Exalon Delft
tank gauging solutions

UCI-108 User Manual / Installation Guide

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Table of Contents

1 Preface....5
1.1 Document conventions....5
1.2 Preface....5
1.3 Legal aspects....5
1.4 EU Declaration of Conformity....5
1.5 Additional information....5
2 Introduction....6
2.1 What is the UCI-108?....6
2.1.1 Limitations....6
3 Connecting the UCI-108....7
3.1 Power supply....7
3.2 BPM bus....7
3.3 RS232/RS485 serial bus....8
3.4 Interconnect....8
4 Functionality....10
4.1 MODEM mode....10
4.2 PET Mode....11
4.3 SMARTLINK Mode....12
4.3.1 GPU messages....13
4.3.2 Flexconn messages....14
4.4 Modbus Tunnel Mode....14
4.4.1 Modbus features....15
4.4.2 Modbus addressing....15
4.5 Multi UCI-108 node....16
4.6 Fast Responses....17
4.7 Command Line Interpreter....18
4.7.1 Sending messages on the BPM bus....18
4.7.2 Message monitoring on the busses....18
4.8 Remote Management....19
4.9 Measuring BPM signal strength....19
4.10 LED indicators....20
5 Configuring the UCI-108....22
5.1 Front Panel and Switches....22
5.2 TERMINAL mode....23
5.3 Configuring using Items....24
5.3.1 Configuring in TERMINAL mode....24
5.3.2 Configuring via Device Address....25
5.4 Item list....25

5.5 Configuration Item Consistency....33
5.6 Multi UCI-108 node....34
5.6.1 Access of command line interpreter....34
5.6.2 Configuration Items....34
6 Commissioning....36
6.1 Entering RS port to TERMINAL Mode....36
6.2 Basic MODEM mode....36
6.3 Basic PET mode....37
6.4 Basic SMARTLINK Mode....38
6.5 Basic MODBUSTUNNEL Mode....38
6.6 Use case: Monitor BPM fieldbus....41
6.7 Use case: Insert network segment....43
6.8 Use case: Extend BPM network....46
6.9 Use case: Connect host(s) to multiple BPM fieldbuses....49
6.10 Use case: Join two BPM buses into one BPM bus....52
6.11 Use case: Modbus tunnel for PLC application....55
6.12 Use case: Modbus tunnel for gauge integration in CIU888....58
6.13 Notes....61
7 Updating Firmware....62
7.1 On Windows....62
7.2 On Linux or MacOS....63
8 Appendix: Firmware release changelog....64

Index of Tables

Table 1: RS232/RS485 connection....8
Table 2: LEDS....20
Table 3: BPM and RS LEDs....21
Table 4: Front panel....22
Table 5: DIP-switches....22
Table 6: Item list....26
Table 7: Relevant items (in yellow) for use case 'Monitor BPM fieldbus'....41
Table 8: Relevant items (in yellow) for use case 'Insert Network Segment'....44
Table 9: Relevant items (in yellow) for use case 'Extend BPM fieldbus'....47
Table 10: Relevant items (in yellow) for use case 'Connect host(s) to multiple BPM fieldbuses'....50
Table 11: Relevant items (in yellow) for use case 'Join two BPM buses to one'....53
Table 12: Relevant items for use case 'Modbus tunnel for proprietary PLC application'....56
Table 13: Relevant items for use case 'Modbus tunnel for gauge integration in CIU888'....59

Table of Figures

Figure 1: Top connectors....7
Figure 2: Bottom connectors....8
Figure 3: Back plane PCB connector....9

Figure 4: UCI with DIN rail back plane connector.....9
Figure 5: UCI-108 DIN rail bus connector.....9
Figure 6: BPM fieldbus monitor.....11
Figure 7: Connect Host application.....12
Figure 8: Insert Ethernet network segment.....12
Figure 9: Basic usage of SMARTLINK mode.....13
Figure 10: PLC application making use of MODBUSTUNNEL mode.....14
Figure 11: Usage of MODBUSTUNNEL mode for level gauge integration with CIU888 14
Figure 12: Connect (multiple) Host with Multi node.....16
Figure 13: Repeater configuration with Multi node.....17
Figure 14: Measuring BPM fieldbus signal strength.....20
Figure 15: Front plate.....22

1 Preface

1.1 Document conventions

Warnings, **Cautions** and **Notes** are used throughout this installation guide to bring special matters to the immediate attention of the reader.

- A Warning concerns danger to the safety of the technician or user.
- A Caution draws the attention to an action which may damage the equipment.
- A Note points out a statement deserving more emphasis than the general text.

1.2 Preface

This installation guide is intended for technicians involved in the mechanical and electrical installation of the Exalon Delft UCI-108. The technician must have basic technical skills and knowledge of safety regulations.

1.3 Legal aspects

The information in this installation guide is the copyright property of Exalon Delft B.V., Netherlands. Exalon Delft B.V. disclaims any responsibility for personal injury or damage to equipment caused but not limited by:

- Deviation from any of the prescribed procedures.
- Execution of activities that are not prescribed.
- Neglect of the general safety precautions for handling tools, use of electricity and microwave radiation.

The contents, descriptions and specifications are subject to change without notice. Exalon Delft B.V. accepts no responsibility for any errors that may appear in this installation guide.

1.4 EU Declaration of Conformity

This Exalon Delft instrument is in conformity with all applicable EC Council Directives, including the EMC Directive 2014/30/EU. Refer to the EC Declaration of Conformity supplied with each instrument separately.

1.5 Additional information

Please do not hesitate to contact Exalon Delft or its representative if you require additional information.

2 Introduction

2.1 What is the UCI-108?

The UCI-108 is a multipurpose Bi-Phase Mark (BPM) communication interface supporting the Honeywell-Enraf[1] GPU/Flexconn protocol, one of the world's standard fieldbusses in tank gauging.

Primarily the UCI-108 converts serial RS232/RS485 GPU/Flexconn communication messages to the BPM-GPU/Flexconn fieldbus and the other way around.

Due to its scalable design advanced functions can be realized by combining multiple UCI-108s. LED indicators on the front show diagnostic information like communication activity and BPM signal quality.

2.1.1 Limitations

The UCI-108 supports:

- 1 Host Port and 1 Field Port
- 15 Field Devices on the BPM Field Port
- GPU messages up to 192 bytes long
- Flexconn messages up to 192 bytes long
- Modbus RTU messages up to 64 bytes long
- 50 cached GPU responses

1 Honeywell-Enraf, Enraf, Honeywell are registered trademarks and trademarks of these organizations and companies. All other marks are property of their respective owners.

3 Connecting the UCI-108

The UCI-108 is a DIN-rail mountable product compatible with EN-IEC60715, mounting rail 35x7,5 mm. Multiple UCI-108s can be interconnected by DIN rail bus connectors forming a UCI-108 node.

The UCI-108 has three terminal blocks and one connector for connecting:

- Power supply (on top)
- BPM bus (on top)
- RS232/RS485 bus (on bottom)
- Interconnect by DIN rail bus (at the back side)

3.1 Power supply

Each UCI-108 has to be individually powered by means of the power terminals on top marked with 24V and GND, see Figure 1. The power terminal block provides double terminals for easy daisy-chaining power to the next module in a multi UCI-108 node. The power supply must comply with 24 Vdc +/- 5% and minimal 80 mA per module.

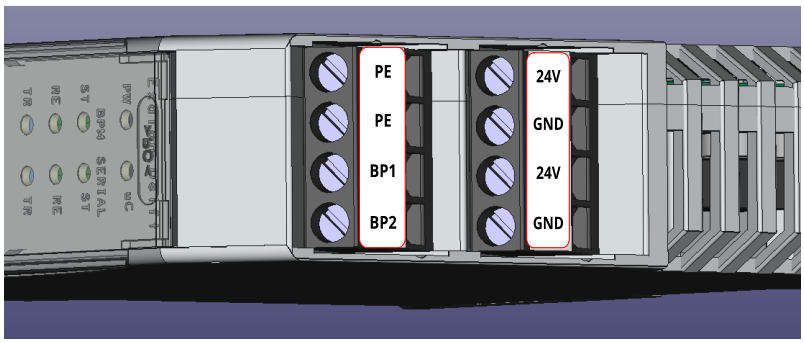


Figure 1: Top connectors

3.2 BPM bus

The BPM bus wires should be connected to BP1 & BP2, see Figure 1. The PE marked terminals are for Protective Earth.

The BPM cable shield has to be connected at one location to the Protective Earth.

3.3 RS232/RS485 serial bus

The RS serial bus should be connected to the terminals with labels A/RX, B/TX and GND terminals. See Figure 2 and Table 1 below.

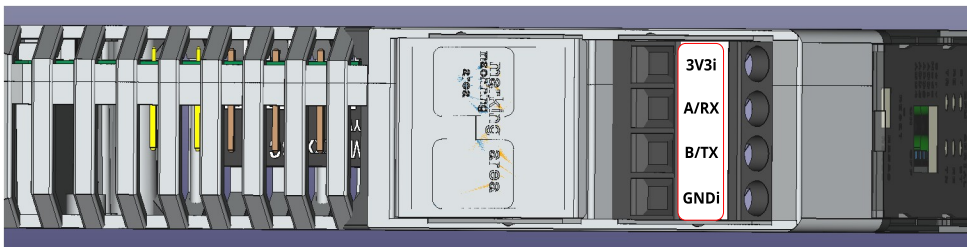


Figure 2: Bottom connectors

Table 1: RS232/RS485 connection

UCI-108 RS232/RS485	RS232 DTE DB9 male	RS485
3V3i		
A/RX	TX (pin 3)	DATA+
B/TX	RX (pin 2)	DATA-
GNDi	GND (pin 5)	GND

Note: RS232 TX is connected to the UCI-108 RX, RS232 RX is connected to UCI-108 TX.

The **3V3i** and **GNDi** is available as an isolated voltage to an optional RS485 external biasing and termination resistor network.

On the RS serial RS the UCI-108 uses the configured baudrate.
The other communication settings like number of data bits, parity and number of stopbits are fixed to 8N1, see also Paragraph 5.2.

3.4 Interconnect

The UCI-108 has a PCB bus connector for optional use in a multi UCI-108 node configuration. The UCI-108 is placed in one of the assembled DIN rail bus connectors mounted on the DIN rail forming the local communication bus.

Note: the optional DIN rail bus connector(s) has to be ordered separately.

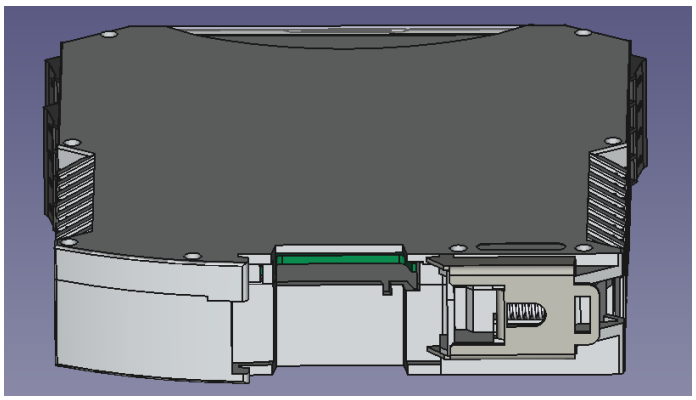


Figure 3: Back plane PCB connector

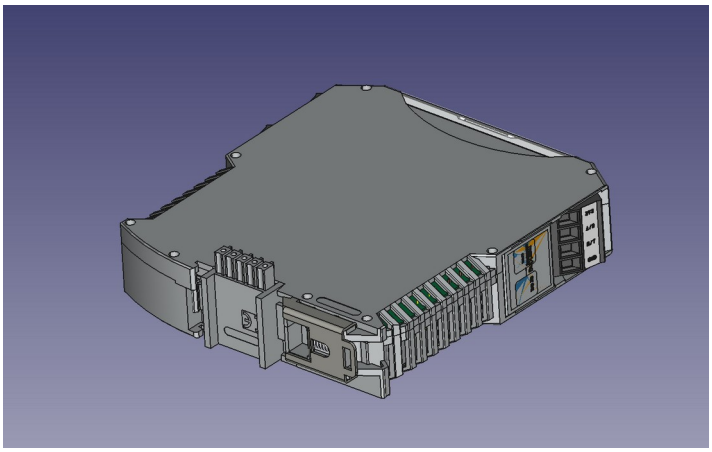


Figure 4: UCI with DIN rail back plane connector

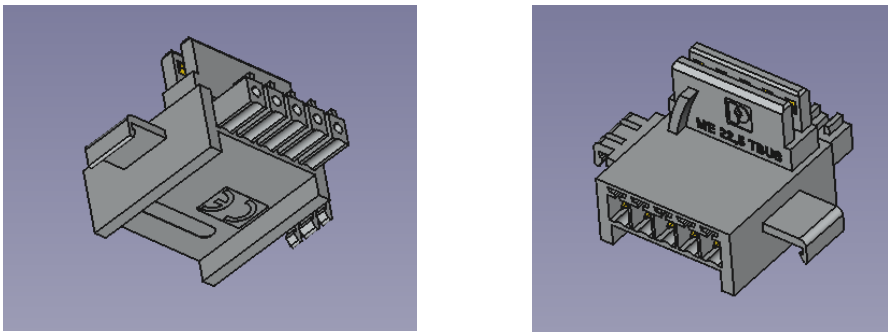


Figure 5: UCI-108 DIN rail bus connector

4 Functionality

The UCI-108 is a versatile and universal communication interface which can be individually configured in three different operating modes covering almost any BPM communication use case. The operating modes are:

- MODEM
- PET
- SMARTLINK
- MODBUSTUNNEL

Each operating mode will be explained in more detail in the following paragraphs.

In addition, multiple UCI-108s can be interconnected to form a single node enabling communicating from multiple host ports to multiple field ports.

The UCI-108 is equipped with an internal command line interpreter for commissioning and BPM communication monitoring purposes. The command line interpreter shares the same RS serial port as used for the operational application. The RS port can be set to TERMINAL or OPERATIONAL mode.

4.1 MODEM mode

In MODEM mode GPU and Flexconn messages received on one bus port are transmitted on the other bus port. None of the ports is active as bus master. A message is passed forward to the other port after being received completely on the one port. Only correct messages are passed on (correct framing, CRC/BCC etc.)[2].

Typical use case for using the MODEM mode is to connect a PC Terminal application to the BPM fieldbus for analyzing the BPM network messages and BPM network signal conditions, see Figure 6.

In MODEM mode the UCI-108 is not visible as Field Device with the 'Sitescan' function in the Honeywell-Enraf Engauge commissioning tool.

Remote management is possible using the UCI-108s ‘GPU Device Address’. On this address the UCI-108 will also respond to an X-record request (‘RX’[3]) and will return “nnRXUCI-108 <tag>” where <nn> is the GPU Device address and <tag> is the current configured UCI-108 tag.

