

Radar Transmitters

SITRANS LR250 (FOUNDATION FIELDBUS)

Operating Instructions • 06/2010



SITRANS

SIEMENS

Safety Guidelines: Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel: This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Warning: Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

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Safety Notes

Special attention must be paid to warnings and notes highlighted from the rest of the text by grey boxes.



WARNING: relates to a caution symbol on the product, and means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.



WARNING¹: means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.

Note: means important information about the product or that part of the operating manual.

Safety marking symbols

In manual	On product	Description
		Earth (ground) Terminal
		Protective Conductor Terminal
		(Label on product yellow background.) WARNING: refer to accompanying documents (manual) for details.

FCC Conformity

US Installations only: Federal Communications Commission (FCC) rules



WARNING: Changes or modifications not expressly approved by Siemens Milltronics could void the user's authority to operate the equipment.

Notes:

- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
- This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference to radio communications, in which case the user will be required to correct the interference at his own expense.

¹⁾ This symbol is used when there is no corresponding caution symbol on the product.

CE Electromagnetic Compatibility (EMC) Conformity

This equipment has been tested and found to comply with the following EMC Standards:

EMC Standard	Title
CISPR 11:2004/EN 55011:1998+A1:1999&A2:2002, CLASS B	Limits and methods of measurements of radio disturbance characteristics of industrial, scientific, and medical (ISM) radio-frequency equipment.
EN 61326:1997+A1:1998+A2:2001+A3:2003 (IEC 61326:2002)	Electrical Equipment for Measurement, Control and Laboratory Use – Electromagnetic Compatibility.
EN61000-4-2:2001	Electromagnetic Compatibility (EMC) Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.
EN61000-4-3:2002	Electromagnetic Compatibility (EMC) Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test.
EN61000-4-4:2004	Electromagnetic Compatibility (EMC) Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test.
EN61000-4-5:2001	Electromagnetic Compatibility (EMC) Part 4-5: Testing and measurement techniques – Surge immunity test.
EN61000-4-6:2004	Electromagnetic Compatibility (EMC) Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields.
EN61000-4-8:2001	Electromagnetic Compatibility (EMC) Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test.

Industry Canada

- Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
- This device shall be installed and operated in a completely enclosed container to prevent RF emission which otherwise can interfere with aeronautical navigation. Installation shall be done by trained installers, in strict compliance with the manufacturer's instructions.
- The use of this device is on a "no-interference, no-protection" basis. That is, the user shall accept operations of high-powered radar in the same frequency band which may interfere with or damage this device. On the other hand, level probing devices found to interfere with primary licensing operations will be required to be removed at the user's expense.

Notes:

- This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.
- Please follow the installation and operating procedures for a quick, trouble-free installation and to ensure the maximum accuracy and reliability of your SITRANS LR250.
- This manual applies to the SITRANS LR250 (FOUNDATIONTM Fieldbus)^{a)} only.

a) FOUNDATIONTM Fieldbus is a trademark of Fieldbus Foundation.

This manual will help you set up your SITRANS LR250 for optimum performance. The manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) provides details on FF communication. We always welcome suggestions and comments about manual content, design, and accessibility. Please direct your comments to techpubs.smpi@siemens.com.

For other Siemens Milltronics level measurement manuals, go to: www.siemens.com/level, and look under **Level Measurement**.

Application Examples

The application examples used in this manual illustrate typical installations using SITRANS LR250. (See *Appendix E: Application Examples* on page 156.) Because there is often a range of ways to approach an application, other configurations may also apply.

In all examples, substitute your own application details. If the examples do not apply to your application, check the applicable parameter reference for the available options.

Technical Support

Support is available 24 hours a day.

To find your local Siemens Automation Office address, phone number and fax number go to:

www.siemens.com/automation/partner

- Click on the tab **Contacts by Product** then find your product group (**+Process Automation > +Process Instrumentation > +Level Measuring Instruments**).
- Select the team **Technical Support**. Click on **Next**.
- Click on the appropriate continent, then select the country followed by the city. Click on **Next**.

For on-line technical support go to:

www.siemens.com/automation/support-request

- Enter the device name (SITRANS LR250) or order number, then click on **Search**, and select the appropriate product type. Click on **Next**.
- You will be prompted to enter a keyword describing your issue. Then either browse the relevant documentation, or click on **Next** to E-mail a detailed description of your issue to Siemens Technical Support staff.

Siemens A&D Technical Support Center: phone +49 180 50 50 222

fax +49 180 50 50 223

Abbreviations and Identifications

Short form	Long Form	Description	Units
AIFB	Analog Input Function Block		
CE / FM / CSA	Conformité Européenne / Factory Mutual / Canadian Standards Association	safety approval	
C _i	Internal capacitance		F
DCS	Distributed Control System	process control	
DD	See EDD		
DIAG TB	Diagnostic Transducer Block		
dK	dielectric constant		
EDD	Electronic Device Description	(also referred to as DD)	
FF	Foundation Fieldbus	communication protocol	
H1	31.25 kbps 2-wire fieldbus protocol		
HSE	High Speed Ethernet	communication protocol	
ITK	Interoperability Test Kit		
I _i	Input current		mA
I _o	Output current		mA
IS	Intrinsically Safe	safety approval	
LCD TB	Liquid Crystal Display Transducer Block		

chart continued on next page

Short form	Long Form	Description	Units (cont'd)
L_i	Internal inductance		mH
LTB	Level Transducer Block		
mH	milliHenry	10^{-3}	Henry
μF	microFarad	10^{-6}	Farad
μs	microsecond	10^{-6}	Second
PED	Pressure Equipment Directive	safety approval	
pF	pico Farads	10^{-12}	Farad
ppm	parts per million		
PV	Primary Value ^{a)}	measured value	
RB	Resource Block		
SELV	Safety extra low voltage		
SV	Secondary Value ^{a)}	equivalent value	
TVT	Time Varying Threshold	sensitivity threshold	
U_i	Input voltage		V
U_o	Output voltage		V

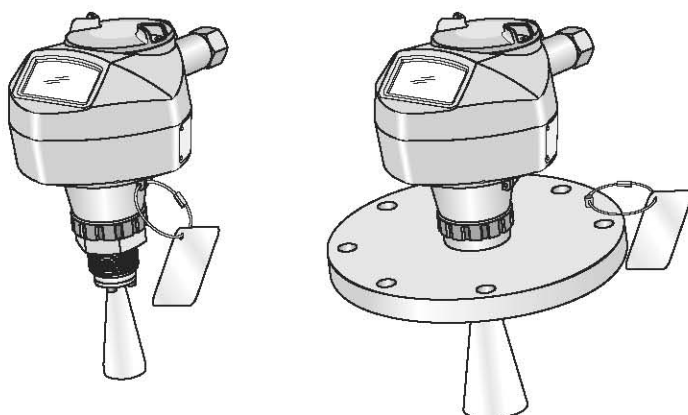
- a) The output from the Level Transducer Block can be called the Primary Value (or Secondary Value). When it becomes the input to the AIFB, it is called the Process Variable.

SITRANS LR250 Overview

SITRANS LR250 is a 2-wire 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries in storage vessels including high pressure and high temperature, to a range of 20 m (66 ft). It is ideal for small vessels and low dielectric media.

The instrument consists of an electronic component coupled to a horn antenna and either a threaded or flange type process connection.

SITRANS LR250 supports Foundation Fieldbus (FF) communication protocol. Signals are processed using Process Intelligence which has been field-proven in over 1,000,000 applications worldwide (ultrasonic and radar). This device can be configured as an FF (H1) Link Master.



Programming

SITRANS LR250 is very easy to install and configure via a graphical local user interface (LUI). You can modify the built-in parameters either locally via the Siemens infrared handheld programmer, via the 375 Field Communicator, or from a remote location via FF host system, or AMS Device Manager.

Applications

- liquids and slurries
- bulk storage vessels
- simple process vessels

Approvals and Certificates

SITRANS LR250 is available with General Purpose approval, or for hazardous areas. For details see *Approvals* on page 10.

Specifications

Notes:

- Siemens Milltronics makes every attempt to ensure the accuracy of these specifications but reserves the right to change them at any time.

Power



General Purpose:

Intrinsically Safe:

Non-Sparking/Energy Limited:

Non-incendive:

9-32 V DC

Bus powered

9-32 V DC, per IEC 61158-2 (Foundation Fieldbus)

Current consumed

20 mA

Performance

Reference operating conditions according to IEC 60770-1

- ambient temperature +15 to +25 °C (+59 to +77 °F)
- humidity 45% to 75% relative humidity
- ambient pressure 860 to 1060 mbar g (86,000 to 106,000 N/m² g)

Measurement Accuracy (measured in accordance with IEC 60770-1)

- Maximum measured error = 5 mm (0.02") (including hysteresis and non-repeatability)

Frequency

25 GHz pulse

Max. measurement range^{1) 2)}

20 m (65.6 ft) except for 1.5" (40 mm) horn which has 10 m (32.8 ft) range

Min. detectable distance³⁾

50 mm (1.97") from end of horn

Update time

Minimum 1.5 seconds, depending on settings for **Response Rate** and **LCD Fast Mode (4.9.)**.

Influence of ambient temperature

<0.003% / K (average over full temperature range, referenced to maximum range)

Dielectric constant of material measured

- dK > 20, horn and application dependent⁴⁾

¹⁾ From sensor reference point: see *Threaded Horn Antenna with extension* on page 12 and *Flanged Horn* on page 13.

²⁾ Although the maximum measurement range can be set to a value up to 30 m (98.4 ft), performance is only guaranteed to 20 m (65.6 ft).

³⁾ Minimum range is horn length + 50 mm. See *Dimensions* on page 11.

⁴⁾ For 1.5" (40 mm) and 2" (51 mm) horns the dK is limited to 3 unless a stillpipe is used.

