PROCESS AUTOMATION

Application Guideline

FOUNDATION™ fieldbus for LEPIU

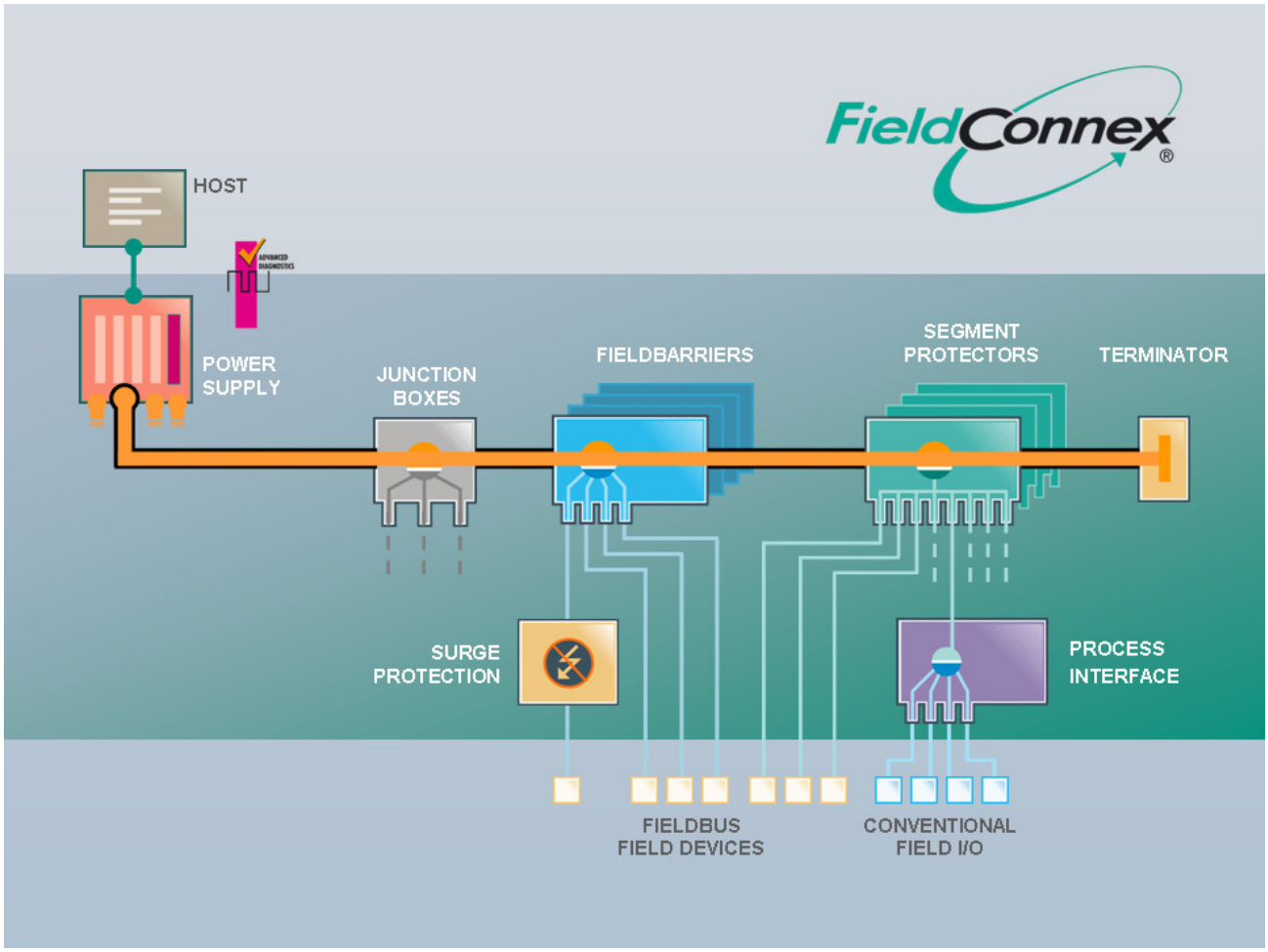
The TDC 2000 and TDC 3000 Low Energy Process Interface Unit (LEPIU) provides termination and pre-processing of various temperature signals. Due to the age of various components, these have become unavailable or very expensive to purchase. Many users are looking for a cost effective replacement.
This document describes how, in case of temperature signals, the LEPIU system could be replaced by a FOUNDATION™ fieldbus solution in Zone 1 and Zone 2 hazardous area applications.

Prepared by:

Thomas Klatt
Business Development Manager

Marty Brickner
Global Account Manager Honeywell

PEPPERL+FUCHS
PROTECTING YOUR PROCESS



Pepperl+Fuchs is the proven market leader for innovative and highly available components for your fieldbus according to IEC 61158-2. With quality components to fit your process automation system and demands in the field our highly reliable and energy-efficient design allows you to focus on the task at hand. Knowing that your fieldbus is running.

