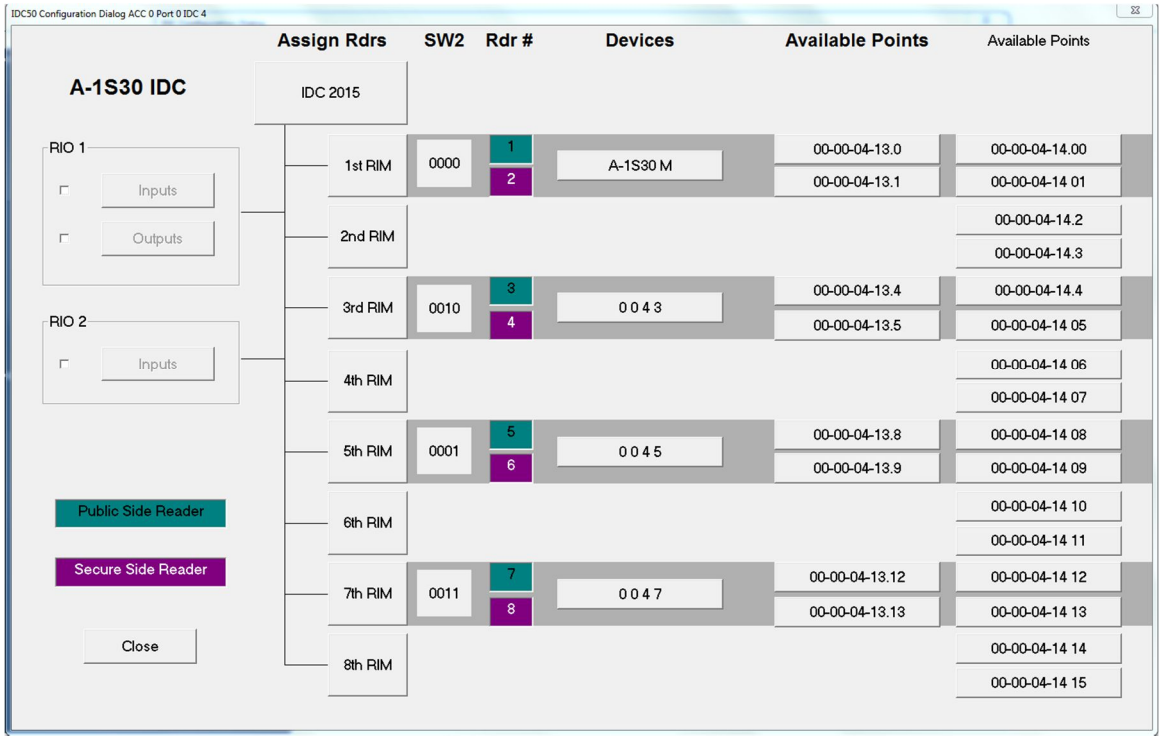


FIGURE 6

Figure 6 shows the setup screen for four RIM2s each configured for one door with two card readers each. SW2 indicates the first four positions of the switch for this configuration. The next column indicates the card reader numbers.

There are two relays on the RIM2. In this configuration, the first device on the RIM2 uses relay K1for the control output and relay K2 for an alarm output.

The six inputs on the RIM2 in this configuration are configured as defined below.

S0 Door position switch (DPS) for door "1".
S1 Request to exit (REX) for door "1".
S2 Aux inputs, Track 13 points defined from first column of available points.
S3 Aux inputs, Track 13 points defined from first column of available points.
S4 Aux inputs, Track 14 points defined from second column of available points.
S5 Aux inputs, Track 14 points defined from second column of available points.

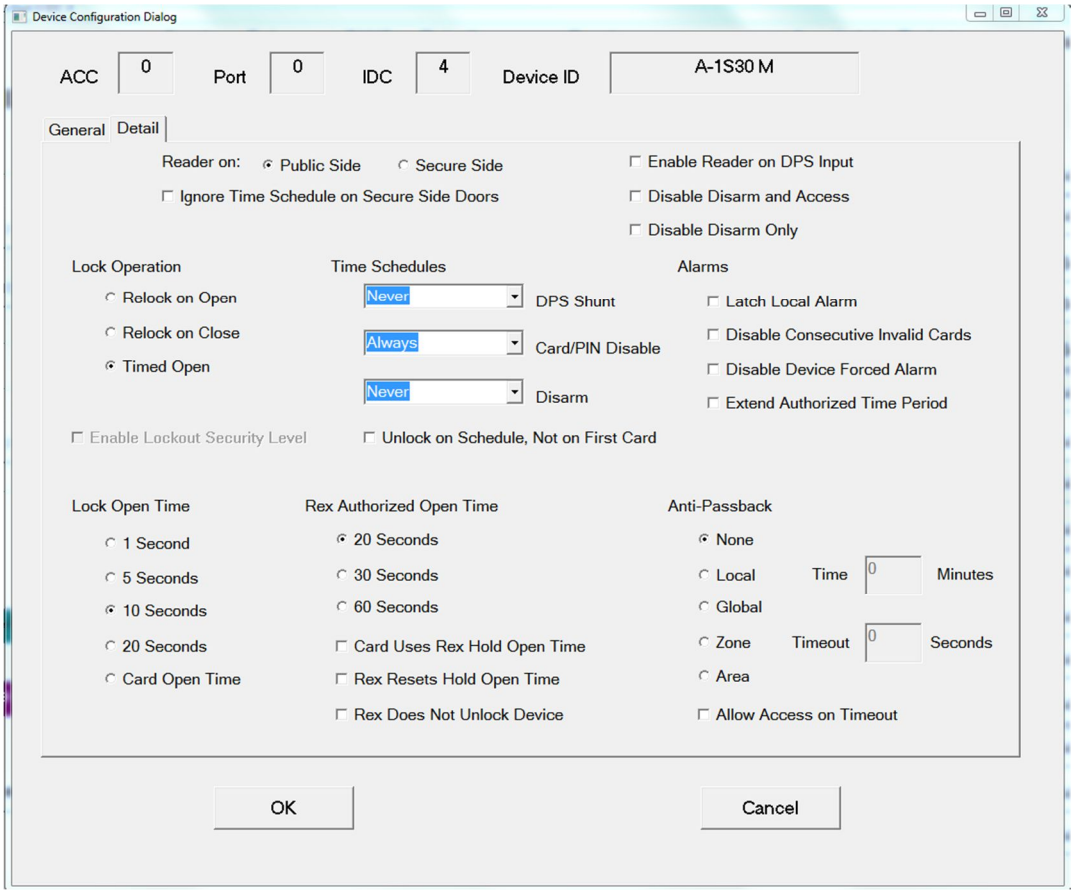


FIGURE 7

Figure 7 is the setup screen for the RIM2. Click on the RIM2 device name shown in figures 4, 5 or 6 to get to this screen. This screen allows you to set up the following options.

1. Reader On: This option allows you to change device with one reader to be on the "Secure Side".
2. Ignore time schedule on Secure Side Doors: This option allows you to only enforce access by time schedule to the public side of the door.
3. Enable Reader on DPS Input: This is sometimes used for gates. If you connect the presence loop or detector to the DPS input, it will only enable the reader when a vehicle is on the presence loop. For card reader enable on DPS, the lock must be set for timed open.
4. Disable Disarm and Access: This disables those functions from the AWS for the selected devices.
5. Disable Disarm only: This function is not active.
6. Lock Operation: These three options control when the device is relocked after a valid card read or REX.
7. Time Schedules: This allows three options to be controlled by time schedule. "DPS Shunt" allows you to ignore the DPS during an active time schedule. Therefore, no door forced alarms would be generated. "Card/PIN Disable" allows you to only require a card read and not a combination of card read and PIN when the time schedule is active. "Disarm" allow you to disarm a device only when the time schedule is active.
8. Latch Local Alarm: This keeps an alarm active until it is acknowledged at the AWS.
9. Disable Consecutive Invalid cards: This disables consecutive invalid card alarms being generated until another card is read.

