User Guide
MC5 Fieldbus Option for FOUNDATION Fieldbus

beamex

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Dear user,

We have made every effort to ensure the accuracy of the contents of this manual. Should any errors be detected, we would greatly appreciate to receive suggestions to improve the quality of the contents of this manual.

The above not withstanding, we can assume no responsibility for any errors in this manual or their eventual consequences.

We reserve rights to make modifications to this manual without any further notice.

For more detailed technical data about MC5 Multifunction Calibrator, please refer to MC5 User Guide or contact the manufacturer.

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Contents

General

MC5's FOUNDATION Fieldbus option allows you to calibrate FOUNDATION Fieldbus instruments. All you need is a fieldbus compatible MC5 and a FI5 Fieldbus Interface suited for your fieldbus type.

The MC5/FI5 for FOUNDATION Fieldbus features listed below are presented in more detail further on in this manual.

- Seen as a guest device in a fieldbus segment already having a Link Active Scheduler (LAS, segment's master device).
- Takes care of the Link Active Scheduler (LAS) duties when connecting to a segment without a master device.
- Capability to read and edit the instrument Tag.
- Read and assign the instrument Node Address.
- Read and edit the Transducer Block parameters.
- Device Descriptions supported.

Note.
MC5/FI5 does not support Device Description Methods.

What is Fieldbus

Fieldbus is an industrial digital communications network specifically designed for process automation use. It is meant to replace the existing standard 4 … 20 mA analog signal.

Fieldbus technology has been around since late 80's, but developing an international standard took a long time. There still are several different types of fieldbus implementations, but some of them have become more dominant than others. The two most widely spread types are:

- **FOUNDATION Fieldbus** (www.fieldbus.org/) and
- **PROFIBUS** (www.profibus.com/pb/profibus/process/).

Both are based on IEC fieldbus standard, 61158.

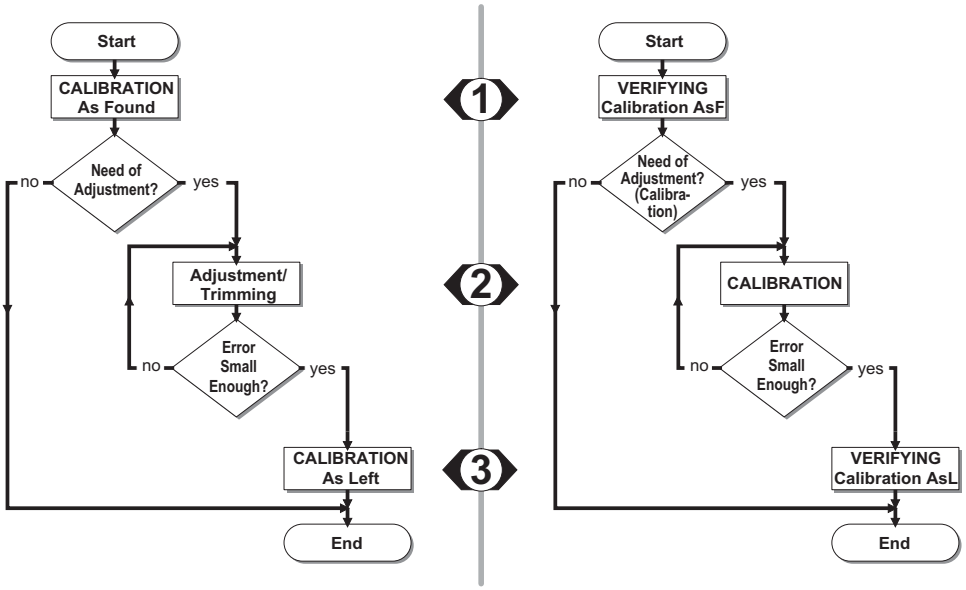
Terminology

There are some inconsistencies between the terminologies used when calibrating/adjusting/trimming traditional analog instruments and new fieldbus instruments.

For both instrument types, the procedure has three phases:

1. Comparing the instrument against a more accurate device (calibrator). This documents the instrument's state "As Found". If all is well (instrument is accurate enough), the 2nd and 3rd phase are not needed.
2. Adjusting/trimming the instrument.
3. Re-comparing to create an "As Left" document of the instrument's state after adjustment/trimming.

The leftmost picture below presents the terms used when calibrating analog instruments. The rightmost one shows the terms used in fieldbus instruments and fieldbus control system software. The numbers of the three phases are shown in the middle.



For analog instruments the term "**Calibration**" is used for comparison phases (1st and 3rd). Phase two is called "**Adjustment**" or "**Trimming**".

In the user interfaces and manuals of fieldbus instruments and fieldbus control system software, the second phase is called "**Calibration**", "Adjustment" and/or "Trimming". So, to avoid confusion Beamex uses the term "**Verifying Calibration**" for the comparison phases in fieldbus environment.

Notes and Warnings

This manual describes the use of MC5 and FI5 for FOUNDATION Fieldbus. For a more general fieldbus information, please refer to your fieldbus control system manuals as well as the manuals for instruments to be calibrated.

Terms like **Function Block Parameters** [**AUTO**, **OOS** (Out of Service), **MAN**], **Transducer Block** etc. should be familiar before attempting to calibrate any fieldbus instruments.

The more instruments a fieldbus segment contains, the slower the communication is. Be patient.

WARNINGS!

When calibrating an instrument that is part of a control system (live segment), first make sure, the control loop the instrument is part of is set to manual. Also remember to check other dependencies between the instrument to be calibrated and other instruments. Finally, set the Transducer Block of the instrument to be calibrated in Out of Service mode before doing the calibration. Failure to do/check these things may result in unexpected behavior of the control system. The consequences may be serious damage, injuries or death!

Using MC5 and FI5 to change the parameters of an instrument may result in discrepancies: A fieldbus host control system may mirror all instrument parameters in its permanent database. In such a case, when returning an instrument with changed parameters to a live segment, ensure that the parameters are also available in the control system's permanent database. Also verify that the new parameters do not result in an unstable control loop.

Do not connect two client devices (e.g. MC5/FI5 and a Field Communicator) at the same time to the same fieldbus segment! They may clash and make the fieldbus segment unstable.

MC5, FI5 and FOUNDATION Fieldbus

A FOUNDATION Fieldbus segment always has a master device called Link Active Scheduler (**LAS**). Beamex's MC5 and FI5 are together seen as a **guest device** (visitor). Connecting FI5 only to the fieldbus does not "awaken" LAS, but once MC5 is communicating with FI5, the LAS should indicate that a guest device is part of a fieldbus segment.

If a fieldbus segment does not have a LAS, MC5/FI5 takes care of the LAS duties.

Calibration Procedure of a Fieldbus Instrument, General

This chapter presents the broad outline of a calibration procedure when calibrating a FOUNDATION Fieldbus instrument using MC5 and FI5. The focus is on presenting requirements unique for FOUNDATION Fieldbus. Being aware of the details presented here allows you to perform a safe and fluent calibration procedure.

A more detailed description of connecting MC5 and FI5 to a FOUNDATION Fieldbus as well as performing the actual calibration is presented further on in this manual.

1. Preparing for the Calibration Procedure

There are two ways to calibrate a FOUNDATION Fieldbus instrument that is part of a live fieldbus segment: Doing it on site or taking the instrument to a workshop for calibration. In both cases:

- Set the instrument's Transducer Block in Out of Service (**OOS**) mode (if applicable). This informs the control system that the instrument's input signal is not available (usable).
- Make sure any other dependencies are set to manual or other corresponding state.

If you calibrate the instrument on site, do the necessary connections and continue to step 2. When taking the instrument to a workshop for calibration, the following additional task is needed:

- Set the instrument as a "**Spare Device**" in the control system ("**Off Line**" in some systems).

See chapter **Notes and Warnings** on page 3 for possible risks when working in a live segment.

2. Verifying Calibration, As Found

Perform the Verifying Calibration using MC5/FI5 for FOUNDATION Fieldbus as presented in chapters further on. Verifying Calibration of fieldbus instruments is basically done as the calibration of analog and HART® instruments. The minor differences that exist are due to the instrument's fully digital output.

Notes.