The High-Power Trunk Concept with Entity or FISCO devices: Connect the maximum number of devices to the same fieldbus trunk; and at the same time make use of maximum cable lengths. This concept utilizes standard power supplies such as the easy to install and configuration free Power Hub. Segment Protectors and FieldBarriers are installed close to field devices and limit the energy at the spur. You are free to work on field devices without hot work permit.

Advanced Diagnostics: Take control of your fieldbus installation. This latest innovation brings transparency to fieldbus. Speed up commissioning with automated documentation. Measure fieldbus performance and detect changes in the control room before they become critical to your plants operation.

You can rely on products built to serve your every need in fieldbus for process automation. You can gain from the experience of knowledgeable engineers to create your fieldbus solution. You can be at ease with products and solutions from Pepperl+Fuchs.

FOUNDATION™ fieldbus for LEPIU

Content

Introduction

The Low Energy Process Interface Unit (LEPIU) is used in a lot of applications for termination and preprocessing of analog inputs. They are commonly used with temperature signals where intrinsic safety (IS) or remote multiplexing of these signals is required.

The LEPIU is a development of the late 1980's, therefore not only is the technology old, a lot of the components have now become obsolete and/or difficult to get.

This document describes how such a LEPIU system for temperature signals could be replaced by Temperature Multi-Input devices (TM-I), using FOUNDATION™ fieldbus as data transmission technology.

Structure of a LEPIU System

LEPIU is a multiplexer system, consisting of

- A common card file assembly (CCFA)
- IS barrier(s) for intrinsic safe application
- Up to 16 multiplexer boxes, which contain the termination cards

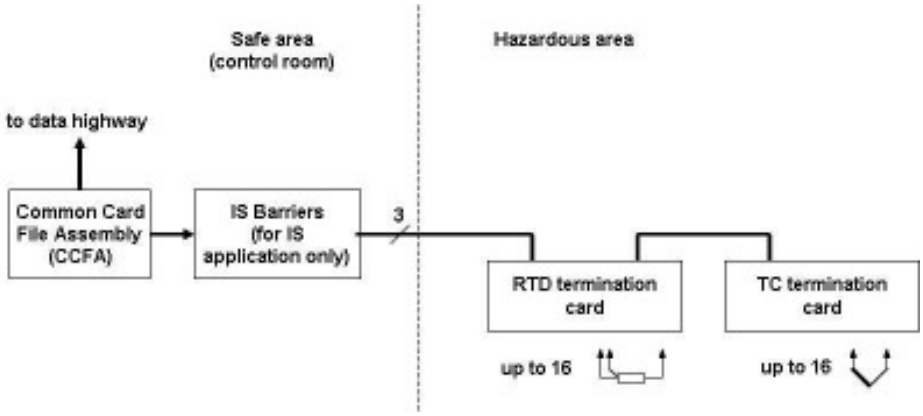


Figure 1: Structure of a LEPIU system

Each termination card is able to handle up to 16 temperature sensors. Overall it is possible to handle up to 254 temperature sensors.

The RTD/TC termination cards in the field are mounted in an enclosure according to the environmental requirements. There are two options available for a replacement:

- Replacing the whole enclosure including the required electronic
- Replacing just the electronic

If the second option should be realized the new electronics must be mounted on a board which matches the inner dimensions of the field enclosure. These dimensions typically are 430 mm * 340 mm.

FOUNDATION™ fieldbus solution

The main target is to transmit as many temperature signals as possible via the lowest amount of cables. Today a common technology for such a data transfer is FOUNDATION™ fieldbus. A solution for transmission of temperature signals by using this technology is shown in the following figure:

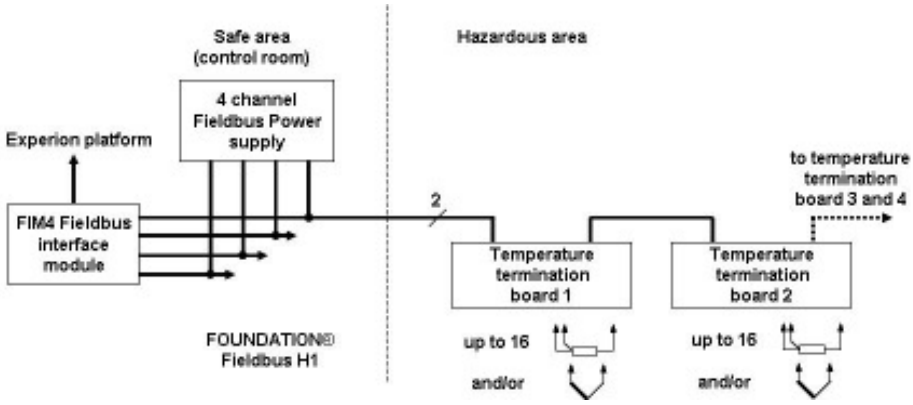


Figure 2: Transmission of temperature signals via FOUNDATION™ fieldbus

The temperature termination board is able to handle 16 temperature signals. This is equal to a termination card of the LEPIU system, and consists of