2 ACK characters (used between a Host and a CIU or SmartLink) are not passed on.
3 An ‘@X’ request will not be responded to in order to remain hidden during a site scan.

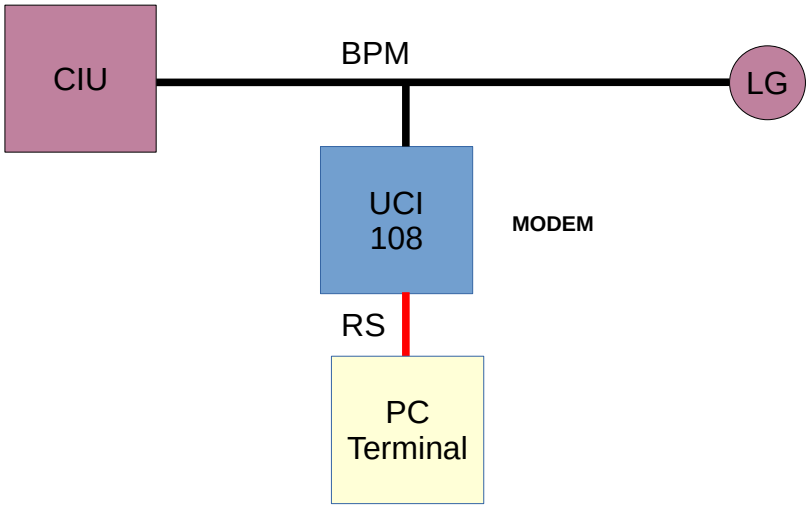


Figure 6: BPM fieldbus monitor

4.2 PET Mode

In PET mode the UCI-108 BPM port has a function as Host or Field port. The RS port will have automatically the opposite function. The UCI-108 only accepts requests on the Host port. The Field port is active as bus master. Messages received on the Field port are considered to be responses. Received responses on the field port without a pending request are ignored.

Typical use cases for PET mode are:

- to connect a Host application (e.g. a Tank Management Application) with RS serial port to one or more BPM fieldbusses.
- to insert a RS, an Ethernet or a Fiber Optic network segment into BPM field network.
- to connect a Field Device (e.g. a proprietary instrument) with a RS serial port to the BPM network.

To support using UCI-108 in parallel PET operation Filters can be set to determine if a message is ignored or passed on, see Figure 7. This will prevent host request and the field responses from other UCI-108(s) connected in parallel which are not in the Filter range to be blocked.

For GPU addresses the filter is specified using a range defined by lower- and upper addresses. Idem for Flexconn addresses. GPU addresses containing a wildcard will always be passed on.

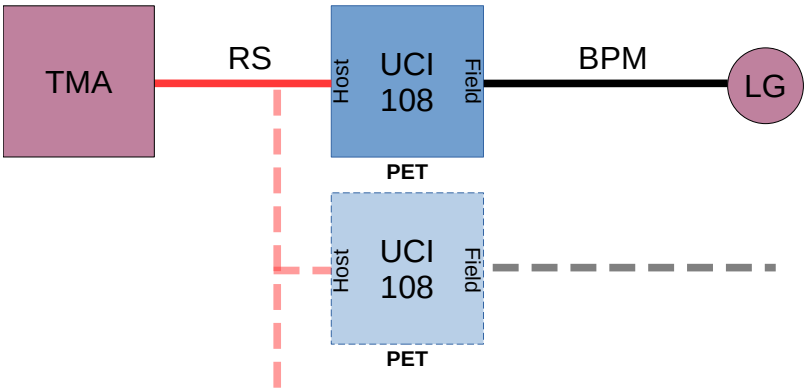


Figure 7: Connect Host application

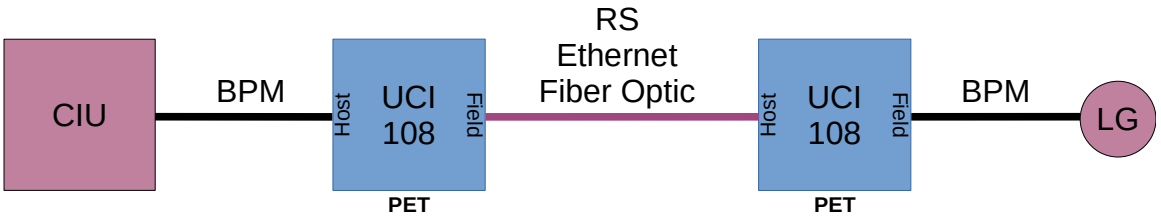


Figure 8: Insert Ethernet network segment

The use of two UCI-108s in series enables the insertion of a network segment using another physical layer and/or protocol in the BPM fieldbus. This can be useful to migrate to e.g. an Ethernet or Fiber Optic communication infrastructure.

Note: to insert an Ethernet or Fiber Optic network segment additional RS to Ethernet or RS to Fiber Optic converters are needed.

The PET mode supports the option to enable the **Fast Responses** feature (see Paragraph 4.6). This optimizes the bandwidth of both BPM segments in the above configuration, see Figure 8.

The rest of the functionality matches that of the MODEM mode.

4.3 SMARTLINK Mode

In SMARTLINK mode the UCI-108 communicates on its RS Host port using the CIU-GPU (CIU858 compatible) or Flexconn protocol.

Typical use cases for the UCI-108 SMARTLINK mode are:

- to connect a Host application (e.g. a Tank Management Application) with RS serial port to one or more BPM fieldbusses.
- to connect as RS 'Downlink' port for the CIU.

This mode supports the following CIU-GPU protocol features:

- Only GPU messages with a matching first address digit (CIU address digit) are handled.
- Optional sending ACK characters while waiting for the Field device to respond.
- Sending GPU Time-out Records to the Host when the Field Device does not respond.
- Identifies itself as a SmartLink with 'Sitescan' function in Honeywell-Enraf Engauge commissioning tool.
- Configurable Flexconn address range to determine which Flexconn messages will be handled.
- Allows to have **Fast Responses** enabled (see Paragraph 4.6) to optimize the bandwidth between Host and UCI-108.

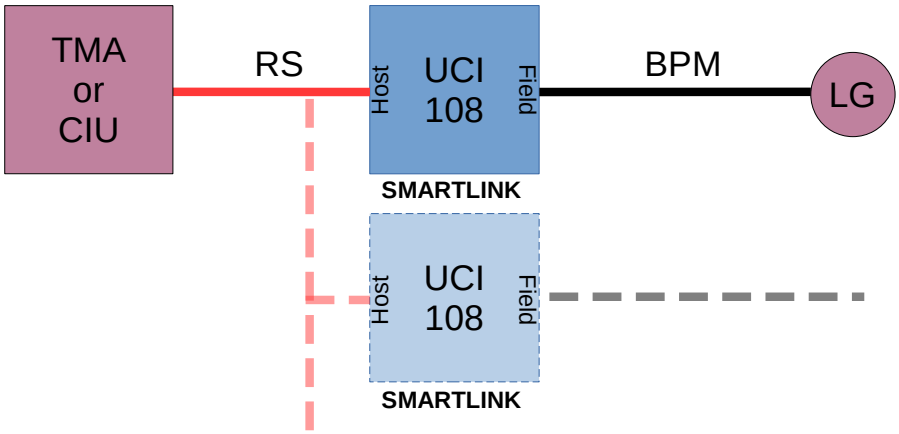


Figure 9: Basic usage of SMARTLINK mode

4.3.1 GPU messages

In SMARTLINK mode the UCI-108 will only handle CIU GPU request messages from a Host directed to its own **CIU GPU address**.
When passing the request message to the other Field port it removes this extra address digit. When passing the response message from a Field Device back to the Host it will add its **CIU GPU address** digit to the message.

4.3.2 Flexconn messages

When passing a Flexconn request message to the Field port it replaces the source address of the message into its own **Flexconn address**. When passing the response message from a Field Device back to the Host it replaces the destination address of the message into the one from the Host.

Note: the UCI-108 will not respond itself to any Flexconn message.

Remote management is possible using the UCI-108s 'CIU GPU Address'.

4.4 Modbus Tunnel Mode

The MODBUSTUNNEL mode allows transparent communication between a Modbus RTU Master and its remote Modbus RTU Slaves over the same BPM fieldbus used by the Tank Management application.

Typical use cases for MODBUSTUNNEL mode are:

- To connect a proprietary PLC host application to one or multiple Modbus Field Device(s) sharing the BPM fieldbus with the Tank Management Application.
- To enable the integration of low cost Modbus, 4..20mA or HART level gauges, pressure and temperature sensors in combination with the CIU888.

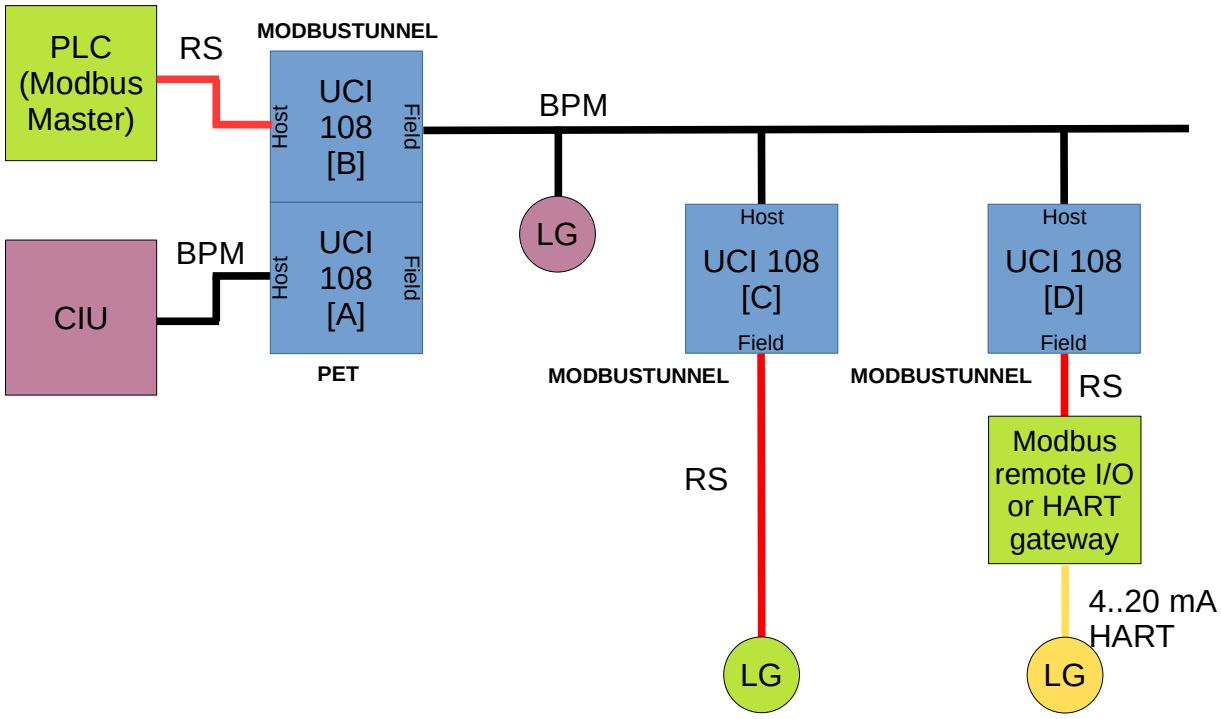


Figure 10: PLC application making use of MODBUSTUNNEL mode

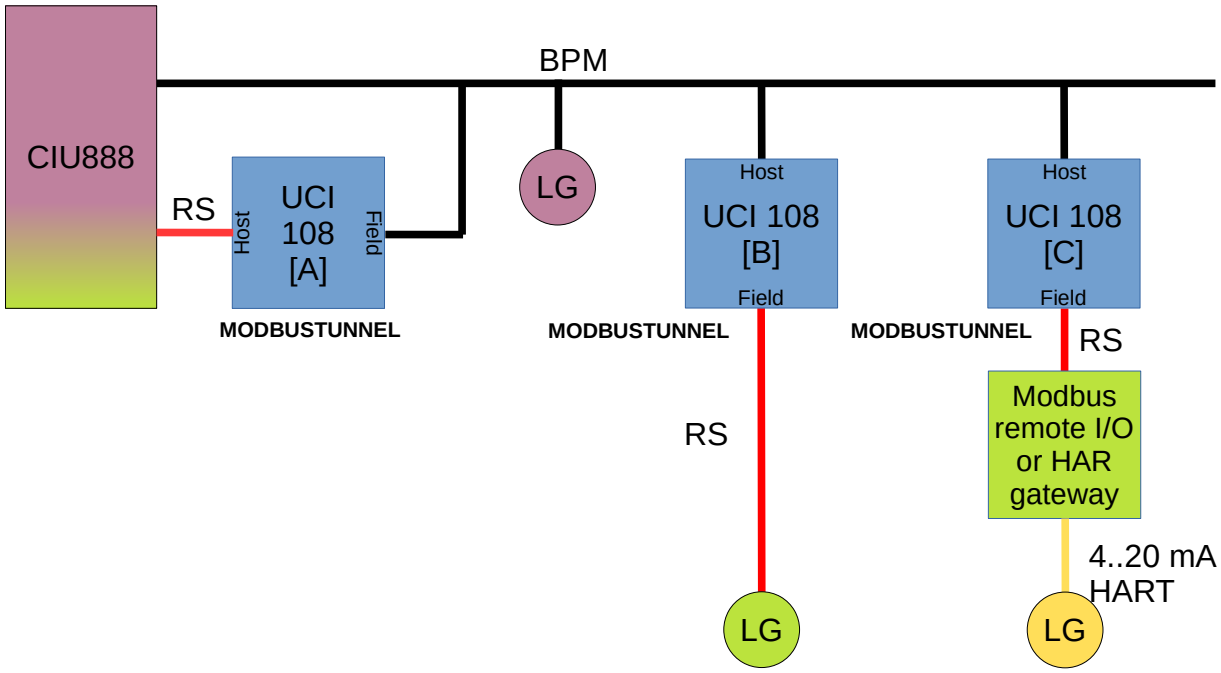


Figure 11: Usage of MODBUSTUNNEL mode for level gauge integration with CIU888

The 'host' UCI-108 is connected by its RS port to a Modbus RTU Master and each 'field' UCI-108 can connect up to two Modbus RTU Devices (slaves). Multiple 'field' UCI-108s can be connected to the same BPM fieldbus.

4.4.1 Modbus features

In MODBUSTUNNEL mode the UCI-108 RS port will work in both RS232 as in RS485 mode. Only RS485 communication can be used in multipoint systems, it is strongly advised to use this one.

The baudrate of the UIC-108 RS port can be set to 9600, 19200, 38400, 57600 and 115200 (see item RB in paragraph 5.4 Item list). The parity is fixed to None , the number of stop bits is fixed to 1. The character format is 8N1.

Only valid Modbus RTU messages are processes. Modbus RTU frames can be no longer then 64 bytes.