Memory

- non-volatile EEPROM
- no battery required

Interface

Communication

- Foundation Fieldbus
- ITK version 5

Blocks supported:

RESOURCE, LTB, AIFB1, AIFB2, LCD, DIAG

Block execution time:

AIFB - 40 ms

Configuration

- remote
- local

FF host system or Emerson AMS (PC)

Siemens Milltronics infrared handheld programmer

[see *Programmer (infrared keypad)* on page 11], or

Field Communicator 375 [see *Field Communicator 375 (FC375)* on page 160]

Display (local)¹⁾

Graphic LCD, with bar graph (representing level)

Mechanical

Process Connections:

- threaded connection

1.5" NPT (ANSI/ASME B1.20.1), R (BSPT, EN 10226-1) or
G (BSPP, EN ISO 228-1)

or 2" NPT (ANSI/ASME B1.20.1), R (BSPT, EN 10226-1) or
G (BSPP, EN ISO 228-1)

- flange connection (flat faced)

2", 3", 4" (ASME 150 lb, 300 lb)

DN50, DN80, DN100 (PN16, PN40)

50A, 80A, 100A (JIS 10K)

materials

316 L /1.4404 stainless steel

or 316 L /1.4435 stainless steel, optional alloy N06022/
2.4602

- flange connection (raised face)

DN50, DN80, DN100 (PN10/16, PN25/40)

DN150 (PN10/16, PN 25/40)

per EN 1092-1 B1

materials

1.4404 or 1.4435 stainless steel, optional Alloy N06022/
2.4602

Antenna:

- horn

standard 1.5" (40 mm), 2" (50 mm), 3" (80 mm), and

4" (100 mm) horn, optional 100 mm (4") horn extension

¹⁾ Display quality will be degraded in temperatures below -20 °C (-4 °F) and above +65 °C (+149 °F).

materials 316L stainless steel with PTFE emitter
optional Alloy N06022/2.4602 with PTFE emitter

Enclosure

- construction aluminum, polyester powder-coated
- conduit entry 2 x M20x1.5, or 2 x 1/2" NPT
- conduit entry connector M12 connector (shipped with M20 to M12 adaptor),
(optional) or 7/8" connector (shipped with 1/2" NPT to 7/8" adaptor)
- ingress protection Type 4X/NEMA 4X, Type 6/NEMA 6, IP 67, IP68
(see note below)

Weight (excluding extensions)

- 1.5" threaded connection with 1.5" horn antenna approx. 5.1 kg
(11.2 lb)
- 2" threaded connection with 2" horn antenna approx. 5.5 kg
(12.1 lb)
- DN50/PN16 or 2" 150 lb flat faced flange with 2" horn antenna approx. 8 kg
(17.6 lb)
- DN100/PN40 or 4" ASME 300 lb flat faced flange with 4" horn antenna approx. 17.4 kg
(38.3 lb)
- DN50/PN16 raised face flange with 2" horn antenna approx. 6 kg
(13.2 lb)
- DN100/PN40 raised face flange with 4" horn antenna approx.
11.3 kg (24.9 lb)

Environmental

Notes:

- Check *Approvals* on page 10, for the specific configuration you are about to use or install.
- Use appropriate conduit seals to maintain IP or NEMA rating.
- location indoor/ outdoor
- altitude 5000 m (16,404 ft) max.
- ambient temperature -40 to +80 °C (-40 to +176 °F)
- relative humidity suitable for outdoor
Type 4X/NEMA 4X, Type 6/NEMA 6, IP67, IP68 enclosure
(see note above)
- installation category I
- pollution degree 4

Specifications

- temperature¹⁾
at process connection
 - with FKM O-ring -40 to +200 °C (-40 to +392 °F)
 - with FFKM O-ring -20 to +200 °C (-4 to +392 °F)
- pressure (vessel)¹⁾ Refer to *Process Pressure/Temperature derating curves* on page 152.

Approvals

Note: The device nameplate lists the approvals that apply to your device.

- General CSA_{US/CE}, CE, FM, NE 21, C-TICK
- Radio FCC, Industry Canada and Europe ETSI EN 302-372, C-TICK
- Hazardous Intrinsically Safe²⁾(Europe) ATEX II 1G, Ex ia IIC T4
ATEX II 1D, Ex tD A20 IP67 T90 °C
Non-sparking/ (Europe) ATEX II 3G, Ex nA/nL IIC T4 Gc
Energy Limited³⁾
Intrinsically Safe (Canada/USA) CSA/FM Class I, Div. 1, Groups A, B, C, D;
Class II, Div. 1, Groups E, F, G; Class III T4
Non-incendive⁴⁾ (Canada/USA) CSA/FM Class I, Div. 2, Groups A, B, C, D
T5
Intrinsically Safe (International) IECEx Ex ia IIC T4, Ex tD A20 IP67 T90 °C
Flame Proof (International IECEx/ATEX II 1/2 GD, 1D, 2D, Ex dmbia IIC
/Europe) T4 Ga/Gb, Ex tD A20 IP67 T90 °C
Increased Safety (International IECEx/ATEX II 1/2 GD, 1D, 2D, Ex embia IIC
/Europe) T4 Ga/Gb, Ex tD A20 IP67 T90 °C
Explosion Proof (Canada/USA) CSA/FM Class I, Div. 1, Groups A, B, C, D;
Class II, Div. 1, Groups E, F, G; Class III T4
- Marine Lloyd's Register of Shipping
ABS Type Approval
Bureau Veritas

1) The specifications apply to the standard configuration only (with FKM O-ring). Maximum and minimum temperatures are dependent on the process connection, antenna and O-ring materials, and vessel pressure. For more detail, or for other configurations, see *Maximum Process Temperature Chart* on page 151, and *Process Pressure/Temperature derating curves* on page 152.

²⁾ See *Intrinsically Safe wiring* on page 26

³⁾ See *Non-Sparking-Energy Limited wiring* on page 28.

⁴⁾ See *Non-incendive wiring (only for USA/Canada)* on page 28.

Programmer (infrared keypad)

Notes:

- Battery is non-replaceable with a lifetime expectancy of 10 years in normal use.
- To estimate the lifetime expectancy, check the nameplate on the back for the serial number. The first six numbers show the production date (mmddyy), for example, device with serial number 032608101V was produced on March 26, 2008.

Siemens Milltronics Infrared IS (Intrinsically Safe) Hand Programmer for hazardous and all other locations (battery is non-replaceable)

- approval
CSA/FM Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G T6
CE
ATEX II 1GD, Ex ia IIC T4 Ga,
Ex iaD 20 T135 °C
IECEx SIR 09.0073X, Ex ia IIC T4 Ga,
Ex iaD 20 T135 °C
INMETRO Br-Ex ia IIC T4
- ambient temperature
–20 to +50 °C (–5 to +122 °F)
- interface
proprietary infrared pulse signal
- power
3 V lithium battery
- weight
150 g (0.3 lb)
- color
black
- part number
7ML1930-1BK

Dimensions

Threaded Horn dimensions

Nominal Horn Size	Horn O.D.	Horn	Height to sensor reference point ^{a)}	Beam Angle ^{b)}	Measurement Range
40 mm (1.5")	39.8 mm (1.57")	A	135 mm (5.3")	19 degrees	10 m (32.8 ft)
50 mm (2")	47.8 mm (1.88")	B	166 mm (6.55")	15 degrees	20 m (65.6 ft)
80 mm (3")	74.8 mm (2.94")	C	199 mm (7.85")	10 degrees	
100 mm (4")	94.8 mm (3.73")	D	254 mm (10")	8 degrees	

a) Height from bottom of horn to sensor reference point as shown: see *Threaded Horn Antenna with extension* on page 12.

b) –3 dB in the direction of the polarization axis (see *Polarization reference point* on page 20 for an illustration).

Threaded Connection Markings

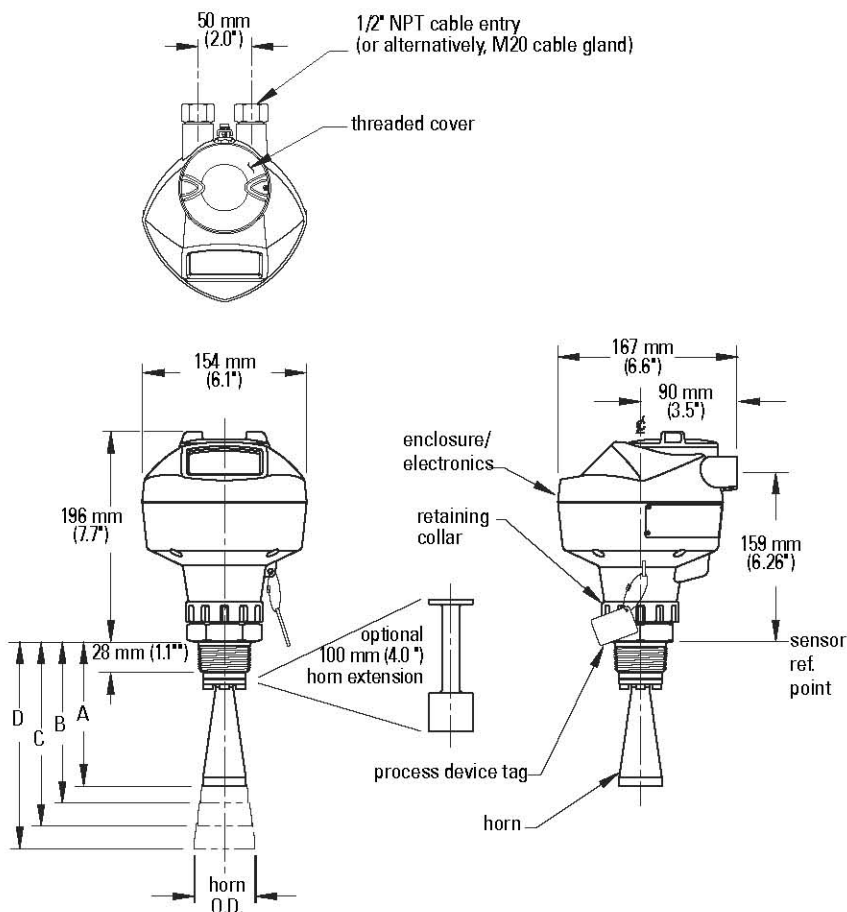
Threaded connection markings are found on the flat face/faces of the process connection.

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.

