

Warehouse Site – Evacuation Alarm System

Keywords: Evacuation alarm system, D2 W MIO-4, Comms-fail output

Introduction

A warehouse complex consists of eight warehouse buildings. At times, some of the warehouses house dangerous goods so an evacuation alarm system was required. Because of the high cost of wiring between buildings, a D2 W MIO wireless system was installed.



The evacuation alarm system comprises a station in each warehouse; each station has a latching activation pushbutton and a siren. When any pushbutton is activated, all sirens sound until the pushbutton is deactivated, or for 1 minute if the pushbutton is not deactivated. Panel lights at each station indicate from which building the alarm originated. Each station has a D2 W MIO-4 wireless I/O unit to transmit the activation signal to the other buildings.

In the building with the manager’s office, additional panel lights indicate fault alarms at any station. The fault alarm indicates if any station loses power, or if any station has a communications problem to any other station.

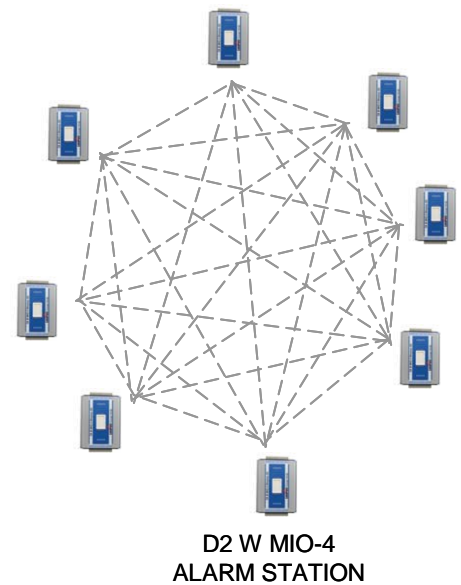
Alarm Station

Each alarm station has a D2 W MIO-4 wireless I/O module, powered by a 110 volt supply with a 5 amp hour battery backup. The D2 W MIO module provides the charging of the battery.

A standard dipole antenna is used at each station, with the antenna mounted on the side the alarm station enclosure, inside each building. Radio path tests showed that radio signals are strong enough for the antennas to be installed inside the buildings, reducing installation costs and reducing the risk of lightning problems.

The D2 W MIO-4 product has 20 discrete I/O channels; 4 fixed inputs, 4 fixed outputs and 12 DIO channels which are selectable as inputs or outputs. Each DIO (selectable I/O) is an output as default, until it is mapped as an input, then this channel is selected as an input and cannot be used as an output. For this project, the DIO channels are used as outputs.

At each station, a large push-button switch on the front of the enclosure is connected to DI1. DI1 is transmitted to an output at all other stations - that is, if a pushbutton is pressed, the D2 W MIO-4 module at that station will transmit 7 separate messages, each message addressed to an output at the 7 other stations. The pushbuttons are “latch-operation” - when pressed, the pushbutton remains active until mechanically unlatched.



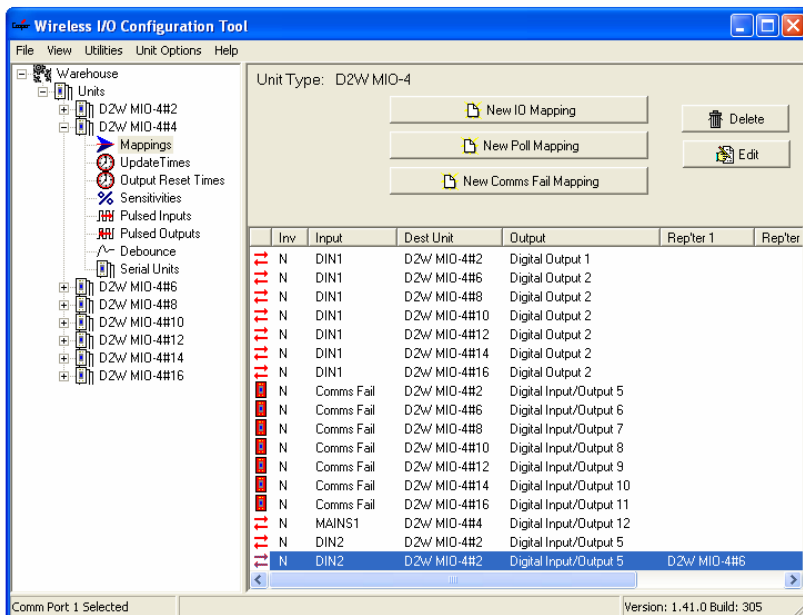
As there are 8 stations, each module has 7 outputs indicating an alarm from the 7 other stations. The outputs used at each station are DO1 – 4 and DIO 1 – 3 - that is, the 4 fixed outputs and the first 3 selectable I/O. Each of these 7 outputs drive a relay and a panel light. Contacts of the relays are connected together to give a common audible alarm (siren).

