Firmware Update via MicroSD Card
Bettis RTS Electric Actuator

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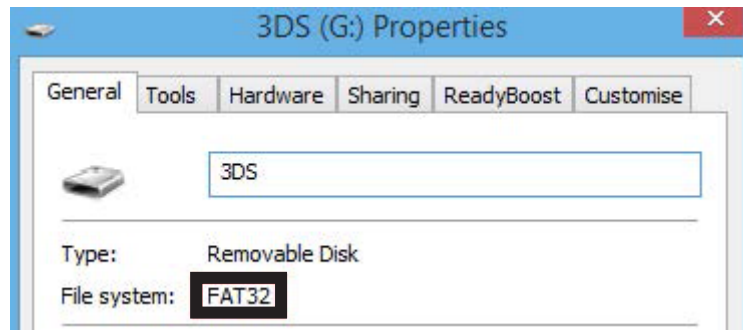
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Section 1: Requirements

For the firmware update, you need a microSD card formatted with the FAT32 file system.

Figure 1. MicroSD Card

Figure 2. FAT32 File System

NOTICE

The filename must be written exactly as displayed below, otherwise the firmware update will not work.

The firmware files are provided with the revision in the filename and it requires to be renamed to the basic form before saving the new firmware files in the microSD card. To avoid any mix of files, ensure that the microSD card does not contain any previous firmware revisions.

Examples:
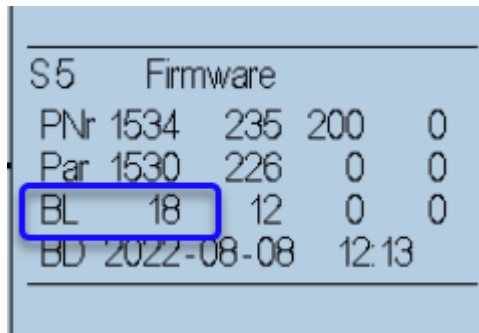
Filename: D2FW_1534_CM.bin   Rename to: D2FW.bin

Filename: L2FW_235.bin   Rename to: L2FW.bin
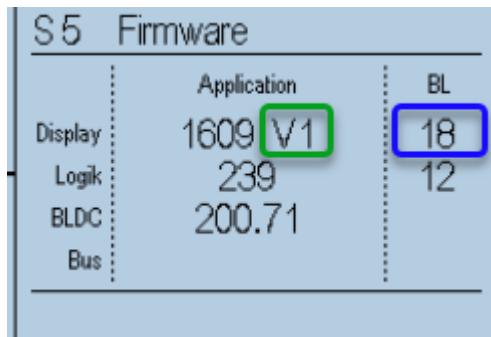
Additional Information

Bootloader version for the display board can be found on the S5 menu of the actuator display as shown in Figures 3 and 4.

Figure 3.   Actuator Display Bootloader Version on 15xx

Figure 4.   Actuator Display Bootloader Versions on 16xx

For the RTS to apply the firmware correctly, the filenames need to be renamed before being put on the microSD card. V2 displays do not require any change to the filename.

The filename nomenclature is shown in Table 1.

Table 1.   **Firmware Files**

Bootloader Rev	Display Rev	Display Firmware File		Logic Firmware File		16xx Preparation File
		Original	Renamed	Original	Renamed	Renamed
11 and below	V1	Display_V1_16xx.bin	Display.bin	Logic_2xx.bin	Logic.bin	D2FW.bin
12 to 20	V1	D2FW_V1_16xx.bin	D2FW.bin	L2FW_2xx.bin	L2FW.bin	D2FW.bin
21 and above	V2	D2FW_V2_16xx.bin	N/A	L2FW_2xx.bin	N/A	N/A

NOTE:
The actuators with bootloader version 12 or above (Starting May/June 2017) require the filenames L2FW.bin for the Logic board and D2FW.bin for the Display board.
Actuators with bootloader older than version 12 (Before May/June 2017) require the filenames Logic.bin for the Logic board and Display.bin for the Display board.

The files D2FW.bin and Display.bin are not exchangeable.
The files L2FW.bin and Logic.bin are not exchangeable.

In very old actuators and very rare occasions, an additional file is required to force the firmware upgrade. If this is the case, use the additional file: fwinfo.txt.

In 2022, a new display hardware was released. Please check Section 3 for the new hardware firmware upgrade process.