4.4.2 Modbus addressing

Modbus messages will be packed into GPU messages and sent over the BPM fieldbus between the 'host' and the 'field' UCI-108s.
The 'host' UCI-108 maps incoming Modbus slave address requests from the Modbus Master to GPU addresses. The Modbus address range is therefore limited to the range of 1..99. All GPU addresses must be unique so a Modbus RTU Slave Device cannot have the same address as any Field Device communicating using GPU.

The 'field' UCI-108 accepts the Modbus request with a Modbus address 1..2 addresses higher than its own UCI-108 GPU Device address[4].

The Modbus address 0 is reserved as Modbus broadcast address. When the Modbus Master sends a broadcast message this is tunnelled using a GPU message with address '**' so all GPU Devices on the fieldbus will receive it. Even though this is supported we advise to not use these broadcast messages in order to not confuse other GPU devices on the network.

4.5 Multi UCI-108 node

Up to four UCI-108s can be interconnected together via the DIN rail bus connector forming a single node enabling communicating from multiple host ports to multiple field ports.

Typical use case for Multi node applications are:

- to connect one Host application (e.g. a Tank Management Application) with RS serial port to one or more BPM fieldbusses.
- to connect multiple Host applications to one or more BPM fieldbusses addressing the same Field Devices.
- to extend a BPM fieldbus by means of a repeater function

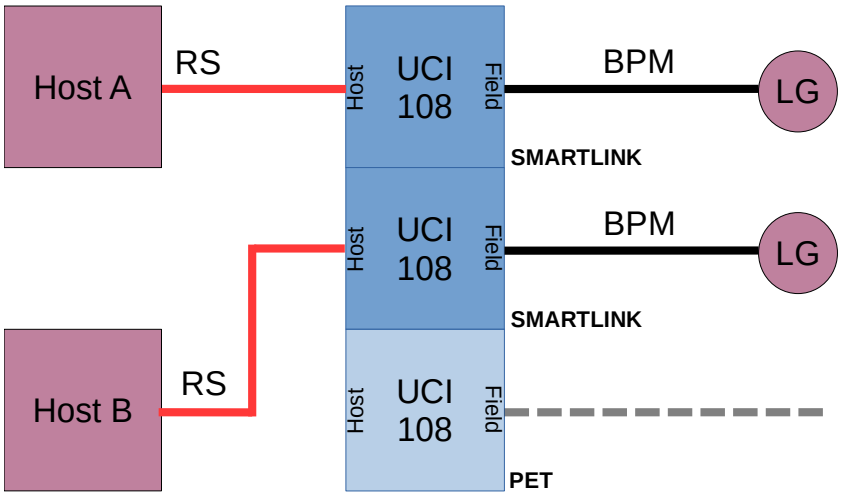


Figure 12: Connect (multiple) Host with Multi node

To enable this feature each UCI-108 must have a unique address set using it's DIP switches. See Table 5 in Chapter 5 Configuring the UCI-108.

4 For example 'field' UCI-108 with address 80 will handle Modbus Tunnel messages addressed to 81..82.

Note: for this mode to work it is mandatory to have a functional First Node with DIP-switch 3 with label AD-1 set to ON .

In Multi-Node arrangement:

- Each individual UCI-108 has its own operational mode and its own GPU Device Address or CIU Address.
- Only nodes in PET and SMARTLINK mode will transfer messages to their configured ports.
- A node in MODEM mode can be used to monitor message traffic.

Tip: reserve a spare DIN rail backplane position for a temporarily UCI-108 used for commissioning and service purposes. Make this UCI-108 node fixed as the Fourth node making it work in every UCI-108 multi node.

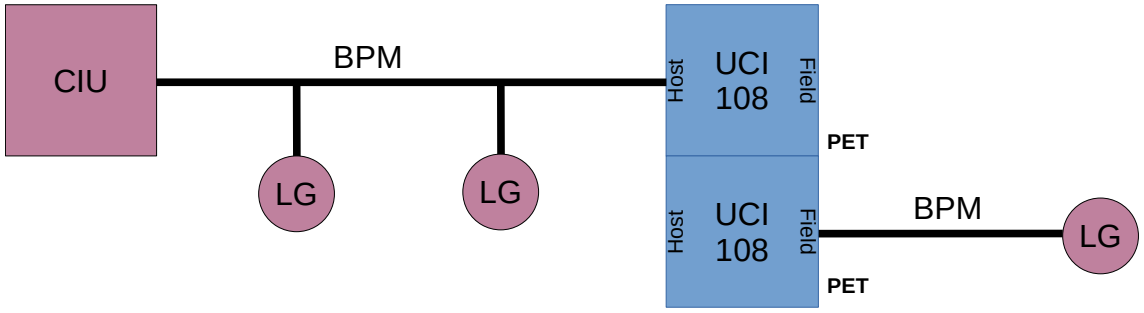


Figure 13: Repeater configuration with Multi node

4.6 Fast Responses

In SMARTLINK mode and PET mode *Fast Responses* can be enabled. This means received requests and responses are cached. The cache works as follows:

- When a request is present in the cache it's associated response will immediately be returned to the Host. The request will be queued for the Field Device to update the associated response.
- New requests not in the cache have a higher priority in the queue than already cached commands/responses.
- Requests and their responses will age. If they are not repeated within a (configurable) time out they will be removed from the cache.
- In case the cache is full the entry with the oldest time stamp will be removed to make space for the new request/response.

The cache will store a maximum of 50 request/responses. GPU requests/responses to the UCI-108 address itself nor Flexconn messages will be cached.

There is no automatic cyclic polling of requests. Requests have to be periodically refreshed by the host to stay updated in cache.

4.7 Command Line Interpreter

The UCI-108 features a command-line interpreter for commissioning and communication monitoring purposes. The command-line interpreter shares its RS232 communication port with the RS Host or Field port. Only one of these functions can be assigned to this RS port at the same time.

4.7.1 Sending messages on the BPM bus

To test Field Devices connected to the BPM fieldbus the command line interpreter allows to send arbitrary GPU commands (see Paragraph 5.2). For example to request the software version by the item 'SV' item from device with address '00':

```
bpmreq 00BZSV
```

The given string will be wrapped in a GPU message-start and -end and the parity bits and BCC will be calculated. Any address digits need to be part of the specified string.

This command also enables monitoring the reply messages so any response will be shown. For example:

```
GPU[B] 00BZSV854NVRAC4.0XPUA4.1SPUD2.1MPUB1.4, rt: 22, qa: 3038/1488
```

Where `GPU[B]` indicates a GPU message has been received on the BPM port, `rt` indicates the response time and `qa` indicates the signal voltages (in mV) of the response.

4.7.2 Message monitoring on the busses

The command line interpreter (see Paragraph 5.2) also supports monitoring (listen mode) for both GPU, Flexconn and Modbus messages on the field port of the network. This will be initiated by the command: `msgmon`.

The logged message will be labeled with `GPU, FLX or MDB` to indicate the protocol of the received message. This label will also add `[B]` or `[R]` to indicate on which port the message has been received ('B' for BPM and 'R' for RS). After the response data follows the timestamp (labeled with `ts`) and the BPM signal quality of the message

(labeled with `qa`). The signal quality are two voltage values (in mV) measured on the UCIs internal BPM receiver hardware, see Paragraph 4.9.

To ease importing the data in a spreadsheet the fields are separated using a TAB character[5].

4.8 Remote Management

Remote management for configuration or status monitoring of a single or multi UCI-108 node is accomplished using proprietary GPU commands to the connected UCI-108 GPU Device Address in MODEM or PET mode. In SMARTLINK mode the remote management is done by the CIU GPU addressing. See Paragraph 5.3 Configuring using Items.

4.9 Measuring BPM signal strength

The BPM signal strength indication can be used to determine the quality of the BPM fieldbus. With this feature BPM communication issues can be isolated. It can be used to determine the location for placing a repeater to extend or improve the BPM fieldbus.

The UCI-108 BPM receiver circuit contains a Programmable Gain Amplifier (configured using item BG). The signal strength of the received replies from each individually connected Field Device is measured before and after this PGA and these two values can be obtained.

See example in Figure 14: Measuring BPM fieldbus signal strength. On location A the weakest received Field Device reply can be determined. On location B the signal strength of the received request from location A can be determined.

The measurements can be obtained by:

- the command `msgmon` in the command line interpreter. Each monitored and displayed BPM fieldbus message is tagged with two measurements values, see Paragraph 4.7.2 for the format.
- the request of item LD to the UCI-108 at both location A and B in the command line interpreter or via remote management, see Paragraph 5.4 Item list.

5 Note that some terminal programs replace a TAB character with spaces. For example TeraTerm does this but using its ‘log to file’ option the TAB characters remain preserved.

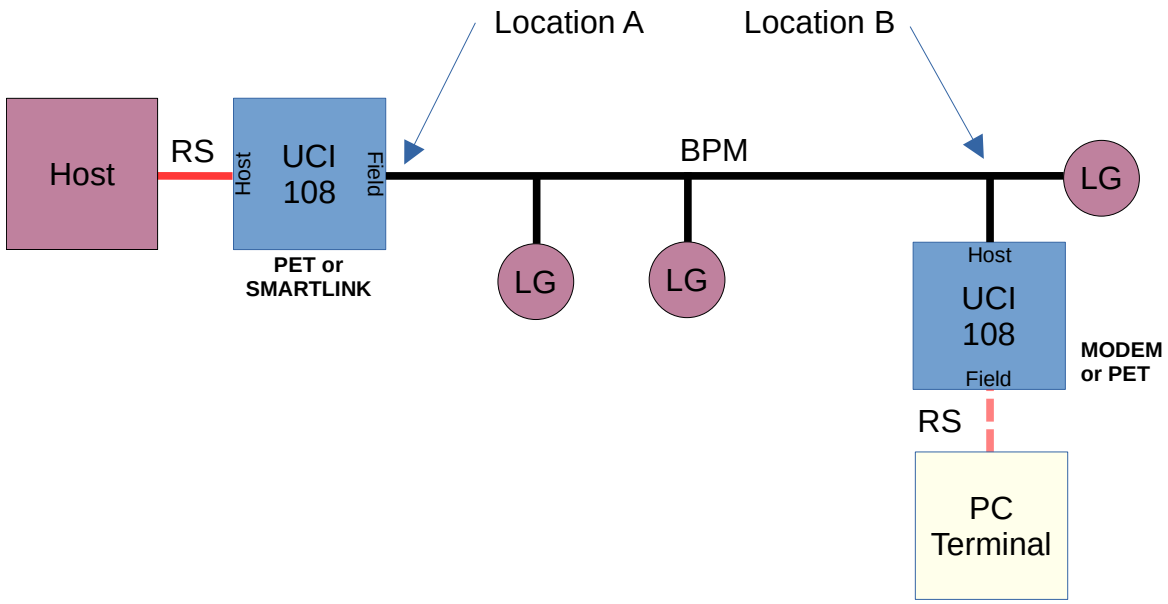


Figure 14: Measuring BPM fieldbus signal strength

The UCI-108 can be used to measure the BPM noise level by connecting the UCI on a certain location, for example at location B. The noise level can be obtained by the item BN. This item is to be requested from a remote Host device. The UCI-108 at location B will hold its response in order to create a quiet BPM line which allows for a correct noise level measurement. The response contains the two signal levels measured during the quiet bus.

Currently noise measurement is supported when the UCI is in MODEM mode when the request arrives on the BPM port or in PET mode when the request arrives on the BPM port configured as HOST.

4.10 LED indicators

The UCI-108 has 8 LEDs on its front.

Table 2: LEDS

Name	Description
PW	When the device is powered this LED will be on.
EXE	When the firmware is running this LED will blink.
BPM	These LEDS will flash when traffic is active on the BPM bus.
RS	These LEDS will flash when traffic is active on the serial bus.

EXE LED

During normal operation the EXE LED will blink with a rate of: 1S on / 1S off.

- When the UCI-108 is running in the bootloader the rate will be:
- When the bootloader detected an application in memory the LED will blink one short pulse.
- When the bootloader did **not** detect an application in memory the LED will blink two short pulses.

Table 3: BPM and RS LEDs

Name	Description
ERR	Will flash whenever an error occurs with the reception of a message on the bus.
RX	Host port: on unless receiving Field port: off unless receiving
TX	Host port: off unless sending Field port: on unless sending

When the RS port is set to RS232 and TERMINAL Mode the RS LEDs will flash when terminal input is received or transmitted.

5 Configuring the UCI-108

Configuring the UCI-108 is done using the switches on the outside of the enclosure and by item commands entered via a PC terminal program connected to the RS232 port.

5.1 Front Panel and Switches

Table 4: Front panel

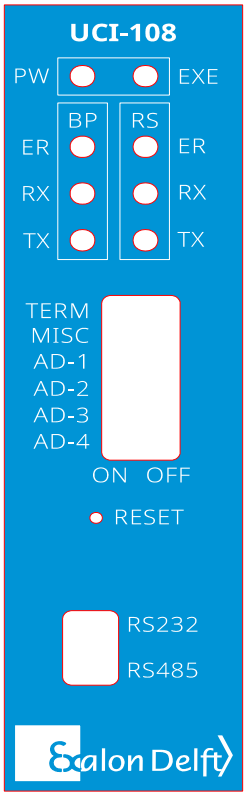


Figure 15: Front plate

For the significance of the LEDs see Table 2: LEDS.

For the DIP-switch positions see Table 5: DIP-switches.

The Reset button will make the device restart.

The RS switch needs to be set in the position corresponding the type connection in use: RS232 or RS485.

The hardware switches allow to configure:

Table 5: DIP-switches

Name	Label	Description
RS switch	RS232 RS485	Set the RS front port in ‘RS232’ or ‘RS485’ mode.
DIP switch 1	TERM	Set the UCI-108 in ‘TERMINAL’ mode (ON) or

		‘OPERATIONAL’ mode (OFF).
DIP switch 2	MISC	Reserved
DIP switch 3..6	 AD-1 AD-2 AD-3 AD-4	UCI-108 node address. When connecting multiple UCI-108s using the DIN rail bus connector use this switch to configure their individual node addresses. Switch 3 ON: First Node Switch 4 ON: Second Node Switch 5 ON: Third Node Switch 6 ON: Fourth Node

Note: detection of the DIP-switch positions and activation of related function is performed only after a power cycle or reset. of the UCI.

5.2 TERMINAL mode

The UCI-108 features a command-line interpreter for commissioning and communication monitoring purposes. The command-line interpreter shares its communication port with the RS Host or RS Field port.

In order to use the command-line interpreter the RS port has to be set to RS232 and assigned for TERMINAL mode. Remove the power, connect a PC terminal emulator to the RS port, set the RS switch into it’ s RS232 position, set the 'TERM' DIP-switch into the ‘ON’ position and set power on.

The communication parameters for the terminal emulator are: 115200 baud, 8 data bits, 1 stop bit, no parity, no flow control.