Threaded Horn Antenna with extension

Notes:

- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the Tag is available on the product page of our website at www.siemens.com/LR250, under **More Info / Installation drawings**. Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.
- Signal amplitude increases with horn diameter, so use the largest practical size.
- Optional extensions can be installed between the flange and the antenna.

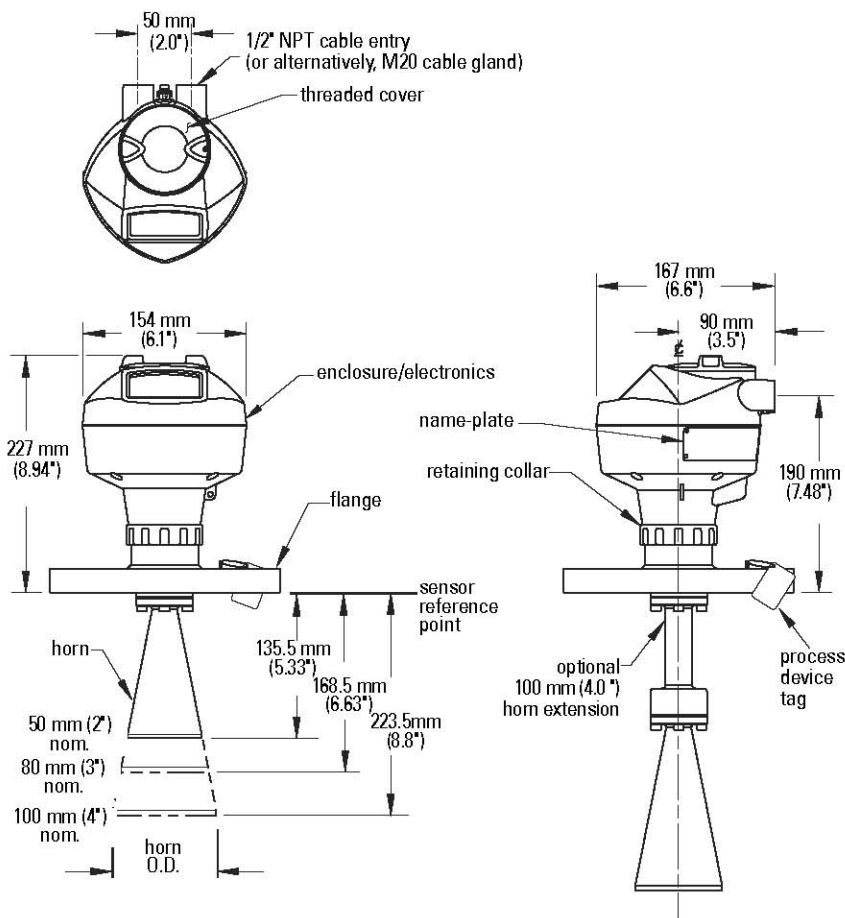


See table under *Dimensions* on page 11 for horn height to sensor reference point (A, B, C, or D).

Flanged Horn

Notes:

- Process temperature and pressure capabilities are dependent upon information on the process device tag. Reference drawing listed on the Tag is available on the product page of our website at www.siemens.com/LR250, under **More Info / Installation drawings**. Additional information on process connections is available on the Installation Drawings page under **Process Connection Diagrams**.
- Signal amplitude increases with horn diameter, so use the largest practical size.
- Optional extensions can be installed between the flange and the antenna.



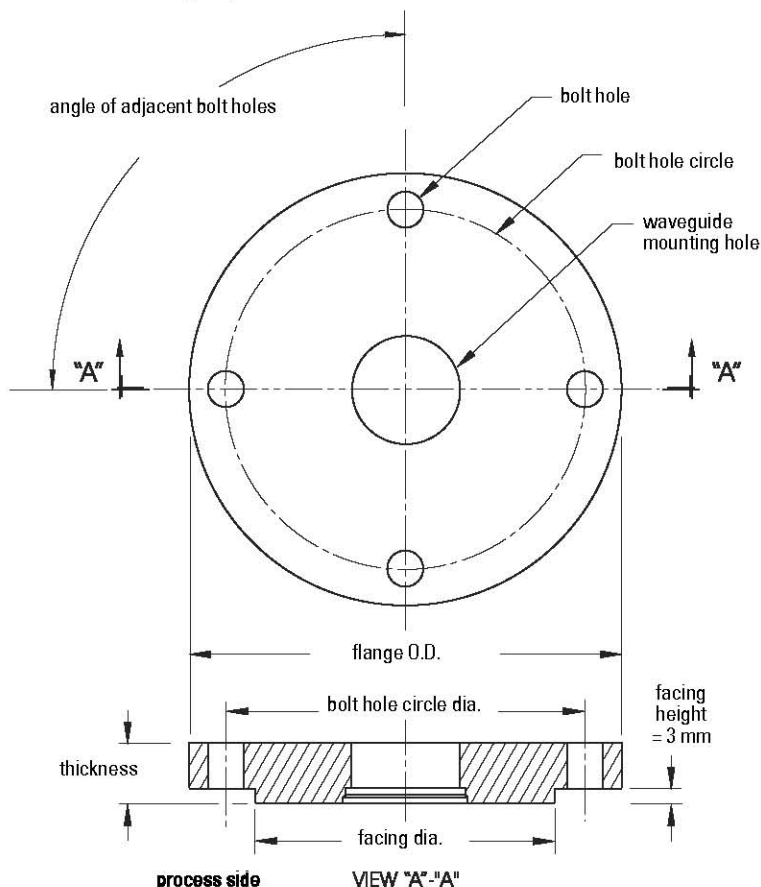
Flanged Horn dimensions

Nominal Horn Size	Horn O.D.	Height to sensor reference point ^{a)}	Beam Angle ^{b)}	Measurement Range
50 mm (2")	47.8 mm (1.88")	135.5 mm (5.33")	15 degrees	20 m (65.6 ft)
80 mm (3")	74.8 mm (2.94")	168.5 mm (6.63")	10 degrees	
100 mm (4")	94.8 mm (3.73")	223.5 mm (8.8")	8 degrees	

- a) Height from bottom of horn to sensor reference point as shown: see *Flanged Horn* on page 13.
- b) – 3 dB in the direction of the polarization axis (see *Polarization reference point* on page 20 for an illustration).

For flange dimensions see *Raised Face Flange per EN 1092-1* on page 14 or *Flat Faced Flange* on page 16.

Raised Face Flange per EN 1092-1



Raised Face Flange Dimensions

Pipe size	Flange bolt hole pattern	Flange O.D. (mm)	Bolt Hole Circle Ø (mm)	Bolt Hole Ø (mm)	No. of Bolts	Angle of adjacent bolt holes	Facing Ø (mm)	Thickness (mm)
DN50	PN10/PN16	165	125	18	4	90	102	18
DN80	PN10/PN16	200	160	18	8	45	138	20
DN100	PN10/PN16	220	180	18	8	45	158	20
DN150	PN10/PN16	285	240	22	8	45	212	22
DN50	PN25/PN40	165	160	18	4	90	138	20
DN80	PN25/PN40	200	160	18	8	45	138	24
DN100	PN25/PN40	235	190	22	8	45	162	24
DN150	PN25/PN40	300	250	26	8	45	218	28

Raised Face Flange markings

Blind Flange Markings (Optional Manufacturer's Logo [optional]; Flange Standard; Nominal Size; Material; Heat Code)	Machining Identification			Welded Assembly Identification ^{a)}		
	Serial no.	Logo	Flange series	Flange series	Heat Code no.	Facing
Manufacturer's logo; EN 1092-1 05 'B1'; 'DN50' 'PN16' '1.4404 or 1.4435' A1B2C3	mmddyyxxx		XXXXX	XXXXX	A1B2C3	RF

a) When flange material is Alloy N06022/2.4602, additional material and heat code identification is provided.

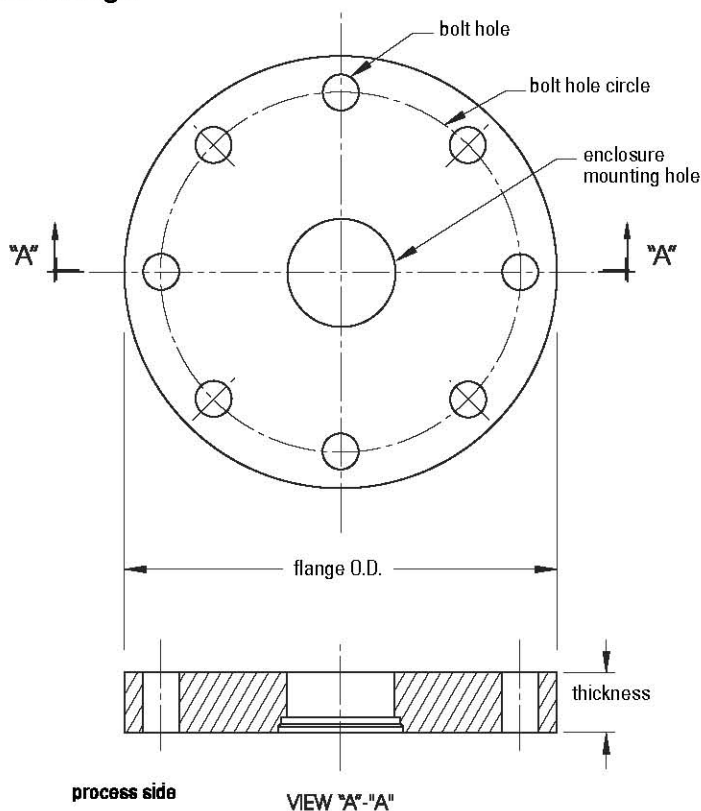
The flange markings are located around the outside edge of the flange.

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.

Flange series: the Siemens Milltronics drawing identification.

Heat code: a flange material batch code identification.

