Denial-of-Service Vulnerability in Robot Controller of MELFA FR Series and CR Series as well as ASSISTA

Release date: January 21, 2021
Last update date: May 18, 2021
Mitsubishi Electric Corporation

■Overview

Mitsubishi Electric is aware of a denial-of-service (DoS) vulnerability in a robot controller of MELFA FR Series and CR Series as well as cooperative robot ASSISTA due to a resource management errors (CWE-399). These robot controllers allow an attacker to cause a DoS of the execution of the robot program and the Ethernet communication by sending a large amount of packets in burst over a short period of time. As a result of DoS, an error may occur. (CVE-2021-20586)

The product models and firmware versions affected by this vulnerability are listed below.

■CVSS

CVE-2021-20586 CVSS:3.0/AV:N/AC:L/PR:N/UI:N/S:U/C:N/I:N/A:H Base Score:7.5

■Affected products

For the MELFA FR Series and CR Series as well as ASSISTA robot controllers, the model names and firmware versions in Table 1 are affected. Please refer to the next section for how to check the firmware version.

Table 1. Affected products

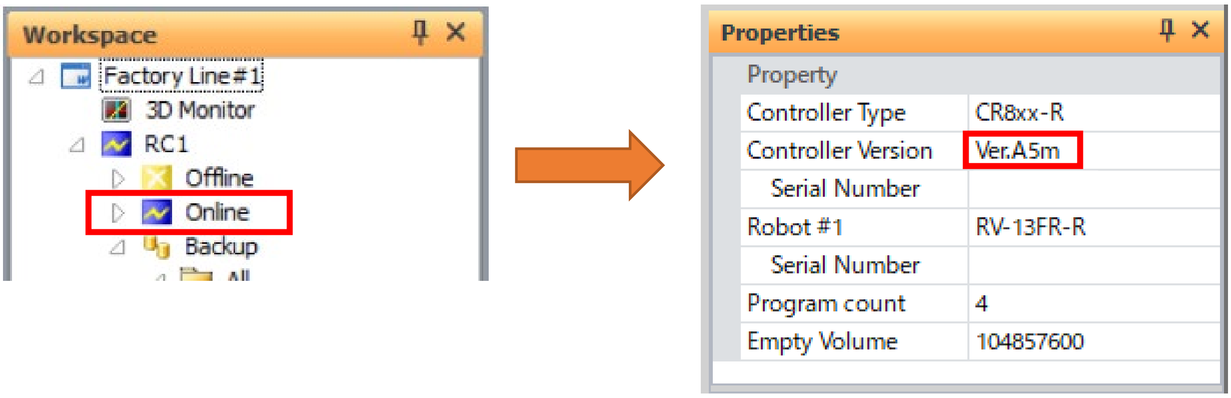
Series	Model name	Controller model name	Firmware Version
MELFA FR Series	RV-#FR$%¥-D-@	CR800-#V$D	All Versions
	RH-#FRH$&¥-D-@	CR800-#HD	
	RH-#FRHR$&¥-D-@	CR800-#HRD	
	RV-#FR$%¥-R-@	R16RTCPU + CR800-#V$R	
	RH-#FRH$&¥-R-@	R16RTCPU + CR800-#HR	
	RH-#FRHR$&¥-R-@	R16RTCPU + CR800-#HRR	
	RV-#FR$%¥-Q-@	Q172DSRCPU + CR800-#V$Q	
	RH-#FRH$&¥-Q-@	Q172DSRCPU + CR800-#HQ	
	RH-#FRHR$&¥-Q-@	Q172DSRCPU + CR800-#HRQ	
MELFA CR Series	RV-8CRL-D-@	CR800-CVD	
	RH-#CRH$&-D-@	CR800-CHD	
MELFA ASSISTA	RV-5AS-D-@	CR800-05VD	

#:Load capacity (Model name:2, 3, 4, 6, 7, 12, 13, 20 Controller model name:02, 03, 04, 06, 07, 12, 13, 20) $:Arm length (Model name RV type:L, LL or blank Model name RH type:35, 40, 45, 55, 60, 70, 85, 100 Controller model name:L or blank) %:Brake specification (B or blank) &:Vertical stroke (12, 15, 18, 20, 34, 35, 45) ¥:Environment specification (M, C, W or blank) @:Special device No. (S** or blank)

■How to check the firmware version

- When using RT ToolBox3

When you select the [Online] section of the target project on the workspace screen (Figure 1(a)), you can check the firmware version on the property screen (Figure 1(b)).



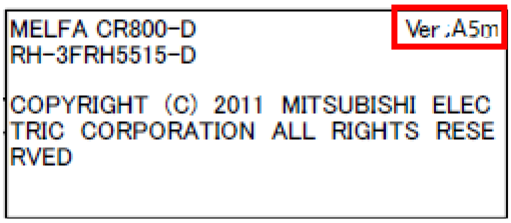
Property	
Controller Type	CR8xx-R
Controller Version	Ver.A5m
Serial Number	
Robot #1	RV-13FR-R
Serial Number	
Program count	4
Empty Volume	104857600

(a) Workspace screen (b) Property screen

Figure 1. How to check the firmware version with RT ToolBox3

– When using R32TB

The firmware version can be checked on the title screen (Figure 2).



