Mandatory Service Bulletin

Mandatory upgrade to DMC board Rev. H with firmware V11R3b4

Task

Timing	Category	Subject
◉ Immediately. Completion anticipated by date 31.10.2014	◉ Mandatory for all affected sites	☑ PowerHelp complaint / HQ issue: PR1302180002 PR1403060003 PR1406260001 PR1312120001
		☑ Problem affects serial number(s) / batch(es) listed below.

Risk

The probability of potential harm is set to the lowest level available in our risk management procedure (“incredible”).

Task Tracking

After completion of your task the following entry in your Service Report is required: **DD+DIS078.14E** *

* Insert the document number into the field "Comment" (SMS form).

Purpose of this document:

- This document informs about the mandatory upgrade to the DMC Board rev. H, the firmware version V11R3b4 and installation of the DMC Isolation Kit.
- For devices where the DMC board rev. H upgrade kit is installed in the field, also the chain of the transmission group needs a tension adjustment.

Affected serial number(s) / batch:

- DX-D 100, Type 5410, with SN < A5410000134
- DX-D 100 Wireless, Type 5411, with SN < A5411000408

For details refer to the attached MS Excel sheet.

This Mandatory Service Bulletin has been issued as part of the Global Corrections and Removals Procedure. It is connected to a product recall. Check with your local QA/RA and HE Sales/Marketing teams to make sure that your service activities are coordinated with their associated responsibilities.

NOTE:
This Bulletin replaces the earlier Mandatory Service Bulletin SB No. 33 DX-D 100 / SB No. 30 DX-D 100 Wireless, DD+DIS152.13E, Mandatory Installation of the DMC Board Upgrade Kit.

1 Introduction

This is the third action to solve the issue: Intermittent, unintended and illogical movements of the DX-D 100 and DX-D 100 Wireless.

The following table shows an overview of all initiated mandatory modifications related to this issue:

#	Modification	Related problem records	Document	Active
1	Perform different tests, adjustments and modifications (no hardware exchange)	PR1302180002	MSB No. 26 DX-D 100 / MSB No. 24 DX-D 100 Wireless, DD+DIS096.13E	May 2013 to Nov. 2013
2	Install DMC Board upgrade kit (DMC Board rev. H with firmware V11R2b6 and a buzzer).	PR1302180002	MSB No. 33 DX-D 100 / MSB No. 30 DX-D 100 Wireless, DD+DIS152.13E	Nov. 2013 to April 2014
3	Install DMC board firmware V11R3b4, install DMC Isolation Kit and check chain tension.	PR1302180002 PR1403060003 PR1312120001 PR1406260001	This document	As of July 2014

This document includes all instructions to bring all DX-D 100 / DX-D 100 Wireless, listed in the attached Excel sheet to following status:

- DMC Board rev. H with firmware V11R3b4 and a buzzer, to indicate error conditions.
- DMC Board mounted isolated from the chassis by the DMC Isolation Kit (4 plastic washers and 4 plastic screws).
- Checked or adjusted chain tension for all devices that are modified in the field with the DMC board upgrade kit.

In details, this mandatory modification solves following issues:

1.1 Intermittent, unintended and illogical movements of the DX-D 100 and DX-D 100 Wireless (PR1302180002)

Symptom Intermittent, unintended and illogical movements of the DX-D 100 and DX-D 100 Wireless.

Risk The probability of potential harm is set to the lowest level available in our risk management procedure (“incredible”).

Cause Cabling issues and/or firmware issues of the DMC board and/or wrong voltage adjustment of the DMC board. In addition at some devices the chain tension of one or both of the two chains that drive the two wheels may be too tight.

Solution Install the DMC Board Upgrade kit (DMC Board rev. H incl. buzzer).
In addition check the chain tension and adjust if required.
For details refer to section 3.

1.2 Difficulty to drive the unit on ramps (PR1403060003)

Symptom Following symptom applies to units with DMC board rev. H and firmware V11R2b6 only:

- A unit may stop moving on the ramp, which then requires the user to restart the motion of the unit. When restarted, there is a risk of possible backwards movement.
  Note, that driving on ramps with an incline greater than 5 degrees is outside the intended use of the device.
- A unit may speed up and/or become difficult to control and stop when driving down a ramp.