10. Disable Device Forced Alarm: This disables the alarm for a door opened without a valid card read.
11. Extend Authorized Time Period. This extends the time between a card read and door open without generating a door forced alarm.
12. Lock Open Time: These selections control the time that the door lock is unlatched.
13. Card Uses REX Hold Open Time: The amount of time a door can be held open after a card read is set to the REX hold open time.
14. REX Resets Hold Open Time: Activating the REX device after the door has been opened resets the hold open time.
15. REX does not Unlock Device: The REX input to the RIM2 does not cause the lock output to activate.

3.2.4. RIN

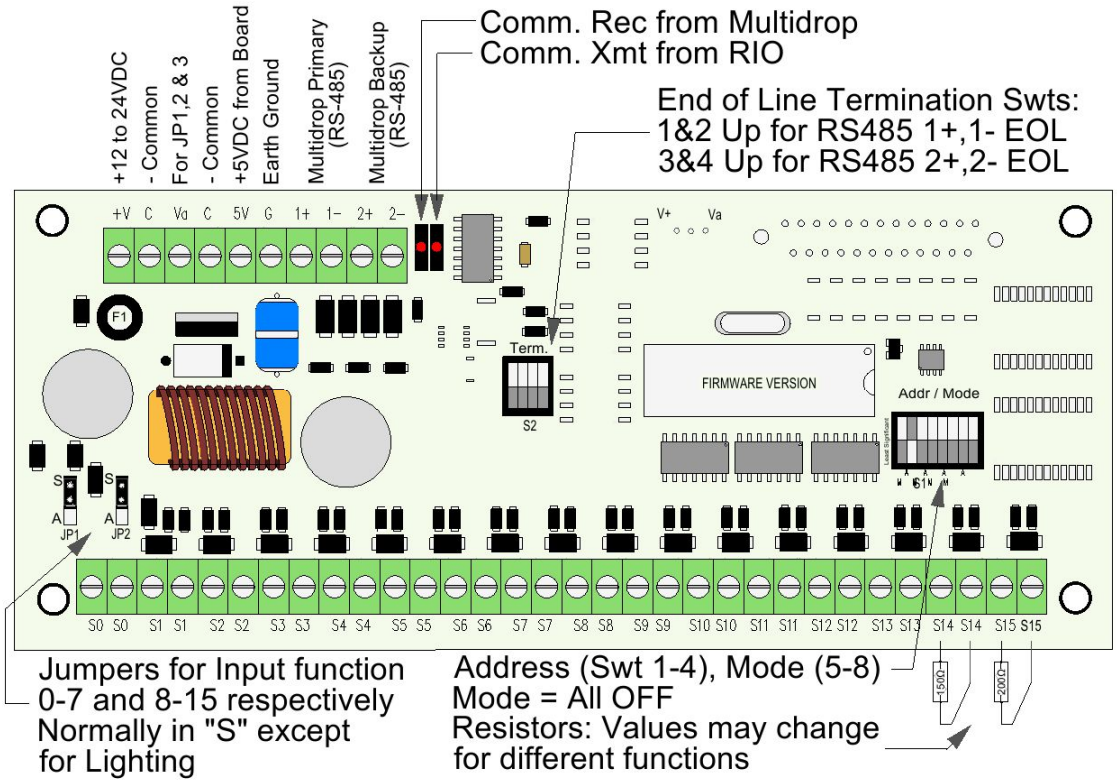


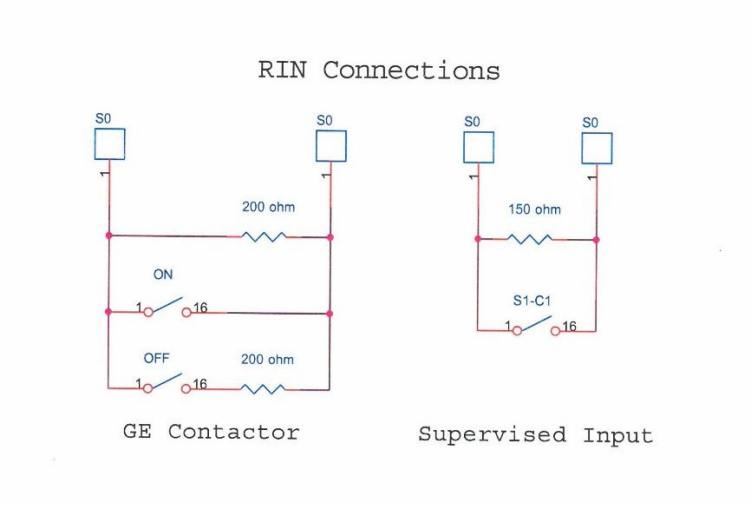
FIGURE 8
RIN Board

The RIN is an input module which provides sixteen supervised inputs. These inputs can be configured for alarm or status inputs or inputs to relay ladder programs for system control functions.

Switch S1 is used to configure the board. The first four positions set the address. Positions five and six set the mode and Positions seven and eight are the End of Line resistors for the RS485 communications.

Switch 1 positions five and six set the Mode. Mode 0, both switches off, selects the smart lighting configuration. Mode 1 selects sixteen 2-state inputs and Mode 2 selects sixteen 4-state inputs.

This board is used for both access control and smart lighting. The input wiring for each mode is shown below. Jumpers for JP1 and JP2 are put in the "A" position for the GE Contactor control and in the "S" position for supervised inputs. If using the "A" position, Va on TB2 must be connected to the +5V terminal.



3.2.5. RIO

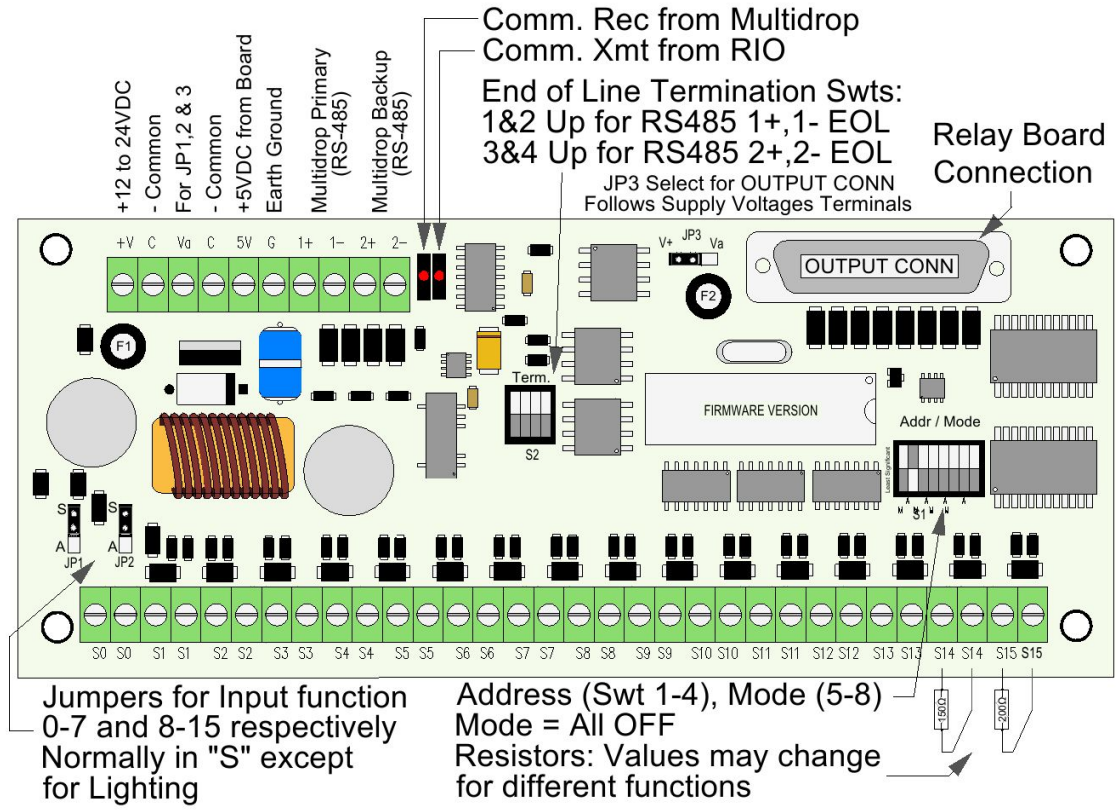


FIGURE 9

The RIO has I/O for sixteen supervised inputs and sixteen outputs. The 25 pin "D" connector on the board allows connecting to terminal or relay output boards via a 25 pin "D" connector cable.