The UCI-108 built-in command-line interpreter sends text lines ending with a ‘newline character’.[6]

The command-line interpreter supports the following commands:

```
help    : print list of all available commands or items
item    : get/set configuration using Items
msgmon  : monitor messages (GPU & Flexconn)
bpmreq  : send GPU command on the BPM bus
stats   : show/reset statistics
config  : show/reset the current configuration
reset   : reset the UCI
```

6 When using the ‘Tera Term’ application set the terminal configuration New-line options to: ‘Receive: LF’ and ‘Transmit: CR’ and uncheck ‘Local Echo’.

```
cu      : change UCI (if multi node is enabled)
```

- The ‘help’ command prints above list.
- The ‘item’ command allows to read or write an Item value. See 5.3 Configuring using Items.
- The ‘msgmon’ command enables received messages to be printed on the terminal. Pressing a key will make this stop. 'Msgmon' shows Flexconn and Modbus messages using a hex dump of the complete messages.
- The ‘bpmreq’ allows to send GPU commands on the BPM port. See 4.7.1 Sending messages on the BPM bus.
- The ‘stats’ command allows to read the current communication and/or system statistics (`stats commshow/sysshow`) and reset them (`stats commreset`).
- The ‘config’ command allows to read the current configuration stored in non-volatile memory (`config show`) and reset it (`config reset`). The reset will set the configuration back to the factory defaults.

Some commands support the `help` parameter. For example `item help` prints a list of supported items.

To exit TERMINAL mode turn of the power, set the 'TERM' DIP-switch in the OFF position and if needed reconnect the front RS port.

5.3 Configuring using Items

The UCI-108 can be configured by using Items, see Table 6: Item list for the overview of available items. This configuration can be accomplished in TERMINAL mode via the command 'item' or remotely via the Host port using the UCI-108 GPU Device address or CIU Device address with GPU messages requesting read/write **Items.**

5.3.1 Configuring in TERMINAL mode

Items are read by the command `item <Item>` where `<Item>` is one of the items from the Item list.

For example command `item UM` will respond with e.g., `UMMODEM`

Items can be written by the command `item <Item>=<Value>` where `<Item>` is one of the items from the Item list and `<Value>` one of the permitted possible values.

For example command `item UM=PET` sets the UCI-108 to PET mode and will respond with `UM=PET&`. The `&` is added to indicate a successful write.

5.3.2 Configuring via Device Address

The GPU read command messages consists of the elements:

- The two digit UCI-108s GPU Device address (default 99) in MODEM and PET mode or the CIU address digit (default 0) when in SMARTLINK mode,
- RZ, for the TOI/TOR for Items,
- The two letter Item indication. See Table 6: Item list.

For example `99RZSV` results in a reply of `99RZSVUCI-108 0.2`
A write command message consist of the same three elements as the read command plus the string '=<value>' with <value> the new value to set.

The UCI-108 returns with the write command appended with:

- a '&' to indicate a successful write
- a '!' in case of an invalid Item or value for the requested value. Any error message will be appended (in text) after the '!'.

For example `99RZBG=3` results in the reply `99RZBG=3&`

To prevent unwanted actions the command items need confirmation data in the form of 'YES'. For example:

```
99RZXR=YES
```

The item request messages can be generated by the Engauge GPU command line tool (Direct Communication).

Note: some Items need a restart of the UCI-108 before they become active. Therefore it is best to perform a reset or a power cycle when configuration is completed.

5.4 Item list

Items are grouped to configure Common, BPM, RS, SmartLink, Field Device Location, Filter and Cache settings. For diagnostic purposes a group of Read Only items are available. Command Items can be given force the UCI-108 to a certain state.

Table 6: Item list

Name		**Description**
Common		
UM	Item name: Description: Possible values:	UCI-108 Mode Read or set the UCI-108 operating mode MODEM, PET, SMARTLINK, MODBUSTUNNEL (default MODEM) *Note: changing the Mode during operation will effect handling messages. It is advised to perform a reset (item US or hardware reset) after changing this item.*
UA	Item name: Description: Possible values:	UCI-108 GPU Device Address. Read or set the UCI-108 Field Device address for remote use while in MODEM or PET operating mode 0..99 (default 99)
UT	Item name: Description: Possible values:	UCI-108 Tag Read or set the UCI-108 identification label of **exactly** eight (8) ASCII characters with no spaces. In case of more than 8 characters only the first 8 characters are used, less than 8 characters results in error message. ASCII character: '!' .. '~' (default 'UCI_0001')
BPM		
BP	Item name: Description: Possible values:	BPM Port Type Read or set the BPM port type of the UCI-108 as Host or Field port HOST, FIELD (default FIELD) *Note: for configuration consistency the RS port type changes to the opposite value.* *Note: changing the port type during operation will effect handling messages. It is advised to perform a reset (item US or hardware reset) after changing this item.* *Note: in MODBUSTUNNEL mode the port type is configured by the Item TT.*
BB	Item name: Description: Possible values:	BPM Baudrate Read or set the baudrate of the BPM port 1200, 2400 or 4800 (default 1200)
BG	Item name: Description:	BPM Gain Read or set the sensitivity of the BPM receiver

	Possible values:	1..8 (default 8, maximum)
BD	Item name: Description: Possible values:	BPM Turnaround delay Read or set the minimum time the UCI-108 waits before sending a reply after it has received a request on a BPM Host port 0..100 ms (default 5 ms) *Note: this Item is only applicable when the BPM port type is configured as HOST.*
BT	Item name: Description: Possible values:	BPM port Time-out[7] Read or set the time-out value of a BPM Field port on Field Device responses when in PET or SmartLink mode. 10..2000 ms (default 250 ms) *Note: this Item is only applicable when the BPM port type is configured as FIELD.*
RS		
RP	Item name: Description: Possible values:	RS port Type. Read or set the RS port type of the UCI-108 as Host or Field port Possible values: HOST or FIELD (default HOST) *Note: for configuration consistency the BPM port type changes to the opposite value* *Note: changing the port type during operation will effect handling messages. It is advised to perform a reset after changing this item.* *Note: in MODBUSTUNNEL mode the port type is configured by the Item TT.*
RB	Item name: Description: Possible values:	RS port Baudrate Read or set the baudrate of the RS port 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 (default 38400) ***Note: the new value will become in use only after a the UCI-108 has been reset***
RD	Item name: Description:	RS port Turnaround delay Read or set the minimum time the UCI-108 waits before sending a reply after it has received a message on its RS Host port.

7 The time-out value is the maximum allowed time between the end of the request and the start of the response message (its first completely received byte

	Possible values:	0..100 ms (default 1 ms) *Note: this Item is only applicable when the RS port type is configured as HOST.*
RT	Item name: Description: Possible values:	RS port Time-out[7] Read or set the time-out value of a RS Field port on Field Device responses when in PET or SmartLink mode. Possible values: 10..2000 ms (default 600 ms) *Note: this Item is only applicable when the BPM port type is configured as FIELD.*
SmartLink *Note: these Items are only applicable when the operational Mode is configured as SMARTLINK*		
SA	Item name: Description: Possible values:	SmartLink ACK state Read or set the enabling of the ACK handshake to the Host on a RS Host port. When enabled the UCI-108 will, in SMARTLINK mode, send ACK characters to the Host while processing a request. ENABLED, DISABLED (default ENABLED)
SG	Item name: Description: Possible values:	UCI-108 SmartLink CIU Address Read or set the address digit of the UCI-108 in SMARTLINK mode for GPU messages. 0..9 (default 0)
SF	Item name: Description: Possible values:	SmartLink Flexconn Address Read or set the Flexconn address of the UCI-108 when in SMARTLINK mode. 1900..1999 (default 1900) *Note: the Flexconn address is used to comply with the Flexconn protocol. The UCI-108 remote configuration is performed by GPU commands*
S3	Item name: Description: Possible values:	Lower SmartLink Flexconn filter address Read or set the lowest address of the Flexconn filter range. The UCI-108 passes all Flexconn messages within this range when in SMARTLINK mode. 0..1899 (default 0)
S4	Item name: Description:	Upper SmartLink Flexconn filter address Read or set the upper address of the Flexconn filter range. The UCI-108 passes all Flexconn messages within this range when in SMARTLINK mode.

	Possible values:	0..1899 (default 1899)
Modbus tunnel *Note: these Items are only applicable when the operational Mode is configured as MODBUSTUNNEL*		
TT	Item name: Description: Possible values:	Modbus Tunnel Port Type. Read or set the RS port type to use in MODBUSTUNNEL mode. The HOST UCI-108 communicates with a Modbus RTU Master. The FIELD UCI-108 communicates with Modbus RTU Slave Devices. HOST, FIELD (default HOST)
TA	Item name: Description: Possible values:	Modbus Tunnel Number of Addresses. Read or set the number of Modbus RTU Slaves Addresses reserved for a FIELD UCI-108. The FIELD UCI-108 can handle up to 2 Modbus RTU Slave Devices by comparing the destination address of the Modbus Tunnel request. 1..2 (default 1)
Field Device Location		
LT	Item name: Description: Possible values:	Field Device Location Expiration time-out Time after last successful communication the information considering on which Field port the Field Device is found is deleted. 10..1000 seconds (default 300)
LN	Item name: Description: Possible values:	Field Device Location Expiration No-Response count Number of consecutive failed communications the information considering on which field port the Field Device is found is deleted. 1..9 (default 3)
Filter *Note: these Items are only applicable when the operational Mode is configured as MODEM or PET.*		
FE	Item name: Description: Possible values:	Filter Enabled state Read or set the GPU/Flexconn address filter state. When enabled only messages with an address that matches within the filter range will be processed. Filtering is only active in MODEM and PET mode. ENABLED, DISABLED (default DISABLED)
F1	Item name:	Lower GPU filter address.

	Description: Possible values:	Read or set the lower address of the GPU filter range. The UCI-108 passes all GPU messages within this range. 0..99 (default 0)
F2	Item name: Description: Possible values:	Upper GPU filter address. Read or set the upper address of the GPU filter range. The UCI-108 passes all GPU messages within this range. 0..99 (default 99)
F3	Item name: Description: Possible values:	Lower Flexconn filter address Read or set the lowest address of the Flexconn filter range. The UCI-108 passes all Flexconn messages within this range. 0..1899 (default 0)
F4	Item name: Description: Possible values:	Upper Flexconn filter address Read or set the upper address of the Flexconn filter range. The UCI-108 passes all Flexconn messages within this range. 0..1899 (default 1899)
Cache *Note: these Items are only applicable when the operational Mode is configured as PET, SMARTLINK or MODBUSTUNNEL*		
AE	Item name: Description: Possible values:	Cache Enabled Read or set the Caching Mode state. ENABLED, DISABLED (default DISABLED)
AT	Item name: Description: Possible values:	Cache Time-out Read or set the number of seconds a response will be cached. 5..60 (default 10)
Readonly Items		
UI	Item name: Description: Returned values:	UCI-108 Identification information Returns the identification information and firmware version A string formatted as: `UCI-108 x.y <mode> <gpu address> <tag>` x.y indicating the firmware version number
UD	Item name: Description:	DIP switch position This item returns 6 digits indicating the positions of the 6

	Returned values:	DIP switches. A ‘1’ indicates the ON position, a ‘0’ indicates the OFF position. A string formatted as for example: `001000`
UE	Item name: Description: Return values:	Environmental conditions. Returns the power supply voltage (V) and internal temperature (degrees Celcius). A string formatted as: `U=<current voltage>:<min. voltage>:<max voltage>;T=<current temperature>:<min. temperature>:<max. temperature>;`
UH	Item name: Description: Returned values:	Memory Allocation Information Returns the number of free items in the various memory pools. A string formatted as: `xx:xx:xx:xx:xx`
UJ	Item name: Description: Returned values:	System Statistics Historical Data. A string formatted as: `RH=<run hours>;RS=<number of resets>;WS=<number of watchdog resets>;U=<min. voltage>:<max. voltage>;T=<min. temperature>:<max. temperature>;`
UP	Item name: Description: Returned values:	UCI-108 Processor information Returns the processor serial number 96-bit unique ID (hexadecimal)
UR	Item name: Description: Returned values:	Runtime information Returns the uptime A string formatted as `RT=<days>:<hours>:<minutes>:<seconds>`
SV	Item name: Description: Returned values:	Software Version Returns the same result as with item ‘UI’. See item 'UI' *Note: used to same abbreviation to be compliant with this common known GPU item.*
EG	Item name: Description: Returned values:	Get Configuration Information Returns meta information about the stored configuration. It consists of the Configuration Id, Version

		Id and the Configuration Changed Counter. <key>:<version>:<ccc>
LD	Item name: Description: Returned values:	Field Device Location Data UCI and Port where the Field Device is located and QA data. The request needs the address of the Field Device as a parameter. GPU: RZLD02 (must be 2 characters) Flexconn: RZLD0164 (must be 4 characters) <address:uci:port:adcOut1:adcOut2> (adc values in mV)
LW	Item name: Description: Returned values:	Field Device Location of device with weakest signal. Read Field Device Location of device with weakest signal. <address:uci:port:adcOut1:adcOut2> (adc values in mV)
XG	Item name: Description: Returned values:	Get Communication Statistics. Return message counts, error counts and elapsed time. ET=dd:hh:mm:ss;GPUB=msg:err;GPUR=msg:err;FLXB=msg:err;FLXR=msg:err;MODR=msg:err; GPU[B|R]: GPU messages on BPM or RS port FLX[B|R]: Flexconn messages on BPM or RS port msg: message count err: error count
AG	Item name: Description: Returned values:	Cache Statistics. Read cache statistics. They are collected using a period determined by the current Cache Timeout setting. <min present:max present:added:updated:removed:aged:requests:hits>
Command Items		
US	Item name: Description: Returned values: Example:	Reset System The UCI-108 will restart immediately. No response will be given on this command. Requires the confirmation parameter. - RZUS=YES
ER	Item name:	Configuration Reset

	Description: Returned values: Example:	The UCI-108 will clear the current configuration and will set all configuration the factory defaults. The UCI-108 will reset after processing command. Requires a restart. Requires the confirmation parameter. - `RZER=YES`
XR	Item name: Description: Returned values: Example:	Reset Communication statistics All communication statistics including it's elapse time will be reset. Requires the confirmation parameter. - `RZXR=YES`
BN	Item name: Description: Returned values:	Measure BPM Noise level Start a BPM Noise level measurement and respond the results. See chapter 4.9 for more. `<adcOut1_noise:adcOut2_noise:adcOut1_Request:adcOut2_Request>` in mV

Note: the UCI-108 can be managed this way on it's GPU Device Address in MODEM and PET operational mode. In SMARTLINK mode this can be done using it's CIU GPU address and thus only on the Host port (the RS one).

5.5 Configuration Item Consistency

Item values can only configured by Remote management via the Host port:

- In PET mode either the RS or BPM port can be the Host port but the other one will then automatically become the Field Port.
- In SMARTLINK mode the RS port is always the Host port and the BPM port is always the Field port.

