

## Application Note

---

### MODEL 903 EVALUATING AND TROUBLE-SHOOTING GUIDE

Doc. No. 700-0290-00

Revision: 1

Date: 2006 March 01

---

#### INITIAL CHECKS

- Ensure cards installed and configured as per installation drawing. (Note: in a 16HP medium speed, high density system, the FMB is furthest right and the HDB-TX card must be installed in the slot adjacent to the FMB).
- Ensure correct input power is supplied and verify the primary fuse is not open.
- Fuses: each module and card have fuse protection. Ensure there are no input power supply issues or incorrect connector wiring before replacing fuses. Several spare kits are available for fuses, e.g. 903-8022-18.
- Verify the proper fuse type and value and location per the User's Guide appendices.
- Ensure voltage rail levels are acceptable using either the diagnostics software or a voltmeter.
- Ensure external fibers and bushings are clean and have low optical loss. (May be verified with diagnostic software or an optical power meter.)
- Ensure optical output power levels are sufficient at the FMB front panels with an optical power meter:
- Typically Console FMB 1550nm downlink output power should be -6 dBm or better and Remote FMB 1310nm uplink output power should be -6 dBm or better. Refer to your Model 903 User's Guide for more details on output power specifications.
- Ensure receiver power at the FMB front panel is acceptable, typically between -8 dBm and -26 dBm. Excessive receive power will cause errors or possibly even damage the receiver and low receive power will cause errors or link faults. In general, bench testing should be conducted with a 5-10 dB optical attenuator.

#### REVIEW SETTINGS

- Cards should be shipped from Focal in the default configuration for the specific system. Shunt terminals are 2-pin or 3-pin; pin 1 is typically designated with a square pad or silk-screened '1'.
- DIP switches are set either on (1) or off (0). Circuit 1 is the leftmost switch when reading the text on the switch.
- Mode settings should generally match on remote and console cards, except AIB-MS900, AIB-ARCNET, and AIB-HYDRO.
- FMB DIP switch settings should not normally be changed. When troubleshooting an older card with a DIP switch, switch the DIP switch back and forth a few times to ensure there is a good, stable contact.

#### USING DIAGNOSTIC SOFTWARE

- Check for acceptable voltage levels (screen LEDs).
- Check acceptable temperature, remote and console (both should be less than +70C).
- Check for uplink/downlink errors ( $\leq 1$  error per hour typical).
- Verify expected optical levels (transmitted and received) with fiber optic power meter.
- Verify flux budget with VOAT (Variable Optical Attenuator), per user's guide.
- Observe strip chart for unusual power fluctuations in the optical link.
- Verify losses of video sync.
- Log diagnostics files for long term monitoring.
- When new FMBs are installed, the software may need to be recalibrated for optical readings. (OK if within 2 dB).

## Application Note

---

### MOST COMMON VIDEO PROBLEMS

- Improper impedance matching (75 ohms) or missing ground connection
- Video signal "too hot", i.e.  $\gg 1$  V<sub>pp</sub> nominal. (Camera outputs may be set to drive long copper cables.)
- RG-179 OK but attenuates at higher frequencies, so limit to a few meters or use RG-59 for long runs
- Isolation required, e.g. Deerfield Labs transformer (grounding problems between camera, mux, monitor)
- Wrong jumper settings on video card for composite versus S-video (Y/C) and RGB (see user's guide).
- Anti-piracy protection on VCR tapes or DVDs during testing (e.g. Macrovision)

### MOST COMMON DATA PROBLEMS

- Improper RS-485 auto sense settings (refer to manual for proper settings)
- AIB plug-ins not installed in proper orientation or socket, or different card types used in remote and console end.
- Incorrect RS-485 polarity: Focal standard is negative pin is inverting and RS-485 biased with 619 ohm pull up/down resistors plus optional 120 ohm terminator. When the two-wire polarity is correct, the red receive LED is typically on less often than when the wires are reversed.
- No or poor terminations: terminators and impedance controlled cable is needed at high data rates ( $> 500$  kbps).
- Poor cabling or grounding: Use twisted pairs for differential serial links. Verify proper grounding and shielding.
- AIB switch settings: Incorrect or default settings need to be changed.
- RS-422 Cross-over: Pins 1, 2 (Mux Rx) and 3, 4 (Mux Tx) are the same at both ends. Hence RS-422 coming into the mux on pins 1/2 at one end will exit the mux at the other end on pins 3/4 for the corresponding channel.
- MS900 AIB settings: Jumper on AIB must be set one way for the remote and the opposite way for the console.
- ARCNET AIB settings: Mux and sonar settings must match, per manual.