3.3. The PLC2015

The PLC2015 is also divided up into 16 devices. Each device can have 16 transactions for a total of 256 transactions. The PLC2015 can also be configured to handle 512 transactions and 512 I/O points.

The PLC connects to 32-point Input and 32-point output boards. The PLC processor and the input and output boards mount in an MIOU (Master I/O Unit) card cage which also has a 5-volt power supply to power those boards. The configuration of the PLCs is set up at the MWS by updating the ACC and IDC tables.

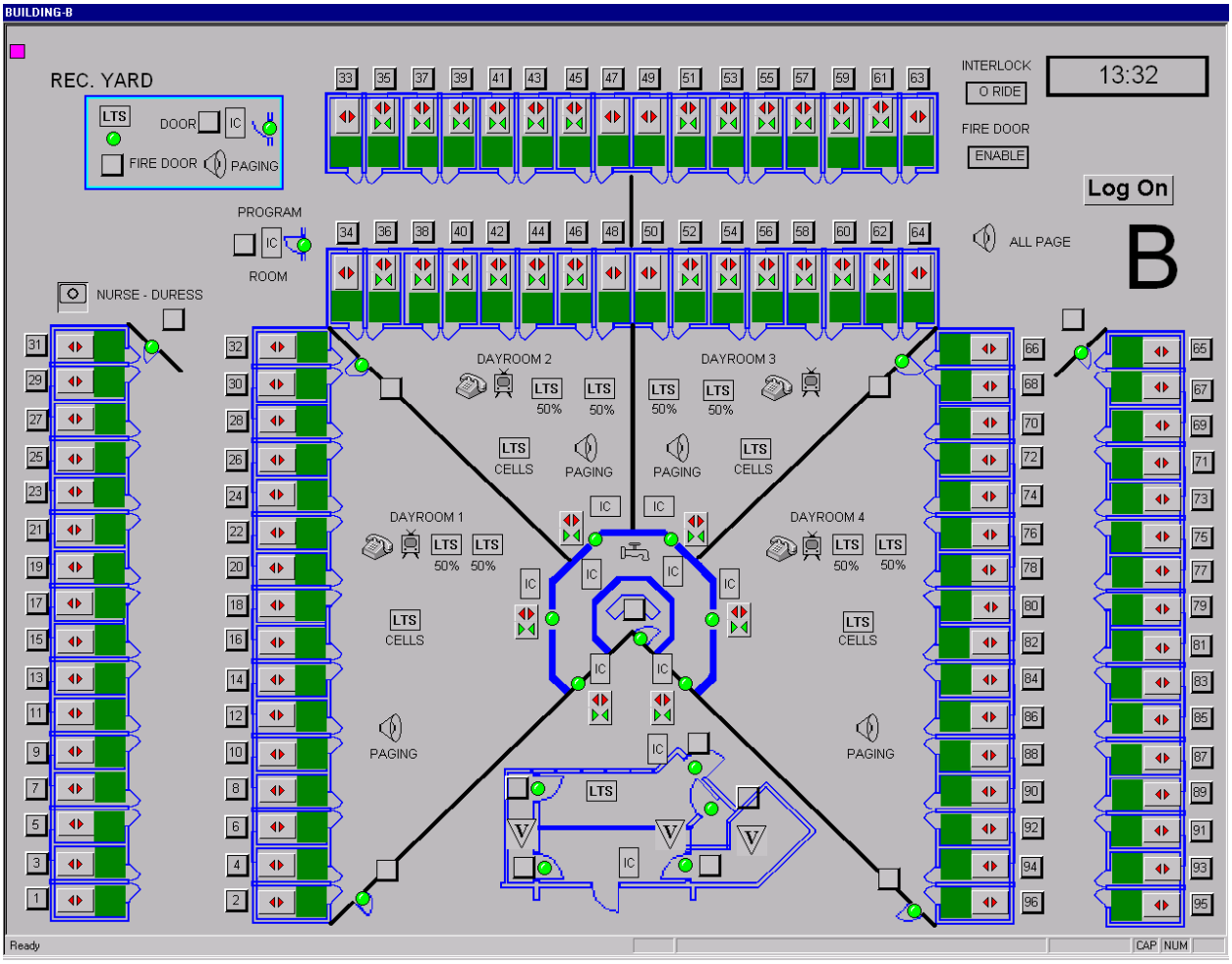
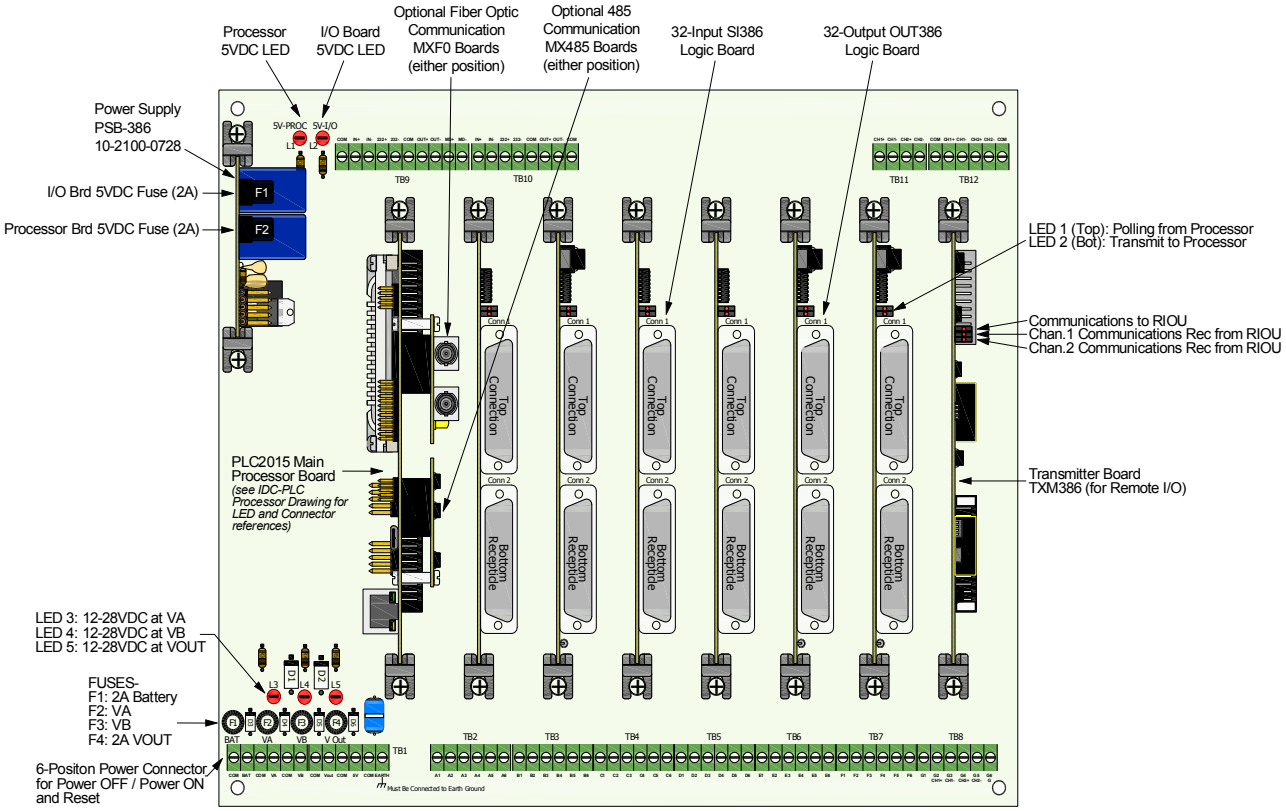


FIGURE 10

This screen shows the monitoring and control objects for a prison application. The green squares show the status of the Door Position Switches. The boxes with the arrows are the door control icons. Two types are shown. The boxes with just the red arrows are "pop" doors that open when the icon is clicked on with a mouse and the box with red and green arrows control open and close for slider doors. The squares with the number in them are intercom buttons. They flash on a call in and show a steady color when selected. The screen also shows other functions that are monitored and controlled.