NOTE:
Following devices have DMC board rev. H and firmware V11R2b6 installed:

- All devices manufactured after introduction of the DMC board upgrade kit and before introduction of firmware V11R3b4 in production (Type 5410: SN A5410000090 to A5410000133; Type 5411: SN A5411000259 to A5411000401).
- All devices that were modified in the field with the DMC board upgrade kit in the time frame November 2013 to April 2014.

The attached Excel sheet lists all affected units.

Risk The probability of potential harm is set to the lowest level available in our risk management procedure (“incredible”).

Cause Changed drive control to solve the issue with intermittent, unintended and illogical movements.

Solution Install updated firmware version V11R3b4 on the DMC board.
For details refer to section 3.

NOTE:

DMC firmware version V11R3b4 improves the driving behaviour by following changes:

- The gauges signal has been amplified to adapt to the DMC board revision H. This improves driving up and down ramps.
- The braking current has been increased in order to get higher torque.
- The braking distance is reduced by activating the brakes sooner.

1.3 Intermittent, unintended and illogical movements of the DX-D 100 and DX-D 100 Wireless due to electrostatic discharge (PR1406260001)

Symptom Intermittent, unintended and illogical movements of the DX-D 100 and DX-D 100 Wireless due to electrostatic discharge.

Risk The probability of potential harm is set to the lowest level available in our risk management procedure (“incredible”).

Cause If an ESD discharge occurs via the arrestor of the unit, there is a possibility that the DMC board is affected resulting in a possible unintended movement.

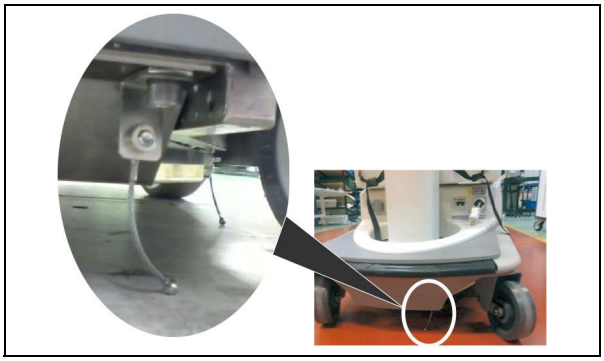

Figure 1: Arrestor

Solution Fix the DMC board with 4 plastic screws and isolate the board from the metallic mounting plate by 4 plastic spacers.
For details refer to section 3.

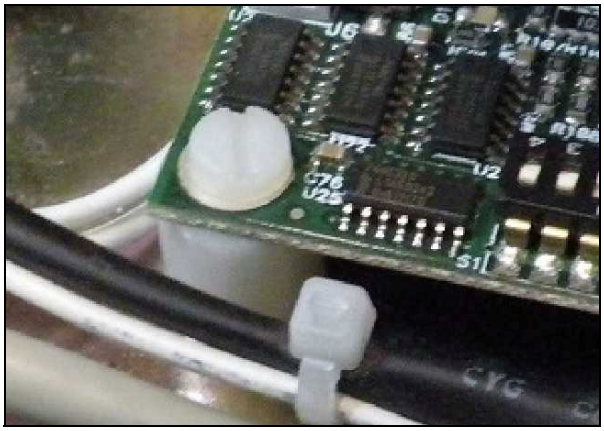

Figure 2

1.4 More difficult driving behavior after installation of the DMC Board Upgrade Kit (PR1312120001)

NOTE:

The reasons for the mandatory modification are Problem Records PR1302180002 and PR1403060003.

The following problem record did not initiate a mandatory modification. It is also solved however with the firmware upgrade to V11R3b4.

Symptom

Users complain about a stiffer or sluggish driving with the DMC board rev. H with firmware V11R2b6.

In addition some users complain about the changed driving behavior: It is more difficult to stop the unit and feels like driving in sand.

Cause

Changed drive control to solve the issue with intermittent, unintended and illogical movements.