For the firmware migration from 15xx to 16xx, please refer to Section 3 or contact Emerson for more information.

Section 2: Steps to Update Firmwares

⚠ WARNING

- Check with the responsible personnel on-site if it is safe to do the firmware update.
- Firmware update must have permission from the personnel on-site.
- You will need to remove the cover away from the control unit or the actuator.
- There is no explosion protection during the firmware update.

1. Go to status menu S5 "Firmware" and write down the current firmware.
2. Power off the actuator.
3. Remove the screws from the control cover using a 5 mm Allen key and slowly pull off the control cover.
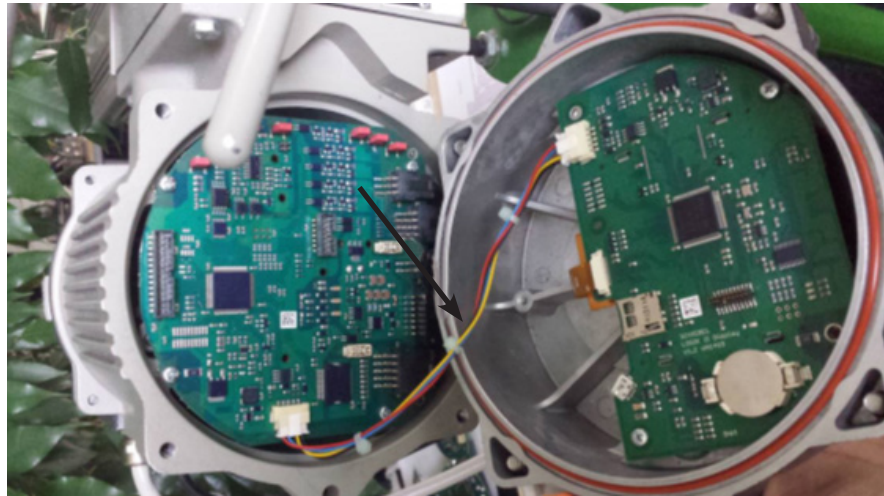
NOTICE

There is a 4-pole cable between the control cover with the display board and the logic board which is fixed in the housing. Mind the cable connection as well as the O-ring from the control cover.

Figure 5. **Control Cover with Four Screws**

Figure 6.   **Cable Between Control Cover Display and Logic Boards**

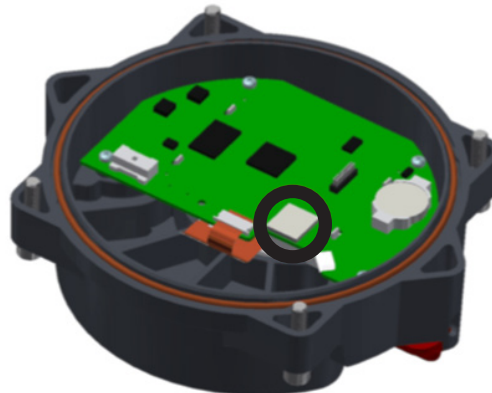**Pay attention to the cable connection**

4.   Insert the microSD card into the slot on the display board.

NOTICE

Display board must be connected to the logic board.

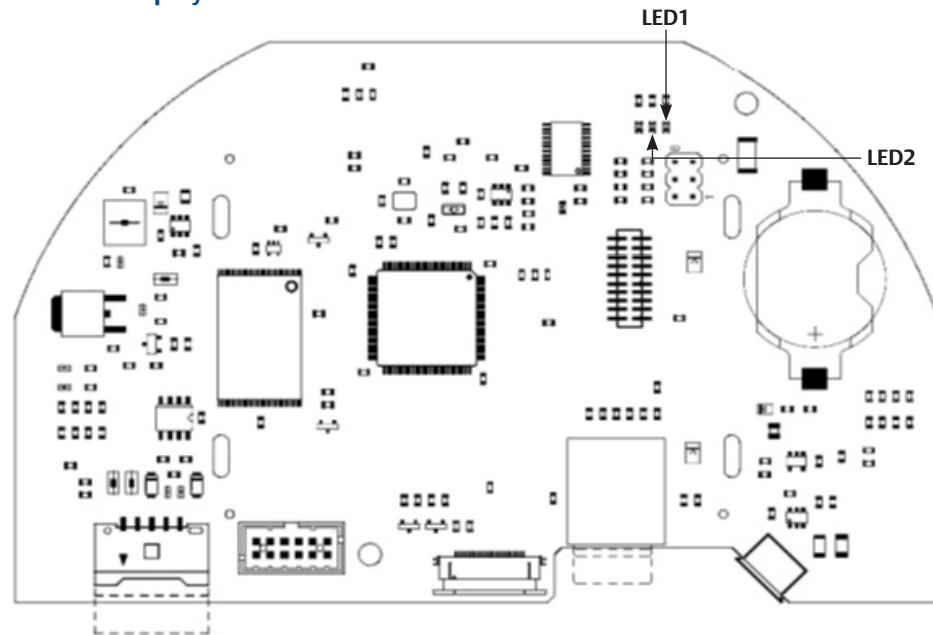**Figure 7.**   **MicroSD Card Slot on Display Board**