3.3.1. MIOU Master I/O Unit Card Cage Assembly



PLC-2015 Master I/O Unit (MIOU)

FIGURE 11

The MIOU Card Cage has a slot for a PSB386 power supply board that has dual 5 VDC power supplies. One supplies the PLC2015 board, which mounts in the left most slot, and the other supplies the I/O boards. There are seven slots for I/O boards. The slot on the far right can be used for either an I/O board or a TXM386 transmitter board. The TXM386 is used to connect to a RIOU, Remote I/O Unit, to provide five additional I/O board slots.

3.3.2. SI386 32 Point Input Module

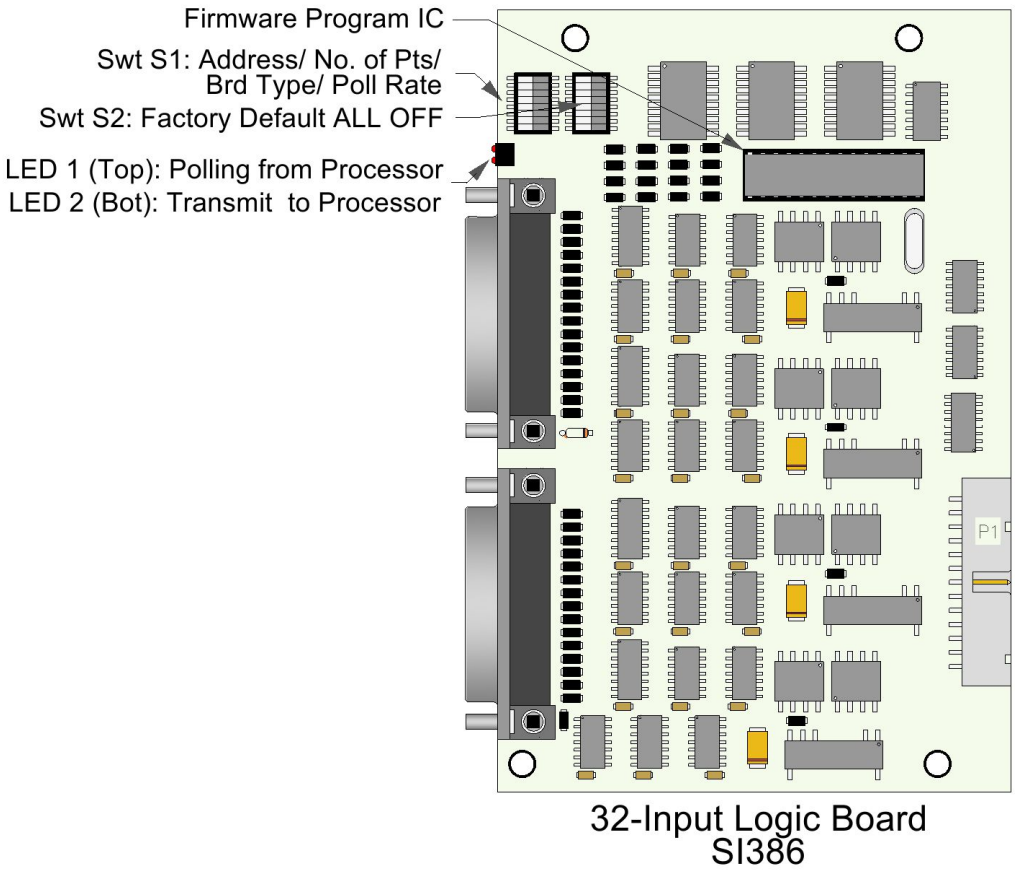


FIGURE 12

The SI386 is an optically coupled 32-point input board. It plugs into an MIOU or RIOU card cage. It connects to a 32-point termination board with two 25 pin "D" connector cables for field I/O connections. The 32-point termination board has removable terminal point plugs for field I/O connections.

Switch S1 is used to configure the board. The first five positions set the address. Position six sets the board for either 16 points, switch off, or 32 points, switch on. Position seven set to off sets the board for an input board. Position eight sets the baud rate. If the switch is off, it is set for 38,400 baud and if it is on it is set for 57,600. The baud rate of the I/O boards must match the setting for the baud rate on the PLC2015 board. Even number addresses are always used for 32-point boards. Odd and even numbered addresses can be used for 16-point boards

3.3.3. OUT386 32 Point Output Board

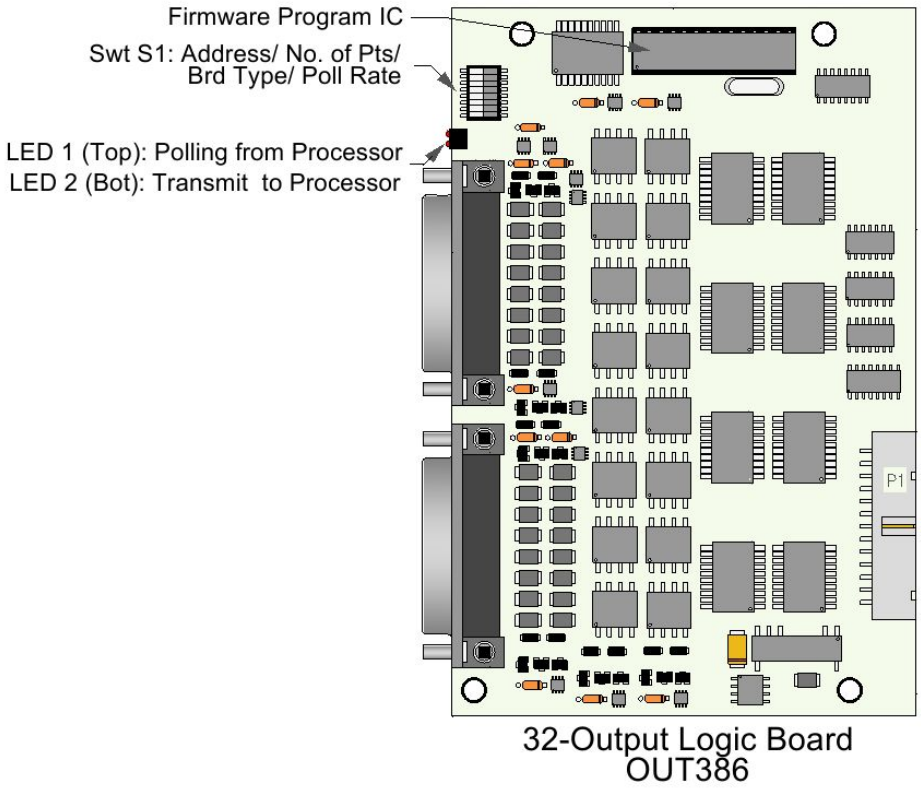


FIGURE 13

The OUT386 is an optically coupled 32-point output board. It plugs into the MIOU card cage. It connects to either a 32-point termination board or AC, DC or audio relay boards for field I/O connections. These relay boards are connected using 25 pin "D" connector cables.

Switch S1 is used to configure the board. The first five positions set the address. Position six sets the board for either 16 points, switch off, or 32 points, switch on. Position seven set to the on position sets the board to an output board. Position eight sets the baud rate. If the switch is off, it is set for 38,400 baud and if it is on it is set for 57,600. The baud rate of the I/O boards must match the setting for the baud rate on the PLC2015 board. Even number addresses are always used for 32-point boards. Odd and even numbered addresses can be used for 16-point boards.