Solution

Install the updated firmware version V11R3b4 on the DMC board.

For details refer to section 3.

2 Prerequisites

SPARE PARTS:

- For devices that are not yet upgraded with the DMC board upgrade kit:
  SC+A521079-01 DIGITAL MOTION CONTROL UPGRADE KIT
  This kit contains:
  - DMC Board rev. H with firmware V11R2b6 or, in the successor spare part, DMC firmware V11R3b4
  - A buzzer

- SC+A521065-02 UPGRADE DIGITAL MOTION CONTROL
  This DMC firmware upgrade kit contains:
  - Windows Serial Downloader Program on CD ROM
  - DMC firmware V5R6b0 or, in the successor spare part, DMC firmware V11R3b4
  - DMC programming cable

  The spare part “SC+A521065-02 UPGRADE DIGITAL MOTION CONTROL” only needs to be ordered **once** per Service Engineer to have the DMC programming cable. Old versions of the spare part are also OK, as the latest firmware is available on the Agfa HealthCare Library.

- SC+A521093-01 - DMC Isolation Kit (4 plastic spacers and 4 plastic screws)

SOFTWARE:

Download the DMC board firmware V11R3b4 from the Agfa HealthCare Library.

Direct Radiography → DX-D 100 → DX-D 100 Generic → Software

Alternatively download the software directly from the global secure FTP server using an FTP client. For details see Service Information Bulletin “Global Secure FTP Server – Imaging Services Software Download”, DD+DIS114.12E.

Contents of the software ZIP File (approx. 1 MB):

- Firmware V11R3b4 (V11R3b4.hex)
- Windows Serial Downloader Program
- readme

REQUIRED TOOLS:

- Service PC with serial port or USB to serial port (RS 232) converter.
- DMC programming cable (part of SC+A521065-02 UPGRADE DIGITAL MOTION CONTROL)
- Dynamometer (spring scale, mechanical or electronic), to measure force in the range of 25 N to 35 N (2,5 to 3,5 kg)

Figure 3

NOTE:

After end of stock of SC+A521065-02 UPGRADE DIGITAL MOTION CONTROL (with DMC firmware V5R6b0) the spare part index will be increased and the firmware will be updated to V11R3b4. By ordering SC+A521065-02 automatically the successor will be delivered when available.

The same is valid for SC+A521079-01 DIGITAL MOTION CONTROL UPGRADE KIT.

Therefore it is important to also download the firmware from the Agfa HealthCare Library.

DOCUMENTS:

- DX-D 100 user manual addendum, Document ID 42843335, in user language, Intranet Link / Extranet Link.
  This addendum contains a description of the different failure conditions that can be detected after installation of the DMC Board Upgrade Kit.
- Updated DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual, Document ID 41600560, Intranet Link / Extranet Link.
  This service document contains updated chapters “Schematics” and “Troubleshooting” based on the DMC Board rev. ≥ H.
  It also contains updated instructions how to load the firmware on the DMC board in section 6.8.6, Updating the Microcontroller.

3 Instructions

REQUIRED TIME:

Depending on the required activities, up to 4 hours

- 60 minutes: Only if not yet done earlier: Performing checks at encoder and gauges
- 45 minutes: Installation of the DMC board rev. H and the buzzer
- 10 minutes: Firmware update*
- 10 minutes: Velocity adjustment via selection switch
- 20 minutes: Voltage adjustment of the DMC board
- 60 minutes: Checking the chain tension
- 15 minutes: Verification
- 30 minutes: Informing the customer

*Firmware update takes 10 minutes if it is part of DMC upgrade kit installation.
If firmware update is the only activity, it takes approx. 45 minutes.

IMPORTANT:

The following instructions list all modifications to get the system to the required status.

Depending on the device serial number and the modifications that have been done already, it may be required to perform a subset of these instructions for a certain device only.

(1) For all devices, listed in the attached MS Excel workbook to perform the “Checks at encoder and gauges”: If the checks at the encoder and the gauges as described in the predecessor documents* have not been performed yet: Perform the steps listed in section 3.1.