Some Item values are not applicable in certain combinations. This depends on the UCI-108 operational mode and Host port and Field port configuration, see also the notes in Table 6 Item list.

5.6 Multi UCI-108 node

5.6.1 Access of command line interpreter

In a multi UCI-108 node configuration the command line interpreter of each node is accessible from the other nodes via the communication bus formed by the DIN rail bus connector. This allows to add a (temporary) node with RS port in TERMINAL mode while having the RS ports of the other nodes in operational mode.
To go to the command line interpreter of another node give the command `cu n` where n is the UCI-108 node address set by the DIP-switch to go to. To go back to the Terminal of the node in TERMINAL mode press `Ctrl-D [Enter]`.

Tip: reserve a spare DIN rail backplane position for a temporarily UCI-108 used for commissioning and service purposes. Make this UCI-108 node fixed as the Fourth node making it work in every UCI-108 multi node.

5.6.2 Configuration Items

The remote configuration of each individual UCI-108 in a multi UCI-108 node configuration using the read/write Items is performed via one of its Host ports.

The UCI-108 with the Host port is configured by using Items addressed by its own (CIU-) GPU Device address. For the other nodes the Item requests can be 'redirected'. This is done by addressing the nodes using `'>n'` where n is the final node to address.

For example: there are 4 UCI-108s (node addresses 1..4) and the Host port used for remote configuration is connected to the 2nd node.
To set the tag of the 2nd one (with e.g. GPU Device Address 98) the message to send is:

```
98RZUT=UCI_0002
```

To set the tag on the first node the message to send is:

```
98RZ>1UT=UCI_0001
```

On success the response will be:

```
98RZ<1UT=UCI_0001&
```

For the last node it would be

```
98RZ>4UT=UCI_0004
```

and on success the response will be:

```
98RZ<4UT=UCI_0004&
```

6 Commissioning

Commissioning of the UIC-108 is done locally via a PC terminal program connected to the RS232 port or after configuring the basic mode remotely by Engauge. This chapter describes examples in a step by step approach for the most commonly used UCI-108 fieldbus setups.

6.1 Entering RS port to TERMINAL Mode

To enter the RS port in TERMINAL Mode:

- Power off the UCI-108.
- Connect a PC terminal emulator via a RS232 cable to the RS serial port (**GNDiso/RX/TX**) and set the RS switch in RS232 position. See 3.3 RS232/RS485 serial bus.
- Enable the UCI-108 in Terminal mode by setting DIP switch **TERM** in the **ON** position, see 5.1 Front Panel and Switches.
- Start a terminal program connected to the appropriate serial port. Communication parameters 115200 baud, 8 data bits, 1 stop bit, no parity, no flow control.
- Power on the UCI-108 and wait for the prompt in the terminal emulator.

To leave TERMINAL Mode:

- Power off the UCI-108.
- Set the **TERM** DIP-switch in the **OFF** position and set the RS switch into the RS232 or RS485 position so it matches the RS serial port of the Host of Field.
- Disconnect the PC terminal emulator cable and connect the RS serial and BPM cables.
- Power on the UCI-108.

6.2 Basic MODEM mode

Message on the one port are passed to the other port. There is no difference in Host nor Field port.

Example instructions for basic configuration:

- Enter the TERMINAL mode (see section 6.1)
- If applicable, set the UCI-108 to factory default configuration values. The UCI-108 will reset after this command.
  `item UR=YES`
- Set the UCI-108 in MODEM mode
  `item UM=MODEM`
- Set the UCI-108 GPU Device Address. For example to 70:

```
item UA=70
```

- Configure the baudrate of the RS port for the application. For example:
  ```
  item RB=38400
  ```
- Configure the baudrate of the BPM port. For example:
  ```
  item BB=2400
  ```
- If wished for enable and configure Filtering. For example to only pass on messages with GPU addresses [0..5]:
  ```
  item F1=0
  item F2=5
  item FE=ENABLED
  ```
- Leave TERMINAL mode (see section 6.1)
- The other configuration settings can now be set or done later remotely by the GPU item commands.

6.3 Basic PET mode

Requests are forwarded from the Host port to the Field port bus. Responses received on the Field port are returned on the Host port. The Field port is active as master for the fieldbus. The Field port Time-out is used to wait for a response of a Field Device.

Instructions for basic configuration:

- Enter TERMINAL mode (see section 6.1)
- If applicable, set the UCI-108 to factory default configuration values. The UCI-108 will reset after this command.
  ```
  item UR=YES
  ```
- Set the UCI-108 in PET mode
  ```
  item UM=PET
  ```
- Set the UCI-108 GPU Device Address. For example to 71:
  ```
  item UA=71
  ```
- Configure the baudrate of the RS port for the application. For example:
  ```
  item RB=38400
  ```
- Configure the baudrate of the BPM port. For example:
  ```
  item BB=2400
  ```
- Choose port types. For example BPM port is the field port, the RS port will get the opposite value:
  ```
  item BP=FIELD
  ```
- Choose time-out on the Field port. For example:
  ```
  item BT=250
  ```
- If wished for enable and configure Filtering. For example to only pass on messages with GPU addresses [0..5]:
  ```
  item F1=0
  item F2=5
  item FE=ENABLED
  ```

- Leave TERMINAL mode (see section 6.1)
- The other configuration settings can now be set or done later remotely by the GPU item commands.

6.4 Basic SMARTLINK Mode

This configuration allows to connect a Host with a RS serial port to one or multiple Field Devices. Only requests from the Host addressed to the UCI will be handled. In SMARTLINK mode the UCI-108 needs to have a CIU GPU address and a Flexconn address so it can be addressed by the Host. The Field port Time-out is used to wait for a response of a Field Device. The Flexconn lower and upper filter addresses are used to determine which Flexconn messages will be forwarded by the UCI.

Instructions for basic configuration:

- Enter TERMINAL mode (see section 6.1)
- If applicable, set the UCI-108 to factory default configuration values. The UCI-108 will reset after this command.
  ```
  item UR=YES
  ```
- Set the UCI-108 in SMARTLINK mode
  ```
  item UM=SMARTLINK
  ```
- Configure the SmartLink mode. For example CIU GPU address to 1, CIU Flexconn addresss to 1901, accept all Flexconn Field Addresses from 0 up to and including 1899:
  ```
  item SG=1
  item SF=1901
  item S3=0
  item S4=1899
  ```
- Configure the baudrate of the RS port. For example baudrate to 38400 baud:
  ```
  item RB=38400
  ```
- Configure the BPM port. For example baudrate to 2400 baud and port time-out to 250 ms:
  ```
  item BB=2400
  item BT=250
  ```
- Leave TERMINAL mode (see section 6.1)
- The other configuration settings can now be set or done later remotely by the GPU item commands.

6.5 Basic MODBUSTUNNEL Mode

This configuration allows to connect a Modbus RTU master to one or multiple Modbus slave Field Device(s) over the BPM fieldbus for concurrently use with the Tank Management application and or integration in the CIU888. Modbus slave Field

Device addresses are mapped to GPU addresses and share the same GPU address space.

Instructions for basic configuration of 'host' UCI-108:

- Enter TERMINAL mode (see section 6.1)
- If applicable, set the UCI-108 to factory default configuration values. The UCI-108 will reset after this command.
  `item UR=YES`
- Set the UCI-108 in MODBUSTUNNEL mode
  `item UM=MODBUSTUNNEL`
- Set the correct tunnel mode for the 'host' UCI-108 to connect the Modbus RTU master. With this item also the RS port is configured as HOST, the BPM port will get the opposite value:
  `item TT=HOST`
- Configure the baudrate of the RS port to the Modbus RTU master. For example baudrate to 38400 baud:
  `item RB=38400`
- Configure the BPM port. For example baudrate to 1200 baud and port time-out to 250 ms:
  `item BB=1200`
  `item BT=250`
- Leave TERMINAL mode (see section 6.1)
- The other configuration settings can now be set or done later remotely by the GPU item commands.

Instructions for basic configuration of 'field' UCI-108:

- Enter TERMINAL mode (see section 6.1)
- If applicable, set the UCI-108 to factory default configuration values. The UCI-108 will reset after this command.
  `item UR=YES`
- Set the GPU address of the 'field' UCI-108 e.g. For example to 81:
  `item UA=81`
- Set the UCI-108 in MODBUSTUNNEL mode.
  `item UM=MODBUSTUNNEL`
- Set the correct tunnel mode for the 'field' UCI-108 to connect Modbus RTU slaves. With this item also the RS port is configured as FIELD, the BPM port will get the opposite value:
  `item TT=FIELD`
- Configure the baudrate of the RS port to the Modbus RTU slave(s). For example baudrate to 38400 baud:
  `item RB=38400`

- Configure the number of connected Modbus RTU slaves to the 'field' UCI-108. For example two slaves (is the maximum) are connected.
  `item TA=2`
- Configure the BPM port baudrate. For example baudrate to 1200 baud:
  `item BB=1200`
- Leave TERMINAL mode (see section 6.1)
- The other configuration settings can now be set or done later remotely by the GPU item commands.

6.6 Use case: Monitor BPM fieldbus

This mode allows to connect a UCI-108 at a certain spot on the BPM fieldbus to monitor the BPM message traffic and signal strength of each received message. See Tabel 7 for the configuration example of the required Items.

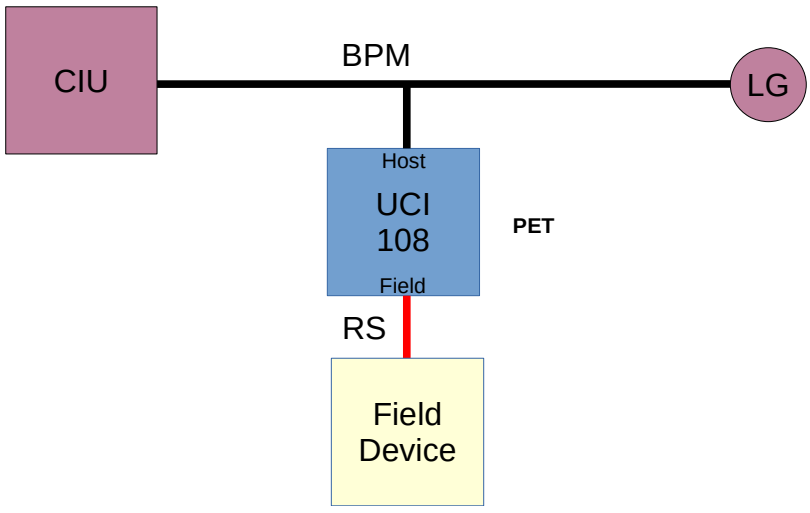
Expected precondition: the item configuration is in factory defaults, see notes.
Commands to perform in the command line interpreter for configuration UCI-108[A]:

`item UM=MODEM`	(Set the mode, is the default value)
`item UA=90`	(Set the UCI-108 GPU Device Address)
`item UT=Unit---A`	(Set the UCI-108 tag name)
`item BB=1200`	(Set the BPM baud rate, is the default value)
`item BG=8`	(Set the BPM gain, is the default value)
`item RB=115200`	(Set the RS port baud rate)

Notes:

- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- In MODEM mode there is no Host or Field port present. So the port turnaround delay and port timeout settings are not applicable.
- The Field Device Location and Filter items are applicable in this mode but not used in the example.
- The cache functionality is in MODEM mode not available and disabled.

Table 7: Relevant items (in yellow) for use case 'Monitor BPM fieldbus'



Use case: Monitor BPM network

UCI Item configuration settings

UCI-108 Unit		A		
Address DIP switch		off		
Common item				
Mode	UM	MODEM		
UCI-108 GPU address	UA	90		
UCI-108 Tag	UT	Unit---A		
BPM items				
BPM port config	BP	FIELD (default)		
BPM port baudrate	BB	1200 (default)		
BPM receiver gain	BG	8 (default)		
BPM port turnaround delay	BD	5 (default)		
BPM port timeout	BT	250 (default)		
RS				
RS port config	RP	HOST (default)		
RS port baudrate	RB	115200		
RS port turnaround delay	RD	1 (default)		
RS port timeout	RT	250 (default)		
SmartLink items				
ACK handshake	SA	ENABLED (default)		
SmartLink CIU address	SG	0 (default)		
SmartLink Flexconn address	SF	1900 (default)		
SmartLink lower filter addr.	S3	0 (default)		
SmartLink higher filter addr.	S4	1899 (default)		
Modbus tunnel				
Modbus Tunnel Port Type	TT	HOST (default)		
Number of Modbus Addresses	TA	1 (default)		
Field Device Location items				
Field Device expiration time	LT	300 (default)		
Field Device expiration count	LN	3 (default)		
Filter items				
Filter enable	FE	DISABLED (default)		
Filter GPU lower addr.	F1	0 (default)		
Filter GPU higher addr.	F2	99 (default)		
Filter Flexconn lower addr.	F3	0 (default)		
Filter Flexconn higher addr.	F4	1899 (default)		
Cache				
Cache	AE	DISABLED (default)		
Cache timeout	AT	10 (default)		

6.7 Use case: Insert network segment

In this example the BPM traffic is ‘tunneled' over a network segment using another physical layer and/or protocol. See Tabel 8 for configuration of the required Items.

Expected precondition: the item configuration is in factory defaults, see notes.
Commands to perform in the command line interpreter for configuration UCI-108[A]:

`item UM=PET`	(Set the UCI-108 mode)
`item UA=98`	(Set the UCI-108 GPU Device Address)
`item UT=Unit---A`	(Set the UCI-108 tag name)
`item BP=HOST`	(Set BPM port type, the Item RS is automatically set to FIELD)
`item BB=1200`	(Set the BPM baud rate, is the default value)
`item BG=8`	(Set the BPM gain, is the default value)
`item BD=10`	(Set the BPM turnaround delay time)
`item RB=115200`	(Set the RS port baud rate)
`item RT=850`	(See notes)
`item AE=ENABLED`	(Enable the cache, see notes)
`item AT=30`	(Set cache timeout)

Expected precondition: the item configuration is in factory defaults, see notes.
Commands to perform in the command line interpreter for configuration UCI-108[B]:

`item UM=PET`	(Set the UCI-108 mode)
`item UA=99`	(Set the UCI-108 GPU Device Address)
`item UT=Unit---B`	(Set the UCI-108 tag name)
`item BP=FIELD`	(The Item RS is automatically set to HOST)
`item BB=1200`	(Set the BPM baud rate, is the default value)
`item BG=8`	(The default value)
`item BT=250`	(The default value)
`item RB=115200`	(Set the RS port baud rate)
`item RD=1`	(The default value)
`item AE=ENABLED`	(Enable the cache, see notes)
`item AT=30`	(Set cache timeout)

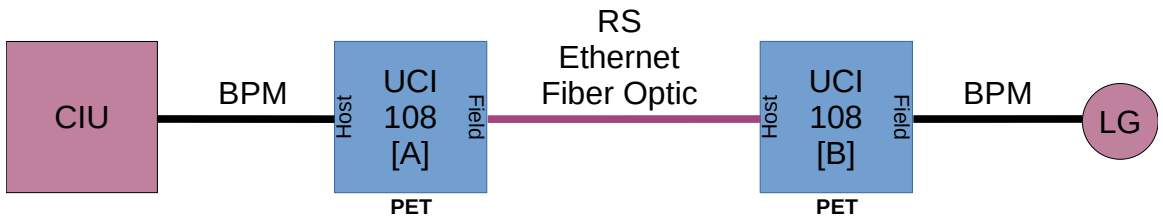
Notes:

- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- The caches of both the UCI-108[A] and UCI-108[B] are ENABLED to optimize the response time to the Host (CIU) for the requests in the foreground scan.
- The UCI-108[A]$_{\text{RS Field port time-out}}$ has to cover at least the delays caused by the network segment, the message relaying by the UCI-108[B] and the UCI-108[B]$_{\text{BPM port timeout}}$. Use formula:
  UCI-108 [A]$_{\text{RS port timeout}}$ >= 2*T$_{\text{delay network segment}}$ + 2*Max(UCI-108[B]$_{\text{BPMrequest/reply time @ baudrate}}$: UCI-108[B]$_{\text{BPM port timeout}}$) + UCI-108[B]$_{\text{BPM port timeout}}$.