3.3.4. TXM386 and RCV386 Remote I/O Interface Boards

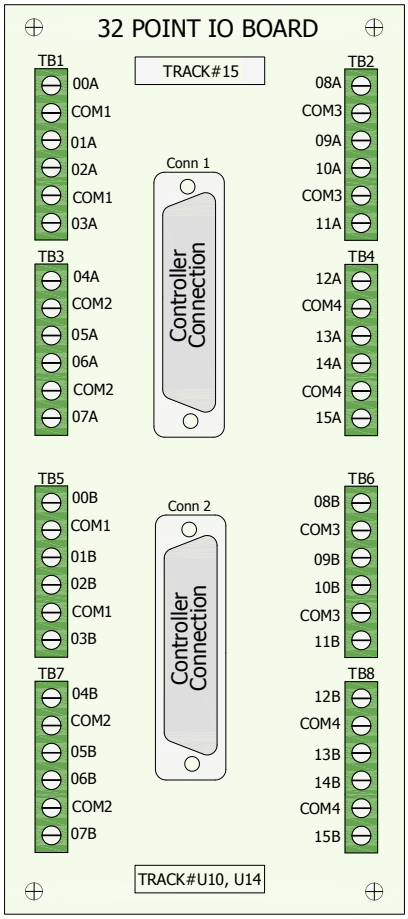
The TXM386 is an interface board that mounts in the MIOU to communicate with a Remote I/O Unit (RIOU) which can expand the number of input and output boards.

The RCV386 is a remote I/O receiver board that is the interface at the Remote I/O Unit (RIOU).

3.3.5.Termination and Relay Boards.

The SI386 and OUT386 boards have two 25 Pin “D” connectors on the edge of the board. These connect to 25 Pin “D” connectors on the termination and relay boards. The following sections describe these boards.

3.3.5.1. 32 Point I/O Termination Board

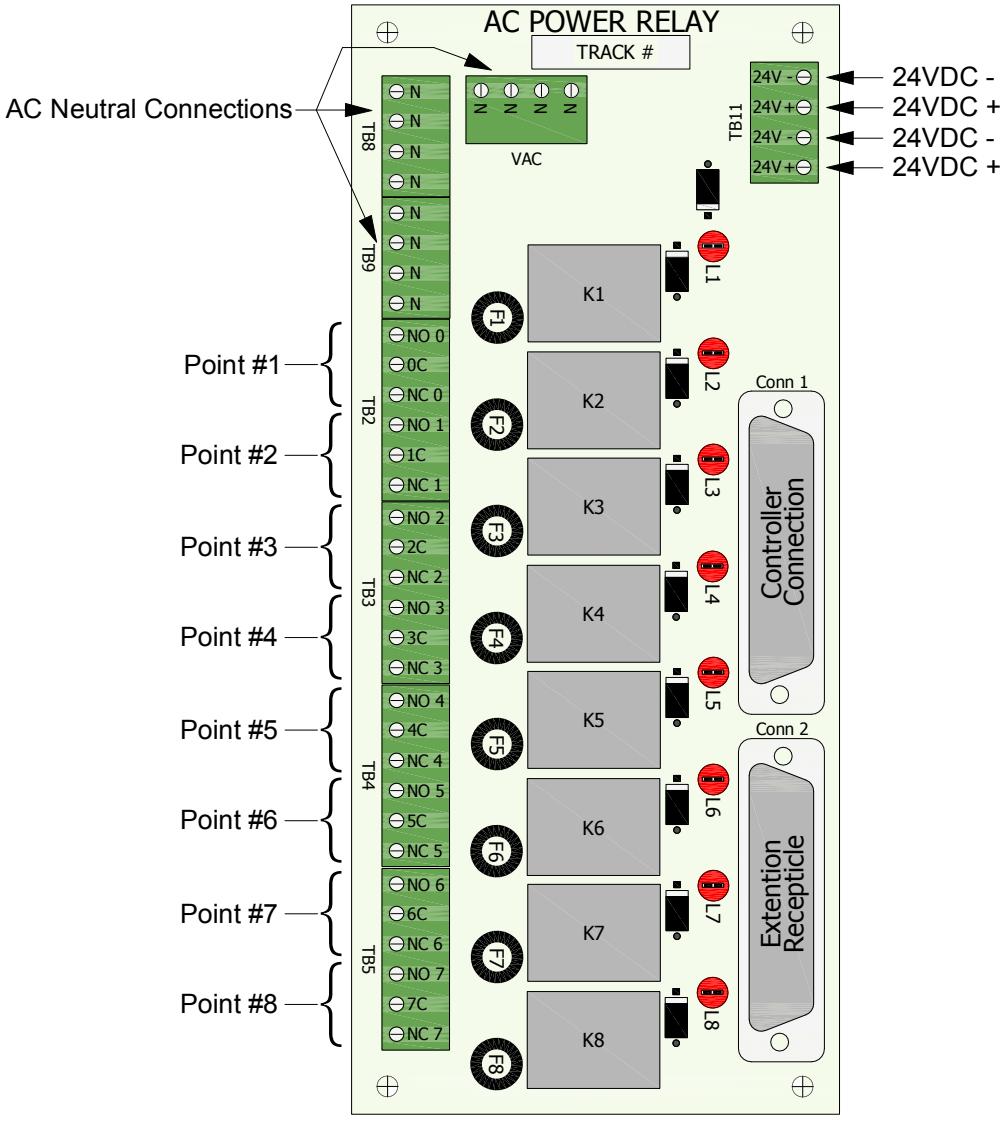


32 Point I/O Board

FIGURE 14

This board can connect to the SI386 input board for dry contact inputs. It can also be connected to the OUT386 output board for loads up to 24VDC and 100 milliamps. The output board has current limited solid-state outputs for driving those loads.