Flat Faced Flange



Flat Faced Flange Dimensions

NOTE: table continues on next page

Flange size	Flange Class	Flange O.D.	Bolt Hole Circle Ø	Bolt Hole Ø	No. of Bolt Holes	Thickness
2"	ASME 150 lb	6.0"	4.75"	0.75"	4	0.88"
3"	ASME 150 lb	7.5"	6.0"	0.75"	4	0.96"
4"	ASME 150 lb	9.0"	7.50"	0.75"	8	1.25"
2"	ASME 300 lb	6.50"	5.00"	0.75"	8	1.12"
3"	ASME 300 lb	8.25"	6.62"	0.88"	8	1.38"
4"	ASME 300 lb	10.00"	7.88"	0.88"	8	1.50"
DN50	EN PN16	165 mm	125 mm	18 mm	4	24.4 mm
DN80	EN PN16	200 mm	160 mm	18 mm	8	31.8 mm
DN100	EN PN16	220 mm	180 mm	18 mm	8	31.8 mm

Flange size	Flange Class	Flange O.D.	Bolt Hole Circle Ø	Bolt Hole Ø	No. of Bolt Holes	Thickness (cont'd)
DN50	EN PN40	165 mm	125 mm	18 mm	4	25.4 mm
DN80	EN PN40	200 mm	160 mm	18 mm	8	31.8 mm
DN100	EN PN40	235 mm	190 mm	22 mm	8	38.1 mm
50A	JIS 10K	155 mm	120 mm	19 mm	4	23.8 mm
80A	JIS 10K	185 mm	150 mm	19 mm	8	24.4 mm
100A	JIS 10K	210 mm	175 mm	19 mm	8	28.5 mm

Flange markings located around the outside edge of the flat faced flange identify the flange assembly on which the device is mounted.

Flat Faced Flange Markings

Flat Face Flange Identification						Welded Assembly Identification	
Serial No.	Logo	Flange Series		Material	Heat Code	Flange Series	HeatCode No.
		Series	Nominal Size				
MMDDYYXXX		25556	2	316L/1.4404 or 316L/1.4435	A1B2C3	25546	A1B2C3
			DN80 PN16				

Serial number: a unique number allotted to each flange, including the date of manufacture (MMDDYY) followed by a number from 001 to 999.

Flange series: the Siemens Milltronics drawing identification.

Nominal size: the flange size followed by the hole pattern for a particular flange class. For example,

— a 2 inch ASME B 16.5 150 lb class flange (North America)

— a DN80 EN 1092-1 PN16 class flange (Europe).

Material: the basic flange material (AISI or EU material designation). North American material codes are followed by European ones. For example, material designation 316L/1.4404.

Heat code: a flange material batch code identification.



WARNINGS:

- **Handle the device using the enclosure, not the antenna or the device tag, to avoid damage.**
- **Installation shall be performed only by qualified personnel and in accordance with local governing regulations.**
- **SITRANS LR250 is to be used only in the manner outlined in this manual, otherwise protection provided by the device may be impaired.**
- **Never attempt to loosen, remove, or disassemble process connection or instrument housing while vessel contents are under pressure.**
- **Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.**
- **The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.**
- **Improper installation may result in loss of process pressure.**

Notes:

- For European Union and member countries, installation must be according to ETSI EN 302372.
- Refer to the device nameplate for approval information.
- The Process Device Tag shall remain with the process pressure boundary assembly¹⁾. In the event the instrument package is replaced, the Process Device Tag shall be transferred to the replacement unit.
- SITRANS LR250 units are hydrostatically tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body provide a unique identification number indicating date of manufacture.
Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX = sequential unit produced)
Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.

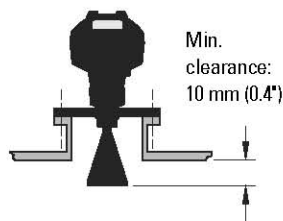
¹⁾ The process pressure boundary assembly comprises the components that act as a barrier against pressure loss from the process vessel: that is, the combination of process connection body and emitter, but normally excluding the electrical enclosure.

Pressure Equipment Directive, PED, 97/23/EC

Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own, and therefore do not come under the Pressure Equipment Directive as pressure or safety accessories (see EU Commission Guideline 1/8 and 1/20).

Nozzle design

- The end of the horn must protrude a minimum of 10 mm (0.4") to avoid false echoes being reflected from the nozzle.
- An antenna extension: (100 mm/3.93") is available.

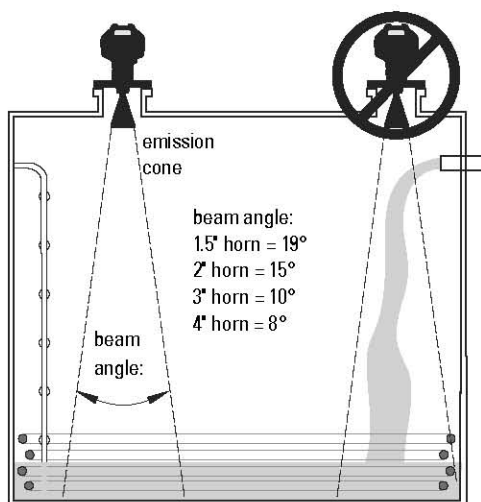


Nozzle location

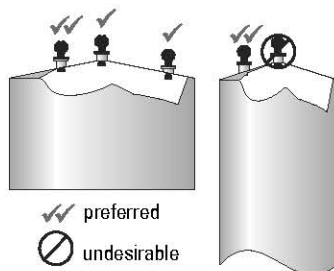
Notes:

- Beam width depends on horn size: see below.
- For details on avoiding false echoes, see *Auto False Echo Suppression (2.5.10.1)* on page 148.

- Keep emission cone free of interference from ladders, pipes, I-beams or filling streams.
- Beam angle is the width of the cone where the energy density is half of the peak energy density.
- Peak energy density is directly in front of and in line with the antenna.
- Signal is transmitted outside the beam angle; therefore false targets may be detected.

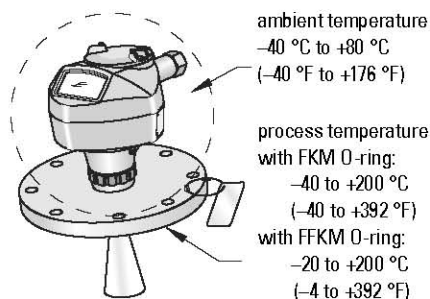


- Avoid central locations on tall, narrow vessels.



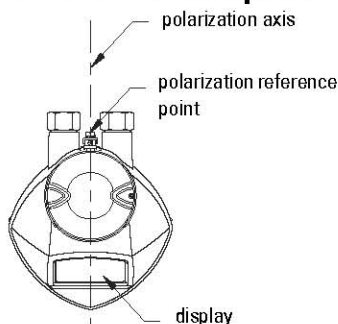
Nozzle location (continued)

- Provide easy access for viewing the display and programming via the hand programmer.
- Provide an environment suitable to the housing rating and materials of construction.
- Provide a sunshield if the instrument will be mounted in direct sunlight.



Orientation in a vessel with obstructions

Polarization reference point



For best results on a vessel with obstructions, or a stillpipe with openings, orient the front or back of the device toward the obstructions (see *Mounting on a Stillpipe or Bypass Pipe* on page 20 for an illustration.)

Mounting on a Stillpipe or Bypass Pipe

A stillpipe or bypass is used for products with a low $dk^{1)}$, or when vortex or extremely turbulent conditions exist. It can also be used to provide optimum signal conditions on foaming materials.

Stillpipe or Bypass Pipe requirements

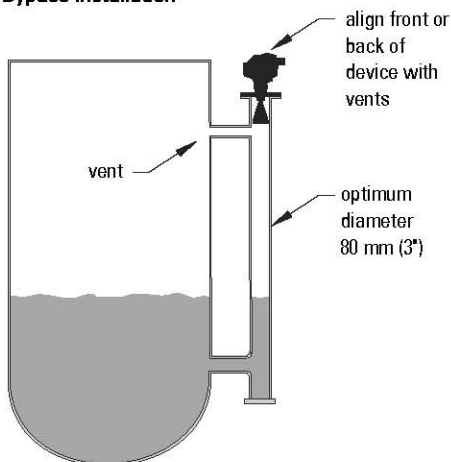
- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (see *Threaded Horn dimensions* on page 11 or *Flanged Horn dimensions* on page 14).
- Suitable pipe diameters: 40 mm (1.5") to 100 mm (4").
[Not recommended: 152.4 mm (6") or 203.2 mm (8")]
- One continuous length of metallic pipe is preferred, without joints (to avoid false echoes).
- Joints (if unavoidable) must be machined to ± 0.25 mm (± 0.010 ") and must have a welded connecting sleeve on the outside
- Bypass vent is required at the upper end of the bypass²⁾

¹⁾ See *Dielectric constant of material measured* on page 7.

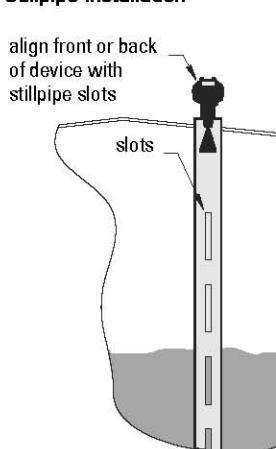
²⁾ To equalize pressure and keep the liquid level in the bypass constant with the liquid level in the vessel.

Device orientation

Bypass Installation



Stillpipe Installation



Installation Instructions

! WARNING: For pressure applications, it will be necessary to use PTFE tape or other appropriate thread sealing compound, and to tighten the process connection beyond hand-tight.

Notes:

- There is no limit to the number of times a device can be rotated without damage.
- When mounting, orient the front or back of the device towards the closest wall.
- Do not rotate the enclosure after programming and vessel calibration, otherwise an error may occur, caused by a polarity shift of the transmit pulse.

Threaded Version

1. Before inserting the device into its mounting connection, check to ensure the threads are matching, to avoid damaging them.
2. Simply screw the device into the process connection, and hand tighten, or use a wrench. A torque of 40 N m (30 ft.lbs) is recommended.

Flanged Version

See *Flanged Horn dimensions* on page 14, *Raised Face Flange per EN 1092-1* on page 14, and *Flat Faced Flange* on page 16 for dimensions.

Wiring

Power

WARNINGS:



The DC input terminals shall be supplied from a source providing electrical isolation between the input and output, in order to meet the applicable safety requirements of IEC 61010-1.



