Application note

Legacy address handling for Hilscher devices which cannot use own flash to save the Second Station Address (netX 52)

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1 Introduction

1.1 About this document

This manual only applies for devices which do not have a possibility to save the Station Alias Address on firmware side, actually only netX 52, and the application want to use both address mechanisms. Both means the address configured from bus side, and address set locally on the device by a rotary switch or display.

1.2 List of revisions

Rev	Date	Name	Chapter	Revision
1	09-2021	JK		Document created.

Table 1: List of revisions

1.3 References to documents

This document refers to the following documents:

[1] Hilscher Gesellschaft für Systemautomation mbH: Protocol API, EtherCAT Slave V4, Revision 12, Englisch, 2021.

[2] EtherCAT Protocol Enhancements. ETG.1020

Table 2: References to documents

2 Legacy handling

2.1 Overview

Beginning with protocol stack version 4.9, the following legacy behavior according to ETG1020 is supported concerning simultaneous handling of rotary switch and Station Alias (= Second Station Address):
Only in case both address values are set before the bus is switched on, the rotary switch value is copied to register 0x12 of the ESC and the Station Alias is set to 0. An emergency error is generated when switching to SafeOP. After going back to state *Init*, the slave can be brought to state *Op* again. (See ETG1020, reference [2]).
Legacy behavior in handling of explicit device IDs according to ETG1020 only applies for cases where both device ID values are set - the one originating from bus side and the local one. This means: if the rotary switch value is set on device startup to a value not equal to 0, it obtains priority over the value originating from bus side. However, this only applies if set on startup, before the device communicates on the bus.

For those Hilscher devices, which do not save the Station Alias on firmware side (netX 52), the application hast to do the remanent address handling. And so it is also partly involved in the legacy mechanism and hast to regard the following rules. Next section shows the correct handling to meet the conformance.

2.1.1 Excerpt from ETG1020

NOTE: Configured Station Alias Register 0x0012 should be used for a complex slave with microcontroller only for compatibility reasons, since this register is also loaded during power-on from SII Configured Station Alias. This might lead to a race condition.
If a slave uses Register 0x0012 for ID-Selector values, following functionality shall be used:

- the host controller reads the ID value from the ID switch immediately after start-up (when powered-on). The ID value for the legacy mechanism is only updated after start-up.
- If ID-Selector value == 0 nothing shall be done (value in register 0x0012 is loaded from SII, independent if “0” or different value)
- If ID-Selector value != 0 AND SII value == 0: value from ID-Selector shall be copied to register 0x0012
- If ID-Selector value != 0 and SII value != 0: a race condition failure procedure shall be started:
    - copy ID-Selector value to register 0x0012
    - set internal error flag (ERRint = 1)
    - overwrite SII value with “0” during state change from Init to PreOp (SII access to PDI)
    - depending on further master action:
        a) if state change to SafeOp is requested: reject state change (AI Status = 0x12) and set error “Device Identification value updated” (AI Status Code = 0x0061)
        b) if state Init is requested OR power cycle OR successful SDO write to Reload object: delete internal error, proceed normal

3 Packet handling on application side

3.1 Saving and restoring the Station Alias on firmware side in addition to handle the ID-Selector value

The Station Alias Address hast to be stored with every change and restored after power up of the device. This is necessary because Hilscher devices have a virtual SII/EEPROM instead of a physical piece of hardware. In case of netX 52 the application hast to do this part because it can not be done in firmware.

It is important to regard the correct order. There is no difference to the initialisation sequence descibed in chapter 5.3 in [1]). Only additional step 9 (packet from firmware) is new. If RCX_SET_FW_PARAMETER_REQ is not sent, there is no activation of the legacy handling. (usDeviceIdentifiactionValue in Setconfig is not sufficent.)

There are two ways for transmitting the restored Station Alias Address to the netX:

3.1.1 Set the restored Station Alias value in the configuration packet

1. Restore the Station Alias Address from your remanent source after power on
2. RCX_REGISTER_APP_REQ (optional)
3. ECAT_SET_CONFIG_REQ ApplicationControlled = 1, **usStationAlias = Saved Value which was restored in 1**., usDeviceIdentifiactionValue = don´t care cause activation of handling with packet in 7.
4. RCX_CHANNEL_INIT_REQ
5. ECAT_ESM_REGISTER_FOR_SIIWRITE_INDICATIONS_REQ ulIndicationFlags = ECAT_ESM_FILTER_SIIWRITE_INDICATIONS_STATION_ALIAS (flag is optional)
6. … other packets needed
7. -> read out current address from your rotary switch/display
8. RCX_SET_FW_PARAMETER_REQ ulParameterID = PID_ECS_DEVICE_IDENTIFICATION , abParameter = current value (LowByte, HighByte,0 0)
9. In case both address values are != 0, the stack sends **ECAT_ESM_SII_WRITE_IND** to the application with Station Alias value = 0. -> Save the value for next startup. (nothing else)
10. RCX_START_STOP_COMM_REQ ulParam = 1 (sets BUS_ON flag)

3.1.2 Send the restored Station Alias value via packet

1. Restore the Station Alias Address from your remanent source after power on
2. RCX_REGISTER_APP_REQ (optional)
3. ECAT_SET_CONFIG_REQ ApplicationControlled = 1, usStationAlias = don´t care, usDeviceIdentifiactionValue = don´t care cause activation of handling with packet in 7.
4. RCX_CHANNEL_INIT_REQ
5. ECAT_ESM_REGISTER_FOR_SIIWRITE_INDICATIONS_REQ ulIndicationFlags = ECAT_ESM_FILTER_SIIWRITE_INDICATIONS_STATION_ALIAS (flag is optional)
6. Send two packets:
    a. ECAT_ESM_SII_WRITE_REQ ulOffset = 0x8, abData = **Saved Value which was restored in 1**

   b. ECAT_DPM_SET_STATION_ALIAS_REQ usStationAlias = **Saved Value which was restored in 1**

7. … other packets needed
8. -> read out current address from your rotary switch/display
9. RCX_SET_FW_PARAMETER_REQ ulParameterID = PID_ECS_DEVICE_IDENTIFICATION , abParameter = current value (LowByte, HighBYte,0 0)
10. In case both address values are != 0, the stack sends **ECAT_ESM_SII_WRITE_IND** to the application with Station Alias value = 0. -> Save the value for next startup. (nothing else)
11. RCX_START_STOP_COMM_REQ ulParam = 1 (sets BUS_ON flag)

3.2 Pitfalls and Hints

- If the Packet RCX_SET_FW_PARAMETER_REQ (ulParameterID = PID_ECS_DEVICE_IDENTIFICATION) is not sent before the BUS_ON flag is set, the legacy handling is not activated!
- In old examples it was shown to save a changed Station Alias value in the following way. After the application gets a ECAT_ESM_SII_READ_REQ to report an Station Alias Address change, it should send a ECAT_ESM_SII_READ_REQ to get sure to have consistent data. But this would be wrong in legacy case! After the stack sends the new Alias Address (with value = 0) as a consequence of a detected racecondition, it does not change the SII value. This value is changed later in INIT2PROP.
- If you start implementing, we recommend to set the value in the SetConfiguration packet like in the fist variant.

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