*Mandatory SB No. 26 DX-D 100 / SB No. 24 DX-D 100 Wireless, DD+DIS096.13E or
Mandatory SB No. 33 DX-D 100 / SB No. 30 DX-D 100 Wireless, DD+DIS152.13E

(2) For all devices, listed in the attached MS Excel workbook to perform the “DMC Board upgrade”: Install the DMC Upgrade Kit if not yet done.
For instructions refer to the attached Service Information Note SIN 13-08-13, Replacement of the DMC board to rev H.

(3) For all devices, listed in the attached MS Excel workbook to perform the “FW upgrade V11R3b4”:
Update the firmware of the DMC board to version V11R3b4 as described in the DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual, section “Updating the Microcontroller”.

Write the firmware version on the board after the upgrade with a waterproof pen.
Skip this step, if the firmware on the DMC board is already on V11R3b4 (or higher version).

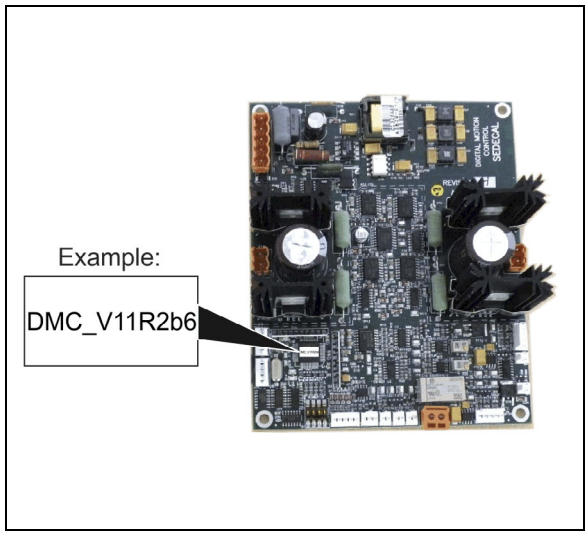

Figure 4

IMPORTANT:
For programming of the DMC board the two clips of the DMC programming cable need to be connected to TP1 and TP2. The location of TP2 changed with introduction of DMC board rev. H. The correct location of TP2 is shown only in DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual, Document ID 41600560, revision ≥ 1.4.
The integrated chapter “Troubleshooting” is revision ≥ TR-1100R4.

NOTE:
During firmware update it is recommended to remove the connector for the buzzer (J15). Otherwise the buzzer will continuously beep as long as the DMC programming cable is connected between TP1 and TP2.

(4) For all devices, listed in the attached MS Excel workbook to check the chain tension:
Check the chain tension as described in the attached Service Information Note SIN 14-01-03, Adjustment chain in mobile.

(5) For all devices, listed in the attached MS Excel workbook to install the DMC Isolation Kit: Replace the metallic mounting material of the DMC board by plastic parts as described in the attached Service Information Note SIN SIN14-06-14, Spacer installation for Digital Motion Control PCB.

(6) At devices where a sticker “Warning – Do not drive on ramps” is attached: Remove the sticker.

Figure 5

(7) Hand over the user manual addendum to the customer in user language if not yet done earlier (for download link see section 2, Prerequisites) or if not available yet. In detail, inform the customer about:

- Improved error detection capabilities of the DMC board revision H. A buzzer is installed to inform about detected errors. Note, that the buzzer beeps once when you turn the key to switch the device on or off.
- The different error conditions are shown via different beep sequences. Details are listed in the user manual addendum.
- At devices where the DMC board rev. H with firmware V11R2b6 was installed, the driving behaviour is improved now.
- This service intervention is related to the Urgent Field Safety Notices that were sent out in 2013 and 2014.