- a FieldBarrier and two Temperature Multi-Input devices for Zone 1 application
- or a Segment Protector and two Temperature Multi-Input devices for safe area or Zone 2 application

As an example the following drawing shows the Zone 1 solution when just the electronic shall be replaced:

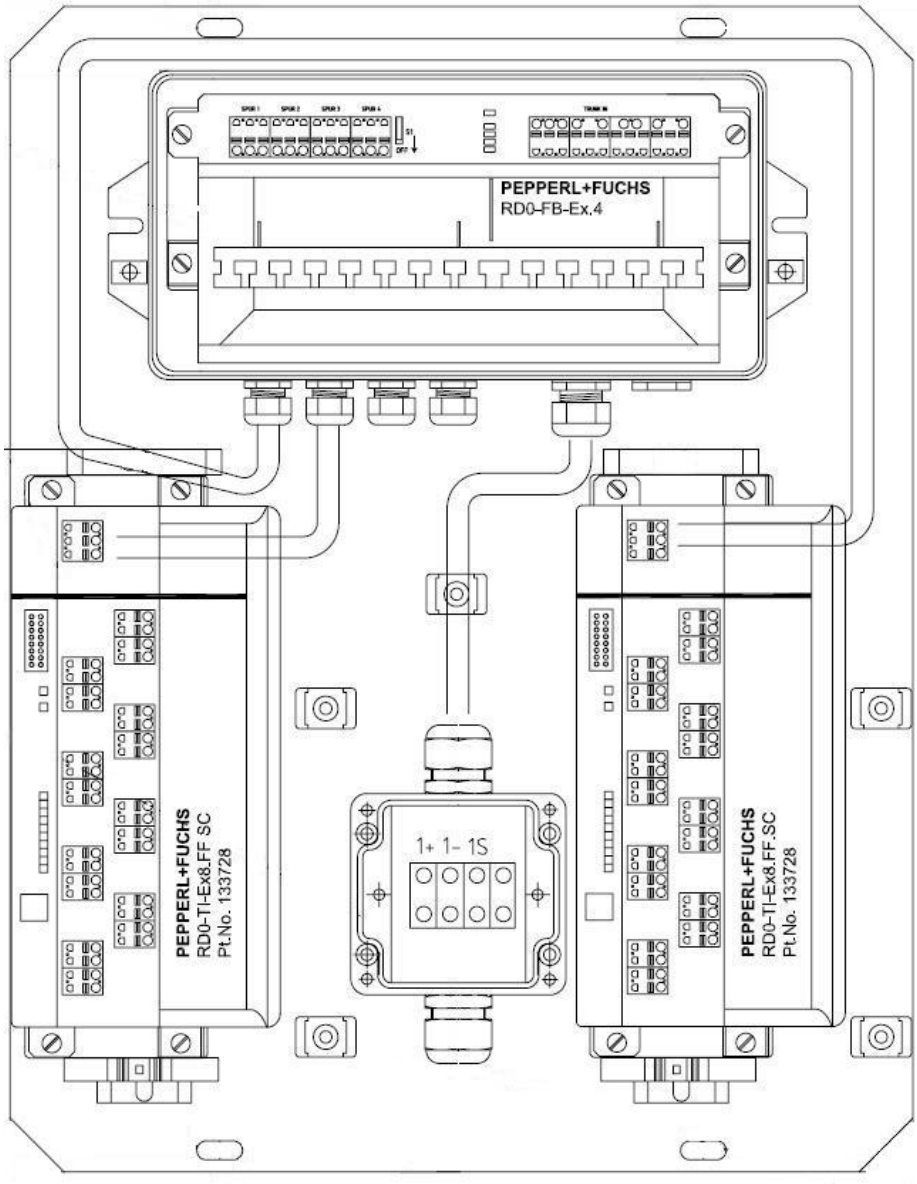


Figure 3: Zone 1 temperature termination board

With the original LEPIU system, differentiation had to be made between an RTD and a T/C termination board, using FOUNDATION fieldbus technology and the TM-I, this is not required anymore. Each input can be configured via the system independently.