3.3.5.2. AC Power Relay Board

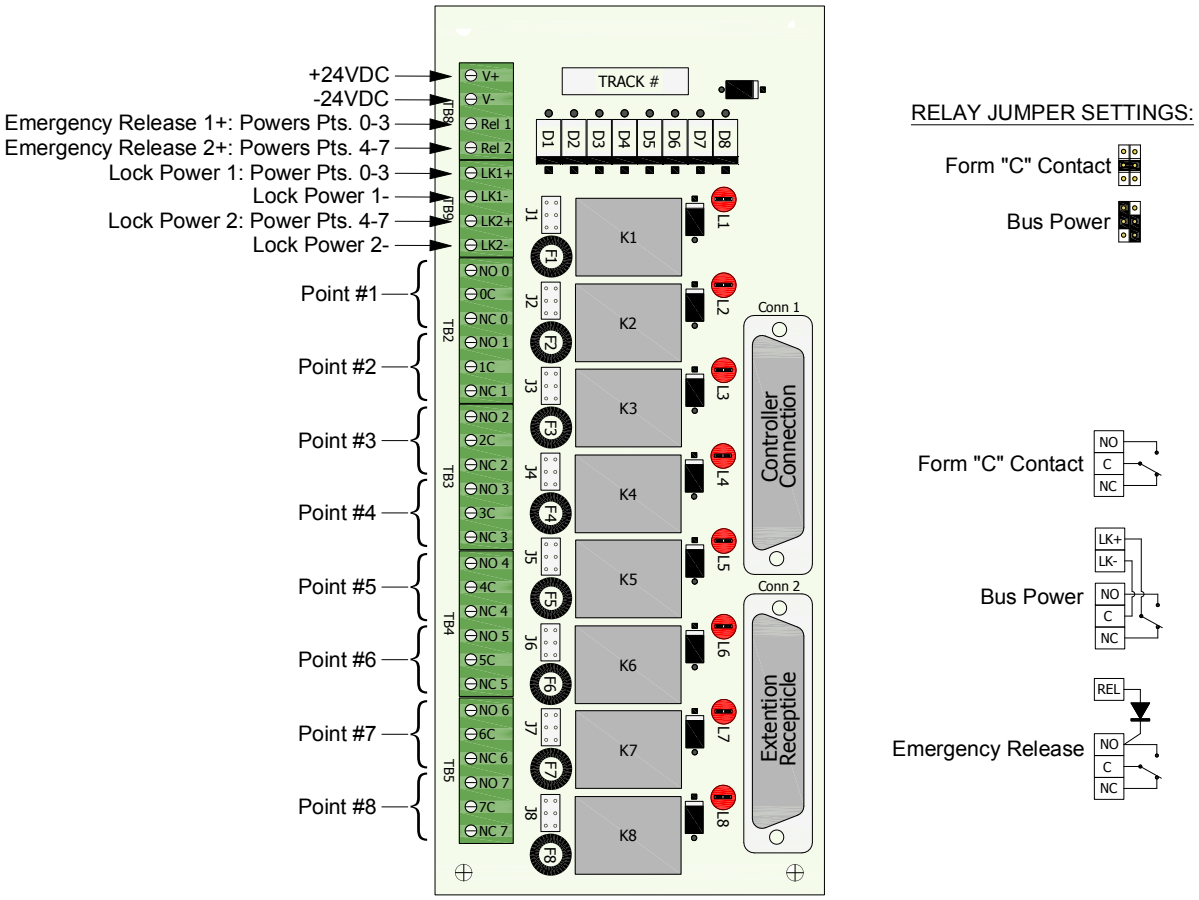


AC Power Relay Board

FIGURE 15

This board can connect to 115VAC output loads up to 3 amps. The outputs are form "C" contacts with the common connection fused at 3 amps.

3.3.5.3. DC Power Relay Board

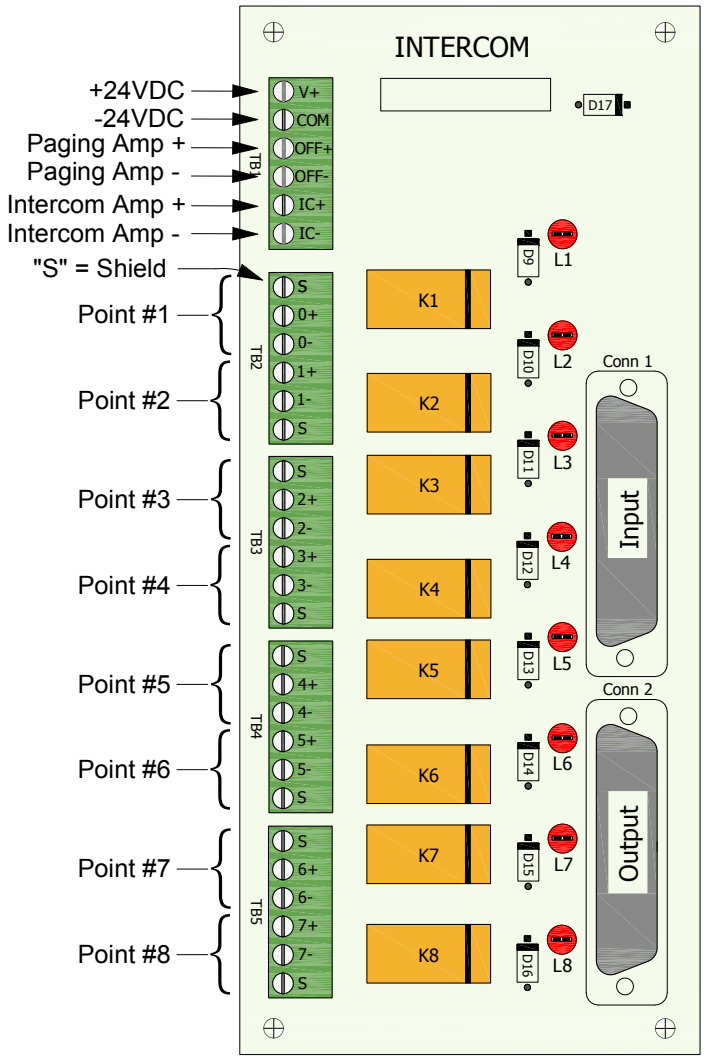


DC Power Relay Board

FIGURE 16

This board can interface to 24 VDC loads up to 3 amps. There is a six-position jumper for each output. This is used to set the output to either a non-powered form "C" contact or to a bus power configuration. There are also two emergency release inputs that power outputs 0 to 3, first input or 4 to 7, second input.

3.3.5.4. Intercom Relay Board



Intercom Relay Board

FIGURE 17

This board can interface to audio intercom systems. Each point can connect to a paging amp if the output is de-energized, or if selected, to an individual intercom station.

3.3.6.PLC2015 MWS Hardware Configuration Screens

The PLC2015 configuration is like the IDC2015. Each PLC2015 can be configured with 16 devices with 16 points each. Each point defines a transaction and has relay ladder control relays (CRs) associated with it. These relay ladder CRs interact with the Graphic Workstation icons to provide status information and operator commands.

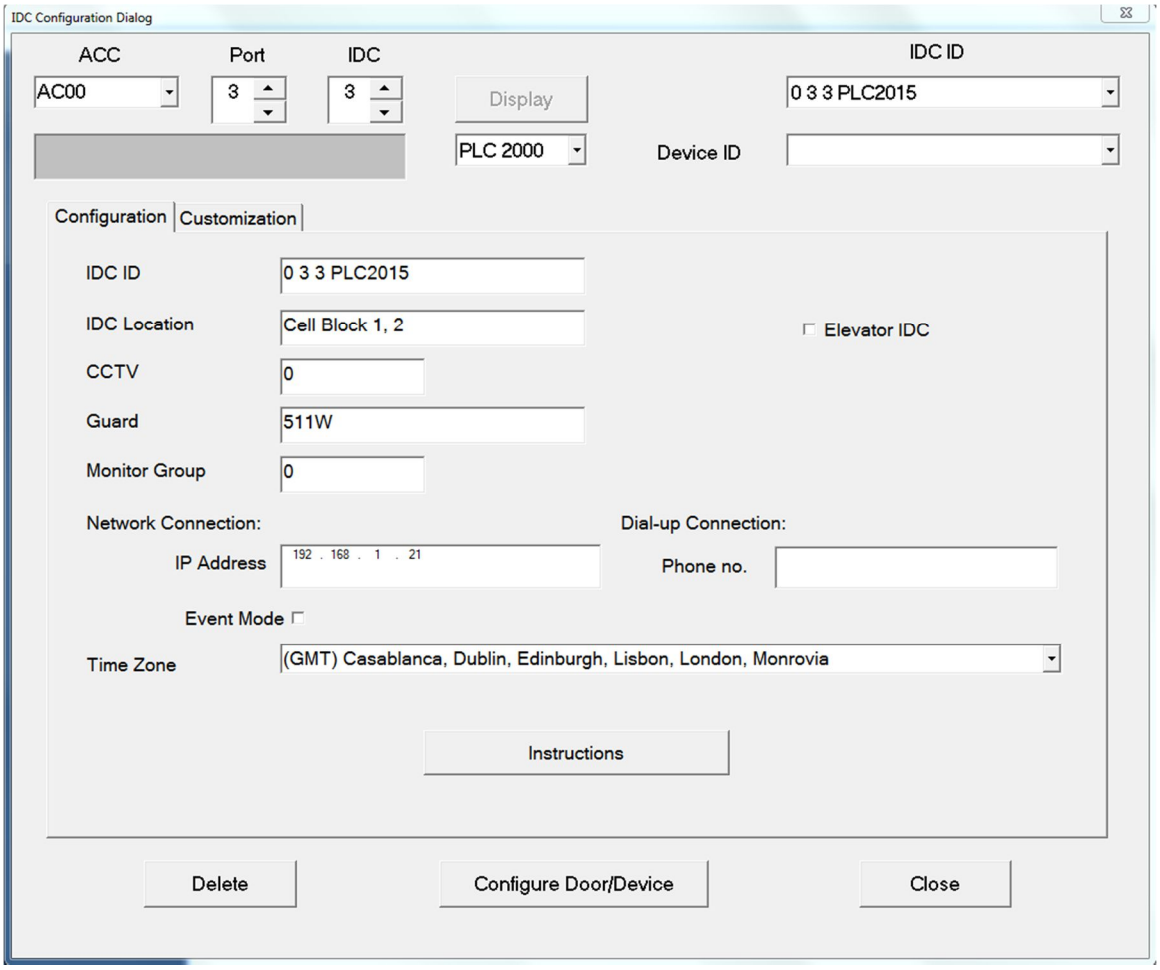


FIGURE 18

Figure 18 shows the screen that is used to set up a PLC2015 Unit. The PLC must be selected as a PLC2015 as shown in the top part of the screen. This will allow you to get to the correct setup screen when you click the configure Door/Device button.