### MOST COMMON OPTICAL PROBLEMS

- Bad or contaminated connections (excessive loss and/or back reflection) cause 80% of all link problems.
- Excessive fiber bends or damaged cables cause excessive optical loss, particularly at 1550 nm.
- Insufficient fiber bandwidth, particularly in multi-mode fiber, can cause intermittent problems on long cables.
- Optical overload (not enough attenuation) during bench tests can cause link faults or errors.
- Dust contamination from bushings or connectors not being covered (especially turrets) can cause link faults.
- Mixed multimode/singlemode fiber jumpers (orange/gray vs yellow jackets) cause optical faults.

### FIBER HANDLING GUIDELINES

- Never use the fiber to pick up or support the weight of the device to which it is attached.
- Do not exceed the minimum bend radius (typically 1" for many loops, 0.5" for single half loops).
- Never clamp down on fiber. For example, when securing the fiber to a PCB, do not use a tight string, clamps or any mechanical mean to tightly bind the fiber. Local stress on the fiber increases loss and may break the fiber. Hard epoxies should also be avoided when securing fibers on a PCB.
- Follow ESD guidelines for handling electrostatic sensitive devices, such as cards with electro-optical devices.
- Clean all optical connectors (tips and barrels), bushings, adapters, and attenuators before use.
- Momentary violations of bend radius or excessive lateral pressure may significantly reduce the long term reliability of fiber, even if it appears undamaged. When in doubt, do not use the fiber.
- Always use dust caps on bushings, turrets and connectors, especially on turrets.
- Ensure connectors are well secured in the bushing and are not side loaded.

## Application Note

The following is a table outlining possible problems, symptoms, and solutions for Model 903:

SYMPTOM	POSSIBLE PROBLEM	POTENTIAL SOLUTION
No link ready lights	Non-functioning optical cable/damaged or dirty connector	Change optical cable Clean optical connections
	Optical loss is too high	Reduce optical loss
	Unit(s) not powered	Apply power to modules
	One or both FMBs in wrong configuration	Configure both the same (e.g. MS/HS)
No diagnostics	Cable not connected to console FMB Cable not straight connection (DTE-DCE)	Install "straight through" RS-232 Cable (EL-E0017)
	Program not installed or properly started	Run 903-0406-00 VDM.exe and press START button (see software manual).
No data and/or no data LEDs	Improper channel configuration (also see no link lights). Improper wiring of WAGO connector. (RED LED = Data into Mux; GREEN LED = Data out of Mux)	Reference appropriate manual section for data board configuration & wiring of WAGO connector
	Data I/O board not connected at the remote end (903-HD only)	Install ribbon cable at J5 of both HDB-TX and DATA IO boards
	Non-working data daughtercard	Replace daughtercard
No Video	Improper channel configuration (see also no link lights)	Reference appropriate manual section for video and high density board configuration
No video sync lights at console	No video source at remote end	Plug camera into appropriate remote video channel.
Console module voltage reading low	PSU internal 110/220 VAC selector switch (bottom side of cassette) may be set incorrectly (default is 110 VAC)	Set switch to appropriate AC input voltage (110 or 220 VAC)
Noisy video	Partial LINK observable in diagnostics	Inspect / clean / replace optical cable system. Ensure valid ground connection on video cables.
Very bright video	Video signal input is too large	Ensure video input is 1.0Vpp

### DIAGNOSTIC LEDES

- PSU LEDs are on solid if +5, +12, -12 VDC rails are valid.
- AIB-4 Data Direction LEDs: Red = Receive (into front panel); Green = Go (from front panel). A lit red LED at one end of the system should have corresponding lit green LED at the other end of the system.
- Only on during the space state (TTL = 0) and off during the mark state (TTL = 1); data activity is indicated by the flashing or brightness of the LED. Idle signals are usually in the mark state (TTL = 1, LED = off)
- FMB-VTX Link LED is on with valid downlink frames, including synchronization frames.
- FMB-VRX Line LED is on with valid uplink frames, including synchronization frames.
- FMB Video Activity LEDs (on with sync pulse present on each video channel)
- Ethernet LEDs (on with valid link and/or collision)