To be able to perform a Verifying Calibration, the instrument needs to have a Tag and the Node Address can not be in the Default Address area.

New FOUNDATION Fieldbus instruments are often shipped with an empty or default Tag and the Node Address is in the Default Address area. Enter a temporary Tag and Node Address to do the Verifying Calibration of a new instrument.

3. Calibration (Trimming, Adjusting)

Calibrate (Trim, Adjust) the fieldbus instrument using MC5/FI5 as presented in chapters further on.

Note.
MC5 and FI5 affect only the instrument's Transducer Block. It is there the instrument's calibration parameters are located.

4. Verifying Calibration, As Left

Again, perform the Verifying Calibration using MC5/FI5 as presented in chapters further on.

5. Returning the Instrument to a Live Fieldbus Segment

Returning an instrument to a live fieldbus segment requires opposite tasks than those done in step 1.

Again, see chapter **Notes and Warnings** on page 3 for possible problems when returning instruments to a live segment.

Device Descriptions

Each FOUNDATION fieldbus instrument type is unique in what kind of parameters it has in its memory. A few common parameters are similar in all devices, but to fully communicate with a FOUNDATION fieldbus instrument, you need to have a device description file that defines all the parameters in the instrument.

Device description files are done by the instrument manufacturers and made available via manufacturer's and certain fieldbus sites.

MC5 accesses only the instrument's Transducer Block. Therefore Beamex publishes special device descriptions for MC5 and the instruments connected to it. Please contact Beamex if you need device descriptions for new instruments. For contact info, see the first pages of this manual.

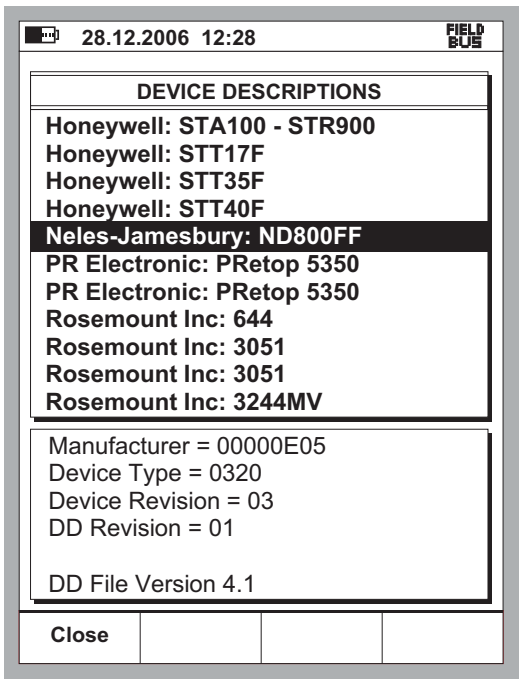
The following chapters describe how available device descriptions can be viewed in MC5 and also how to add new device descriptions to MC5.

Viewing Device Descriptions in MC5

To view device descriptions saved in MC5's memory, press:
D/Menu
C/Others and
4/Device Description Information.

Each row in the list is a device description.

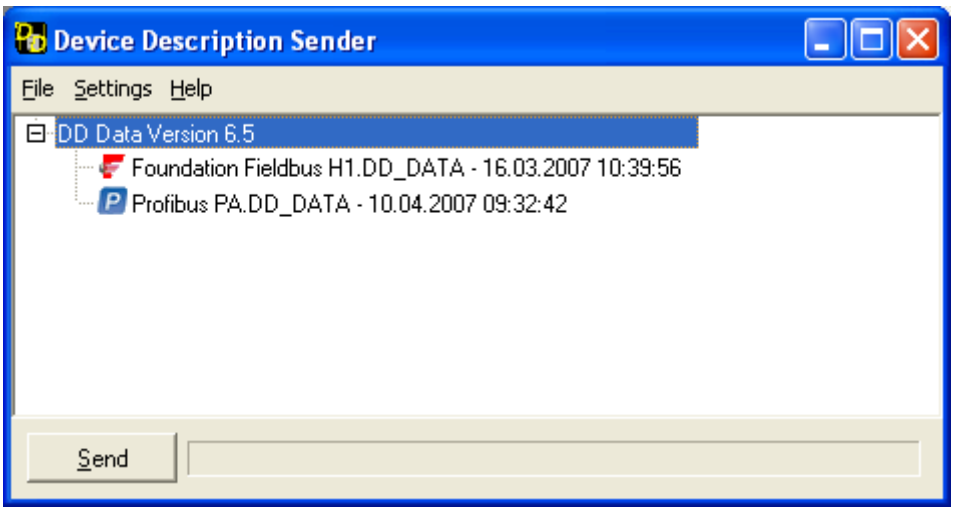
The lower window displays detailed data for the highlighted device and the version number of the Device Description File in MC5.



If the same device name is shown twice in the list, there is some difference in the **Device Type**, **Device Revision** and/or **DD Revision** detail data.

Device Description Sender

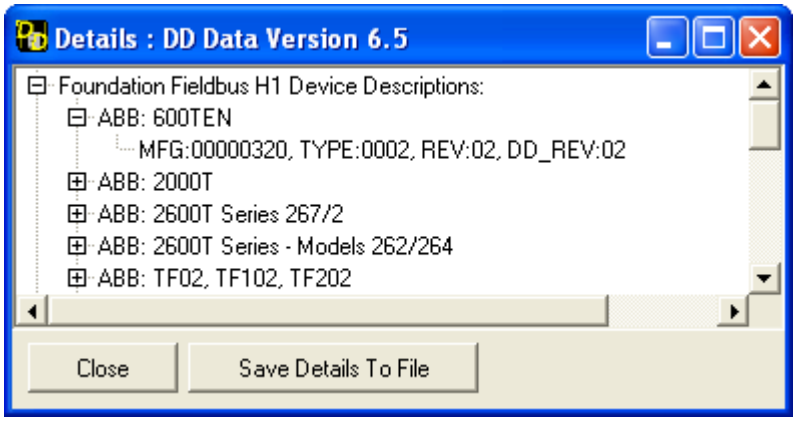
Beamex offers a tool for sending device descriptions to MC5.



Running the Device Description Sender software opens a window with a list of device description data it contains.

Hint.
If the highlight is as shown in the picture above, both FOUNDATION Fieldbus and Profibus PA device descriptions are sent to MC5. If you, e.g. have FOUNDATION Fieldbus instruments only, highlight corresponding row and send only FOUNDATION Fieldbus instrument device descriptions to MC5.

Click the secondary mouse button to view details of the selected set of device data (the secondary mouse button is the rightmost button, if you use the mouse with your right hand).
Details window:



Please contact Beamex if you need Device Descriptions for new instruments. For contact info, see the first pages of this manual.

Fieldbus Instruments and Beamex's Calibration Database Software

CMX Calibration Management Software V2, revision 2.1 and later support fieldbus instruments.

Older calibration software (QM6, QD3 etc.) do not support fieldbus instruments.

Connecting to a FOUNDATION Fieldbus Instrument

The following subchapters present different connection methods. In the two first methods, the instrument is not part of a live segment. In the third method MC5 and FI5 communicate with an instrument connected to a live factory fieldbus segment.

Beamex recommends that instruments should first be removed from a live segment before attempting to communicate with it using MC5 and FI5. For advice on how to remove an instrument from a live segment, see chapter **Calibration Procedure of a Fieldbus Instrument, General** on page 4. For further information, please refer to your fieldbus control system manuals as well as the instrument's manual.

Chapter **Notes and Warnings** on page 3 contains information of things to be aware of when working with live segments.

Notes.

There are no polarity requirements when connecting FI5 to a fieldbus segment.

FI5 takes the power supply from the fieldbus, not via the FI5/MC5 serial communication cable.