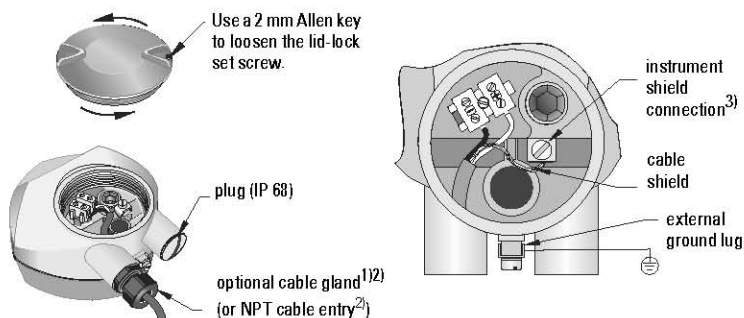
All field wiring must have insulation suitable for rated voltages.

Connecting SITRANS LR250



WARNINGS:

- Check the nameplate on your instrument, to verify the approval rating.
- Use appropriate conduit seals to maintain IP or NEMA rating.
- See *Wiring Setups for hazardous area installations* on page 24.



1. Strip the cable jacket for approximately 70 mm (2.75") from the end of the Foundation Fieldbus cable, and thread the wires through the gland²⁾.
2. Connect the wires to the terminals as shown below (SITRANS LR250 is not polarity sensitive).
3. Ground the instrument according to local regulations⁴⁾.

1) May be shipped with device.

2) If cable is routed through conduit, use only approved suitable-size hubs for waterproof applications.

3) The instrument shield connection is internally connected to the external ground lug.

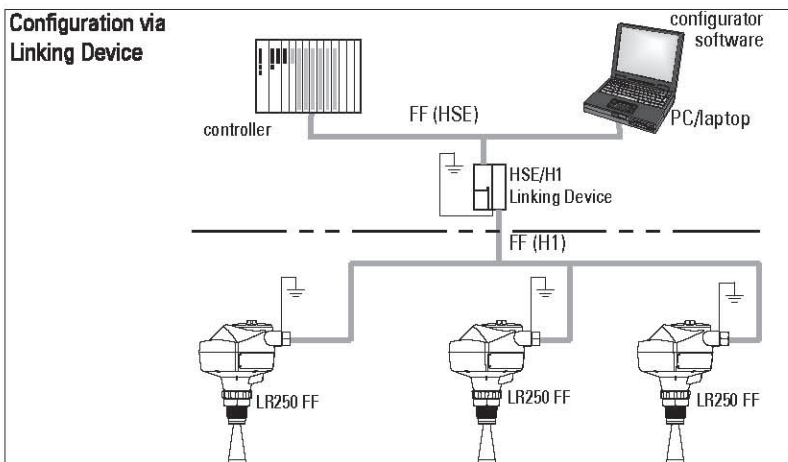
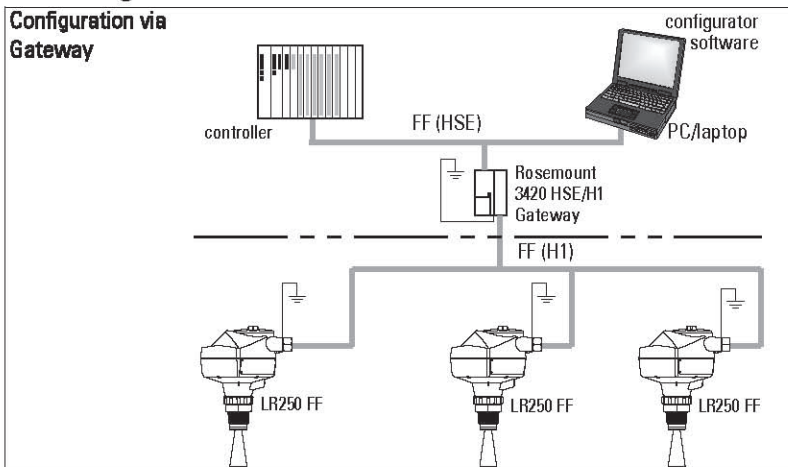
4) For optimum EMC protection, it is recommended that the FF H1 cable shield be connected to ground at every node.

4. Tighten the gland to form a good seal.
5. Close the lid and secure the locking ring before programming and instrument configuration.

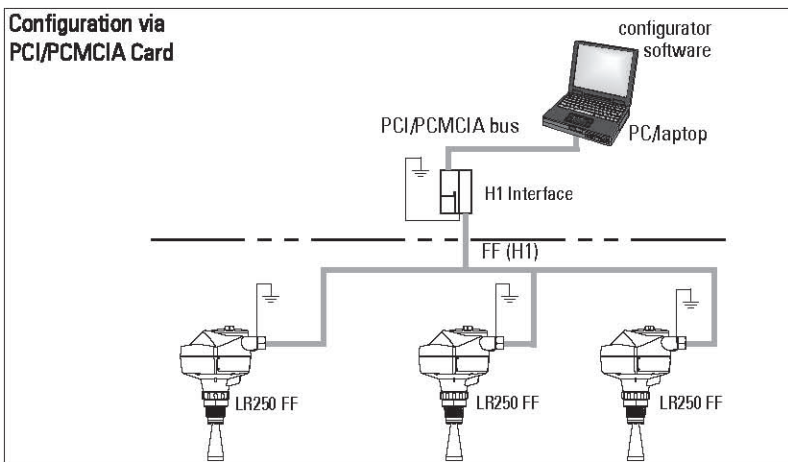
Notes:

- Foundation Fieldbus (H1) must be terminated at both extreme ends of the cable for it to work properly.
- Please refer to the *Foundation Fieldbus System Engineering Guidelines (AG-181) Revision 2.0*, available from www.fieldbus.org, for information on installing FF (H1) devices.

Basic Configuration with Foundation Fieldbus (H1)



Basic Configuration cont'd on next page.



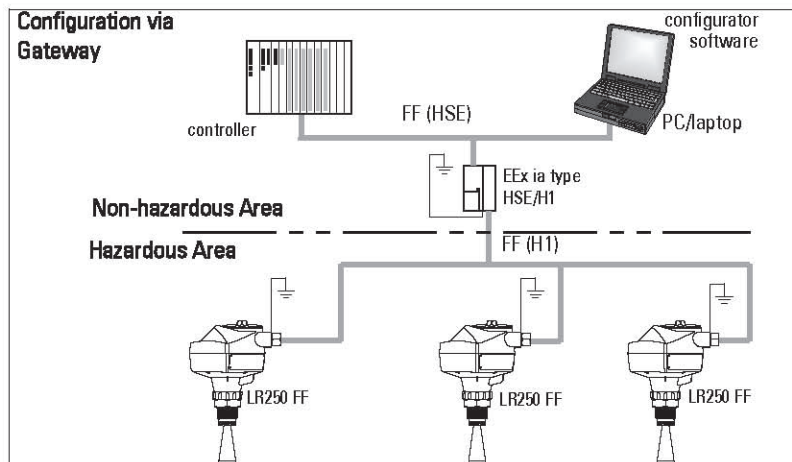
Wiring Setups for hazardous area installations

There are three wiring options for hazardous area installations:

- *Intrinsically Safe wiring* on page 26
- *Non-Sparking-Energy Limited wiring* on page 28
- *Non-incendive wiring (only for USA/Canada)* on page 28

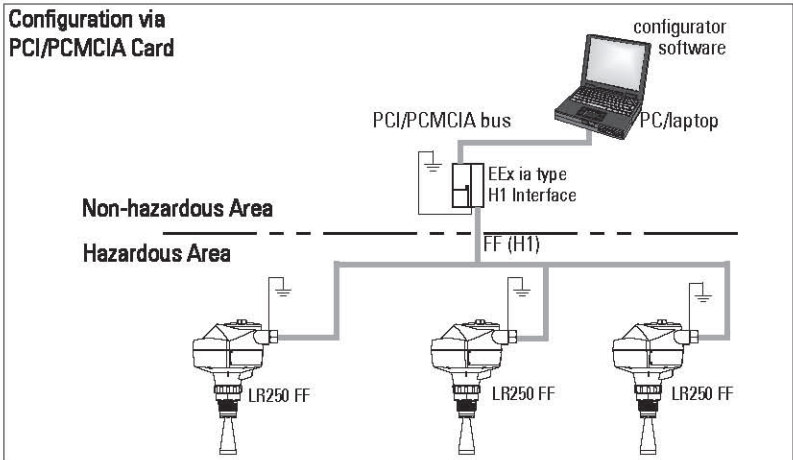
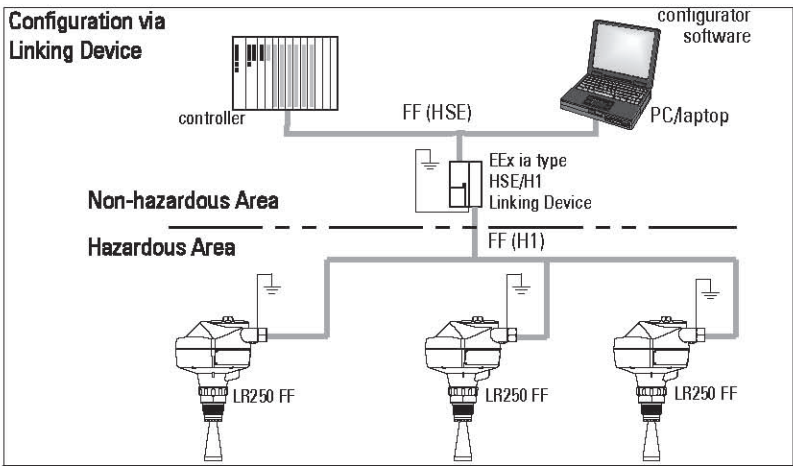
In all cases, check the nameplate on your instrument, and confirm the approval rating.

Configuration with Foundation Fieldbus for hazardous areas



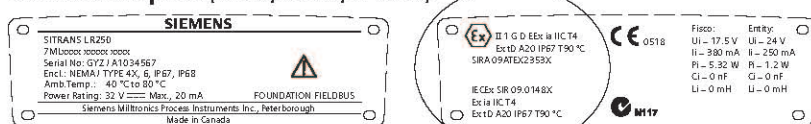
Configuration for hazardous areas cont'd on next page.