## Application Note

### CARD DIAGNOSTIC LEDES:

CARD	LED STATUS – NORMAL OPERATION CONDITION
Fiber Multiplexer Boards	Green LED “Link” indicator between the Console and Remote Modules
Ethernet Cards	Green RJ-45 port LED: ON = valid link, FLASHING = data activity Yellow RJ-45 port LED: ON = full duplex link, FLASHING = data collisions Green Panel LED (“T”): ON = data received from backplane (10 Mbps EIB only) Red Panel LED (“R”): ON = data sent to backplane (10 Mbps EIB only)
AIB-4, DIB-232, DIB-485 Cards	Two LEDs for each channel indicate the presence of a signal transmitted or received:  Green LED (“T”): ON = data being transmitted out of card front panel Red LED (“R”): ON = data being received into card front panel  Non-digital i/o cards (e.g. AIB-MS900) or blank sockets force both LEDs on.
Remote Module Data I/O (903-HD Only)	Two LEDs for each channel indicate the presence of a signal transmitted or received:  Green LED (“T”): ON = data being transmitted out of i/o box Red LED (“R”): ON = data being received into i/o box
Power Supply	Red power switch located on the front of the console system indicates presence of AC power.
	Green LEDs on PSU front panel indicate corresponding output voltage levels are OK. Flickering or dim LEDs indicates power problems on the rails.

### FMB LINK READY LEDES (FMB FRONT PANEL):

LED STATUS	CONDITION	POTENTIAL SOLUTION
Both LEDs On	Normal operating condition (Valid uplink/downlink established)	OK
LED Flickering	Insufficient flux budget	Verify optical power budget with VOAT.
One LED On	Insufficient optical power or optical frame mismatch.	Re-establish synchronization. Replace FMB that has the unlit LED if received optical power is OK. Check FMB DIP switch settings per Manual.
Both LEDs Off	Problem with optics between remote and console modules	Bad connector: clean all optical connections. Bad fiber: bypass fiber sections with jumpers.

## Application Note



Model 903 Console showing the location of the “Link Ready” LED.

### CARD HANDLING GUIDELINES

- Use ESD protection as appropriate. Ensure unit is powered down when removing or installing cards, as the system is not “hot swappable”.
- Unscrew both captured front panel screws, but leave a few threads on upper screw to prevent “popping out”.
- Pull on card until backplane connector unmates. Undo the upper screw completely and withdraw the card slowly, especially if it is an optical card or adjacent to the FMB to avoid snagging fibers.
- Do not subject fibers to excessive bends, even momentarily.
- Ensure any re-mated optical connectors are cleaned immediately prior to remating. (Even clean connectors will accumulate dirt if left uncovered.)
- Transport cards in ESD safe bags or boxes.
- Ensure AIB plug-in modules are installed with their alignment dots matching the dots on the AIB motherboard.

## Application Note

---

### GENERAL HANDLING AND FAILURE REPORTING GUIDELINES

- Use a spare card and see if that fixes the problem.
- Verify the problem on other cards or channels, if possible.
- Note card part number and serial number, as well as PO number, if possible.
- Confirm whether the problem appeared during installation or well after successful installation, i.e. did the problem occur with no changes to a previously working system?
- Log a diagnostics file, if relevant, and email it to Focal. Diagnostics files include all optical measurements, temperature, voltage levels, video syncs, and errors detected. Ensure the log file is configured properly per the software users manual. (The various log fields may be enabled/disabled and the logging frequency may be changed from the one second default.)

### FOCAL SERVICE AND SUPPORT

It is recommended that damaged cards or cards/systems that the fault cannot be found in using the above guide be returned to Focal.

- Request a RMA # from Focal (Tel: 902-468-2263) and complete a return product form.
- Provide key information, such as a description of the problem, the part number of the board, how long the board has been in service, any attempted fixes, and the urgency for repair.
- Ensure packaging is secure and ESD safe.
- Typical assessment response is 3 days after receipt of product.