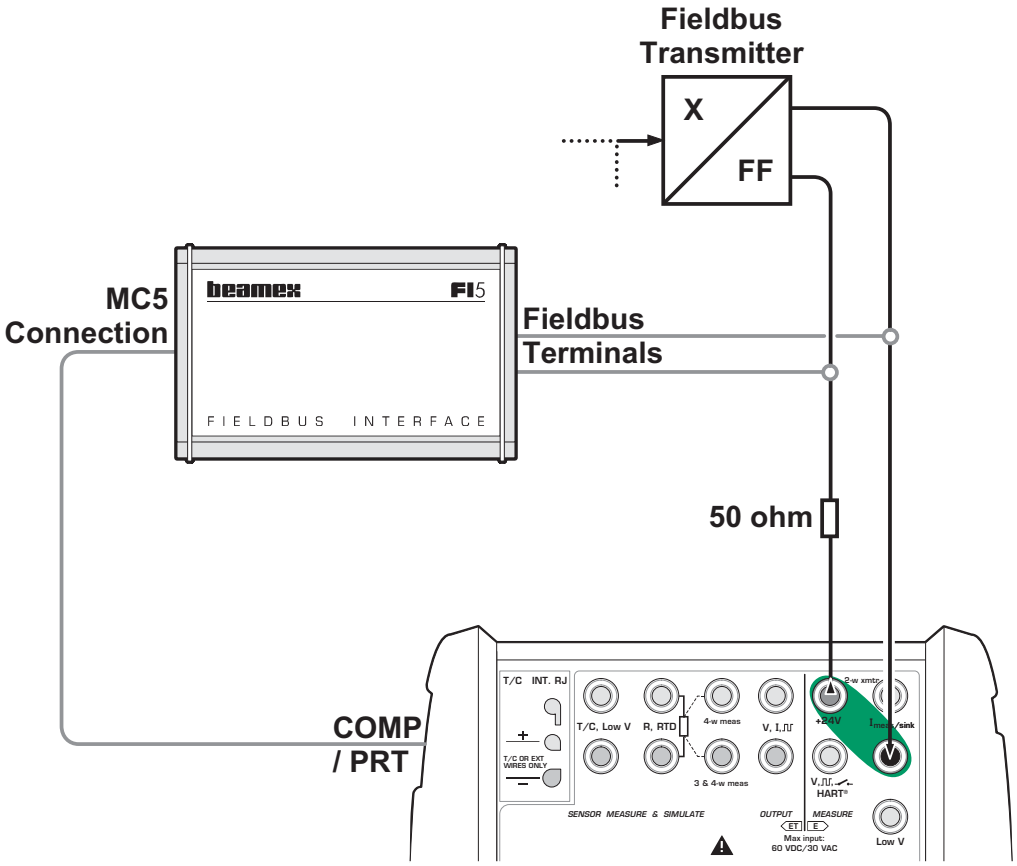
The current consumption of FI5 is between 15 to 20 mA. The current consumption of fieldbus instruments are typically between 10 to 20 mA each.

Methods 1 and 2 do not require that the connections are done using a fieldbus compliant cable. A pair of standard measurement cables can be used. However, when using longer connecting cables there may be need for fieldbus terminators.

Method 1: Supply from the Calibrator

In this method, the instrument is not part of the process or a live factory fieldbus segment. The instrument communicates with MC5 as a standalone instrument and MC5 supplies the power for the fieldbus "stub".

The following picture presents the connections when you want MC5 to provide the power supply without measuring the current consumption:



MC5 provides the power supply and receives fieldbus data via FI5 Fieldbus Interface. Depending on the instrument's input signal, it is either generated/simulated or measured with MC5 (not included in the picture).

MC5's power supply is always available provided the E module is not assigned for other duties in either Basic Mode window.

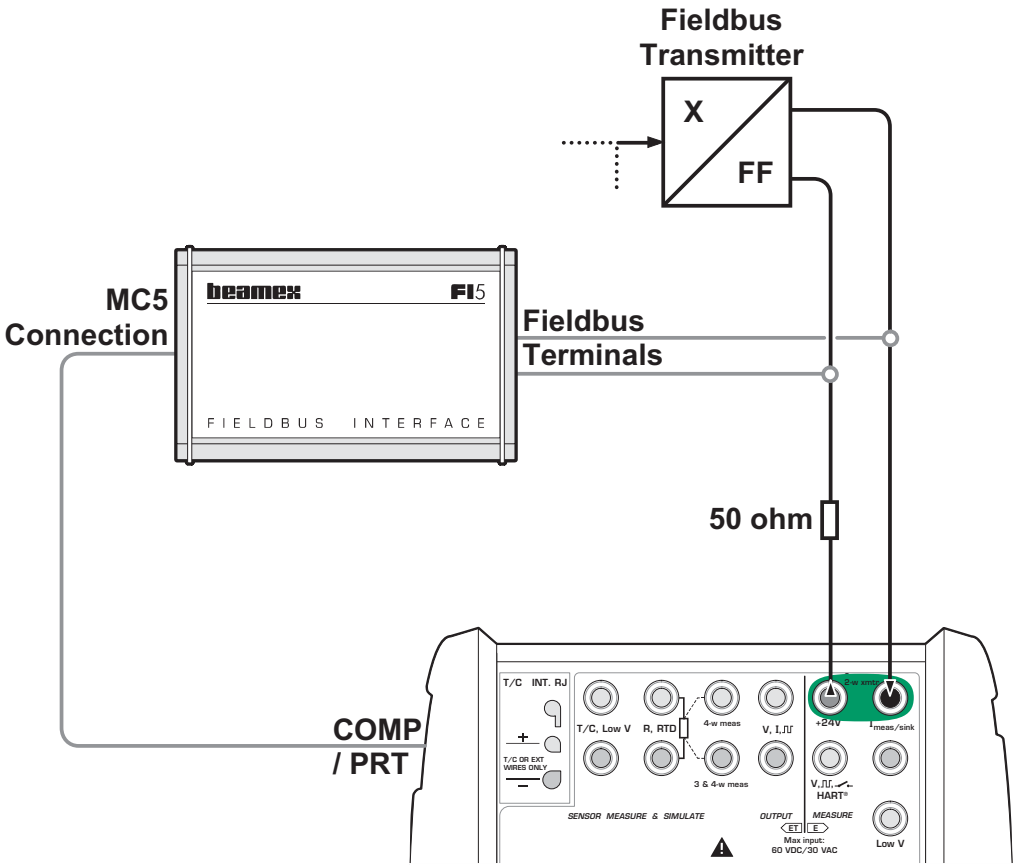
Notes.

Ensure that the loop also includes a resistor with a resistance of approx. 50 ohms between MC5 and the network. See also notes on page 9.

To be able to use this method, MC5 needs to be fieldbus compatible, i.e. able to source current both for FI5 and the fieldbus instrument(s). See notes on page 9 for current consumption specifications.
Max. load for a fieldbus compatible MC5 is approx. 40 mA.
Max. load for a non-fieldbus compatible MC5 is 25 mA.

If you have a non-fieldbus compatible MC5, please contact Beamex to have it serviced to be fieldbus compatible. Beamex's contact info is in the beginning of this manual. Meanwhile, use the method presented on next page.