Figure 19 is the screen for setting up the 16 devices.

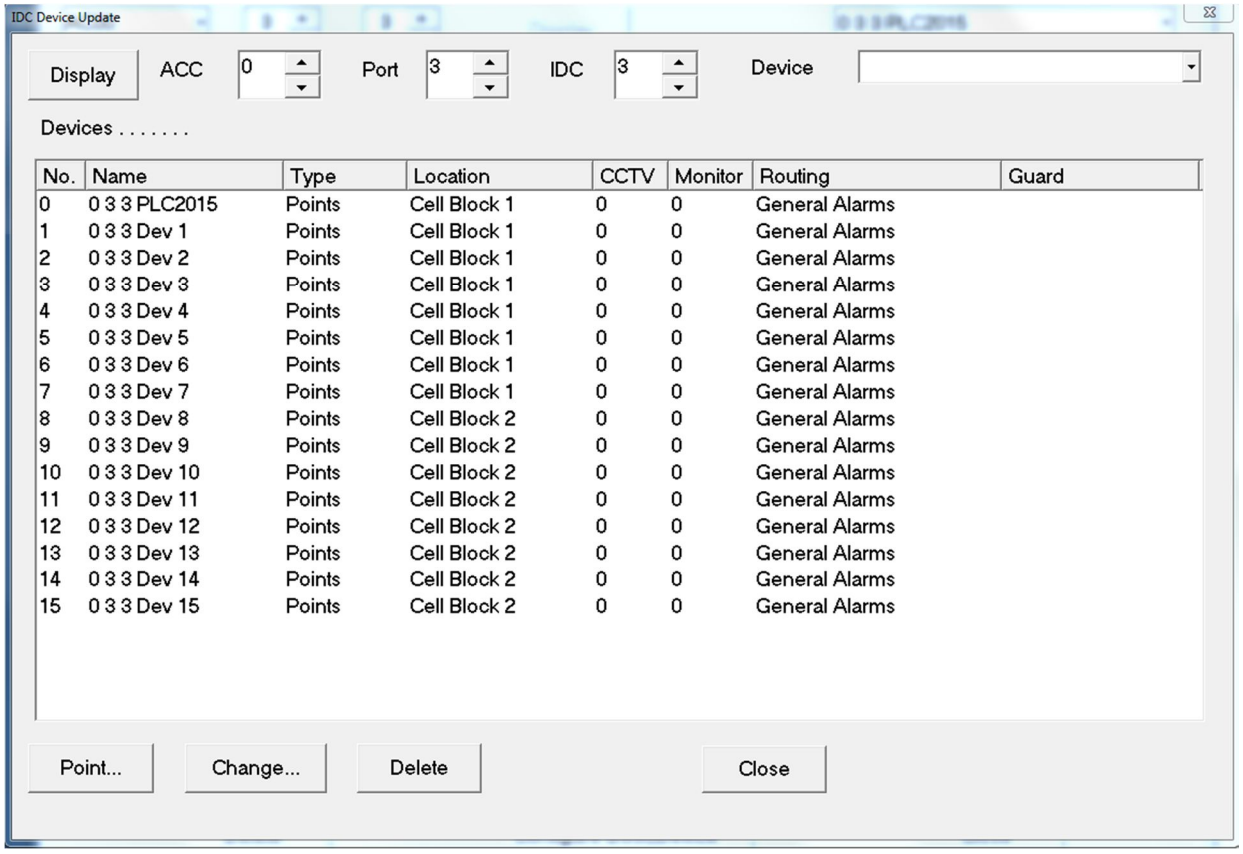


FIGURE 19

The 16 devices can each have a name that should be descriptive of the area or equipment that it is associated with. As with the IDC2015 that generally controls doors, the PLC2015 can control the jail environment but also individual machines such as generators or conveyor belts.

Relay ladder logic is generally used for these applications since the control algorithms vary considerably from controlling access control doors using standard internal firmware logic.

Figure 20 is the MWS screen for setting up the points for each device.

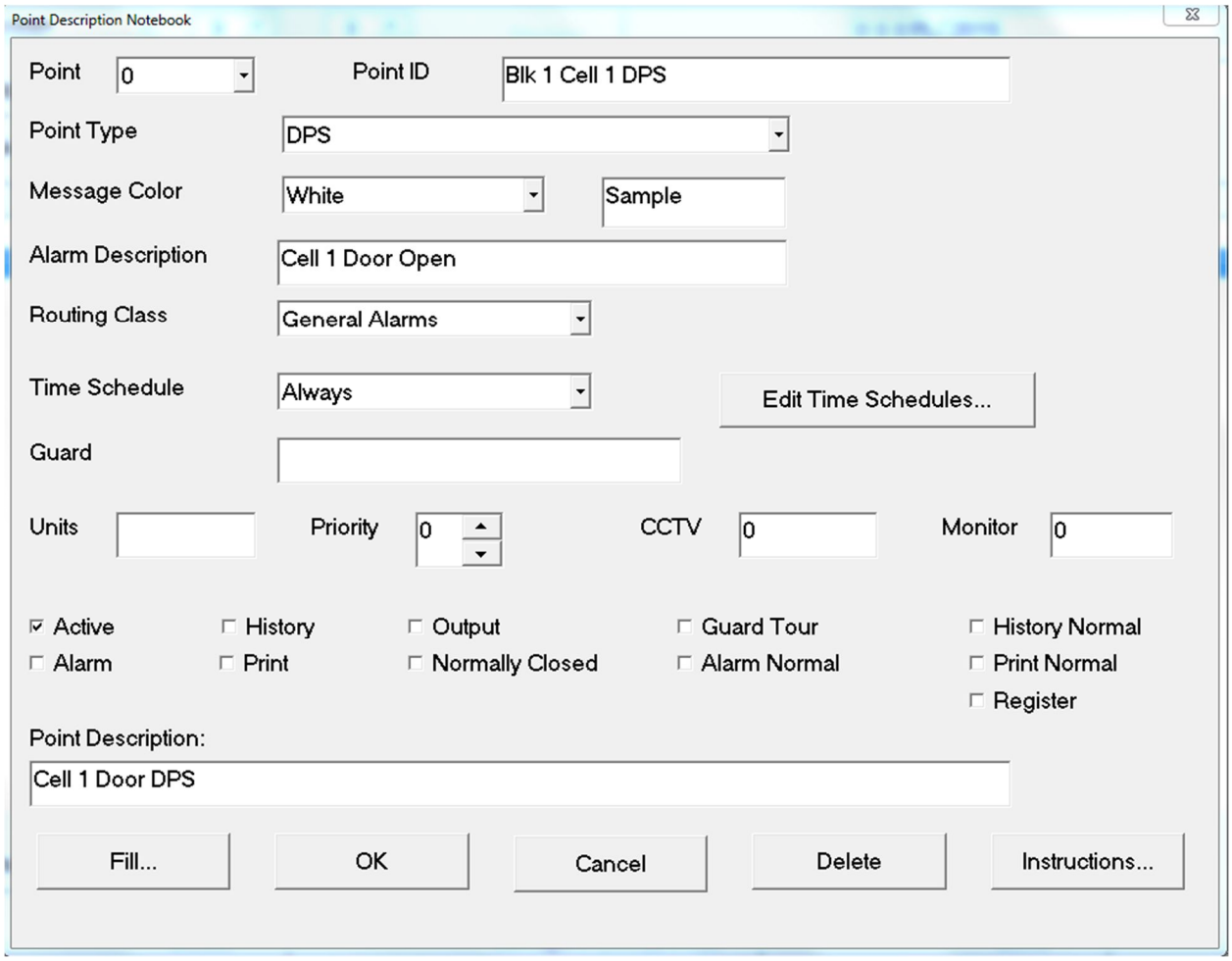


FIGURE 20

This screen is used to set up each of the 16 points for a device.