3.1 Additional steps before DMC Board Upgrade Kit installation, if checks at encoder and gauges have not been performed yet

Symptom – sporadic or persistent	Check encoder Connection. See 3.1.1.	Check encoder cable. See 3.1.2	Check gauges visually. See 3.1.3	Troubleshoot gauges. See 3.1.4	Troubleshoot tube collimator handle buttons. See 3.1.5
User does not report intermittent, unintended and illogical movements OR After releasing the handle bar (dead man switch) or tube collimation movement buttons, the unit accelerates in the backward or forward direction with/without turning to the left or right for a maximum of 1.5 seconds before stopping.	✓	✓	✓	—	—
While pressing the handle bar (dead man switch) and driving straight forward or backwards, the unit keeps on turning in one direction (left or right).	✓	✓	✓	✓	—
While using the tube collimator handle buttons the unit keeps on turning in one direction (left or right).	✓	✓	✓	—	✓
Unintended movements during start-up.	✓	✓	✓	✓	✓

DANGER:

Keep the unit turned off and isolated from the power supply.

Although the mobile unit is off and disconnected from mains, dangerous voltage is present in the unit. Refer to “General Cautions” at the troubleshooting chapter of the DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual.

3.1.1 Checking encoder connections

(1) Check the encoder connections on the DMC board (J4, J6) and on the motor. They must be tightly snapped-in.

(2) Do not unplug these connectors on the motor side if they are snapped-in correctly, as it is extremely difficult to plug them back in. The long pins on the motor side are easy to bend and to damage.

Perform following steps only, if one of the connectors on the motor side was not entirely and tightly plugged in:

(3) Remove the motor as described in DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual, chapter Troubleshooting, section 6.3 Motor Replacement.

(4) Unplug and inspect the motor connector in detail.
Ensure that the pins of the unplugged connector on the motor side are all straight and not bent.

3.1.2 Checking the encoder cable

(1) Check the encoder cable condition.
If there is stress on the encoder cables, continue with the next steps in this section.
If there is no stress on the encoder cables, continue with section 3.1.3.

(2) Untie the tie wraps of the encoder cables.

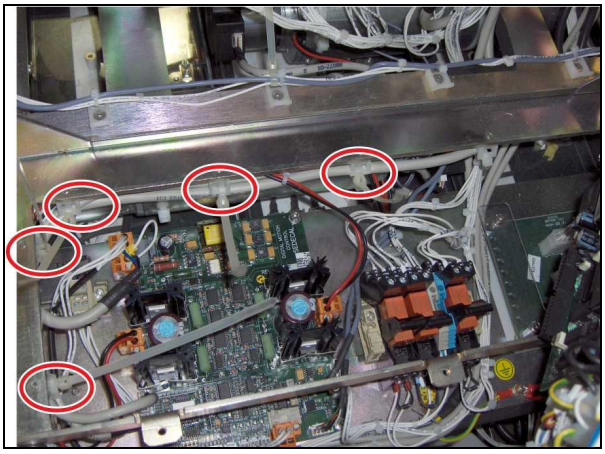

Figure 6

(3) Fix the rerouted cable on the right-hand side motor encoder.
Ensure, that there is no stress on the encoder wires.

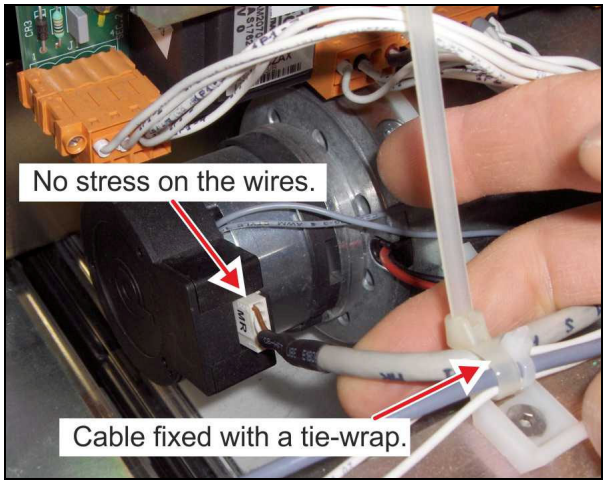

Figure 7

(4) Fix the rerouted cable on the left-hand side motor encoder.
Ensure, that there is no stress on the encoder wires.