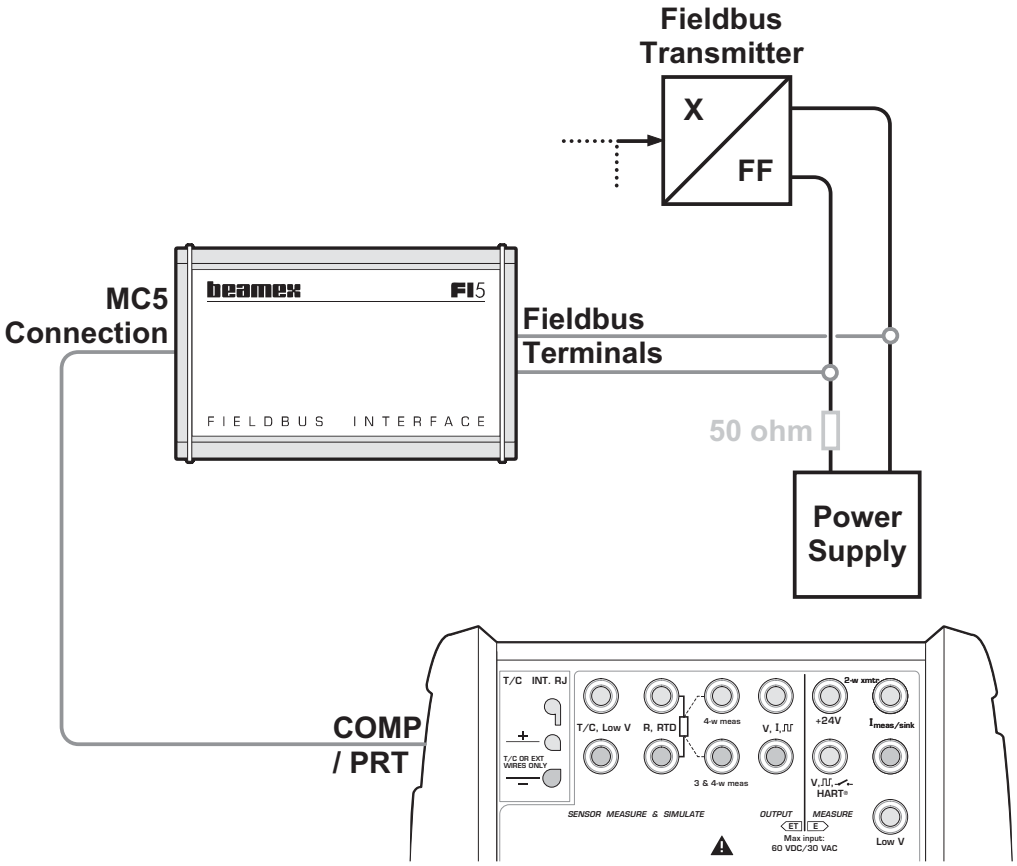
If you want to monitor the current consumption of the fieldbus "stub" and FI5, configure one of MC5's windows to source current (Quantity "**Current**" and Function/Port "**E: I(meas)**"). Then do the connections as shown in the picture below.



Method 2: External Supply

This is also a method where the instrument is not part of the process or a factory fieldbus segment. The instrument communicates with MC5 as a standalone instrument. A separate power supply provides the loop power for the fieldbus "stub".

The following picture presents the connections:



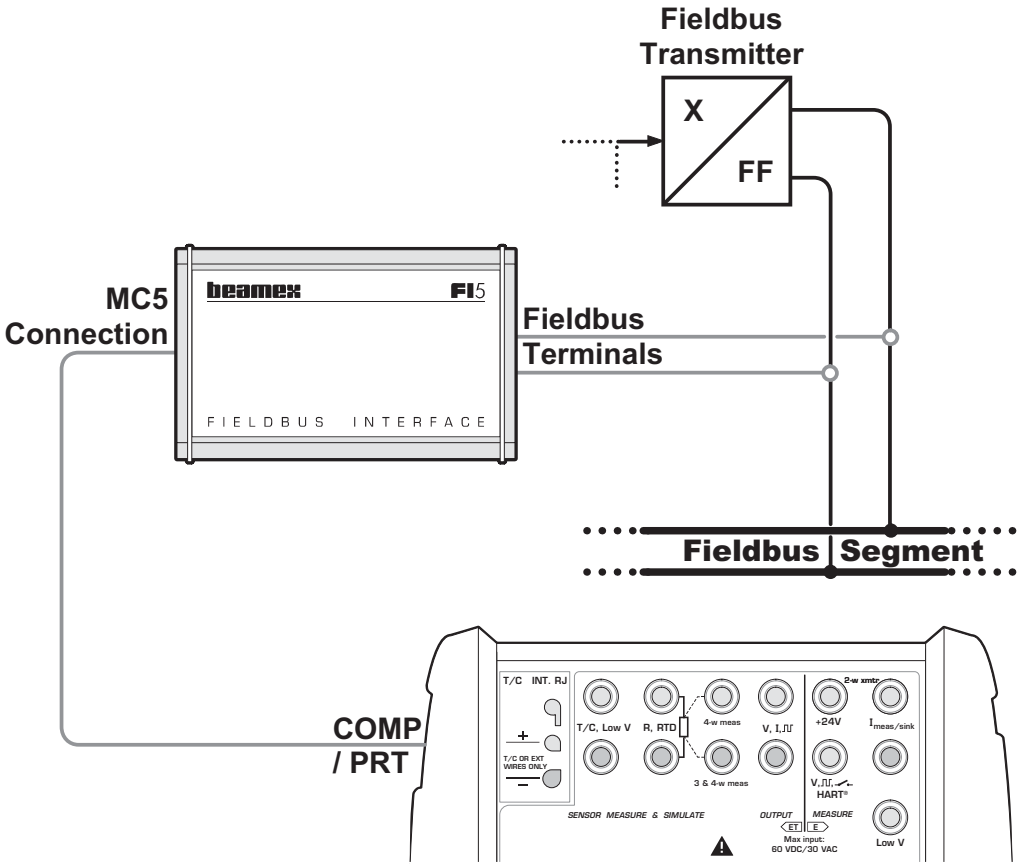
MC5 receives fieldbus data via FI5 Fieldbus Interface. Depending on the instrument's input signal, it is either generated/simulated or measured with MC5 (not included in the picture).

Note.
When using fieldbus compliant power supplies, no additional resistors are needed. With conventional power supplies, include an approx. 50 ohm resistor between the power supply and the network.

Method 3: Connecting MC5 to a Fieldbus Segment

In this method MC5 communicates with the instrument via a live factory fieldbus segment possibly containing several instruments.

Please read chapter Notes and Warnings on page 3 before attempting to connect using this method. Beamex cannot be held responsible for any damages caused by connecting MC5 to a live factory fieldbus segment.



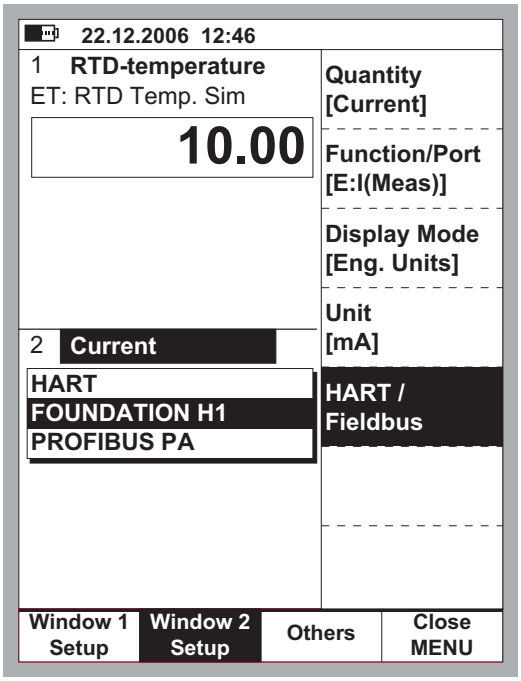
Notes.
Connecting to a live factory fieldbus segment does not require any additional resistors. The segment already includes the required impedance that enables digital communication. See notes on page 9 for current consumption specifications.
In some cases, the power supply of the fieldbus segment cannot maintain a sufficient voltage level when MC5/FI5 is added to the segment. As a result, the communication between MC5/FI5 and the fieldbus transmitter cannot be initiated. When this happens, use one the previously mentioned methods.

Fieldbus and MC5's Basic Mode

Connecting to a FOUNDATION Fieldbus Instrument

To initiate communication with a fieldbus instrument, press:
D/Menu,
B/Window 2 Setup, if needed and
5/HART / Fieldbus.

Select
Foundation H1
from the pop-up list.

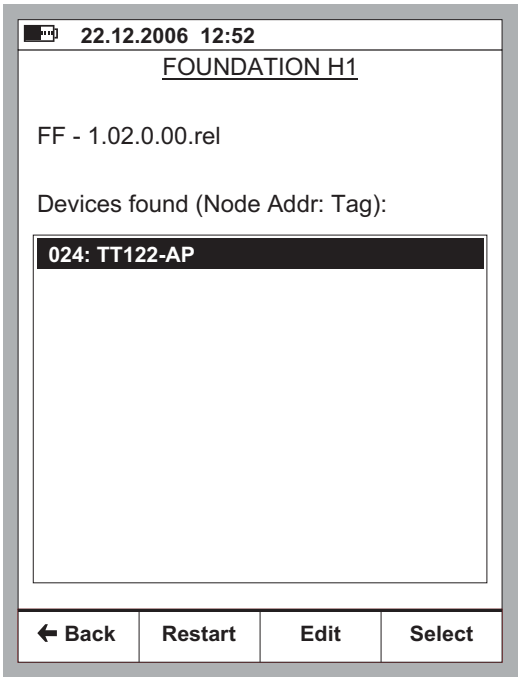


Notes.
The HART / Fieldbus menu options are disabled if the other window already has one of the available Fieldbus communications active. Change the setup of the other window to enable the HART / Fieldbus menu option.