Configuration for hazardous areas cont'd.



1. Intrinsically Safe wiring

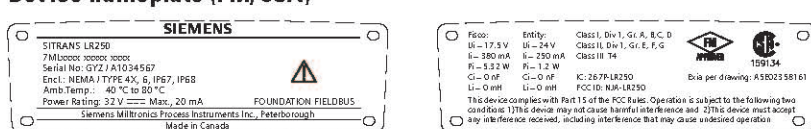
Device nameplate (ATEX/IECEx/C-TICK)



The ATEX certificates listed on the nameplate can be downloaded from the product page of our website at: www.siemens.com/LR250. Go to **More Info > Certificates**.

The IECEx certificate listed on the nameplate can be viewed on the IECEx website. Go to: <http://iecex.iec.ch> > **Ex Equipment Certificates of Conformity** and enter the certificate number **IECEx SIR 09.0148X**.

Device nameplate (FM/CSA)



The FM/CSA Intrinsically Safe connection drawing number **A5E02358161** can be downloaded from the product page of our website at www.siemens.com/LR250.

Go to **More Info > Installation Drawings > Level Measurement > SITRANS LR250**.

- For wiring requirements: follow local regulations.
- Approved dust-tight and water-tight conduit seals are required for outdoor NEMA 4X / type 4X / NEMA 6, IP67, IP68 locations.
- Refer to *Instructions specific to hazardous area installations* on page 29.

Under the entity evaluation concept, SITRANS LR250 has the following characteristics:

(input voltage) U_i	= 24 V
(input current) I_i	= 250 mA
(input power) P_i	= 1.2 W
(internal capacitance) C_i	= 0
(internal inductance) L_i	= 0

Entity Concept:

The Entity Concept allows interconnection of Intrinsically Safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage and current which Intrinsically Safe apparatus can receive and remain Intrinsically Safe, considering faults, must be equal to or greater than the output voltage (U_o) and output current (I_o) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C_i) and Inductance (L_i) of the Intrinsically Safe apparatus, including interconnecting wiring, must be equal to or less than the capacitance and inductance which can be safely connected to associated apparatus.

FISCO Concept

Under the FISCO evaluation concept, SITRANS LR250 has the following characteristics:

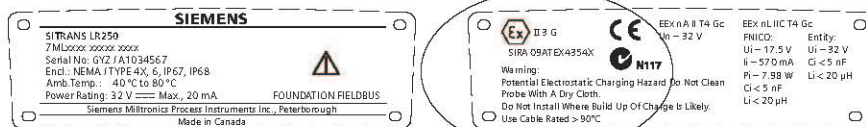
(input voltage) U_i	= 17.5 V
(input current) I_i	= 380 mA
(input power) P_i	= 5.32 W
(internal capacitance) C_i	= 0
(internal inductance) L_i	= 0

Note: For complete details and instructions regarding the FISCO Concept The FM/CSA connection drawing number **A5E02358161** can be downloaded from the product page of our website at: www.siemens.com/LR250. Go to **More Info > Installation Drawings > Level Measurement > SITRANS LR250**.

The FISCO Concept allows interconnection of Intrinsically Safe apparatus to associated apparatus not specifically examined in such combination. The criteria for interconnection is that the voltage (U_i or V_{max}), the current (I_i or I_{max}) and the power (P_i or P_{max}) which Intrinsically Safe apparatus can receive and remain Intrinsically Safe, considering faults, must be equal to or greater than the voltage (U_o or V_o or V_i), the current (I_o or I_{sc} or I_i), and the power (P_o or P_{max}) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (C_i) and inductance (L_i) of each apparatus (other than the termination) connected to the fieldbus must be less than or equal to 5 nF and 10 μ H respectively.

In each segment only one active device, normally the associated apparatus, is allowed to provide the necessary energy for the fieldbus system. The allowed voltage U_o (or V_o or V_t) of the associated apparatus is limited to the range of 14V dc to 24V dc. All other equipment connected to the bus cable has to be passive, meaning that they are not allowed to provide energy to the system, except for a leakage current of 50 μ A for each connected device. Separately powered equipment needs a galvanic isolation to assure that the Intrinsically Safe fieldbus circuit remains passive.

2. Non-Sparking-Energy Limited wiring



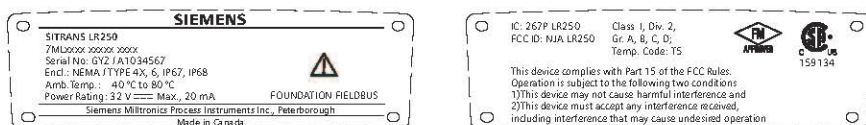
The ATEX certificate listed on the nameplate

can be downloaded from the product page of our website at: www.siemens.com/LR250.

Go to **More Info > Installation Drawings > Level Measurement > SITRANS LR250**.

- For wiring requirements: follow local regulations.
- Approved dust-tight and water-tight conduit seals are required for outdoor NEMA 4X / type 4X / NEMA 6, IP67, IP68 locations.

3. Non-incendive wiring (only for USA/Canada)



FM/CSA Class 1, Div 2 connection drawing number 23650673

can be downloaded from the product page of our website at: www.siemens.com/LR250.

Go to **More Info > Installation Drawings > Level Measurement > SITRANS LR250**.

- For wiring requirements: follow local regulations.
- Approved dust-tight and water-tight conduit seals are required for outdoor NEMA 4X / type 4X / NEMA 6, IP67, IP68 locations.
- Refer to *Instructions specific to hazardous area installations* on page 29.

Instructions specific to hazardous area installations

(Reference European ATEX Directive 94/9/EC, Annex II, 1/0/6)

The following instructions apply to equipment covered by certificate number SIRA 09ATEX2353X and 09ATEX4354X:

1. For use and assembly, refer to the main instructions.
2. The equipment is certified for use as Category 1GD equipment per SIRA 09ATEX2353X certificate and as Category 3G per SIRA 09ATEX4354X certificate.
3. The equipment may be used with flammable gases and vapors with apparatus group IIC, IIB and IIA and temperature classes T1, T2, T3 and T4.
4. The equipment has a degree of ingress protection of IP67 and a temperature class of T90 °C and may be used with flammable dusts.
5. The equipment is certified for use in an ambient temperature range of -40 °C to +80 °C.
6. The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
7. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
8. The equipment is non-repairable.
9. The certificate numbers have an 'X' suffix, which indicates that special conditions for safe use apply. Those installing or inspecting this equipment must have access to the certificates.
10. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

Suitable precautions: e.g. establishing from the material's data sheet that it is resistant to specific chemicals.

Quick Start

SITRANS LR250 carries out its level measurement tasks according to settings made via parameters. The settings can be modified locally via the Local User Interface (LUI) which consists of an LCD display and a handheld programmer.

A Quick Start Wizard provides an easy step-by-step procedure to help you configure the device for a simple application. There are two ways to access the wizard:

- locally (See *Quick Start Wizard via the handheld programmer* on page 36)
- from a remote location (See *Quick Start Wizard via AMS Device Manager* on page 45)

For more complex setups see *Appendix E: Application Examples* on page 156, and for the complete range of parameters see *Parameter Reference (LUI)* on page 96.

Activating SITRANS LR250

Out of the box, SITRANS LR250 will not begin measurements, and all blocks will be **Out of Service** until the device has been configured via the local user interface (LUI), or a remote configuration tool.

(If the SITRANS LR250 FF is to be used in an FF application, configure using a network configuration tool, such as DeltaV or NI-FBUS Configurator. See *Quick Start Wizard via AMS Device Manager* on page 45.)

Follow these steps to configure the device via the LUI:

- Power up the instrument
- The LCD at startup will show LANGUAGE. Edit or cancel this selection. When complete, the device will show QUICK START.
- Complete the Quick Start Wizard (see *Quick Start Wizard via the handheld programmer* on page 36). Completing the Quick Start Wizard or writing any parameter via the LUI causes the device to begin measuring. The Resource Block (RES) and Level Transducer Block (LTB) will move to Automatic mode.
- AIFB 1 and AIFB 2 will remain Out of Service (as displayed on the LCD). These blocks can only be configured and scheduled using a network configuration tool. For more details, see **System Integration** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01).

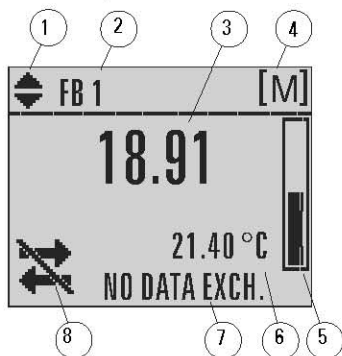
Note: The last step of the Quick Start run from the LUI will place the RESOURCE block in *Automatic* mode.

The LCD Display

Press **Mode**  to toggle between Measurement and Program Mode.

Measurement mode

Normal operation



- 1 – toggle indicator¹⁾ to switch between AIFB 1/ AIFB 2 (displayed as FB1/FB2)
- 2 – identifies which block is source of displayed value
- 3 – measured value (level, space, distance, or volume)
- 4 – units
- 5 – bar graph indicates level
- 6 – secondary region indicates on request²⁾ electronics temperature, echo confidence, or distance
- 7 – text area displays status messages
- 8 – device status indicator

¹⁾ Press **UP** or **DOWN** arrow to switch.

²⁾ In response to a key press request. For details, see *Programming SITRANS LR250 on page 33*.