3.4. Smart Lighting

Smart Lighting can be added to either the IDC or PLC. Refer to the Smart Lighting configuration and programming manual for detailed information for setup and programming.

3.4.1.SLC32 Board

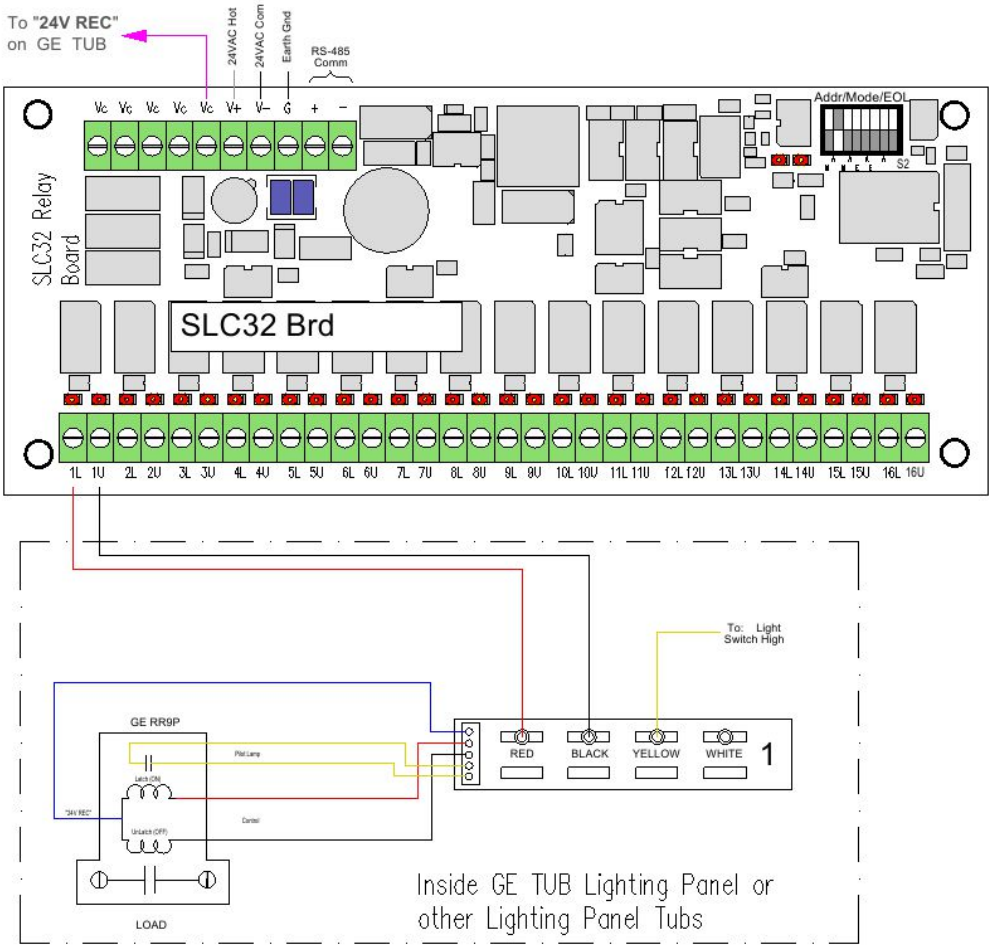


FIGURE 21

The SLC32 board interfaces to lighting contactors that have latch on and latch off inputs. These contactors do not require continuous current to maintain their on and off state. Figure 21 shows connections to a GERR9P Latch on, Latch off contactor.

These boards receive commands from the PLC or IDC processor module to control the lighting contactors from time schedules, control inputs or other control events.

3.4.2.SI420 Board

The SI420 board interfaces to Analog inputs and outputs to handle LED lighting ballasts and inputs such as occupancy sensors, potentiometers and ambient light sensors to implement smart lighting.

Light levels can also be adjusted by commands from the PLC or IDC processor module to control the lighting contactors from time schedules, control inputs or other control events.

Refer to the Smart Lighting Configuration and Programming Manual.

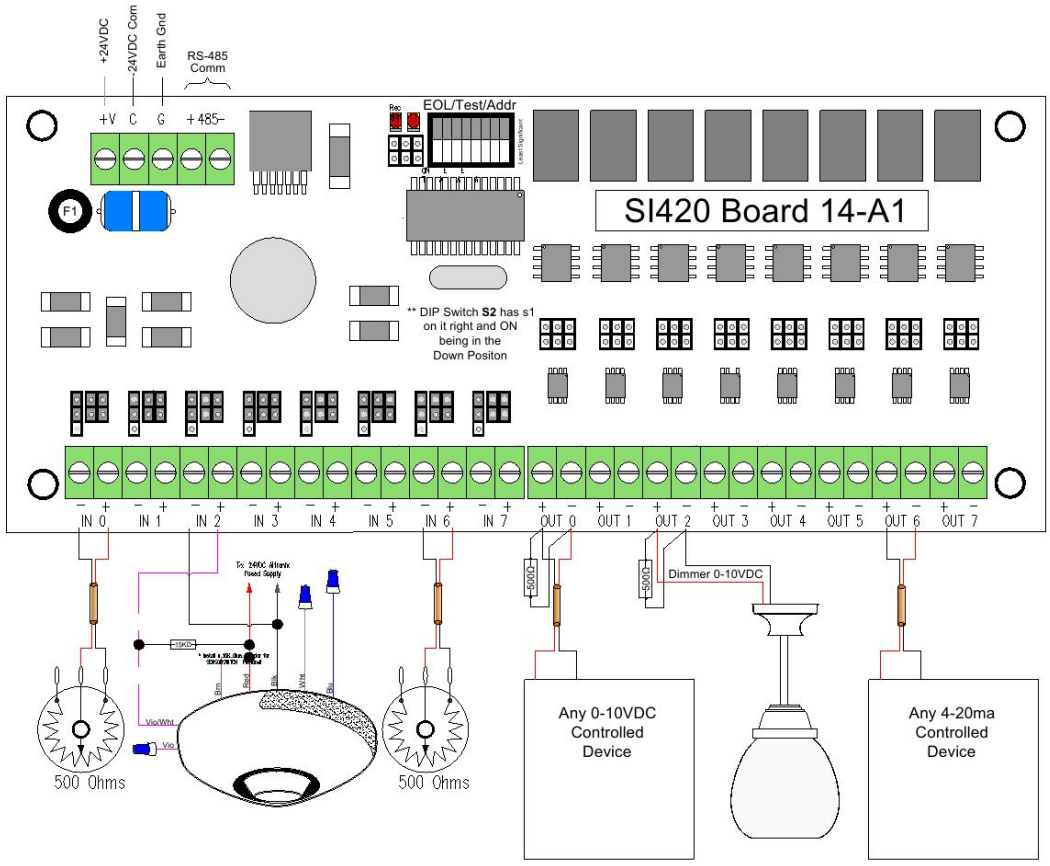


FIGURE 22

Both the IDC2015 and the PLC2015 can be configured to also interface with the smart lighting boards.

3.5. I/O Linking

I/O linking is used to link transactions generated in one IDC or PLC to another. An I/O link events table in the database is set up with these links.

This function enables transactions to be directly communicated between IDC's and PLC's.