Refer to chapter **Connecting to a FOUNDATION Fieldbus Instrument** on page 9 for information on how to connect MC5 and a fieldbus instrument.

MC5 searches for fieldbus devices connected to FI5 and opens a window similar to the one seen to the right.

Up to 32 instruments may be found in the same fieldbus segment.



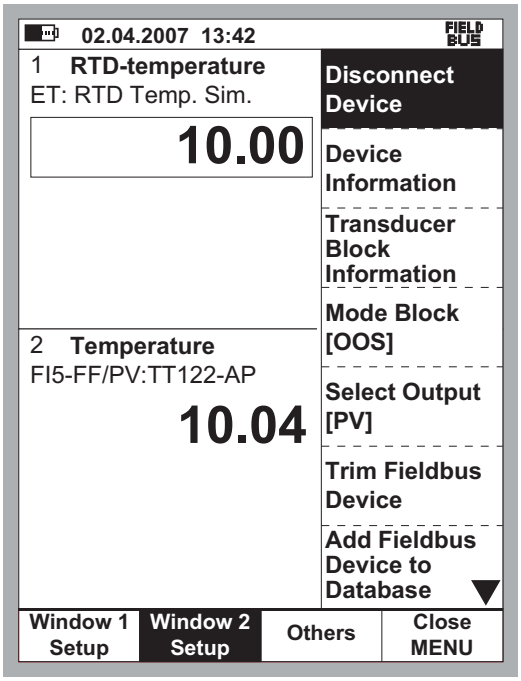
Use the ***C***/Edit button to edit the selected instrument's **Tag** and/or its **Node Address**.

Choose an instrument by pressing ***D***/Select (optionally either the ↵ or the ⑨ key).

> *Note.*
> *If MC5 does not have required Device Descriptions, full communication cannot be initiated. In this case a window opens telling what kind of Device Description is needed. Contact Beamex to receive instructions on how to correct the problem.*

After required instrument data is read, MC5 returns to Basic Mode with the fieldbus instrument assigned to the chosen window. The measurement quantity of the window where the fieldbus instrument was selected to is automatically changed to the quantity of the fieldbus instrument's primary value.

The standard Window Setup menu is replaced by a fieldbus menu (see adjacent picture).



Fieldbus Window Setup Menu

A window reserved for fieldbus communication has its own menu. All menu items are presented in the following subchapters.

Disconnect Device

This option disconnects the fieldbus instrument from MC5/FI5.

To disconnect, select
D/Menu and
B/Window 2 Setup, if needed
1/Disconnect Device.

The fieldbus communication is terminated and the fieldbus menu is replaced by the standard Window Setup menu.

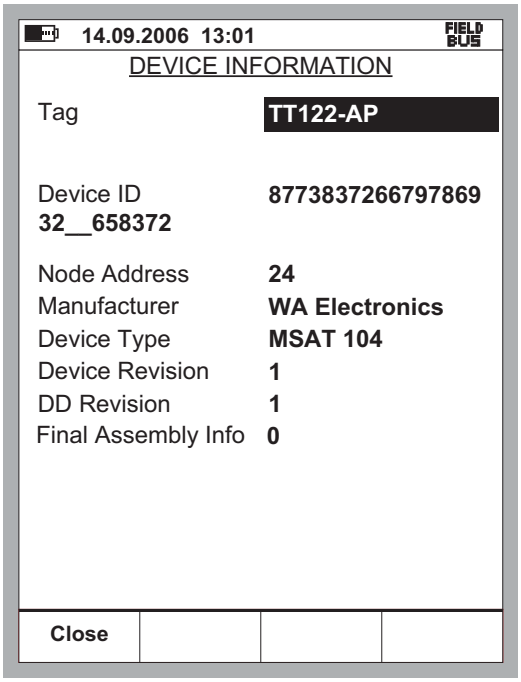
Device Information

To open the Device Information window, press

D/Menu and
B/Window 2 Setup, if needed
2/Device Information.

This window contains read-only information of the connected instrument.

Note that the **Tag** and **Node Address** fields cannot be edited here. It is done while connecting to the instrument using the ***C***/Edit Function Key.



Transducer Block Information

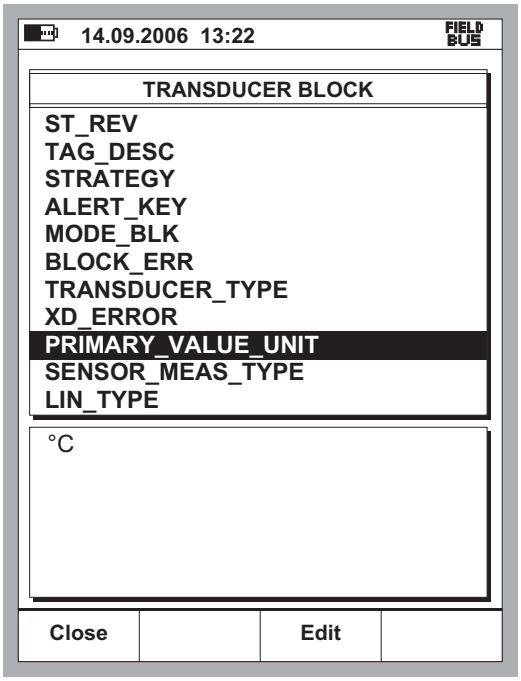
To open the Transducer Block Information window, press

D/Menu and

B/Window 2 Setup, if needed

3/Transducer Block Information.

The contents of this window depend on the connected instrument. This is because Transducer Block parameters vary from instrument to instrument.



Normally you do not need to edit any of the parameters shown here. The most likely one in need of editing is the unit. If MC5 supports the unit, it is shown as in the example picture above. If MC5 does not support the unit, a numeric value is shown instead of the unit.

Notes.

To quickly browse through the list of parameters use MC5's 8 and 0 keys.

When editing a unit field, MC5 displays the numeric code for the unit (the code is as defined in fieldbus specifications). Please refer to ***Appendix 1*** *on page 28 or the instrument's manual to see which numeric code corresponds to which unit.*

Several other Transducer Block parameters are also edited using a numeric code.

Mode Block

Mode Block is an important Transducer Block parameter while calibrating instruments. That's why it is directly available via MC5's menu.

Use this to set the instrument in either **OOS - Out Of Service** or **Auto - Automatic** mode.

See also chapter **Notes and Warnings** on page 3

Select Output

Select Output is another important Transducer Block parameter directly available via MC5's menu. The available options vary depending on the instrument at hand.

Some instruments require that another output is selected when trimming/adjusting the instrument. That is why the selection of output is made easily available.

Trim Fieldbus Device

This option allows you to trim/adjust a fieldbus instrument without performing a Verifying Calibration.

When selected, you first need to enter instrument data as presented in MC5 User Guide's Section D (Chapter **Maintaining MC5's Instrument database**).

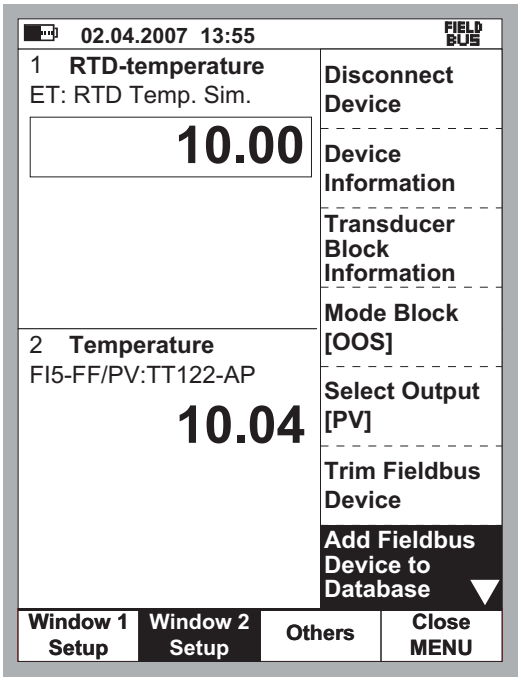
The rest of the trimming/adjustment procedure is done as presented in chapter **Calibrating (Trimming, Adjusting) a Fieldbus Instrument** on page **24** of this manual.

