

Daniel Gas and Liquid Ultrasonic Meters IS Barrier Module Soldering Issue Technical Bulletin

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1 Background

Some customers have returned Mark III CPU boards due to a communications issue created by intermittent pin contact. The cause of this issue is the formation of cracks around the solder joints of the components, causing permanent, random or temperature-dependent loss of communication with the acquisition board.

2 Purpose

Provide a description of the issue, methods for identifying boards with the solder issue and recommendations for resolving the issue.

3 Reference Materials

- Daniel MeterLink™ v1.21.002 or later

4 Description

The IS Barrier Module is the black assembly installed on the Mark III CPU Board (part number 2-3-3400-418). It is a potted assembly that provides the intrinsic safety isolation as required by hazardous location approvals. There are two isolation schemes implemented: one for power and one for communication. The power isolation scheme is implemented via a transformer which isolates and limits the power from the safe area to the hazardous area. The communication isolation scheme is implemented via opto-isolators which provide similar isolation and energy limiting to the communication signals. The solder issue affects communication isolation, specifically the opto-isolator components. The solder issue was caused by a change in the manufacturing process of the components which can result in tarnish on the component leads of the opto-isolators. The tarnish on the leads prevents the solder from adhering properly to the component leads, resulting in weakened solder joints for these particular components. Temperature expansion and contraction of the potting material and the component leads can cause cracks in the solder joint. Repeated expansion and contraction eventually can cause the solder joint to break. Once the solder joint is broken, an increase in ambient temperature causes the potting material to expand and subsequently the pin to lift off the pad, causing loss of electrical contact. As the temperature decreases, the electrical contact will resume. In more severe soldering issue cases, multiple pins are broken which causes random or permanent loss of electrical contact between the pad and component lead. In minor cases, the solder issue may only be indicated by messages in the System or Alarm logs.

Symptoms:

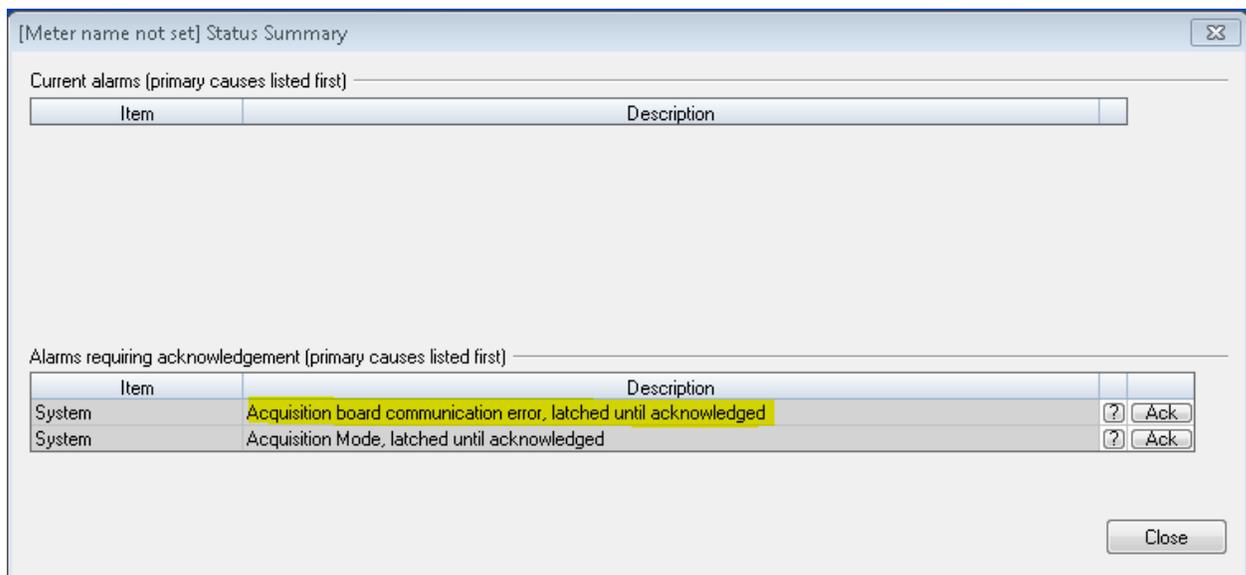
- Permanent, random, or temperature-dependent loss of communication and measurement data from the Acquisition board.
- Repeated messages in Alarm logs indicating Acquisition board communication errors.
- Repeated messages in System logs indicating FPGA communication errors.
- Repeated occurrences of Acquisition board communication errors in meter status reported by MeterLink.