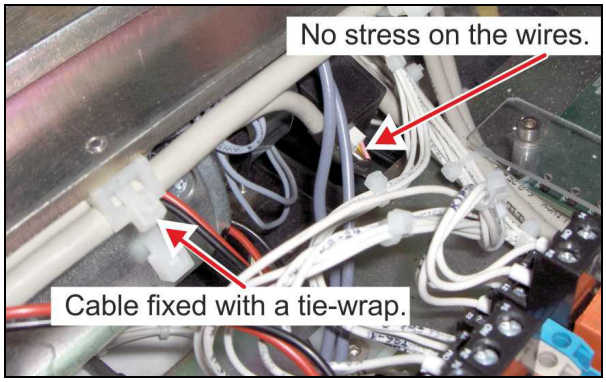

Figure 8

(5) Ensure that there is no stress on the encoder wires on DMC board side.
See Figure 9.

(6) Mount new tie wraps for the rerouted encoder cables.

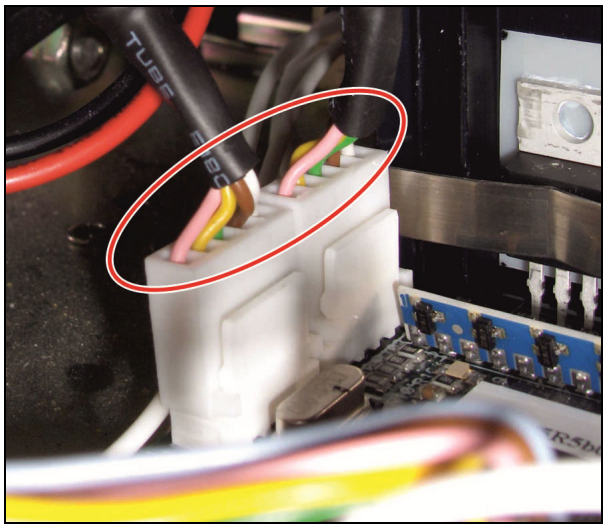

Figure 9

3.1.3 Visually checking gauges connections and wires

(1) On the DMC Board, check the wires and the crimping of the wires around the J5 connector pins.

(2) Check the pins of the J5 connector counterpart.

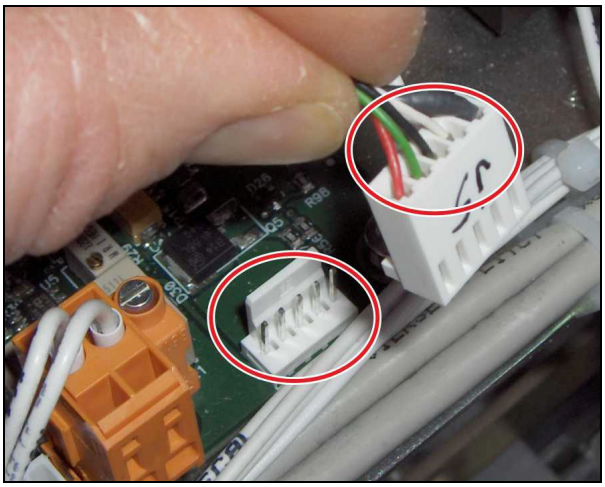

Figure 10

(3) On the DMC Board, check the wires and the crimping of the wires around the J7 connector pins.

(4) Check the pins of the J7 connector counterpart.

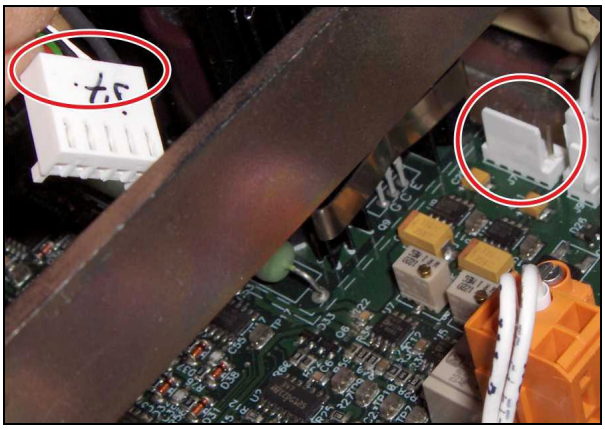

Figure 11

(5) Carefully check the cable outlet of the two gauges for damages.