Engineering

The number of connectable temperature termination boards depends on

- The required update time of the temperature signals
- Distance between

- the control room, where the fieldbus power supply used for this application is mounted and the last termination board
- the termination boards in the field

When using as an example

- 4 temperature termination boards per segment, where each termination board consists of one FieldBarrier and two 8-channel TM-I (see Figure 2). This is equal to 16 temperature signals per termination board or 64 temperature signals per segment.
- One fieldbus power supply board with 25 V supply voltage at 360 mA for 4 segments
- One 4-segment Series C-FIM

the overall amount of temperature signals per Series C-FIM is 256.

Update time

The update time for this layout can be calculated as follows:

The Series C FIM (Fieldbus Interface Module) is the newest development from Honeywell. It supports four (4) H1 links and is able to realize 16 publications of process variables per second and link. Taking this into account all temperature signals of one temperature termination board will be transmitted within 1 s. Per link up to 4 temperature termination boards can be handled per segment/link which is equal to an update time of 4 s. Due to that the Series C FIM supports four (4) H1 links in parallel the update time for 256 temperature signals is also 4 s.

Segment layout

The field equipment consisting of

- Temperature sensors
- Temperature Multi Input device
- FieldBarrier (for zone 1 application) or Segment Protector (for zone 2 application)

is completely powered by the fieldbus power supply located in the control room. It must be ensured that the fieldbus power supply provides enough energy to the field equipment. This could easily be verified by using the Segment Checker software (download free of charge see www.segmentchecker.com).

When using the example mentioned above (64 temperature signals per segment) with the most cost effective fieldbus power supply (HD2-FBPS-1.25.360) a distance of approx. 400 m between the control room and the 1st temperature termination board could be reached at an ambient temperature of 50 °C. In this example the distance between 2 temperature termination boards is set to 50 m.

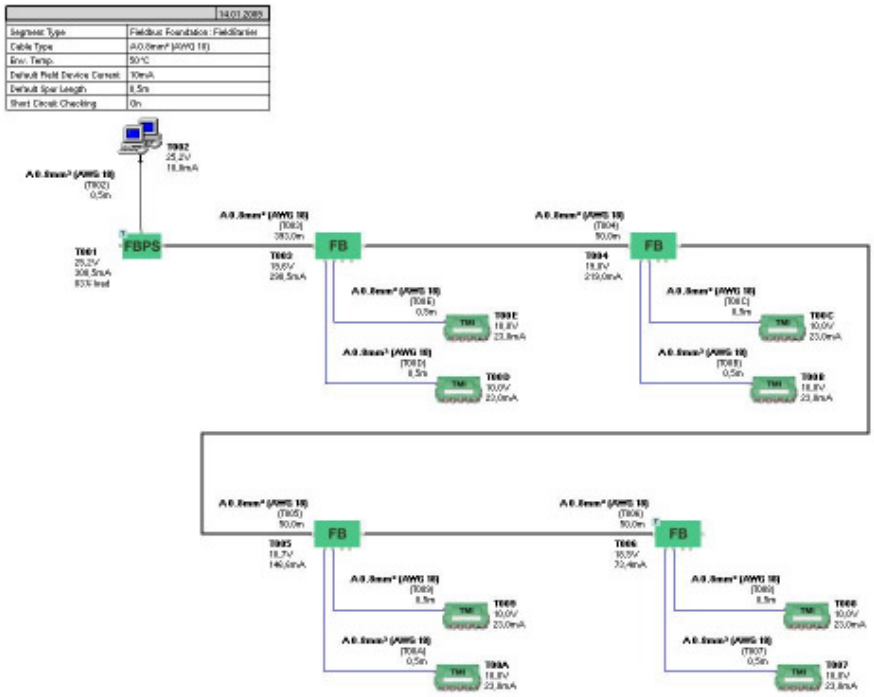


Figure 4: Example segment layout

If longer distances are required

- A fieldbus cable with a higher cross section (in the example above the cross section of the fieldbus cable is 0.8 mm²)
- A fieldbus power supply which offers more energy to the field

can be used.

Using existing cables?

Fieldbus foundation recommends for FF application a cable called cable type A. It is not ensured that existing cables are matching the requirements of the FOUNDATION™ fieldbus cable specification.

If existing cables should be used it is strongly recommended to do a checkout in advance. This checkout could be done by building up the “worst segment” and do a checkout with the Advanced Diagnostic module from Pepperl+Fuchs. In this respect “worst segment” means the segment with the longest cable run and the highest amount of temperature signals.