Add a Fieldbus Device to Database

This is a semi-automatic tool for adding a fieldbus instrument to MC5's instrument database. To start adding, press

D/Menu and
B/Window 2 Setup, if needed
7/Add Fieldbus Device to Database.

The instrument is added and MC5 places some default values for calibration related fields that are missing in the instrument's memory.

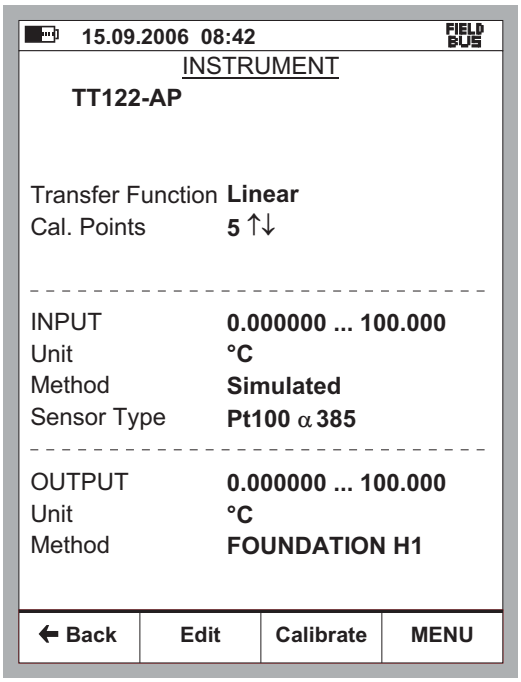


Note.
MC5 supports Tags and Device IDs that have max. 25 characters. Longer Tags and Device IDs are truncated.

The following table presents which parameter in a fieldbus instrument gets linked to which field in MC5 when adding a fieldbus instrument to MC5:

Fieldbus Instrument Parameters	Corresponding Fields in MC5
PD_TAG	Position ID
DEVICE_ID	Device ID
FINAL_ASSY_NUM	Serial Number

When the instrument is added to MC5, a display like the adjacent picture opens.



To edit the default values, press ***B***/Edit. Edit/check at least the following fields:

- **Error Calculation Method**
- **Reject if >**
- **Input Port**
- **Input Range**
- **Input Unit**
- **Output Range**
- **Output Unit**
- **Calibration Method**
- **Calibration Points**

For more information MC5's instrument database, see section D in your MC5 User Guide.

The **Output Method** for a FOUNDATION Fieldbus instrument is always "**FOUNDATION H1**".

Notes.

MC5 sets its own internal default values to the input and output ranges. Check/edit them in order to create valid Verifying Calibrations.

When adding a fieldbus instrument to MC5, the measurement unit is fetched from the fieldbus instrument. If MC5 does not support the unit, you need to change it to a unit supported by MC5. Verifying Calibration and Trimming is not possible when a unit not supported by MC5 is in use in the fieldbus instrument. See ***Appendix 1, FOUNDATION Fieldbus Units Supported*** by MC5 *on page 28 for a list of supported unit.*

For information on how to change the instrument's unit, see chapter ***Transducer Block Information*** *on page 17.*

Unit

To change the unit used in MC5's display, press

D/Menu,
B/Window 2 Setup, if needed
8 (opens the second page of the menu) and
4/Display Unit.

Notes.

In Basic Mode, the unit used in MC5's display need not be the same as in the instrument itself. Fieldbus instruments use numeric codes for the units they support. When connecting to an instrument, MC5 gets the unit from the instrument. If the unit is not supported in MC5, the unit's numeric code is shown and the Quantity is set to "None". Verifying Calibration and Trimming is not possible when a unit not supported by MC5 is in use in the fieldbus instrument. See ***Appendix 1, FOUNDATION Fieldbus Units Supported*** by MC5 *on page 28 for a list of supported unit.*

This setting does not alter the unit used in the instrument. For information on how to change the instrument's unit, see chapter ***Transducer Block Information*** *on page 17.*

Performing a Verifying Calibration

Selecting the Instrument

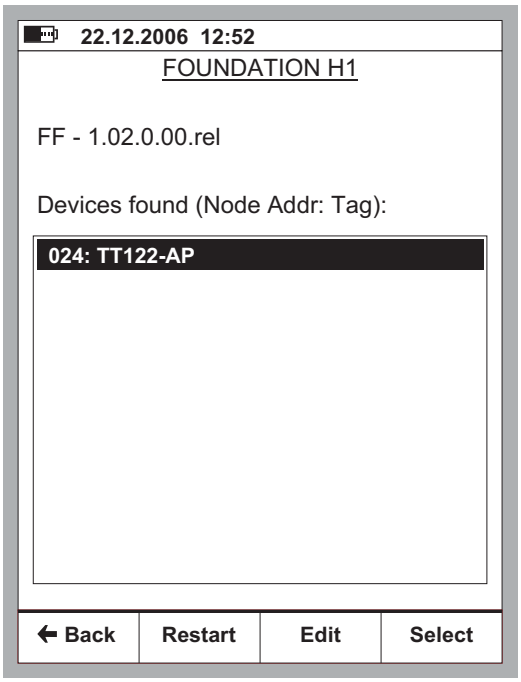
To be able to calibrate a fieldbus instrument, it has to be added to MC5's instrument database.

Adding the instruments can be done using the utility described in chapter **Add a Fieldbus Device to Database** on page 19. Additionally, you can also manually enter the instrument data into MC5's instrument database.

From **Basic Mode**, go to **Calibration Mode** (***A***/Calibration Mode). Then select the instrument to be calibrated from MC5's list of available instruments.

If you are already connected to the fieldbus instrument (fieldbus communication started in Basic Mode), MC5 continues directly from the Instrument Window to the Calibration Windows.

If fieldbus communication is not started, MC5 prompts you to start the communication and select the instrument in a window similar to the adjacent picture.

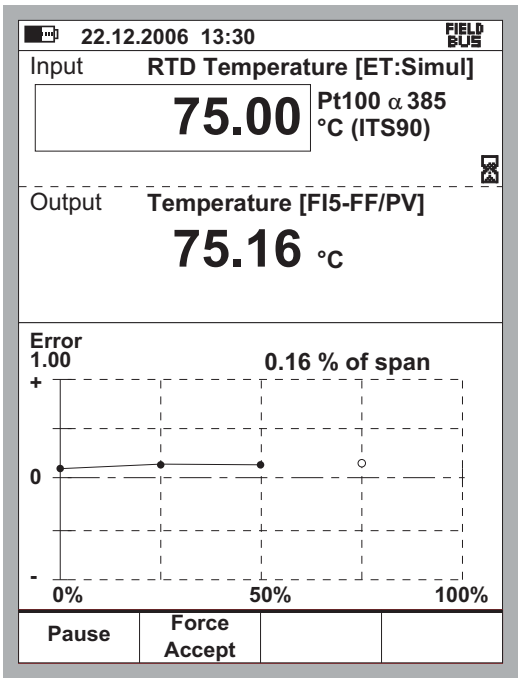


MC5 accepts the fieldbus instrument as the instrument to be calibrated only if its instrument data matches with the data of the instrument selected in MC5.

Note.
The instrument data in MC5 and in the instrument to be connected need to match.

Doing the Verifying Calibration

Doing a Verifying Calibration for a fieldbus instrument does not differ from the calibration of a non-fieldbus instrument with similar input quantity, input method and output quantity. Refer to the examples in MC5 User Guide's Part D.



Note.