5.   Power on the actuator.
6.   If a newer firmware is placed inside the microSD card, then the firmware update
       will start automatically.

Display (see Figure 8)

- LED 1 will light while one of the boards is flashed.
- LED 2 will be flashing during the update.

**Figure 8.**   **Display LED 1+2**

Logic (see Figure 9)

- LED 1 will light while the update of the display and logic are in progress.
- LED 2 will flash while the update of the logic board is in progress.

Information

- If a logic bootloader (version <= 5) is installed in the logic, the LED 2 will light and not flash while the update is in progress.
- The behavior of LED 1 will not change in this case.

Figure 9.   **Logic LED 1+2**
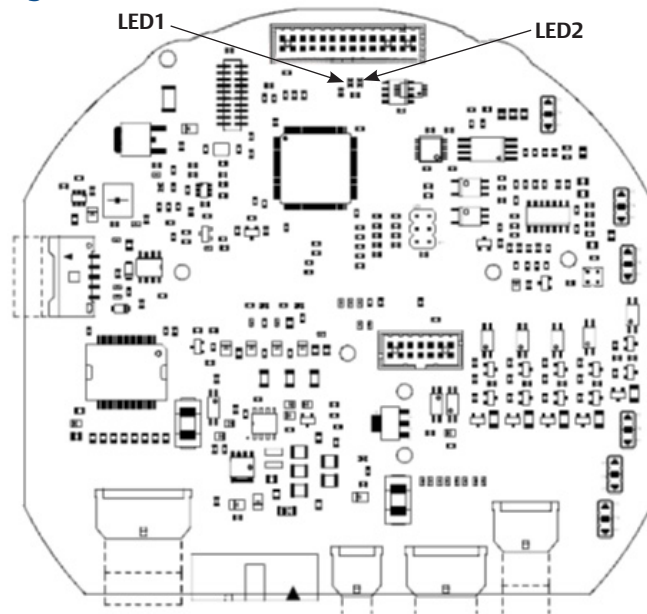
7.   When the update is completed, the display will light red for a short time and then it will change to a white screen for normal operation.

8.   You can check in the status menu S5 if the new firmware is installed on both boards. The row with "PNr" is the one to compare with 15xx firmware.

Examples:

		Display	Logic	BLDC
S5	PNr	1534	235	200
S5	PNr	1609	239	200.71

Compare the current firmware with the firmware version that you have written down in the second step.

If the firmware version is higher than before, the firmware update is successful.

Examples:

Before	PNr	1513 221	PNr	1513 221
After	PNr	1534 235	PNr	1532 0

Update successful   Update failed
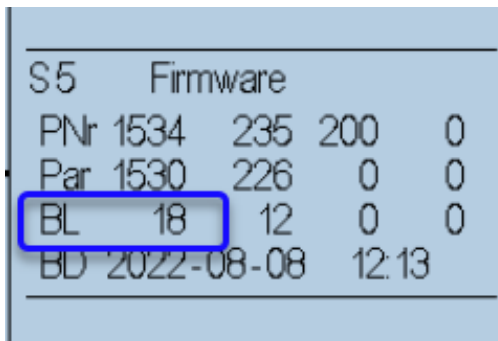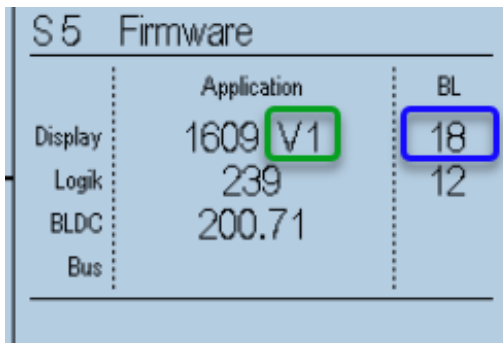
Figure 10.   Example 15xx