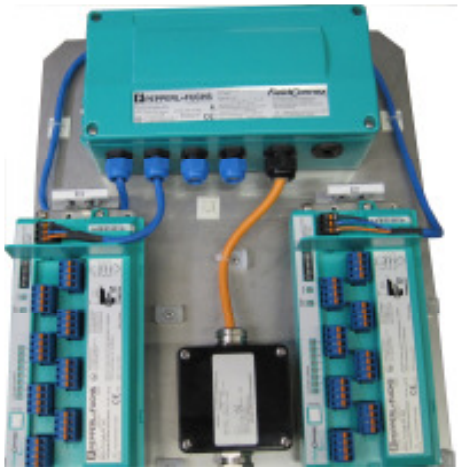
Workflow

Mechanical replacement

Typically the LEPIU exchange will be done either when the existing system fails or during a modernization of the DCS (e.g from Honeywell TDC 2000 to Experion C300 controller). In that case the workflow for the hardware exchange is as follows when just the electronic will be replaced:

1. Remove old LEPIU PCB

2. Mount the Pepperl+Fuchs temperature termination board into the enclosure



3. Connect the wires of the temperature sensors to Ex i terminals of the TM-I

4. Connect the Ex e trunk terminals to FF H1 trunk

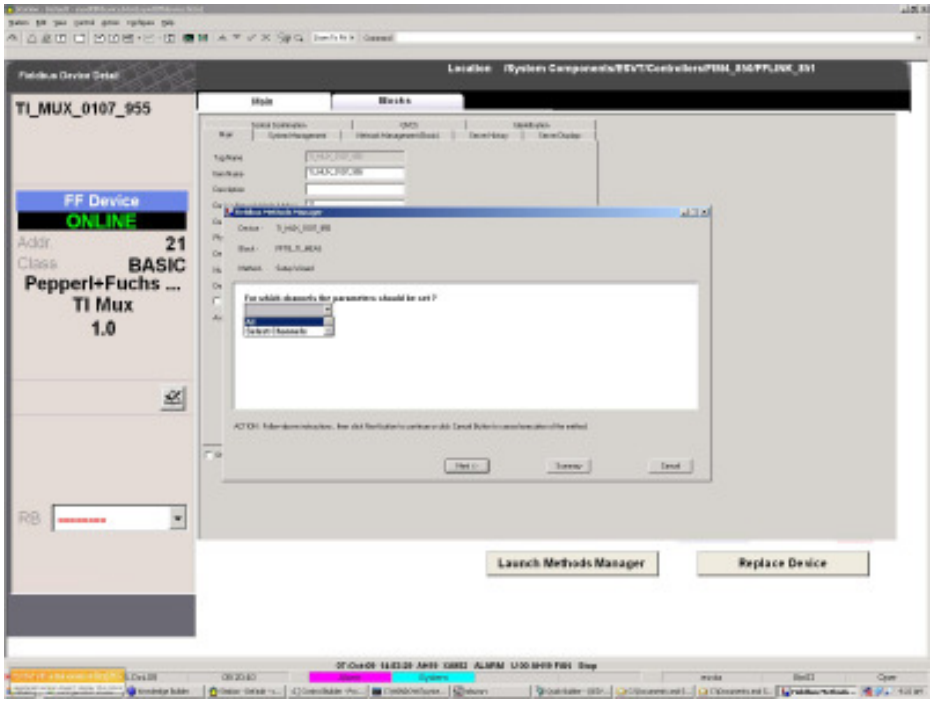
Configuration and Parameterization

When installing a Temperature Multi Input device each channel of this component needs to be parameterized with

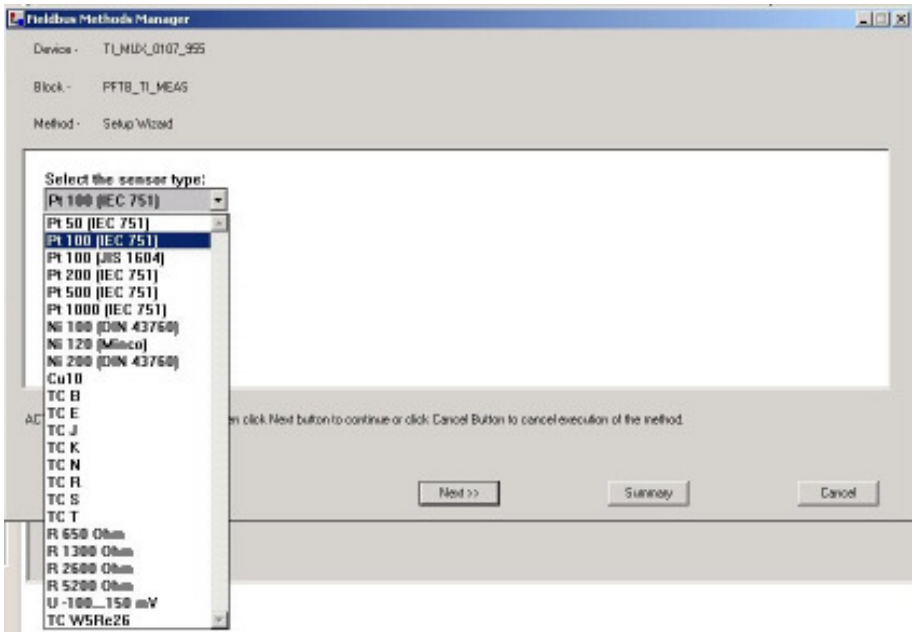
- the type of sensor connected to the channel
- technology in use (e.g. 2, 3 or 4-wire technology for RTD's; internal or external cold junction compensation for T/C's)
- lead breakage and/or short circuit monitoring
- ...