MELFA CR800-D
RH-3FRH5515-D

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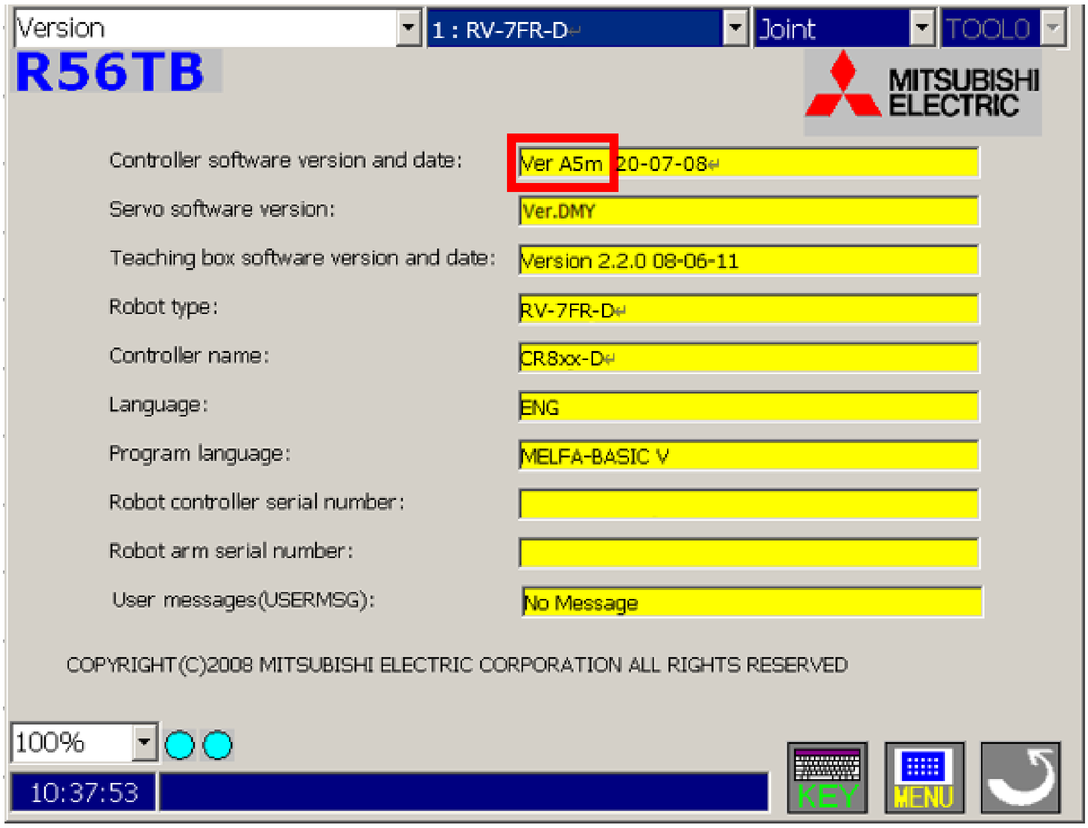
Figure 2. How to check the firmware version with R32TB

– When using the R56TB

The firmware version can be checked on the Version screen (Figure 3).



Controller software version and date: Ver A5m 20-07-08

Servo software version: Ver.DMY

Teaching box software version and date: Version 2.2.0 08-06-11

Robot type: RV-7FR-D

Controller name: CR8xx-D

Language: ENG

Program language: MELFA-BASIC V

Robot controller serial number:

Robot arm serial number:

User messages(USERMSG): No Message

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Figure 3. How to check the firmware version with R56TB

■Description

A Denial of Service (DoS) vulnerability due to a resource management errors (CWE-399) exists in the robot controllers of industrial robots MELFA FR series and CR series as well as ASSISTA.

■Impact

Affected robot controllers allow an attacker to cause a DoS of the execution of the robot program and the Ethernet communication by sending a large amount of packets in burst over a short period of time. As a result of DoS, an error may occur. If the error occurs, the robot controller needs to be turned on again to recover.

■Countermeasures

Please carry out the mitigations below.

■Mitigations

Mitsubishi Electric recommends that customers take the following mitigation measures to minimize the risk of exploiting this vulnerability:

- Use a firewall or virtual private network (VPN), etc. to prevent unauthorized access when Internet access is required.
- Use within a LAN and block access from untrusted networks and hosts through firewalls.
- Use an IP filter function*1 and block access from untrusted networks and hosts.

＊1 The product models and firmware versions support the IP filter function are listed below.

<The product models and firmware versions>

- MELFA FR Series : firmware version "C2" or later
- MELFA CR Series : firmware version "C2" or later
- MELFA ASSISTA : firmware version "C2" or later

<How to get the product supporting the IP filter function>

Please contact your local Mitsubishi Electric representative.

■Acknowledgement

Mitsubishi Electric would like to thank Industrial Control Security Laboratory of Qi An Xin Group Inc. from China who reported this vulnerability.

■Contact information

Please contact your local Mitsubishi Electric representative.

■Update history

May 18, 2021

Modified the description of "Countermeasures".
Added the IP filter function to "Mitigations".