If a pushbutton at one station is pressed, a particular output at every other station will activate. At all stations, a panel light will show which station initiated the alarm, and the evacuation siren at each station will sound.

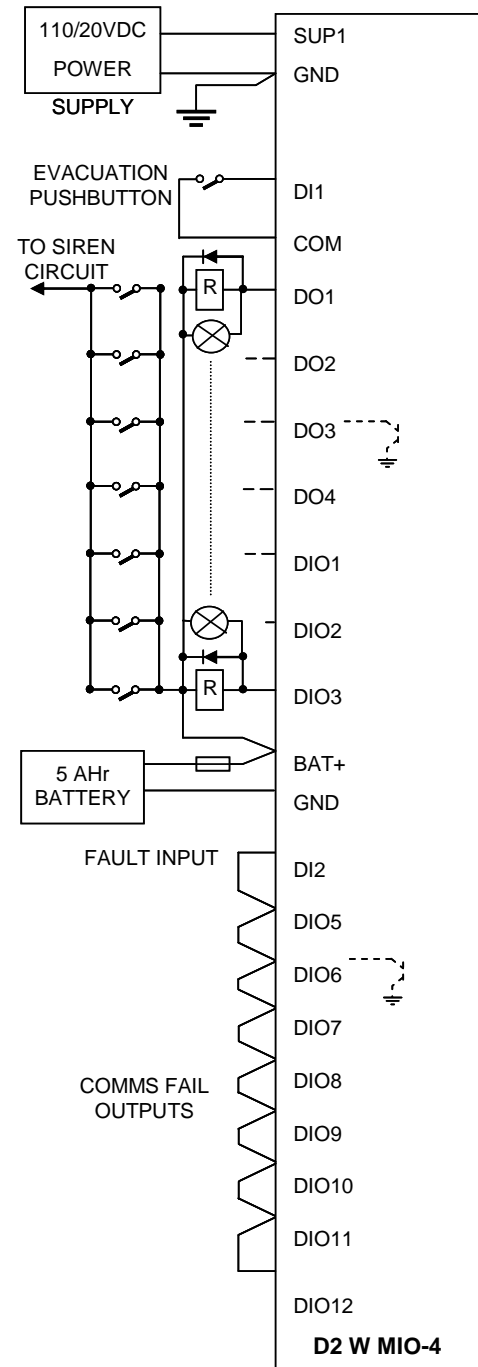
Output Reset Time

The mappings for the pushbutton input at each station have an update time between 8 and 12 minutes - the updates times are staggered by 0.5 minute increments to avoid different stations updating at the same time. Each station will attempt to transmit to each other station once every 8 to 12 minutes.

Each of the alarm outputs are configured with a 1 minute reset time. If the pushbutton has not been un-latched after 1 minute, then the active alarm output at each station will reset after 1 minute. If the pushbutton remains latched on, then the alarm outputs will activate again when the next update message is sent, 8 – 12 minutes after the initial transmissions.



This cycle will continue until the pushbutton has been un-latched.



Failure Monitoring

It is very important that the radio system is self-checking to ensure that the system is always ready for operation.

Each station will attempt to transmit to each other station once every 8 to 12 minutes. If any station is unable to communicate with any other station, then a “comms fail” alarm occurs. The system is designed such that a comms-fail is indicated at the station which detects it, and is also indicated at the station at the main office building.

At each station, “comms fail” mappings are entered for each remote station. If a transmission to another station is not successful, a “comms-fail” event occurs and a particular output is activated. Different outputs are used for different stations such that technicians can determine which radio link has failed by looking at the LED’s on the D2 W MIO module. The outputs used for comms-fail are DIO5 – 11. DIO12 is used to indicate local power failure - if the local 110V power fails, DIO12 will activate.

All of the failure outputs (DIO5 – 12) are connected together in parallel and connected to DI2. If any one of the failure outputs turn on, DI2 will switch on. DI2 at each station (except at the main office building) is mapped to an output at the main office station, in order to indicate a fault status.

Example: Suppose the antenna at station #8 fails. If station #4 is the first station to try and communicate with #8, station #4 will detect a comms-fail, and will set it’s output DIO7 (which is mapped to “Comms Fail at #8”). The LED for DIO7 will indicate that a comms-fail has occurred at station #8. When DIO7 turns on, it will also turn on input DI2. DI2 at #4 is mapped to output DIO5 at the main station #2 - this output will then activate, indicating that a fault has been detected at station #4.

The other stations will also detect “comms-fail” to station #8 when they try to communicate with #8, and will transmit this fault through to the master station.

The “comms-fail” outputs at each station have a reset time of 32 minutes. This means that the comms-fail outputs will reset 32 minutes after the last comms-fail has been detected.

The mappings between DI2 and the master station are configured with an update time varying between 13 and 15 minutes.

Master Station

The station in the main office is configured the same as the other stations. The 8 fault outputs (DIO5 – 12) will be activated either by a “comms-fail” between the main station and one of the other stations, or activated by a radio message from the other station indicating that the other station has detected a fault.