To keep this required engineering work as easy and quick as possible the Honeywell Experion PKS system and the Pepperl+Fuchs TM-I are supporting a method which allows the user to do this parameterization and to select to which channels this parameter set shall be downloaded. These methods can be executed from Experion by starting the "Method Manager" (see example below) or from the Control Builder.

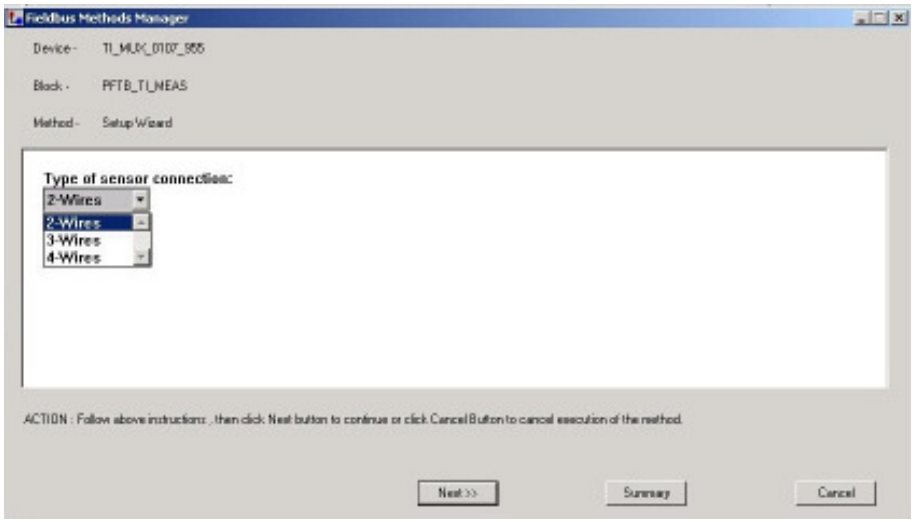
Example: Eight PT100 RTD's are connected to a Temperature Multi Input device. They all require the same set of parameters. This example shows how this works within Experion PKS by starting the Methods Manager:



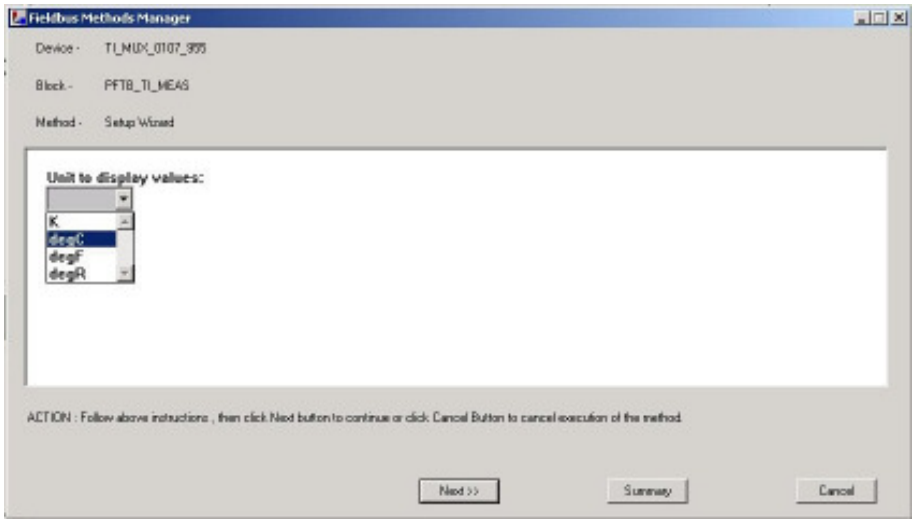
Step 1: Define channels to be configured. In case “Select channels” will be chosen it can be configured which channels shall be configured.