Figure 11.   Example 16xx

9.   Power off the actuator.

10.   Remove the microSD card.

11.   Mount the control cover to the control unit and reattach the screws.

NOTICE

Like in step 3, mind the cable connection between display and logic board.
Make sure that the O-ring from the control cover is in the right place.

12.   Power on the actuator.

13.   The actuator is ready for normal operation.

NOTE:

Bootloader information, see Figures 10 and 11:
At the example 15xx, Bootloader = 18
At the example 16xx, Bootloader = 18, Hardware rev = V1

Section 3: Firmware Upgrade to FW16xx

Before upgrading to firmware version FW1600 or higher from a firmware version 15xx, a special preparation software is necessary.

NOTE:

It is recommended to use two separate microSD cards to avoid upgrading to FW16xx without the preparation software.

As mentioned in Section 1, the firmware name must follow a certain naming convention to be loaded to the actuator control unit. Please make sure, that only the preparation software is written on the one microSD card (e.g., from the file Display_bin_01584_00000_Prepare_For_and the actual firmware FW16xx files are on the other). You may also label the microSD cards to make their content apparent.

3.1 Procedure

NOTE:

Only applies for a firmware upgrade from a firmware version FW15xx to FW16xx.

Please follow these steps for the firmware upgrade procedure:

1. Before starting upgrade firmware procedure, user must at least go through RTS training 2xx or above and contact Emerson LCS or Emerson Sales Team to obtain 16xx firmware activation key for units that will be upgraded from firmware 15xx to 16xx.

2. Have the microSD card containing the preparation software ready (renamed to D2FW.bin).

3. Follow the steps as described in Section 2 up to step 6.

4. The microSD card may be removed from the display, as soon as the display shows that "The actuator is ready for the upgrade to FW16xx". Put aside the microSD card containing the preparation software.

5. Have the microSD card containing the 16xx firmware files ready.

6. Follow all the upgrading steps again as described in Section 2 until the end.

7. Insert 16xx firmware activation key to activate 16xx firmware.

NOTE:

When the RTS units bootloader is <=20, the firmware name must follow a certain naming convention to be loaded to the actuator control unit as Section 1. When the RTS units bootloader is >=21, please read through Section 4.

Section 4: New Version of Display Board

4.1   General

Due to the current difficult sourcing situation, we designed a new version of the display board to be more flexible.

The microcontroller was changed to a version with half the FLASH memory and to compensate an additional external FRAM was added.

For each version of the display board, there is a dedicated firmware to be fully compatible.

