Subject: ASD Bus Communication Troubleshooting Checklist
Product: ASD controllers; MicroZone II, MicroFlo II, LIM, PEM, MN-ASDI
Originator: Product Support Services - Rockford Revision 1.0
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This checklist provides several settings/configurations to review when faced with a communication problem at the controller level. The content that follows was compiled from different resources, summarized, and laid out in an easy-to-use manner so as to provide a quick-reference document.

If there are questions about this document, or, if, after using this checklist, communication problems persist, please contact us at 1-888-444-1311 or product.support@tac.com for further assistance. You may also visit "***Lessons Learned***" located on ExchangeOnline – a self-service web portal that provides access "24/7" to the most frequently asked questions and solutions.

Before contacting us, have the following information available:

DESCRIPTION OF ISSUE:
CONTROLLER MODEL(S) INVOLVED: - MicroZone II, MicroFlo II, LIM, PEM, MN-ASDI
QUANTITY AFFECTED:
TYPE OF INSTALLATION: - new, existing, or existing with add-ons

These troubleshooting tips can be applied to any ASD bus, whether under a GCM, UNC, ENC, or future area controllers.

Procedures applicable to specific area controllers will be added in future revisions.

Topology

It is very helpful to draw the topology of the bus when you start troubleshooting.

The 3 valid topologies are:
Daisy Chain
Active Tee (requires a repeater)
Active Star (requires a repeater)

Any other topology is unsupported. A common problem is that an invalid topology will work for a while, but then intermittent problems start happening. These problems can be caused by RS-485 transceivers degrading over time, which is normal; the valid topologies take this effect into account and provide safety margins, but the invalid topologies don't.
Troubleshooting is greatly complicated when the bus topology includes passive tees or other unsupported features.

Length

Wire segment 4000' using 24 AWG or larger
Effect of Dataline Protector, GCMA-131-1, each reduces allowable wire segment length by 500'. So a pair reduces the allowable wire segment to 3000'.

Repeaters

Wire, RPTR-WIRE
RPTR-MF2
Up to 5 repeaters in series

Maximum Number of Devices on the ASD bus =128, with a maximum of 31 on a single wire segment.

See tech bulletin 95-26 for practical considerations that affect the number of ASD controllers under GCMs.

Addressing

It's very important not to duplicate addresses between controllers of the same type. For example, there should only be one Microzone II with physical address = 7 on the bus. However, different types of controllers can share a common address; there can be a Microzone II addressed as #5, and also a PEM addressed as #5. This is not documented.

Biasing

Minimum Requirement :One pair of Pull Apart, or biasing, resistors per wire segment.

Maximum Allowed: 2 pairs of Pull Apart resistors per wire segment.

A Pull Apart pair consists of one Pull Up resistor, and one Pull Down resistor.

Terminators

A 120-Ohm End of Line resistor is required across the ASD terminals at each controller at the end of a wire segment.

Cable

The ASD bus is polarized. The cable must be color-coded, 2-conductor, shielded, twisted pair, 24 AWG or larger.
18-2 STP is very common; see Belden # 8760 or equivalent.

The shield wire should be connected to the Shield terminal on each controller.

Transient Protection

When the ASD bus is extended outdoors or between buildings, it must be shielded and installed in a transient-protected environment (such as rigid, grounded conduit, or direct-burial cable buried underground) due to lightning and other electrical transients.

Any ASD bus leaving the building must be equipped with a lightning protector, GCMA-131-1.

Install a 470 pF capacitor between the bus shield and the ground terminal on the GCMA-131-1. This capacitor acts as a 60 Hz notch filter.

Connect the GCMA-131 to a good earth ground with a #6 AWG copper conductor, maximum of 5' long.

Test the GCMA-131 per tech bulletin 91-44.Repeaters

RPTR-WIRE

There are 2 sets of jumpers to select the network type (really the baud rate), one for each terminal, BOTH must be set for ASD.

For Daisy Chain topology, set the EOL = ON for both terminals. Set the Pull Apart pair = ON for both terminals.

For Active Star, set the EOL = OFF for both terminals. Follow the rule for Pull Apart resistors (minimum 1 pair / segment, max 2 pair / segment). To properly bias the bus and follow the rule, you must know where other Pull Apart pairs are installed.