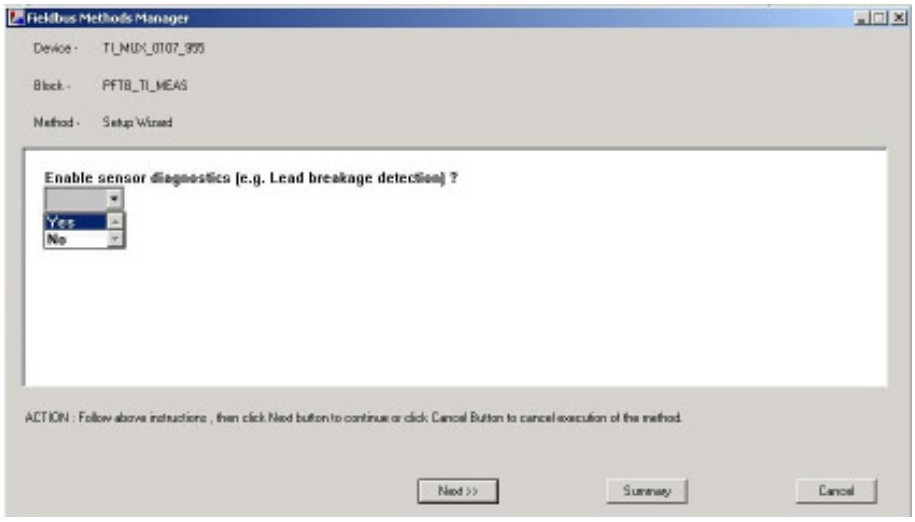
Step 2: Choose type of temperature sensor



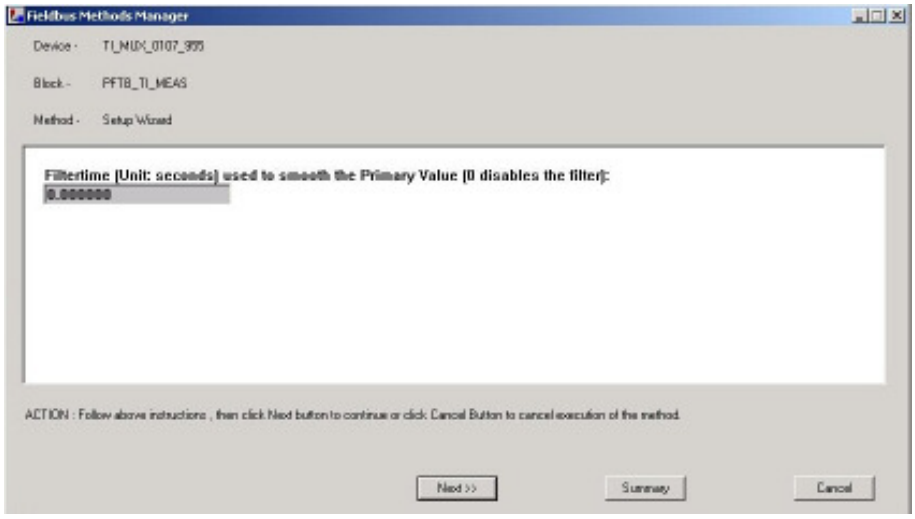
Step 3: Define type of sensor connection (RTD's only)