For this example: UCI-108[A]$_{\text{RS port timeout}}$ >= 2*50 + 2*Max(250 : 250)+ 250 = 100+2*250 + 250 = 850 ms. Set UCI-108[A]$_{\text{RS port timeout}}$ to at least 850 ms.

- The **CIU BPM Field port time out setting** has to be set to minimal the UCI-108 [A] RS Field port timeout. Add a margin to avoid time out by large request/reply messages, set in this case to 1000 ms.
- For good initialization of the cache set the cache timeout to at least 2,5 times the total scanning period (including overhead by scanning timeouts). In this example it is set to the 30 seconds (max 60 seconds).
- The Field Device Location and Filter items are applicable in this mode but not used in the example.

Table 8: Relevant items (in yellow) for use case 'Insert Network Segment'



Use case: Insert network segment

IMPORTANT: Set the CIU880/888 BPM field port timeout to 1000 ms

UCI Item configuration settings				
UCI-108 Unit		A	B	
Address DIP switch		off	off	
Common item				
Mode	UM	PET	PET	
UCI-108 GPU address	UA	98	99	
UCI-108 Tag	UT	Unit---A	Unit---B	
BPM items				
BPM port config	BP	HOST	FIELD (default)	
BPM port baudrate	BB	1200 (default)	1200 (default)	
BPM receiver gain	BG	8 (default)	8 (default)	
BPM port turnaround delay	BD	10	5 (default)	
BPM port timeout	BT	250 (default)	250 (default)	
RS				
RS port config	RP	FIELD	HOST (default)	
RS port baudrate	RB	115200	115200	
RS port turnaround delay	RD	1 (default)	1 (default)	
RS port timeout	RT	850	250 (default)	
SmartLink items				

ACK handshake	SA	ENABLED (default)	ENABLED (default)	
SmartLink CIU address	SG	0 (default)	0 (default)	
SmartLink Flexconn address	SF	1900 (default)	1900 (default)	
SmartLink lower filter addr.	S3	0 (default)	0 (default)	
SmartLink higher filter addr.	S4	1899 (default)	1899 (default)	
Modbus tunnel				
Modbus Tunnel Port Type	TT	HOST (default)	HOST (default)	
Number of Modbus Addresses	TA	1 (default)	1 (default)	
Field Device Location items				
Field Device expiration time	LT	300 (default)	300 (default)	
Field Device expiration count	LN	3 (default)	3 (default)	
Filter items				
Filter enable	FE	DISABLED (default)	DISABLED (default)	
Filter GPU lower addr.	F1	0 (default)	0 (default)	
Filter GPU higher addr.	F2	99 (default)	99 (default)	
Filter Flexconn lower addr.	F3	0 (default)	0 (default)	
Filter Flexconn higher addr.	F4	1899 (default)	1899 (default)	
Cache				
Cache	AE	ENABLED	ENABLED	
Cache timeout	AT	30	30	

6.8 Use case: Extend BPM network

In this example the BPM fieldbus with a maximum of connected Field devices is extended by placing a dual UCI-108 node at the end of the fieldbus. New Field devices can be connected at the extended BPM fieldbus. See Table 9 for configuration of the required Items.

Set the Address DIP switch to AD-1.
Expected precondition: the item configuration is in factory defaults, see notes.
Commands to perform in the command line interpreter for configuration UCI-108[A]:

`item UM=PET`	(Set the UCI-108 mode)
`item UA=93`	(Set the UCI-108 GPU Device Address)
`item UT=Unit---A`	(Set the UCI-108 tag name)
`item BP=HOST`	(Set BPM port type, the Item RS is automatically set to FIELD)
`item BB=1200`	(Set the BPM baud rate, is the default value)
`item BG=8`	(Expected to be set to most sensitive, the default value)
`item BD=5`	(The default value)
`item AE=ENABLED`	(Enable the cache, see notes)
`item AT=30`	(Set cache timeout)

Set the Address DIP switch to AD-2.
Expected precondition: the item configuration is in factory defaults, see notes.
Commands to perform in the command line interpreter for configuration UCI-108[B]:

`item UM=PET`	(Set the UCI-108 mode)
`item UA=94`	(Set the UCI-108 GPU Device Address)
`item UT=Unit---B`	(Set the UCI-108 tag name)
`item BP=FIELD`	(Set BPM port type, the Item RS is automatically set to HOST)
`item BB=1200`	(Set the BPM baud rate, is the default value)
`item BG=8`	(The default value)
`item BT=250`	(Set the BPM port timeout, the default value)
`item AE=DISABLED`	(Disable the cache, see notes)

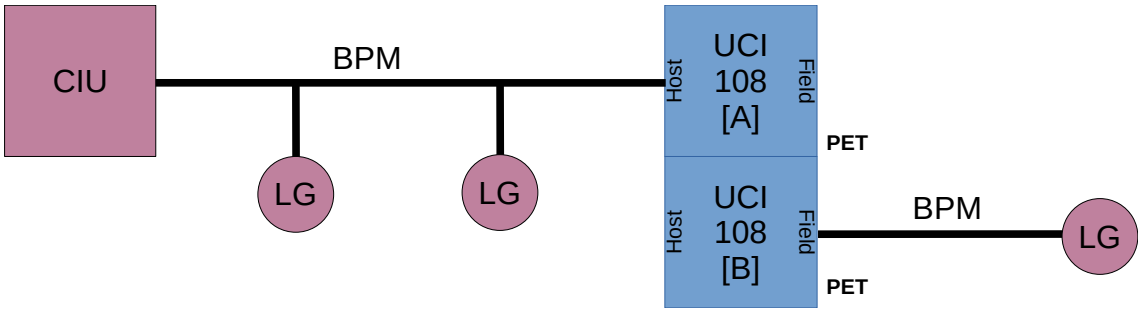
Notes:

- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- The two UCI-108s are connected to each other by means of the DIN rail bus connector.
- The cache of UCI-108[A] is ENABLED to optimize the response time to the Host (CIU) for the requests in the foreground scan.
- The **CIU BPM Field port time out** has to cover the delay caused the message relaying of the UCI-108[A] and UCI-108[B], the UCI-108[B]$_{\text{BPM port timeout}}$ and the internal bus communication delay. Use formula:

$CIU_{BPM\ Field\ port\ time\ out}$ >= 2*Max(UCI-108[B]$_{BPMrequest/reply\ time\ @\ baudrate}$: UCI-108[B]$_{BPM\ port\ timeout}$) + UCI-108[B]$_{BPM\ port\ timeout}$ +20.
For this example: $CIU_{BPM\ Field\ port\ time\ out}$ >= 2*Max(250 : 250) +250+20= 2*250+250+20=770 ms. Add a margin to avoid time out by large request/reply messages, set the CIU BPM Field port time out setting in this case to **1000 ms**.

- For good initialization of the cache set the cache timeout to at least 2,5 times the total scanning period (including overhead by scanning timeouts). In this example it is set to the 30 seconds (max 60 seconds).
- The free RS port of UCI-108[B] can be used to connect a PC terminal application for commissioning the UCI-108 node, monitor the BPM messages or the Honeywell-Enraf Engauge tool. Configure therefore also the items for RS Host port. The Engauge COM port timeout has to be set to >= 1000 ms. The cache feature is disabled to enable the reception of the latest response.
- The Field Device Location and Filter items are applicable in this mode but not used in the example.

Table 9: Relevant items (in yellow) for use case 'Extend BPM fieldbus'



Use case: Extend BPM fieldbus

IMPORTANT: Set the CIU880/888 BPM field port timeout to 1000 ms

UCI Item configuration settings				
UCI-108 Unit		A	B	
Address DIP switch		AD-1=ON	AD-2=ON	
Common item				
Mode	UM	PET	PET	
UCI-108 GPU address	UA	93	94	
UCI-108 Tag	UT	Unit---A	Unit---B	
BPM items				
BPM port config	BP	HOST	FIELD (default)	
BPM port baudrate	BB	1200 (default)	1200 (default)	
BPM receiver gain	BG	8 (default)	8 (default)	
BPM port turnaround delay	BD	5 (default)	5 (default)	

BPM port timeout	BT	250 (default)	250 (default)	
RS				
RS port config	RP	FIELD	HOST (default)	
RS port baudrate	RB	38400 (default)	115200	
RS port turnaround delay	RD	1 (default)	1 (default)	
RS port timeout	RT	250 (default)	250 (default)	
SmartLink items				
ACK handshake	SA	ENABLED (default)	ENABLED (default)	
SmartLink CIU address	SG	0 (default)	0 (default)	
SmartLink Flexconn address	SF	1900 (default)	1900 (default)	
SmartLink lower filter addr.	S3	0 (default)	0 (default)	
SmartLink higher filter addr.	S4	1899 (default)	1899 (default)	
Modbus tunnel				
Modbus Tunnel Port Type	TT	HOST (default)	HOST (default)	
Number of Modbus Addresses	TA	1 (default)	1 (default)	
Field Device Location items				
Field Device expiration time	LT	300 (default)	300 (default)	
Field Device expiration count	LN	3 (default)	3 (default)	
Filter items				
Filter enable	FE	DISABLED (default)	DISABLED (default)	
Filter GPU lower addr.	F1	0 (default)	0 (default)	
Filter GPU higher addr.	F2	99 (default)	99 (default)	
Filter Flexconn lower addr.	F3	0 (default)	0 (default)	
Filter Flexconn higher addr.	F4	1899 (default)	1899 (default)	
Cache				
Cache	AE	ENABLED	DISABLED (default)	
Cache timeout	AT	30	10 (default)	

6.9 Use case: Connect host(s) to multiple BPM fieldbuses

In this example the UCI-108 provides access to multiple BPM fieldbuses for a host application or for a CIU as 'Downlink'. The setup is configured as dual UCI-108 node to join multiple hosts and split to multiple BPM fieldbuses. See Table 10 for configuration of the required Items.

Set the Address DIP switch to AD-1.
Expected precondition: the item configuration is in factory defaults, see notes.
Commands to perform for configuration UCI-108[A]:

`item UM=SMARTLINK`	(Set the UCI-108 mode)
`item UA=99`	(Set the UCI-108 GPU Device Address, the default value)
`item UT=Unit---A`	(Set the UCI-108 tag name)
`item BP=FIELD`	(Set BPM port type, the Item RS is automatically set to FIELD)
`item BB=1200`	(Set the BPM port baudrate, the default value)
`item BG=8`	(Set the BPM gain, the default value)
`item BT=250`	(Set the BPM port time out, the default value)
`item RB=38400`	(Set the RS port baudrate, the default value)
`item RD=1`	(The default value)
`item SA=ENABLED`	(Set the ACK handshake, the default value)
`item SG=1`	(Set the CIU address)
`item SF=1901`	(Set the Flexconn address)
`item AE=ENABLED`	(Enable the cache, see notes)
`item AT=30`	(Set cache timeout)

Set the Address DIP switch to AD-2.
Expected precondition the item configuration is in factory defaults, see notes.
Commands to perform for configuration UCI-108[B]:

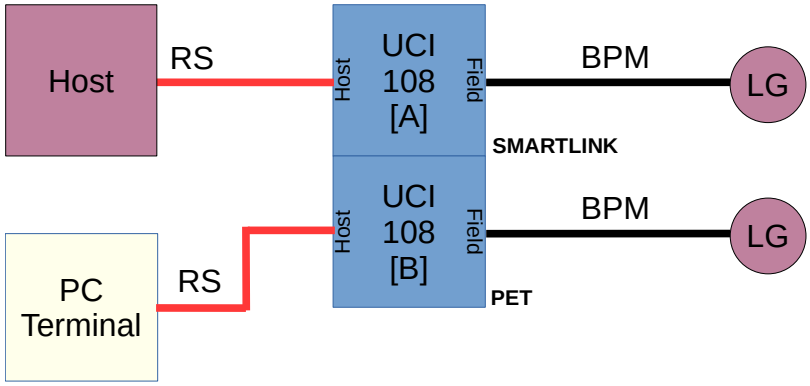
`item UM=PET`	(Set the UCI-108 mode)
`item UA=98`	(Set the UCI-108 GPU Device Address)
`item UT=Unit---B`	(Set the UCI-108 tag name)
`item BP=FIELD`	(Set BPM port type, the Item RS is automatically set to HOST)
`item BB=1200`	(Set the BPM port baudrate, the default value)
`item BG=8`	(Set the BPM gain, the default value)
`item BT=250`	(Set the BPM port time out, the default value)
`item RB=155200`	(Set the RS port baudrate)
`item RD=1`	(The default value)
`item AE=DISABLED`	(Disable the cache, see notes)

Notes:

- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- The two UCI-108s are connected to each other by means of the DIN rail bus connector.

- It is recommended to enable the cache of UCI-108[A] to optimize the response time to the Host application or CIU for requests in the foreground scan.
- For good initialization of the cache set the cache timeout to at least 2,5 times the total scanning period (including overhead by scanning timeouts). In this example it is set to the 30 seconds (max 60 seconds).
- The free RS port of UCI-108[B] can be used to connect a PC terminal application for commissioning the UCI-108 node, monitor the BPM messages or the Honeywell-Enraf Engauge tool. Configure therefore also the items for RS Host port. The Engauge COM port timeout has to be set to >= 1000 ms. The cache feature is disabled to enable the reception of the latest response.
- The Field Device Location and Filter items are applicable for UCI-108[B] in this mode but not used in the example.