When adding a fieldbus instrument to MC5, the measurement unit is fetched from the fieldbus instrument. If MC5 does not support the unit, you need to change it to a unit supported by MC5. Verifying Calibration and Trimming is not possible when a unit not supported by MC5 is in use in the fieldbus instrument. See ***Appendix 1, FOUNDATION Fieldbus Units Supported*** by MC5 *on page 28 for a list of supported unit.*

For information on how to change the instrument's unit, see chapter ***Transducer Block Information*** *on page 17.*

Calibrating (Trimming, Adjusting) a Fieldbus Instrument

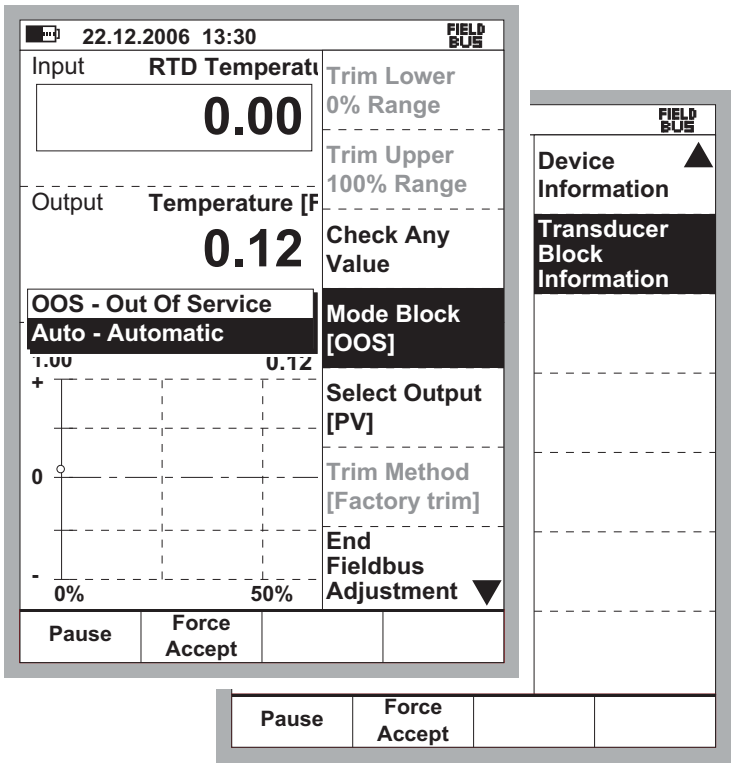
To start Calibrating (Trimming, Adjusting) a Fieldbus Instrument in Calibration Mode, press

D/Menu and

1/Start Fieldbus Adjustment

while viewing the calibration windows.

The opened menu has two pages as shown in the adjacent picture.



The actual Calibrating (Trimming, Adjusting) procedure varies depending on the instrument at hand.
Please refer to your fieldbus instrument's manual for device specific information.

The following list present the most common steps together with some hints on what to additional steps may be included:

1. Certain fieldbus instruments require that the mode of the Transducer Block is set to Out of Service Mode before any Calibration (Trimming, Adjustment) is allowed.
   Use the Fieldbus Instrument Adjustment menu's
   4/Mode Block option to set the mode.
   Also check the note at the end of this chapter.

2. If some of the options in the Fieldbus Instrument Adjustment menu's items are greyed (refer to the picture on the previous page), the selected output for that particular instrument cannot be trimmed. Change the output using menu option ***5***/Select Output.
3. When enabled, check the Trim Method option in the Fieldbus Instrument Adjustment menu. It should be as stated in the instrument's manual (Transducer Block parameter **SENSOR_CAL_METHOD**).
4. Some instruments have extra parameters that need to be set before Trimming can be performed, e.g **CAL_UNIT** and **TRIM_MODE**.
   For these parameters, use the Transducer Block Information option on the second page of the Fieldbus Instrument Adjustment menu to see/edit all Transducer Block parameters. When the menu is opened, press ***8*** to see the second menu. Then select ***2***/Transducer Block Information.
5. To perform the actual trimming procedure, do as follows:
   Select the ***1***/Trim Lower 0% Range option from the Fieldbus Instrument Adjustment menu.
   - If the input signal is generated/simulated with MC5, the input signal is automatically set to span zero value.
   - For instruments where MC5 measures the input and another device generates/simulates the instrument's input, set the input to span zero value.

   In both cases, MC5's Input window displays the instrument's input signal. The Output window displays the digital output of the instrument.
6. The lower part of the Output window includes an additional trim field. Use either the ***C***/Fetch Function Key to copy the value shown in the input window or manually enter a value the digital output should be trimmed to. Then use the ***D***/Send Function Key to trim the zero point.
   The corrected value is sent to Transducer Block parameter, **CAL_POINT_LO** (or similar, depending on the instrument at hand).

7. Then select the ***2***/Trim Upper 100% Range option from the Fieldbus Instrument Adjustment menu. Otherwise, the trimming procedure is similar to phases 5 and 6.
   In this case, the corrected value is sent to Transducer Block parameter, **CAL_POINT_HI** (or similar, depending on the instrument at hand).
   Note.
   *You may also check the trim of any point by using the menu's **3**/Check Any Value option.*
8. Setting the calibration date in the fieldbus is done by editing the following (or corresponding) Transducer Block parameters:
   SENSOR_CAL_DATA
   SENSOR_CAL_WHO
   SENSOR_CAL_LOC
   To edit these parameters, use the Transducer Block Information option on the second page of the Fieldbus Instrument Adjustment menu to see/edit all Transducer Block parameters. When the menu is opened, press ***8*** to see the second menu. Then select ***2***/Transducer Block Information.
9. To end the trimming procedure, reset all the fields that were modified while enabling Calibration (Trimming, Adjusting), e.g. ***4***/Mode Block, ***6***/Trim Method etc.

Notes.

*If the Instrument's Resource Block's mode is set to Out of Service (**OOS**), the mode of the Transducer Block cannot be changed until the mode of the Resource Block is set to "**Auto**".*

*The PV output value of some FOUNDATION Fieldbus instruments "freeze" when the mode of the Transducer Block is set to Out of Service (**OOS**). The instrument's input signal is however still received and you may trim the instrument anyhow. When the Transducer block is set to "**Auto**" again, the new trim values are automatically taken into use and the output is "alive" again.*

Fieldbus Communication Settings

You may view/edit fieldbus settings in Basic Mode by pressing:

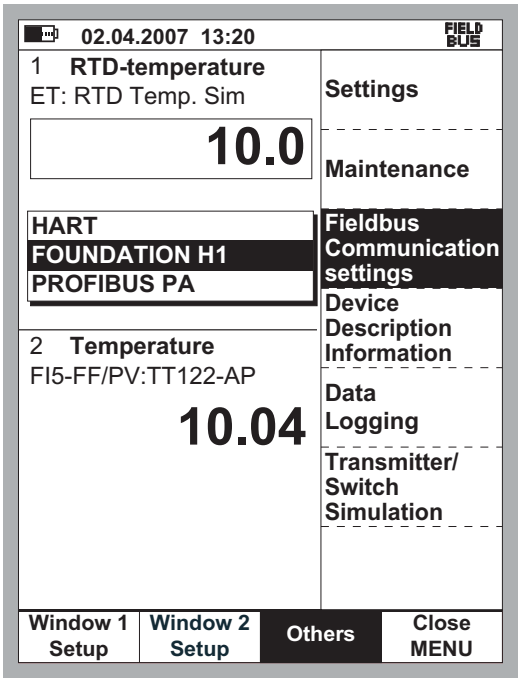
D/Menu,
C/Others,
3/Fieldbus Communication Settings.

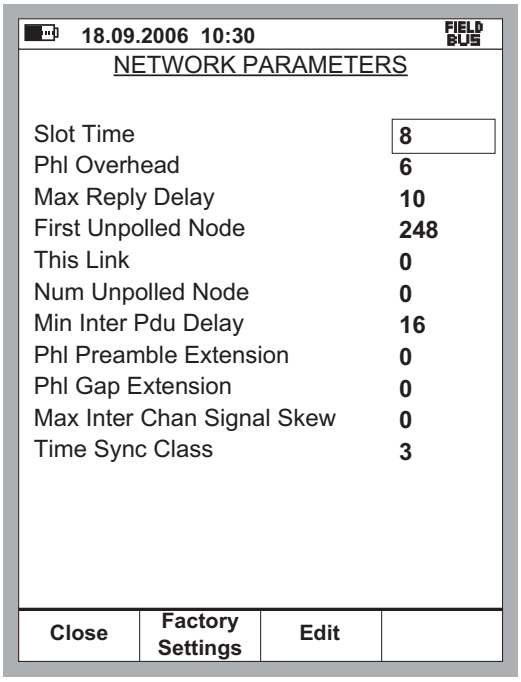
Select Foundation H1 from the pop-up list.