Fault present



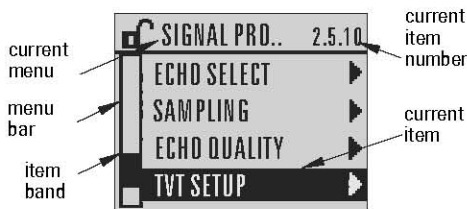
S: 0 LOE

- 7 – text area displays a fault code and an error message
- 8 – service required icon appears

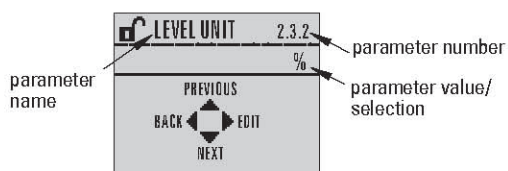
PROGRAM mode display

Navigation view

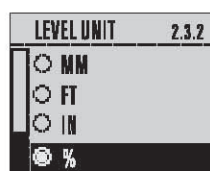
- A visible menu bar indicates the menu list is too long to display all items.
- A band halfway down the menu bar indicates the current item is halfway down the list.
- The depth and relative position of the item band on the menu bar indicates the length of the menu list, and approximate position of the current item in the list.
- A deeper band indicates fewer items.



Parameter view



Edit view



Handheld Programmer

(Part No. 7ML1930-1BK)

The programmer is ordered separately.



Key functions in Measurement mode

Key	Function	Result
	Updates internal enclosure temperature reading.	New value is displayed in LCD secondary region.
	Updates echo confidence value.	
	Updates distance measurement.	
	Mode opens PRO-GRAM mode.	Opens the menu level last displayed in this power cycle, unless power has been cycled since exiting PROGRAM mode or more than 10 minutes have elapsed since PRO-GRAM mode was used. Then top level menu will be displayed.
	RIGHT arrow opens PROGRAM mode.	Opens the top level menu.
	UP or DOWN arrow toggles between AIFB 1 and AIFB 2.	Identifies which AIFB is the source of the displayed value.

Programming SITRANS LR250

Notes:

- While the device is in PROGRAM mode the output remains active and continues to respond to changes in the device.
- SITRANS LR250 automatically returns to Measurement mode after a period of inactivity in PROGRAM mode (between 15 seconds and 10 minutes, depending on the menu level).

Change parameter settings and set operating conditions to suit your specific application. (For remote operation see *Operating via AMS Device Manager* on page 40.)

Parameter menus

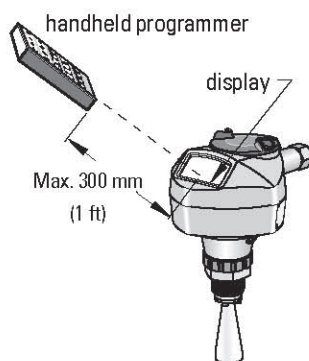
Note: For the complete list of parameters with instructions, see *Parameter Reference (LUI)* on page 96.

Parameters are identified by name and organized into function groups, then arranged in a 5-level menu structure (see *LCD Menu Structure* on page 169).



1. Enter PROGRAM mode

- Point the programmer at the display (from a maximum distance of 300 mm [1 ft]).
- **RIGHT arrow**  activates PROGRAM mode and opens menu level 1.
- **Mode**  opens the menu level last displayed in PROGRAM mode within the last 10 minutes, or menu level 1 if power has been cycled since then.



2. Navigating: key functions in Navigation mode

Notes:

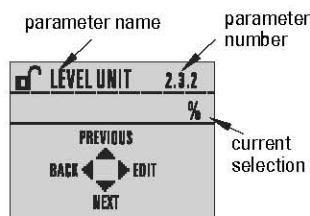
- In Navigation mode **ARROW** keys move to the next menu item in the direction of the arrow.
- For Quick Access to parameters via the handheld programmer, press **Home** , then enter the menu number. For example, to access parameter *2.4.1 Volume*, press **2.4.1**.

Key	Name	Menu level	Function
 	UP or DOWN arrow	menu or parameter	Scroll to previous or next menu or parameter.
	RIGHT arrow	menu	Go to first parameter in the selected menu, or open next menu.
		parameter	Open Edit mode.
	LEFT arrow	menu or parameter	Open parent menu.
	Mode	menu or parameter	Change to MEASUREMENT mode.
	Home	menu or parameter	Open top level menu: menu 1.

3. Editing in PROGRAM mode

Selecting a listed option

- Navigate to the desired parameter.
- Press **RIGHT arrow**  to open parameter view.

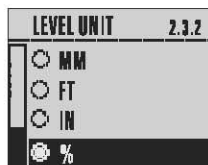


- Press **RIGHT arrow**  again to open **Edit** mode. The current selection is highlighted.

Scroll to a new selection.

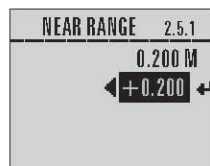
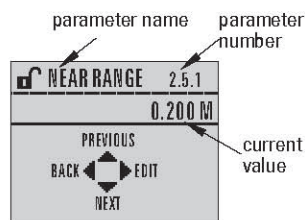
- Press **RIGHT arrow**  to accept it.

The LCD returns to parameter view and displays the new selection.



Changing a numeric value

- Navigate to the desired parameter.
- Press **RIGHT arrow**  to open parameter view. The current value is displayed.
- Press **RIGHT arrow**  again to open **Edit** mode. The current value is highlighted.
- Key in a new value.
- Press **RIGHT arrow**  to accept it. The LCD returns to parameter view and displays the new selection.



Key functions in Edit mode

Key	Name	Function
 	UP or DOWN arrow	Selecting options Scrolls to item.
		Numeric editing - Increments or decrements digits - Toggles plus and minus sign
	RIGHT arrow	Selecting options - Accepts the data (writes the parameter) - Changes from Edit to Navigation mode
		Numeric editing - Moves cursor one space to the right - or with cursor on Enter sign, accepts the data and changes from Edit to Navigation mode
	LEFT arrow	Selecting options Cancels Edit mode without changing the parameter
		Numeric editing - Moves cursor to plus/minus sign if this is the first key pressed - or moves cursor one space to the left - or with cursor on Enter sign, cancels the entry.
	Clear	Numeric editing Erases the display.
	Decimal point	Numeric editing - Enters a decimal point - Captures the current path [see Secondary Value (4.11.)]
	Plus or minus sign	Numeric editing Changes the sign of the entered value.
 to 	Numeral	Numeric editing Enters the corresponding character.

Quick Start Wizard via the handheld programmer

Notes:

- Default settings in the Quick Start Wizard are indicated with an asterisk (*) unless explicitly stated.
- When using the handheld programmer, the Quick Start wizard settings are inter-related and changes apply only after you select **FINISH** in **Wizard Complete**.
- Do not use the Quick Start wizard to modify individual parameters: see instead *Parameter Reference (LUI)* on page 96. (Perform customization only after the Quick Start has been completed.)

1. Quick Start

- Point the programmer at the display [from a maximum distance of 300 mm (1 ft)], then press **RIGHT arrow**  to activate PROGRAM mode and open menu level 1.
- Press **RIGHT arrow**  twice to navigate to menu item 1.1 and **DOWN arrow**  to enter the Quick Start Wizard.
- Press **RIGHT arrow**  to open **Edit** mode or **DOWN arrow**  to accept default values and move directly to the next item.
- To change a setting, scroll to the desired item or key in a new value.
- After modifying a value, press **RIGHT arrow**  to accept it and press **DOWN arrow**  to move to the next item.
- Quick Start settings take effect only after you select **Finish** in **Wizard Complete**.

1.1. Quick Start Wizard

Introduction

Note: The introduction screen is displayed only on the device when using the handheld programmer. This screen is not part of the Quick Start Wizard when using AMS Device Manager.

Introduction to Quick Start Wizard showing purpose of wizard: to setup common applications easily.

Options	CANCEL, NEXT
---------	--------------

Language

Selects the language to be used on the LCD and takes effect immediately.

Options	*	ENGLISH
		DEUTSCH
		FRANCAIS
		ESPAÑOL
		简体中文

Material

Selects the appropriate echo processing algorithms for the material (see Position Detect (2.5.7.2.) on page 146 for more detail).

Options	*	LIQUID
		LIQUID LOW DK (low dielectric liquid – CLEF algorithm enabled)

Response Rate

Sets the reaction speed of the device to measurement changes in the target range.

Options		Response Rate (2.3.8.1.)	Fill Rate per Minute (2.3.8.2.)/Empty Rate per Minute (2.3.8.3.)
	*	SLOW	0.1 m/min (0.32 ft/min)
		MED	1.0 m/min (3.28 ft/min)
		FAST	10.0 m/min (32.8 ft/min)

Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

Units

Sensor measurement units.

Options	M, CM, MM, FT, IN
	Default: M

Low Calibration Point

Distance from Sensor Reference to Low Calibration Point: usually process empty level. (See Calibration 2.3.7. on page 99 for an illustration.)

Values	Range: 0.0000 to 30.000 m
	Default: 20.000 m

High Calibration Point

Distance from Sensor Reference to High Calibration Point: usually process full level. (See Calibration 2.3.7. on page 99 for an illustration.)

Values	Range: 0.0000 to 30.000 m
	Default: 0.000 m

Wizard Complete

Note: Wizard Complete is only displayed on the device when using the handheld programmer. This step is not part of the Quick Start Wizard when using AMS Device Manager.)

In order to save the Quick Start settings it is necessary to select FINISH to apply changes.

Options	BACK, CANCEL, FINISH (Display returns to 1.1 Quick Start Wizard menu when Quick Start is successfully completed.)
----------------	---

Press **Mode**  to return to Measurement mode. The Level Transducer Block (LTB) will now be operational. To view a measurement reading over the network, one of the Analog Input Function Blocks (AIFB) will need to be setup and scheduled using a network configuration software tool.

Auto False Echo Suppression

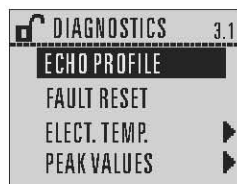
If you have a vessel with known obstructions, we recommend using Auto False Echo Suppression to prevent false echo detection. See **TVT (Auto False Echo Suppression) Setup (25.10.)** for instructions.

This feature can also be used if SITRANS LR250 displays a false high level, or the reading is fluctuating between the correct level and a false high level.