Table 10: Relevant items (in yellow) for use case 'Connect host(s) to multiple BPM fieldbuses'



Use case: Connect host(s) to multiple BPM fieldbuses

UCI Item configuration settings				
UCI-108 Unit		A	B	
Address DIP switch		AD-1=ON	AD-2=ON	
Common item				
Mode	UM	SMARTLINK	PET	
UCI-108 GPU address	UA	99 (default)	98	
UCI-108 Tag	UT	Unit---A	Unit---B	
BPM items				
BPM port config	BP	FIELD (default)	FIELD (default)	
BPM port baudrate	BB	1200 (default)	1200 (default)	
BPM receiver gain	BG	8 (default)	8 (default)	
BPM port turnaround delay	BD	5 (default)	5 (default)	
BPM port timeout	BT	250 (default)	250 (default)	
RS				
RS port config	RP	HOST (default)	HOST (default)	
RS port baudrate	RB	38400 (default)	115200	

RS port turnaround delay	RD	1 (default)	1 (default)	
RS port timeout	RT	250 (default)	250 (default)	
SmartLink items				
ACK handshake	SA	ENABLED (default)	ENABLED (default)	
SmartLink CIU address	SG	1	0 (default)	
SmartLink Flexconn address	SF	1901	1900 (default)	
SmartLink lower filter addr.	S3	0 (default)	0 (default)	
SmartLink higher filter addr.	S4	1899 (default)	1899 (default)	
Modbus tunnel				
Modbus Tunnel Port Type	TT	HOST (default)	HOST (default)	
Number of Modbus Addresses	TA	1 (default)	1 (default)	
Field Device Location items				
Field Device expiration time	LT	300 (default)	300 (default)	
Field Device expiration count	LN	3 (default)	3 (default)	
Filter items				
Filter enable	FE	DISABLED (default)	DISABLED (default)	
Filter GPU lower addr.	F1	0 (default)	0 (default)	
Filter GPU higher addr.	F2	99 (default)	99 (default)	
Filter Flexconn lower addr.	F3	0 (default)	0 (default)	
Filter Flexconn higher addr.	F4	1899 (default)	1899 (default)	
Cache				
Cache	AE	ENABLED	DISABLED (default)	
Cache timeout	AT	30	10 (default)	

6.10 Use case: Join two BPM buses into one BPM bus

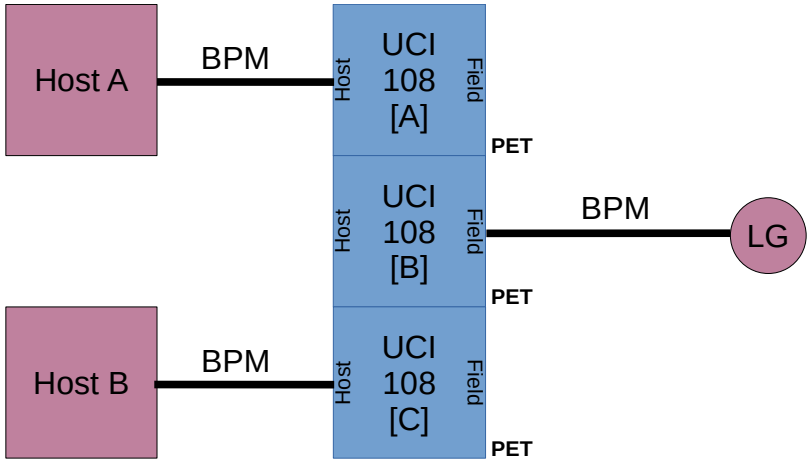
In this example the requests on the BPM fieldbus from two individual CIUs addressing the same Field Devices are forwarded to a single BPM fieldbus. This can be of use in CIU migration projects. It is a different variant of using multi hosts. In this example three UCI-108s are connected to form a multi UCI-108 node.

Set the Address DIP switch for each UCI-108 at the right position and configure each UCI-108 according the settings in Table 11.
Expected precondition: the item configuration is in factory defaults, see notes.
Use the command `item <Item>=<Value>` in the command line interpreter as explained in the previous examples for the applicable values not having the default setting.

Notes:
- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- The three UCI-108s are connected to each other by means of the DIN rail bus connector.
- The **CIU BPM Field port time out setting** of both CIUs has to cover the delay caused by message relaying of the UCI-108 [A], UCI-108 [B] and UCI-108[C], the UCI-108[B]$_{\text{BPM port timeout}}$ and the internal bus communication delay. Use formula: CIU$_{\text{BPM Field port time out}}$ >= 2*Max(UCI-108[B]$_{\text{BPMrequest/reply time @ baudrate}}$: UCI-108[B]$_{\text{BPM port timeout}}$) + UCI-108[B]$_{\text{BPM port timeout}}$ +20).
  For this example: CIU$_{\text{BPM Field port time out}}$ >= 2*Max(250 : 250)+250+20= 2*250+250+20=770 ms. Add a margin to avoid time out by large request/reply messages, set the CIU BPM Field port time out setting in this case to **1000 ms**.
- The delay can be reduced by increasing the BPM baudrate of the BPM fieldbuses. E.g. to 4800 baud from the CIUs to the UCI-108[A] and UCI-108[C] and 2400 baud to the Field Devices at UCI-108[B].
- It is recommended to enable the cache of UCI-108[A] and UCI-108[C] to optimize the response time to the CIUs for the requests in the foreground scan.
- For good initialization of the cache set the cache timeout to at least 2,5 times the total scanning period (including overhead by scanning timeouts). In this example it is set to the 30 seconds (max 60 seconds).
- The free RS port of UCI-108[B] can be used to connect a PC terminal application for commissioning the UCI-108 node, monitor the BPM messages or the Honeywell-Enraf Engauge tool. Configure therefore also the items for RS Host port. The Engauge COM port timeout has to be set to >= 1000 ms. The cache feature is disabled to enable the reception of the latest response.

- The Field Device Location and Filter items are applicable in this mode but not used in the example.

Table 11: Relevant items (in yellow) for use case 'Join two BPM buses to one'



Use case: Join two BPM buses to one

IMPORTANT: Set the CIU880/888 BPM field port timeout to 1000 ms

UCI Item configuration settings

UCI-108 Unit		A	B	C
Address DIP switch		AD-1=ON	AD-2=ON	AD-3=ON
Common item				
Mode	UM	PET	PET	PET
UCI-108 GPU address	UA	95	96	97
UCI-108 Tag	UT	Unit---A	Unit---B	Unit---C
BPM items				
BPM port config	BP	HOST	FIELD (default)	HOST
BPM port baudrate	BB	1200 (default)	1200 (default)	1200 (default)
BPM receiver gain	BG	8 (default)	8 (default)	8 (default)
BPM port turnaround delay	BD	5 (default)	5 (default)	5 (default)
BPM port timeout	BT	250 (default)	250 (default)	250 (default)
RS				
RS port config	RP	FIELD	HOST (default)	FIELD
RS port baudrate	RB	38400 (default)	115200	38400 (default)
RS port turnaround delay	RD	1 (default)	1 (default)	1 (default)
RS port timeout	RT	250 (default)	250 (default)	250 (default)
SmartLink items				
ACK handshake	SA	ENABLED (default)	ENABLED (default)	ENABLED (default)
SmartLink CIU address	SG	0 (default)	0 (default)	0 (default)
SmartLink Flexconn address	SF	1900 (default)	1900 (default)	1900 (default)
SmartLink lower filter addr.	S3	0 (default)	0 (default)	0 (default)

SmartLink higher filter addr.	S4	1899 (default)	1899 (default)	1899 (default)
Modbus tunnel				
Modbus Tunnel Port Type	TT	HOST (default)	HOST (default)	HOST (default)
Number of Modbus Addresses	TA	1 (default)	1 (default)	1 (default)
Field Device Location items				
Field Device expiration time	LT	300 (default)	300 (default)	300 (default)
Field Device expiration count	LN	3 (default)	3 (default)	3 (default)
Filter items				
Filter enable	FE	DISABLED (default)	DISABLED (default)	DISABLED (default)
Filter GPU lower addr.	F1	0 (default)	0 (default)	0 (default)
Filter GPU higher addr.	F2	99 (default)	99 (default)	99 (default)
Filter Flexconn lower addr.	F3	0 (default)	0 (default)	0 (default)
Filter Flexconn higher addr.	F4	1899 (default)	1899 (default)	1899 (default)
Cache				
Cache	AE	ENABLED	DISABLED (default)	ENABLED
Cache timeout	AT	30	10 (default)	30

6.11 Use case: Modbus tunnel for PLC application

In this example the UCI-108 Modbus tunnel feature is used to run a proprietary PLC application with remote Modbus RTU slave devices over the BPM fieldbus concurrently with Tank Management Application. It is a special case of 'Join multiple hosts to one or multiple BPM fieldbus(es)'.
In this example the CIU request the level gauge connected on the BPM fieldbus, the PCL requests the Modbus level gauges connected to the two 'field' UCI-108s.

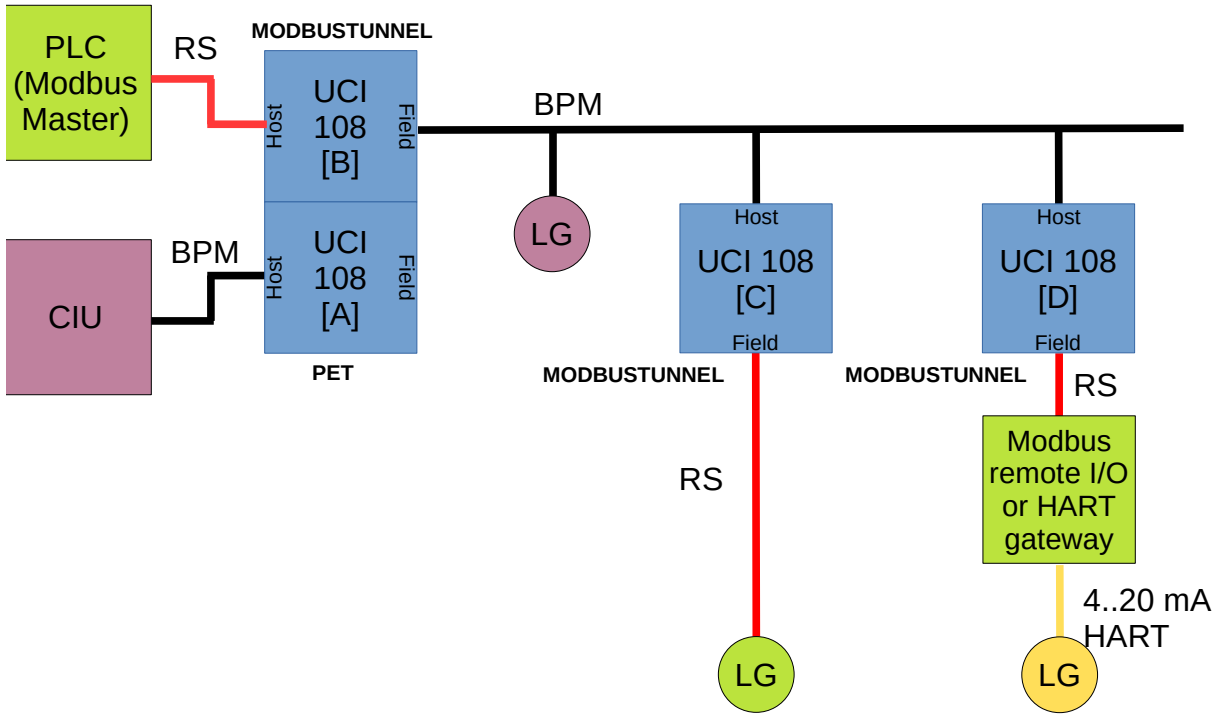
Set the Address DIP switch for each UCI-108 at the right position and configure each UCI-108 according the settings in Table 12.
Expected precondition: the item configuration is in factory defaults, see notes.
Use the command `item <Item>=<Value>` in the command line interpreter as explained in the previous examples for the applicable values not having the default setting.

Notes:
- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- The UCI-108[A] and UCI-108[B] are connected to each other by means of the DIN rail bus connector.
- Due to the PLC Modbus connection the 'host' UCI-108[B] does not have an operational GPU Device Address.
- The caches of UCI-108's are ENABLED to optimize the response time to the hosts for the requests in the foreground scan.
- The Modbus RTU slave address is one or two addresses higher than its 'field' UCI-108 GPU Device address. The address of Modbus RTU level gauge device connected to UCI-108[C] has to be set to UCI-108[C] GPU device address+1. In this case 90+1=91.
- The address of Modbus RTU remote I/O slave connected to UCI-108[D] has to be configured to be set to UCI-108[D] GPU device address+1. In this case 92+1=93.
- The **CIU BPM Field port time out** has to cover the delay caused the message relaying of UCI-108[A], the ‘host’ UCI-108[B], the ‘field’ UCI-108[C or D], the UCI-108[B]$_{\text{BPM port timeout}}$,the maximum ‘field’ UCI-108[C or D]$_{\text{RS port time out}}$ and the internal bus communication delay. Use formula:
  CIU$_{\text{BPM Field port time out}}$ >= 2*Max(UCI-108[B]$_{\text{BPMrequest/reply time @ baudrate}}$: UCI-108[B]$_{\text{BPM port timeout}}$) + UCI-108[B]$_{\text{BPM port timeout}}$ + UCI-108[C/D]$_{\text{RS port timeout}}$ + 20).
  Modbus messages over the BPM fieldbus are approximately 1,4 time larger than the average GPU message. An average Modbus register request/reply message over the BPM fieldbus requires 330 ms at 1200 baud.

For this example: $CIU_{BPM\ Field\ port\ time\ out}$ >= 2*Max(330 : 200) + 200 +100 +20 = 2*330 +200+100+20=980 ms. Set the CIU BPM Field port time out setting in this case to **1000 ms**.
The $CIU888_{BPM\ Field\ port\ time\ out}$ can be reduced by increasing the BPM baudrate and reducing the $UCI\text{-}108[B]_{BPM\ time\ out}$ and the 'field' $UCI\text{-}108[C\ or\ D]_{RS\ port\ time\ out}$.

- The same value of the $CIU_{BPM\ Field\ port\ time\ out}$ is applicable for the timeout setting of the PLC Modbus RTU master.
- For good initialization of the cache set the cache timeout to at least 2,5 times the total scanning period (including overhead by scanning timeouts). In this example it is set to the 30 seconds (max 60 seconds).
- The Field Device Location and Filter items are applicable for UCI-108[A] in this mode but not used in the example.