4.2   Difference Between the Versions

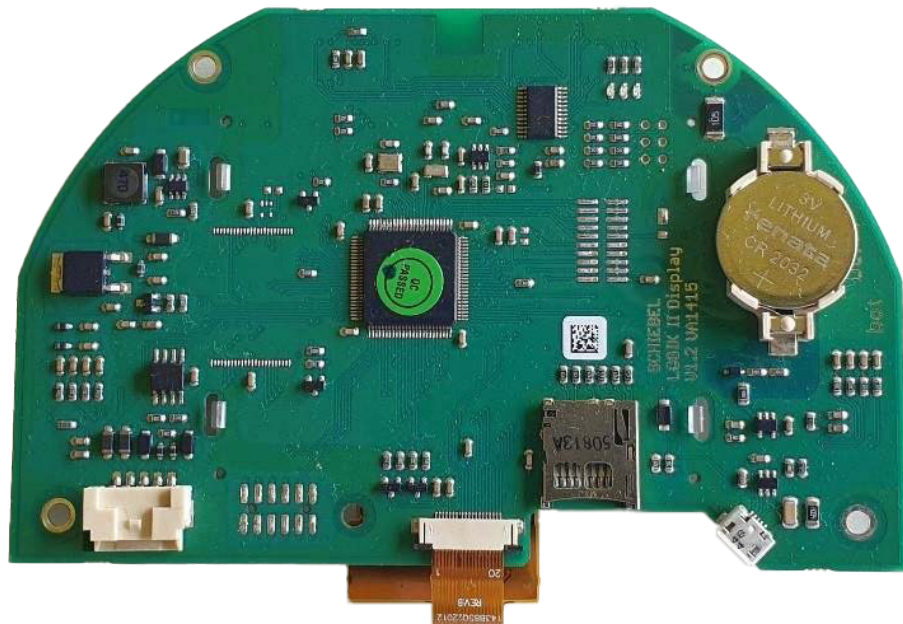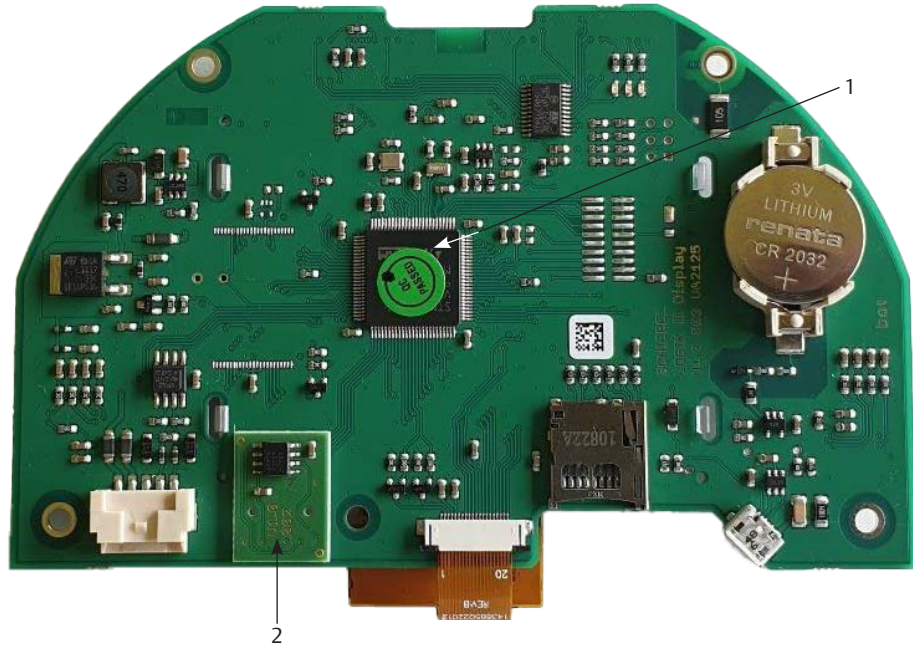**Figure 12.   Version V1 (Original Version)**

Figure 13.   Version V2 (New Version) Delivery Not Before 22.3.2022

1.   Microcontroller with half FLASH (but looks the same as original)
2.   Additional external FRAM Adapter board

4.3 Compatibility

4.3.1 Bootloader (New Version) V21

For supporting both versions of the display board, the new Bootloader V21 is necessary. The display is fully compatible with all logic boards.

There are several new functions with the new Bootloader V21:

Graphical User Interface (GUI)

The Bootloader V21 is the first version with a GUI.

Figure 14.   GUI of Bootloader v21

The new Bootloader V21 detects and displays the firmware and hardware versions of the boards inside the actuator.
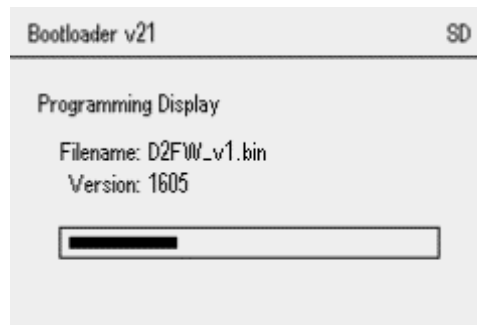
You can see the version of the display board in the field Hardware for the display:

Original: 0 - Display Board Version 1

New version: 1 - Display Board Version 2

During Firmware update, you can also see the transfer progress and the file information.

Figure 15.   Display of Firmware Update Progress Status

Long filename support

With display hardware version 2, it is possible to leave additional information text on the tail end of the filenames on the SD Card.