Figure 1: Log Messages Associated with IS Barrier Communication Issues

62	68669	7/27/2014	8:19:37 PM	ERR_WARNING	FILE: hal.c. LINE: 587. MESSAGE: Unrecognized remote FPGA error TOTAL_ERRORS:0NO_ACK_ERRORS:0CRC_ERRORS:0TX_ERRORS:0RX_ERRORS:0UNKNOWN_ERRORS:0NO_ERRORS:0ACC_MASTER_OTHER_ERRORS:152303ACC_MASTER_CRC_ERRORS:3680REMOTE_STATUS: OK.
76	68683	7/27/2014	8:22:05 PM	ERR_WARNING	FILE: hal.c. LINE: 690. MESSAGE: Remote FPGA not responding and unable to initialize its ERRNO: 1
2875	418271	7/27/2014	8:19:39 PM	IsCommErrAcqBd	Activated High TRUE TRUE

Figure 1 identifies the log Messages most commonly associated with the solder issue. For intermittent connections, “Unrecognized remote FPGA error” may only be observed in the system log. Depending on the severity of the issue, “Remote FPGA not responding and unable to initialize its” messages may be observed in the system log and “IsCommErrAcqBd” alarms may be observed in the Alarm log at similar time periods. These messages indicate the CPU is not communicating to the Acquisition board properly. With minor solder issues, the “Unrecognized remote FPGA error” may only be observed and the meter may show no observable signs or symptoms. In severe cases, the system and alarm logs will have repeated occurrences of these messages and the meter will show symptoms where all chord measurement drops out intermittently or permanently. In these situations, the meter status as reported by MeterLink will indicate a latched Acquisition board communication error. This is an indication that the CPU lost communication with the Acquisition board for a period of time but was able to reestablish communication. Repeated occurrences of these messages after acknowledgment are symptoms of the solder issue. If the communication to the acquisition board was not re-established, the message would be listed in the Current alarm section.

Figure 2: MeterLink Meter Status Summary



Any loss of communication with the Acquisition board is an indication of loss of measurement and should be investigated further. The loss of communication with the Acquisition board can be misdiagnosed as a problem with the Acquisition board due to the loss of measurement data. If the meter is showing symptoms of complete measurement failure, it is important to view the log record

and typically a specific meter event can be correlated to messages in the archive logs. This helps to prevent misdiagnosis of the issue, and ensure only the necessary boards are returned.

As indicated previously, in many instances the symptoms are temperature dependent. As the ambient temperature increases, the occurrence of the log messages increases and the frequency and duration of the meter symptoms will tend to increase. Similarly, as the ambient temperature decreases, the occurrence of log messages as well as the frequency and duration of the meter symptoms will also tend to decrease.

The solder issue has been narrowed to a subset of CPU boards.

Serial Number Range Potentially Affected by Solder Issue:

- P/N 2-3-3400-418/425 - CPU S/N Range 15500 to 19000

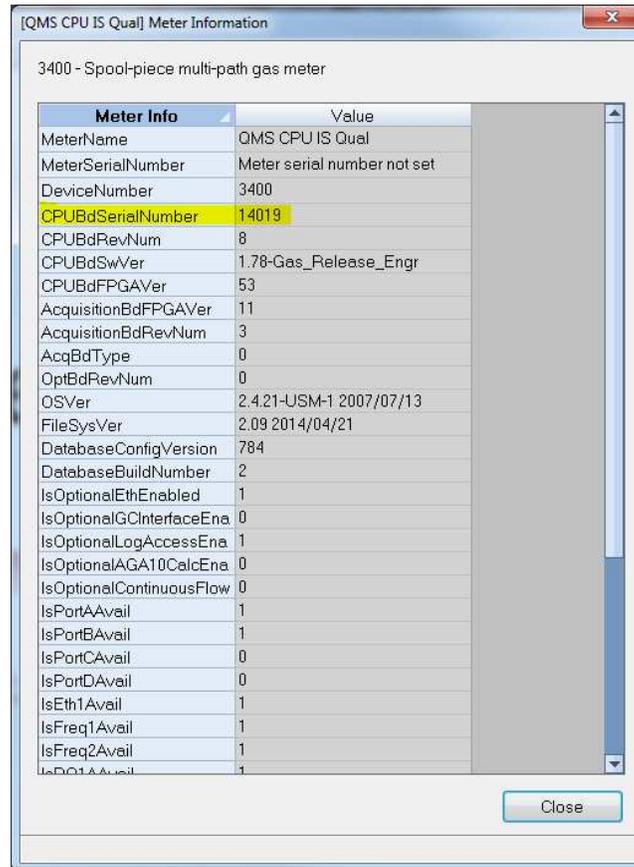
The serial number of each board can be found by serial number tags located on the assembly. Figure 3 shows the location of the serial tag and designates the location of the serial number.

Figure 3: Location of CPU and IS Barrier Module Serial Numbers



The serial number of the CPU Board can be viewed in MeterLink by Selecting Meter -> Meter Information from menu options. The CPU serial number is listed as CPUBdSerialNumber in Meter Information window as shown in Figure 4.

Figure 4: CPU Board Serial Number as displayed on the MeterLink Meter Information Screen



5 Recommendations

If relevant messages are observed in the log record and/or the meter is showing symptoms of communication problems, it is recommended to immediately contact Daniel Service for assistance. Daniel personnel can evaluate log records and/or meter symptoms and make recommendations on proper resolution. Upon verification of the solder issue, repair or replacement options will be provided.

6 Technical Bulletin Revision History

Revision A

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Approved by: Kerry Groeschel

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