Table 12: Relevant items for use case 'Modbus tunnel for proprietary PLC application'



Use case: Modbus tunnel for proprietary PLC application

IMPORTANT: Set the Modbus RTU master timeout to 1000 ms.
IMPORTANT: Set the CIU880/888 BPM field port timeout to 1000 ms

UCI Item configuration settings

UCI-108 Unit		A	B	C	D
Address DIP switch		AD-1=ON	AD-2=ON	off	off

Common item					
Mode	UM	PET	MODBUSTUNNEL	MODBUSTUNNEL	MODBUSTUNNEL
UCI-108 GPU address	UA	50	99 (default)	90	92
UCI-108 Tag	UT	Unit---A	Unit---B	Unit---C	Unit---D
BPM items					
BPM port config	BP	HOST	FIELD (default)	HOST	HOST
BPM port baudrate	BB	1200 (default)	1200 (default)	1200 (default)	1200 (default)
BPM receiver gain	BG	8 (default)	8 (default)	8 (default)	8 (default)
BPM port turnaround delay	BD	5 (default)	5 (default)	5 (default)	5 (default)
BPM port timeout	BT	250 (default)	250 (default)	250 (default)	250 (default)
RS					
RS port config	RP	FIELD	HOST (default)	FIELD	FIELD
RS port baudrate	RB	38400 (default)	115200	38400 (default)	38400 (default)
RS port turnaround delay	RD	1 (default)	1 (default)	1 (default)	1 (default)
RS port timeout	RT	200	250 (default)	100	100
SmartLink items					
ACK handshake	SA	ENABLED (default)	ENABLED (default)	ENABLED (default)	ENABLED (default)
SmartLink CIU address	SG	0 (default)	0 (default)	0 (default)	0 (default)
SmartLink Flexconn address	SF	1900 (default)	1900 (default)	1900 (default)	1900 (default)
SmartLink lower filter addr.	S3	0 (default)	0 (default)	0 (default)	0 (default)
SmartLink higher filter addr.	S4	1899 (default)	1899 (default)	1899 (default)	1899 (default)
Modbus tunnel					
Modbus Tunnel Port Type	TT	HOST (default)	HOST (default)	FIELD	FIELD
Number of Modbus Addresses	TA	1 (default)	1 (default)	1 (default)	1 (default)
Field Device Location items					
Field Device expiration time	LT	300 (default)	300 (default)	300 (default)	300 (default)
Field Device expiration count	LN	3 (default)	3 (default)	3 (default)	3 (default)
Filter items					
Filter enable	FE	DISABLED (default)	DISABLED (default)	DISABLED (default)	DISABLED (default)
Filter GPU lower addr.	F1	0 (default)	0 (default)	0 (default)	0 (default)
Filter GPU higher addr.	F2	99 (default)	99 (default)	99 (default)	99 (default)
Filter Flexconn lower addr.	F3	0 (default)	0 (default)	0 (default)	0 (default)
Filter Flexconn higher addr.	F4	1899 (default)	1899 (default)	1899 (default)	1899 (default)
Cache					
Cache	AE	ENABLED	ENABLED	ENABLED	ENABLED
Cache timeout	AT	30	30	30	30

6.12 Use case: Modbus tunnel for gauge integration in CIU888

In this example the UCI-108 Modbus tunnel feature is used to integrate (low cost) level gauges, pressure and temperature sensors in the CIU888. The CIU888 has the feature to map Modbus variables to the internal database variables level, temperature, pressure etc. to enable this.
To make use of this feature an additional CIU888 RS field port is installed which has to be configured for poll strategy as a group with the CIU888 BPM field port in sequential mode. In this configuration the CIU888 BPM and RS fieldbus do not run concurrently, the devices on the BPM fieldbus and the RS fieldbus are alternating requested. In the example drawing the CIU888 BPM port request for GPU/Flexconn field devices, the CIU888 RS port request for Modbus devices.

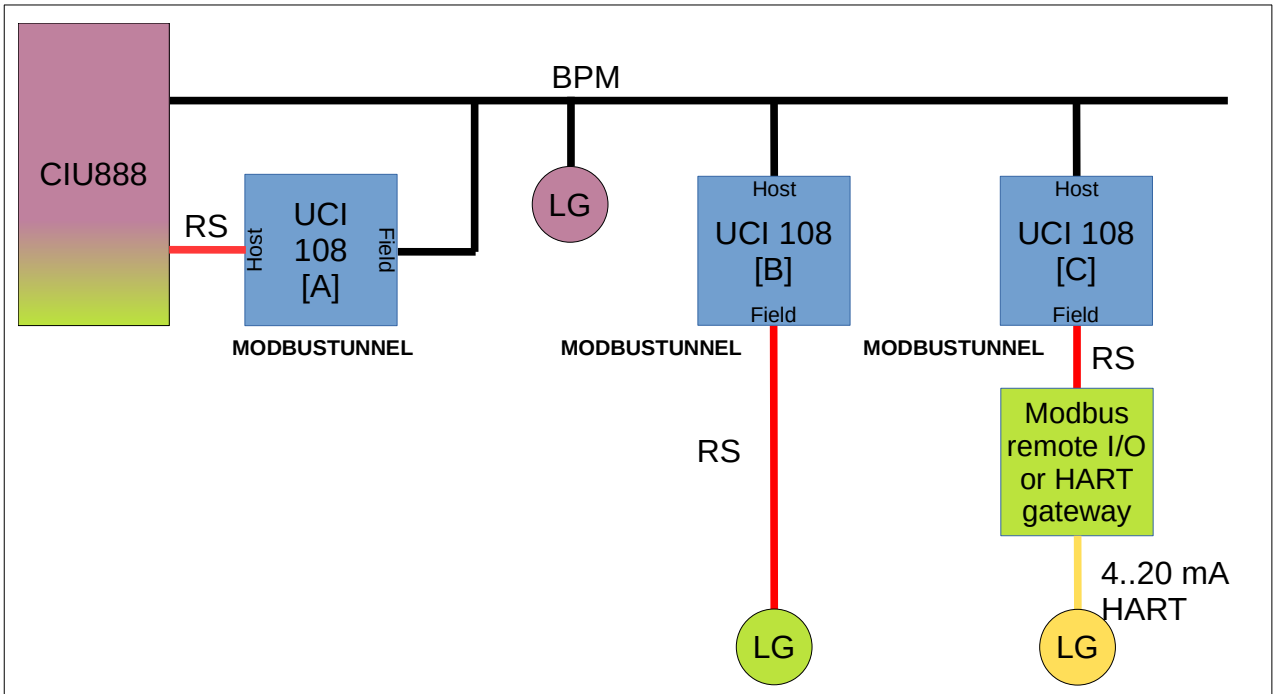
Set the Address DIP switch for each UCI-108 at the right position and configure each UCI-108 according the settings in Table 13.
Expected precondition: the item configuration is in factory defaults, see notes.
Use the command `item <Item>=<Value>` in the command line interpreter as explained in the previous examples for the applicable values not having the default setting.

Notes:
- Use command item `item UR=YES` in case you first want to restore the UCI-108 to default configuration settings before commissioning.
- Due to the PLC Modbus connection the 'host' UCI-108[A] does not have an operational GPU Device Address.
- The cache of the ‘host’ UCI-108[A] must be **DISABLED** to prevent accessing the BPM fieldbus by the UCI-108[A] caused by queued cache requests during the period the CIU888 uses the BPM field port.
- The cache of the ‘field’ UCI-108[B or C] are ENABLED to get a faster response.
- The Modbus RTU slave address is one or two addresses higher than its 'field' UCI-108 GPU Device address. The address of Modbus RTU level gauge device connected to UCI-108[B] has to be set to UCI-108[B] GPU device address+1. In this case 90+1=91.
- The address of Modbus RTU remote I/O slave connected to UCI-108[C] has to be configured to be set to UCI-108[C] GPU device address+1. In this case 92+1=93.
- The **CIU888 RS Field port time out** has to cover the delay caused by the message relaying of the ‘host’ UCI-108[A], the ‘field’ UCI-108[B or C], the $\text{UCI-108[A]}_{\text{BPM port timeout}}$ settings and the maximum ‘field’ $\text{UCI-108[B or C]}_{\text{RS port time out}}$ setting. Use formula: $\text{CIU888}_{\text{RS Field port time out}} >= \text{UCI-108[A]}_{\text{BPM request/reply time @ baudrate}} + \text{UCI-108[A]}_{\text{BPM port timeout}} + \text{UCI-108[B/C]}_{\text{RS port timeout}}$.

An average Modbus register request/reply message over the BPM fieldbus requires 330 ms at 1200 baud. For this example: $CIU888_{RS\ Field\ port\ time\ out}$ >= 330+250+100= 680 ms. Add a margin to avoid time out by large request/reply messages, set the $CIU888_{RS\ Field\ port\ time\ out}$ setting in this case to **1000 ms**.
The $CIU888_{RS\ Field\ port\ time\ out}$ can be reduced by increasing the BPM baudrate and reducing the $UCI\text{-}108[A]_{BPM\ time\ out}$ and the 'field' $UCI\text{-}108[B\ or\ C]_{RS\ port\ time\ out}$.

- For good initialization of the cache set the cache timeout to at least 2,5 times the total scanning period (including overhead by scanning timeouts). In this example it is set to the 30 seconds (max 60 seconds).
- The Field Device Location items are applicable for the MODBUSTUNNEL mode but not used in the example.

Table 13: Relevant items for use case 'Modbus tunnel for gauge integration in CIU888'



Use case: Modbus tunnel for gauge integration in CIU888

IMPORTANT: Set the CIU888 RS field port timeout to 1000 ms

UCI Item configuration settings

UCI-108 Unit		A	B	C
Address DIP switch		off	off	off
Common item				
Mode	UM	MODBUSTUNNEL	MODBUSTUNNEL	MODBUSTUNNEL
UCI-108 GPU address	UA	99 (default)	90	92

UCI-108 Tag	UT	Unit---A	Unit---B	Unit---C
BPM items				
BPM port config	BP	FIELD (default)	HOST	HOST
BPM port baudrate	BB	1200 (default)	1200 (default)	1200 (default)
BPM receiver gain	BG	8 (default)	8 (default)	8 (default)
BPM port turnaround delay	BD	5 (default)	5 (default)	5 (default)
BPM port timeout	BT	250 (default)	250 (default)	250 (default)
RS				
RS port config	RP	HOST (default)	FIELD	FIELD
RS port baudrate	RB	38400 (default)	38400 (default)	38400 (default)
RS port turnaround delay	RD	1 (default)	1 (default)	1 (default)
RS port timeout	RT	250 (default)	100	100
SmartLink items				
ACK handshake	SA	ENABLED (default)	ENABLED (default)	ENABLED (default)
SmartLink CIU address	SG	0 (default)	0 (default)	0 (default)
SmartLink Flexconn address	SF	1900 (default)	1900 (default)	1900 (default)
SmartLink lower filter addr.	S3	0 (default)	0 (default)	0 (default)
SmartLink higher filter addr.	S4	1899 (default)	1899 (default)	1899 (default)
Modbus tunnel				
Modbus Tunnel Port Type	TT	HOST (default)	FIELD	FIELD
Number of Modbus Addresses	TA	1 (default)	1 (default)	1 (default)
Field Device Location items				
Field Device expiration time	LT	300 (default)	300 (default)	300 (default)
Field Device expiration count	LN	3 (default)	3 (default)	3 (default)
Filter items				
Filter enable	FE	DISABLED (default)	DISABLED (default)	DISABLED (default)
Filter GPU lower addr.	F1	0 (default)	0 (default)	0 (default)
Filter GPU higher addr.	F2	99 (default)	99 (default)	99 (default)
Filter Flexconn lower addr.	F3	0 (default)	0 (default)	0 (default)
Filter Flexconn higher addr.	F4	1899 (default)	1899 (default)	1899 (default)
Cache				
Cache	AE	DISABLED (default)	ENABLED	ENABLED
Cache timeout	AT	10 (default)	30	30

6.13 Notes

When doing a Site Scan, for example using Honeywell-Enraf Engauge, a UCI-108 is transparent (e.g. will not be seen) when used in MODEM and PET mode. When used in SMARTLINK mode it will be detected as a SmartLink device.

7 Updating Firmware

Updating firmware can be done by booting into the UCI-108 bootloader and downloading the new firmware using the YModem protocol.

7.1 On Windows

Connect an YModem capable terminal program to the UCI-108s RS port in RS232 mode. The communication parameters are 115200 baud, 8 data bits, 1 stop bit, no parity, no flow control.

This procedure has been tested with TeraTerm version 4.85 (SVN #5727). Newer versions might not work due to bugs in TeraTerms YModem implementation. [8]

To boot the UCI-108 in it's bootloader set the **TERM** DIP-switch in the **On** position and press the **Reset Button** for more then 5 seconds.

The terminal emulator will then show a menu looking like:

```
uci-108-bootloader 0.4. [37002300165030503034302O]
MSG: Console Activated.

 Current Application Image Status: present and valid.
 Released version 0.4, length: 95160, [D0355F7E]

 --- Firmware Maintenance Menu ---
  1: Download image to the internal Flash
  2: Execute the application
```

Type **1** and press **Enter** and the terminal will show:

```
Waiting for the firmware file to be sent ...
(send 'a' to abort)
```

Then launch the YModem transfer (on TeraTerm use **File|Transfer|YModem|Send** and select the firmware file to flash.

When done the result will be printed ("Programming completed." or an error message). The menu will reappear and the new firmware version should be shown.

8 Exalon Delft can supply you with a copy of this software. Another solution is using a macro to launch the transfer.

7.2 On Linux or MacOS

Also on Linux and MacOS any YModem capable serial terminal program can be used.

There are also various command line utilities that can do the job. For example one could use **picocom** in combination with the **sb** tool (from the **lrzsz** package) the following way:

```
picocom -b 115200 -r -l -s "sb -k -vv" –imap lfcrlf /dev/ttyUSB0
```

Take care to use the correct serial port device.

To start a file transfer press `Ctrl-A Ctrl-S` and select the file to transfer.

8 Appendix: Firmware release changelog

Release	***Date***	***Changes***
2.0.0	2022-8	Added: Modbus tunnel feature Added: Command **bpmreq** is renamed into **gpu**. The terminal command **gpu** can also be given to an RS field port in a Multi node configuration. Added: Improved error message on item UT if TAG name is not exactly 8 characters. Added: Made terminal command case insensitive. Added: Item LW for requesting the weakest measured BPM signal on BPM fieldbus. Added: Item BN also returns the signal levels of the request itself. Added: Cache statistics. Changed: Extended the maximum cache time out value from 30 to 60 seconds. Changed: Default RS field port time out setting from 250 to 600 ms. Changed: Default BPM gain setting from 5 to 8. Bug fix: processing of corrupted GPU messages.
1.0	2022-6	Bug fix: Corrected field port time out processing Bug fix: Store reply from previous request in cache while interrupted by new request Added: command **cu** in help function Added: command **item help** to show available items Changed: replaced commas to \t characters in command **msgmon** output Changed: Textual changes in configuration overview Removed: unused items MB and MR
0.7	2022-5	Changed: renamed UCI modes + corresponding items Bug fixes
0.6	2022-3	Added: Signal strength- and noise level measurements feature
0.5	2022-3	Bug fixes
0.4	2022-2	Added: Multi Node feature Bug fixes
0.3	2021-11-29	Added: Fast Responses (caching) feature
0.2	2021-11-03	Initial Release

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