This is also necessary to distinguish the firmware files for the two different display boards. The new Bootloader V21 searches for the following filenames:

- D2FWxxxx.bin for Display Board Firmware
- L2FWxxxx.bin for Logic Board Firmware
- B2FWxxxx.bin for Bus Board Firmware (for Modbus II boards only)

The characters behind the 4 trailing characters are for user information only and are ignored by the bootloader. It is not necessary to delete the characters after the first 4 characters with this new Bootloader V21.

Old filenames	New filenames (Bootloader V21 required)
D2FW.bin	D2FW_V1_1605.bin
	D2FW_V2_1605.bin
L2FW.bin	L2FW_0236.bin

Figure 16.   Content of the SD Card
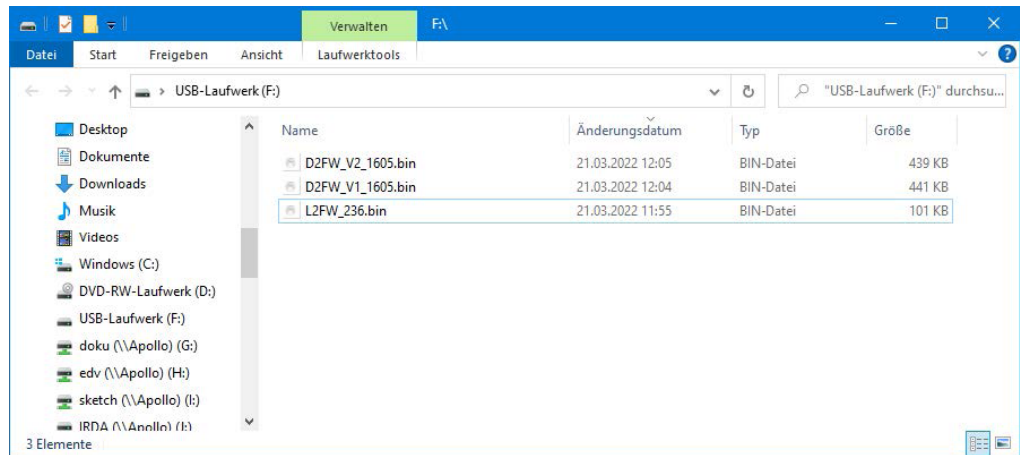
4.3.2   Firmware Update

The new Bootloader V21 automatically searches for the correct firmware file compatible for the hardware. For the two different versions of the display board, two different firmware files exist. For better differentiation of the two firmware files, the filename contains additional information:

Original: D2FW_V1_1605.bin for Display Version V1

New version: D2FW_V2_1605.bin for Display Version V2

You can put both files on the same SD card, the bootloader V21 takes the correct one automatically.

4.3.3   Incompatibility

NOTICE

The new version of the display board is only supported with firmware version >= FW1605.

4.3.4 Exchange Matrix

Table 2. **Display Board Exchange Matrix**

Old Display Board Version	New Display Board Version	New Display Board Bootloader	Filename Style	New Display Firmware	Remarks
V1	V1	<= V20	short	Compatible FW for the logic board	Update to latest FW15xx or FW16xx recommended
		V21	short or long	Compatible FW for the logic board	Update to latest FW15xx or FW16xx recommended
V1	**V2**	only >= V20	short or long	>= FW1605	**Upgrade to FW1605 or higher is mandatory**
V2	V1	<= V20	short	Compatible FW for the logic board	Update to latest FW15xx or FW16xx recommended
		V21	short or long	Compatible FW for the logic board	Update to latest FW15xx or FW16xx recommended
V2	**V2**	only >= V21	short or long	>= FW1605	Update to latest FW16xx recommended

4.4 Troubleshooting Failure Messages During Firmware Update

1. Bad Memory, please contact supplier (red screen)

- Reason of failure: User input wrong type of firmware to upgrade RTS unit.

- Action: Please refer to Section 4.2 and Section 4.3 to identify the correct firmware for the correct Hardware. The V1 firmware could only be used for V1 firmware and V2 firmware is for V2 firmware only.

2. Please input/insert preparation file (red screen)

- Reason of failure: User did not input the preparation file before input logic card firmware and display firmware.

- Action: Please refer to Section 3.1 to restart the firmware upgrade process.

3. Please activate firmware (red screen)

- Reason of failure: User did not insert the 16xx firmware activation key after upgrade.

- Action: Please refer to Section 3.1 to insert key to RTS unit and if user does not have the key, please provide unit key number to Emerson LCS to request firmware activation key.

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