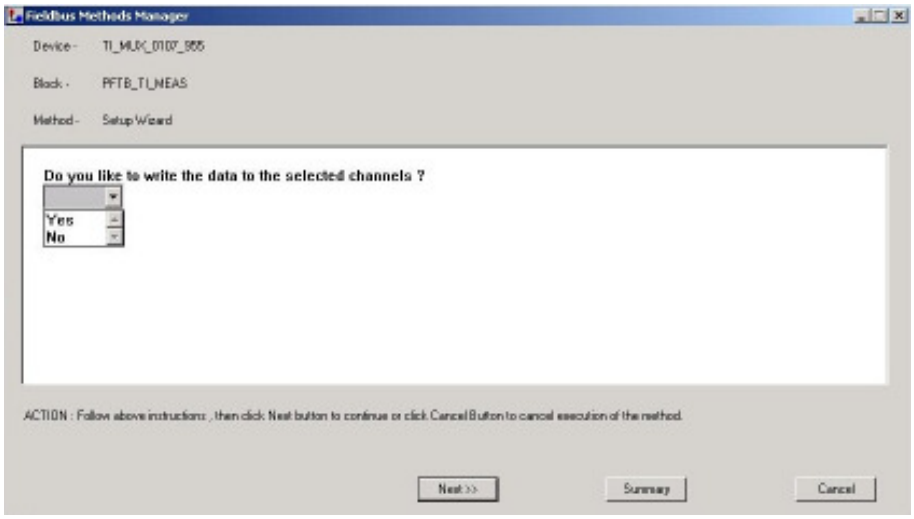
Step 4: Define type of Unit



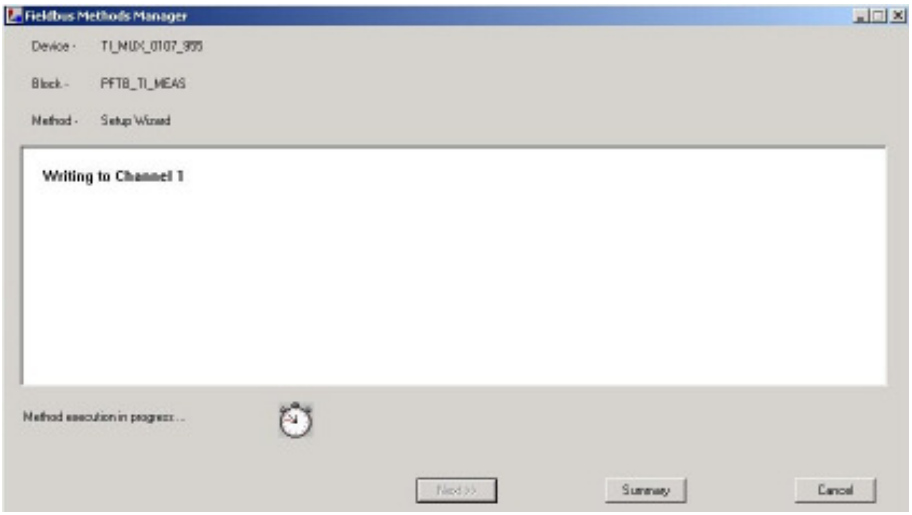
Step 5: Enable/disable sensor diagnostics



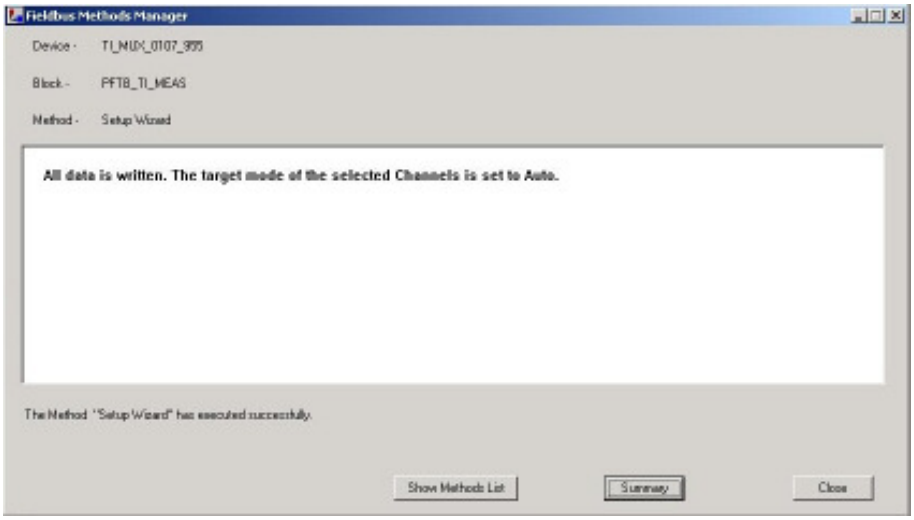
Step 6: Define filter time for primary value



Step 7: Confirmation of channels to be parameterized



Step 8: The parameter set will be written automatically to the device channel by channel.



Step 9: Confirmation that all 8 channels are written and the channels are set to Auto mode.

The procedure above has shown how to configure the Transducer Blocks of the TM-I. Additionally it is required to configure the application itself in the meaning of engineering the control or monitoring loops. When for example Control Builder is used it is simply

- Defining a Control Module
- Opening the Control Module
- Selecting the required Function Blocks for example
  - AI function blocks or
  - MAI function block for the TM-I
- “Drag and drop” the function blocks in the loop

- Configure
  - Interconnection of the function blocks
  - Required PV range
  - Channel number
  - Alarms
  - ...

After configuring the loops just a download is required and the system can operate.

Advantages

- Existing field wiring for all T/C's and RTD's can be used and do not need to be extracted out of the cable glands with the possible risk of breaking leads.
- Standard solution for zone 1 or zone 2 application. Other solutions can be made available on demand.
- Full diagnostic capability of physical layer by using an Advanced Diagnostic Module.
- Future proof technology (FF) compatible.
- Cost effective; minimum cabling between cabinet and control room exchange. If the existing cable matches the requirements of FOUNDATION™ fieldbus H1 no wiring is required (can be approved with Advanced diagnostic module from Pepperl+Fuchs).
- Quick and easy engineering by the use of methods