A window opens where the communication settings are presented (see picture below).

Normally you do not need to chance the default settings (seen in the adjacent picture).

Consult your fieldbus instruments' manual when you plan to change the communication settings. Otherwise you may lose connection with it.





Appendix 1, FOUNDATION Fieldbus Units Supported by MC5

Note.
Certain instruments may not support all codes listed here. When in doubt, please consult the instrument's manual.

Temperature Units

Unit Code in Fieldbus Instruments	Displayed Unit in Fieldbus Instruments	Displayed Unit in MC5
1000	K	K
1001	°C	°C
1002	°F	°F
1003	°R	°R

Frequency Units

Unit Code in Fieldbus Instruments	Displayed Unit in Fieldbus Instruments	Displayed Unit in MC5
1077	Hz	Hz
1081	kHz	kHz
1083	cpm	cpm

Pressure Units

Unit Code in Fieldbus Instruments	Displayed Unit in Fieldbus Instruments	Displayed Unit in MC5
1130	Pa	Pa
1132	MPa	MPa
1133	kPa	kPa
1136	hPa	hPa
1137	bar	bar
1138	mbar	mbar
1139	torr	torr
1140	atm	atm
1141	psi	psi
1142	psia	psia

Cont…

Pressure units, continued

Unit Code in Fieldbus Instruments	Displayed Unit in Fieldbus Instruments	Displayed Unit in MC5
1143	psig	psig
1144	gf/cm^2	gf/cm^2
1145	kgf/cm^2	kgf/cm^2
1146	inH_2O	inH_2O
1147	inH_2O(4°C)	inH_2O @ 4°C
1148	inH_2O(68°F)	inH_2O @ 68°F
1149	mmH_2O	mmH_2O
1150	mmH_2O(4°C)	mmH_2O @ 4°C
1151	mmH_2O(68°F)	mmH_2O @ 68°F
1152	ftH_2O	ftH_2O
1153	ftH_2O(4°C)	ftH_2O @ 4°C
1154	ftH_2O(68°F)	ftH_2O @ 68°F
1155	inHg	inHg
1156	inHg(4°C)	inHg @ 4°C
1157	mmHg	mmHg
1158	mmHg(4°C)	mmHg @ 4°C
1541	Paa	Pa
1542	Pag	Pa
1545	mPaa	mPa
1546	mPag	mPa
1547	kPaa	kPa
1548	kPag	kPa
1553	hPaa	hPa
1554	hPag	hPa
1555	gf/cm^{2}a	gf/cm^2
1556	gf/cm^{2}g	gf/cm^2
1557	kgf/cm^{2}a	kgf/cm^2
1558	kgf/cm^{2}g	kgf/cm^2
1559	inH_2Oa	inH_2O
1560	inH_2Og	inH_2O
1561	inH_2Oa(4°C)	inH_2O @ 4°C
1562	inH_2Og(4°C)	inH_2O @ 4°C
1563	inH_2Oa(68°F)	inH_2O @ 68°F
1564	inH_2Og(68°F)	inH_2O @ 68°F
1565	mmH_2Oa	mmH_2O
1566	mmH_2Og	mmH_2O
1567	mmH_2Oa(4°C)	mmH_2O @ 4°C
1568	mmH_2Og(4°C)	mmH_2O @ 4°C
1569	mmH_2Oa(68°F)	mmH_2O @ 68°F
1570	mmH_2Og(68°F)	mmH_2O @ 68°F
1571	ftH_2Oa	ftH_2O
1572	ftH_2Og	ftH_2O
1573	ftH_2Oa(4°C)	ftH_2O @ 4°C
1574	ftH_2Og(4°C)	ftH_2O @ 4°C
1575	ftH_2Oa(68°F)	ftH_2O @ 68°F
1576	ftH_2Og(68°F)	ftH_2O @ 68°F

Cont…

Pressure units, continued

Unit Code in Fieldbus Instruments	Displayed Unit in Fieldbus Instruments	Displayed Unit in MC5
1577	inHga	inHg
1578	inHgg	inHg
1579	inHga(0°C)	inHg @ 0°C
1580	inHgg(0°C)	inHg @ 0°C
1581	mmHga	mmHg
1582	mmHgg	mmHg
1583	mmHga(0°C)	mmHg @ 0°C
1584	mmHgg(0°C)	mmHg @ 0°C
1590	barg	bar
1591	mbarg	mbar

Electrical Units

Unit Code in Fieldbus Instruments	Displayed Unit in Fieldbus Instruments	Displayed Unit in MC5
1211	mA	mA
1212	µA	µA
1240	V	V
1243	mV	mV
1244	µV	µV
1281	ohm	Ω
1284	kohm	kΩ

Appendix 2, Useful FOUNDATION Fieldbus Codes

Sensor Types (Variable SENSOR_TYPE)

Sensor Type, Code	Description
100	Flow sensor unknown
101	Coriolis (Gyroscopic)
102	Electromagnetic
103	mV
104	Ω
105	ΔΩ
106	Nuclear magnetic resonance
107	Positive displacement
108	Refraction
109	Taggin
110	Ultrasonic (Doppler)
111	Ultrasonic (time of travel)
112	Vortex
113	Target
114	Variable area
115	Level sensor unknown
116	Radar
117	Capacitance
118	Nuclear
119	Ultrasonic
120	Float gauge
121	Pressure sensor unknown
122	Resonant wire
123	Vibrating beam
124	Strain gauge
125	Piezo resistive
126	Silicon resonant
127	Temperature sensor unknown
128	PT100_A_385 (IEC 751)
129	PT100_A_392 (JIS 1604)
130	PT200_A_385 (IEC 751)
131	PT500_A_385 (IEC 751)
132	NI120, Edison # 7
133	CU10, Edison # 15

Cont…

Sensor Types, continued

Sensor Type, Code	Description
134	T/C Type B (IEC 584-1, and NIST 175)
135	T/C Type C (NIST 175)
136	T/C Type E (IEC 584-1, and NIST 175)
137	T/C Type J (IEC 584-1, and NIST 175)
138	T/C Type K (IEC 584-1, and NIST 175)
139	T/C Type N (IEC 584-1, and NIST 175)
140	T/C Type R (IEC 584-1, and NIST 175)
141	T/C Type S (IEC 584-1, and NIST 175)
142	T/C Type T (IEC 584-1, and NIST 175)
143	T/C Type DIN L (DIN 43710)
144	T/C Type DIN U (DIN 43710)
145	BALCO, 3KOhm
146	Contacting Conductivity
147	Toroid Conductivity
148	PT1000_A_385 (IEC 751)
149	Magnetostrictive
150	TDR Level
151	pH
152	ORP
153	Standard Oxygen Amperometric
154	Trace Oxygen Amperometric
155	Steam Sterilizable Oxygen Amperometric Type 1
156	Steam Sterilizable Oxygen Amperometric Type 2
157	Free Chlorine Amperometric
158	Total Chlorine Amperometric
159	Monochloramine Amperometric
65520- 65534	Reserved (Manufacturer Specific)
65535	Non-standard

Linearity Types (Variable LIN_TYPE)

Linearization Type, Code	Description
0	undefined
1	linear with input
2	linear with output
3	square root
4	square root to the third power
5	square root to the fifth power
255	other

Calibration Methods (Variable SENSOR_CAL_METHOD)

Calibration Method, Code	Description
100	volumetric
101	static weigh
102	dynamic weigh
103	factory trim standard calibration
104	user trim standard calibration
105	factory trim special calibration
106	user trim special calibration
240-254	Reserved (Manufacturer Specific)
255	other

Notes

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