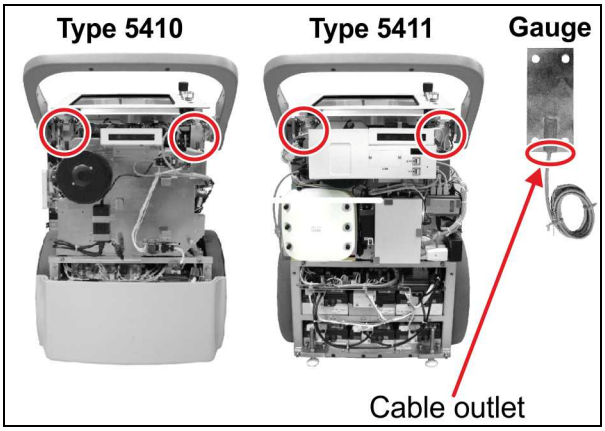

Figure 12

3.1.4 Troubleshooting the Gauges

DMC Board and Gauges:

For troubleshooting the gauges and the DMC board, refer to chapter 6.7 Troubleshooting Gauges of the DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual.

Handle Bar:

(1) Disassemble the handle bar.

(2) Inspect switches, wires, continuity to plug J9 at the DMC board and also the connector on the DMC board.

(3) Check the mechanical adjustment of the handle bar.

(4) Both sides should have the same travel (should be symmetrically adjusted).

Evaluation of the Checks:

In case that none of the checks listed above showed any apparent or measurable damage or defect, exchange the Handle Gauge, spare part number SC+17492-01.

For instructions refer to DX-D 100 / DX-D 100 Wireless - Mobile X-Ray Unit - Service Manual - Troubleshooting, section 6.6 Gauge Replacement.

3.1.5 Checking the Tube Collimator Handles

Following check is required only, if the unit keeps on turning in one direction (left or right) after releasing the tube collimation movement buttons.

(1) Check the status of the drive batteries (Tray 6).
Make sure the drive batteries are fully charged before further testing. If they are not, then also check the condition of the fuses and charger boards.

(2) Disconnect the cable from J2 on DMC board.

(3) Measure resistance at each pin (1, 2, 3, 4) against pin 5 (Common).

Normally these contacts should be open and with the button pressed the resistance should be close to 0.0 Ω.

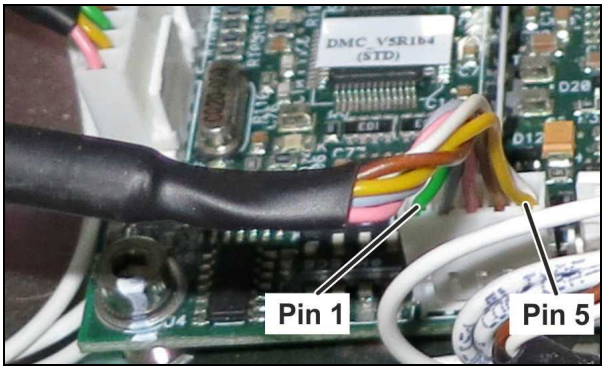

Figure 13

4 Verification

Perform the following tests, depending on the performed modifications:

Installation of DMC board upgrade kit and new firmware V11R3b4:

(1) Connect the system to the mains.
(2) Press the handle bar, to simulate a defective handle bar switch.
(3) Switch on the system. The buzzer starts to beep constantly with an interval of 3 seconds (one beep every 3 seconds).
(4) Release the handlebar. The buzzer stops beeping.
(5) When the system has booted up completely, disconnect the mains cable. Drive the system forth and back by operating the handle bar: No beep must be audible.
(6) Perform a fine positioning via the four buttons on the tube-collimator handles: No beep must be audible.

Installation of new firmware V11R3b4 and / or DMC Isolation Kit only:

(1) Drive and stop the unit a few times. The unit must start driving and stop as expected.

5 Keywords

DMC, firmware, buzzer

6 Version history

Version	Change	Date
1.0	Initial version	07-2014