For Active Tee, set the EOL = ON for the segment that ends at the repeater. Set the EOL = OFF for the other terminal, where the segment is tied to the repeater but doesn't end there. Again, follow the rule for biasing each segment.

Note: Repeaters sometimes behave like a fusible element, isolating and protecting a segment. If communications appear to stop at a repeater, but devices on one side or the other can still communicate, check the red LEDs; both RS1 and RS2 should be blinking to indicate passing communications. If either side doesn't blink, it can indicate that side of the repeater has been damaged by a transient.

RPTR-FIBER
There are 2 sets of jumpers to select the network type (really the baud rate), one for each terminal, BOTH must be set for ASD.

The wire terminal blocks RS-485 #1 and RS-485 #2 are parallel connections, so the + on #1 is connected to the + on #2, the – on #1 is connected to the – on #2, and the SHLDs are connected.

Series topology, wire-to-fiber (one wire segment, one fiber segment)

Each RS-485 bus segment must be a continuous daisy chain, no tees are allowed. F-23024-1, p. 191

On the RS-485 wire terminal, there is one set of jumpers to select EOL and PA resistors. Set EOL = ON, follow the rule for biasing the wire segment. No biasing or end of line terminations required on the fiber segment.

Fiber Optics

The RPTR-FIBER is compatible with multi-mode fibers with core diameters of either 50, 62.5, or 200 microns, with 62.5 being the most common. The light used has a wavelength of about 820 nanometers, which is a deep ruby red in color. A fiber optic transmitter on one repeater must be connected to a fiber optic receiver on the other repeater via one optical fiber; because the repeater must transmit and receive, each RS-485 segment must be connected by a pair of fibers.

Any un-used fiber terminals should remain capped to keep out dust, as any dust or dirt will greatly attenuate the light signal. Don't touch the end of the fiber, as oil from skin will cause any dust to stick to the fiber, can block the signal path. The fiber tip can be cleaned with compressed air or with rubbing alcohol.

A quick check of end-to-end integrity on an optical fiber is to shine a flash light into one end, see if any light shows at the other end (obviously will take 2 people). This is not a substitute for completely measuring the signal strength using an optic power meter, but if the fiber doesn't pass the flashlight test, it is broken, and there's no point in measuring signal strength.
See the Network 8000 Service & Troubleshooting Manual, F-23024-1, pp 192-193 for instructions on measuring signal attenuation.

Power Settings

The optical power settings depend on two things; the core diameter of the fiber and the length of the fiber run. See the table in the Repeater Installation Instructions, F-23077-3, page 6.
Same table is in the Repeaters Hardware Installation Practices, F-23078, page 19.

See the Caution, " The jumper setting should be set to the lowest possible value, since it is possible to over drive the fiber segment and cause the system to malfunction."

LEDs

The red LEDs indicate when the segment is receiving data:
RS1 - the RS-485 segment is receiving data when the LED is flashing.
FO1 - the Fiber Optic 1 is receiving data when the LED is flashing.
FO2 - the Fiber Optic 2 is receiving data when the LED is flashing.

Controller Status LEDs

The LEDs on the controllers can be useful diagnostic tools.

RED Should be ON and flicker when the controller has power.

If it is ON, but doesn't flicker at all, it can indicate the microprocessor has failed. Reset the controller, if the LED doesn't flicker, replace the controller.

If it is not on at all, check the power transformer is providing 24 VAC.
If the transformer is OK, but the LED is not on, replace the controller.

(On the MN-ASDI, The Red LED indicates processor activity AND communication activity on the U-bus interface. The frequency of blinking is dependent on the amount of activity.)

Green Should blink when the controller transmits on the bus

Yellow
Should blink when the controller receives data or detects communications with any controller on the bus. With more controllers and traffic on the bus, the frequency of flashes increases.

Note:
If the Yellow LED is on continuously, it indicates a fault condition.
Check for reversed polarity of the ASD bus at the controller.
Check for ASD wires shorted together, or to ground.

Divide and Conquer

This is a strategy for dividing a bus into smaller sections in order to isolate a controller or section of bus that might be causing communication problems.
The general idea is to divide the bus in half, and see if communications are possible from one end to the other end. If not, divide each half again, and continue until the problem(s) are found.