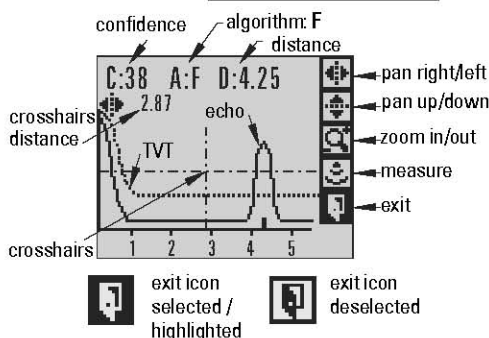
Requesting an Echo Profile

- In PROGRAM mode, navigate to: **Level Meter > Diagnostics (3.) > Echo Profile (3.1)**

- Press **RIGHT arrow**  to request a profile.



- UP/DOWN arrows** are dedicated to scrolling through the icons.
- The selected icon is highlighted.
- Press **UP arrow** to select **Measure** and **RIGHT arrow**  to update the profile.



- Press **DOWN arrow**  to select **Exit** then press **RIGHT arrow**  to return to the previous menu.

Device Address

Note: The address can only be changed from a remote master such as NI-FBUS Configurator or DeltaV. See **Addressing** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for further details.

Read only. The unique address of the device on the network.

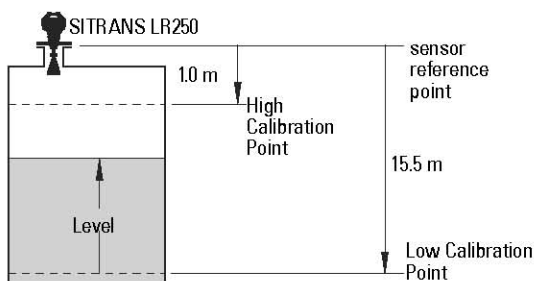
Values	Temporary range during initial commissioning: 248 - 251. Permanent range after commissioning complete (written to non-volatile memory in the device): 16-247
---------------	---

- In PROGRAM mode, navigate to: **Level Meter > Communication (5.) > Device Address (5.2)** to view the device address.
- Press **Mode**  to return to Measurement mode.

Level application example

The application is a vessel that takes an average 3 hours (180 minutes) to fill and 3 weeks to empty.

$$\begin{aligned}\text{Fill rate} &= 0.08 \text{ m/minute } [(\text{Low Cal Pt. minus High Cal Pt.}) / \text{fastest of fill or empty time}] \\ &= (15.5 \text{ m} - 1 \text{ m}) / 180 \text{ min.} \\ &= 14.5 \text{ m} / 180 \text{ min.} = 0.08 \text{ m/min.}\end{aligned}$$



Quick Start Parameter	Setting	Description
Material	LIQUID	
Response Rate	SLOW	Resets Fill Rate and Empty Rate to 0.1 m/minute.
Units	M	
Low Calibration Point	15.5	Process empty level.
High Calibration Point	1.0	Process full level.
Wizard Complete	FINISH	Save new settings and exit Wizard

Operating via AMS Device Manager

AMS Device Manager is a software package used to commission and maintain SITRANS LR250 and other process devices. Please consult the operating instructions or online help for details on using AMS Device Manager. (You can find more information at <http://www.emersonprocess.com/AMS/>.)

Functions in AMS Device Manager

Note: Do not use the handheld programmer at the same time as AMS Device Manager, or erratic operation may result. (To disable operation via the handheld programmer, see *Local Operation* on page 130.)

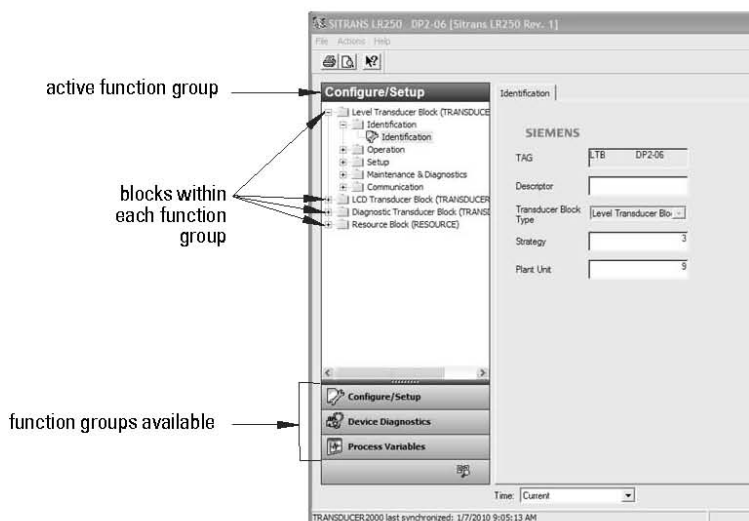
AMS Device Manager can be used to monitor the process values, alarms and status signals of the device. It allows you to display, compare, adjust, verify, and simulate process device data.

Configuration and monitoring of the device is completed via parameters organized into three main function groups:

- Configure/Setup
- Device Diagnostics (read only)
- Process Variables (read only)

Each function group is further divided into four blocks:

- Level Transducer Block (LTB)
- Liquid Crystal Display Block (LCD)
- Diagnostic Block (DIAG)
- Resource Block (RESOURCE)



In general, process parameters are accessed through the Level Transducer Block, and device parameters are accessed through the Resource Block.

Key Features of AMS Device Manager Rev. 9.0

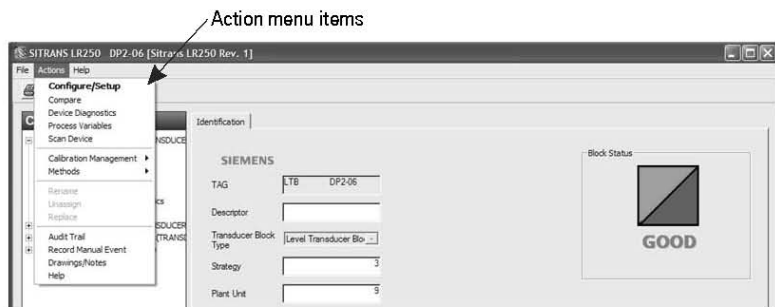
The graphic interface in SITRANS LR250 makes monitoring and adjustments easy.

CONFIGURE/SETUP function group			
Block	Feature	Page	Function
LTB	Echo Profile	58	Echo profile viewing
LTB	TVT (time varying threshold)	56	Screen out false echoes
LTB	Linearization (LTB)	53	Volume measurement in an irregular vessel
LTB	Maintenance & Diagnostics (LTB)	59	Set schedules and reminders for sensor maintenance and service
RESOURCE	Quick Start Wizard via AMS Device Manager	45	Device configuration for simple applications
RESOURCE	Maintenance & Diagnostics (RESOURCE)	69	Set schedules and reminders for device maintenance and calibration
RESOURCE	Security (RESOURCE)	72	Protect security and communication parameters from modification by the maintenance user

DEVICE DIAGNOSTICS function group			
Block	Feature	Page	Function
LTB	Alarms & Errors (LTB)	73	Monitor process errors and alarms
RESOURCE	Alarms & Errors (RESOURCE)	77	Monitor device errors and alarms

PROCESS VARIABLES function group			
Block	Feature	Page	Function
LTB	Process Variables (Level Transducer Block-LTB)	79	Monitor process variables and level trend

Pull-down menu access



A pull-down menu under **Actions** gives alternative access to several features.

Adding a new device

Electronic Device Description (EDD)

Note: SITRANS LR250 requires the EDD for AMS Device Manager version 9.0.

Check the product page of our website at: www.siemens.com/LR250, under **Downloads**, for the latest version of EDD: SITRANS LR250 FF - Foundation Fieldbus - AMS V9.0.

1. Check that you have the latest version of the EDD for AMS Device Manager that matches the firmware revision of your device (see Firmware Revision on page 66), and if necessary download it from the product page listed above. Save the files to your computer, and extract the zipped file to an easily accessed location.
2. Launch **AMS Device Manager – Add Device Type**, browse to the unzipped EDD file and select it.
3. The device is shipped with a unique tag, consisting of a manufacturer id and serial number. The device tag can only be read from the device. It is not necessary to change the device tag to make the device operational, however if you wish to change it, use AMS Device Manager.

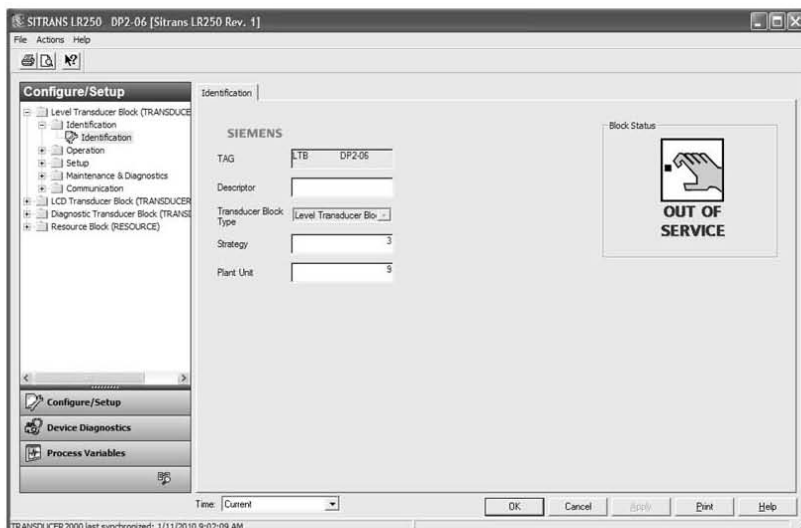
Set Device Tag via AMS Device Manager:

- a) Launch **AMS Device Manager – AMS Device Manager**.
- b) From the Device Connection View, right click on the FF Network icon and select **Rebuild Hierarchy**.
- c) Right click on the device icon, and choose **Rename** from the menu.
- d) Enter a device tag and press **Enter**.

Note: The Device Tag described above is separate from the Tag that describes each block type (as shown in the *Identification* folder of each block).

Startup

1. Launch **AMS Device Manager – AMS Device Manager**. (If AMS already running, go to step 4.
2. From the Device Connection View, right click on the FF Network icon and select **Rebuild Hierarchy**.
3. Double-click the device icon to open the startup screen. The startup screen shows device identification details, and a navigation window on the left-hand side of the screen. (The Block Status will show Out of Service at initial startup.)

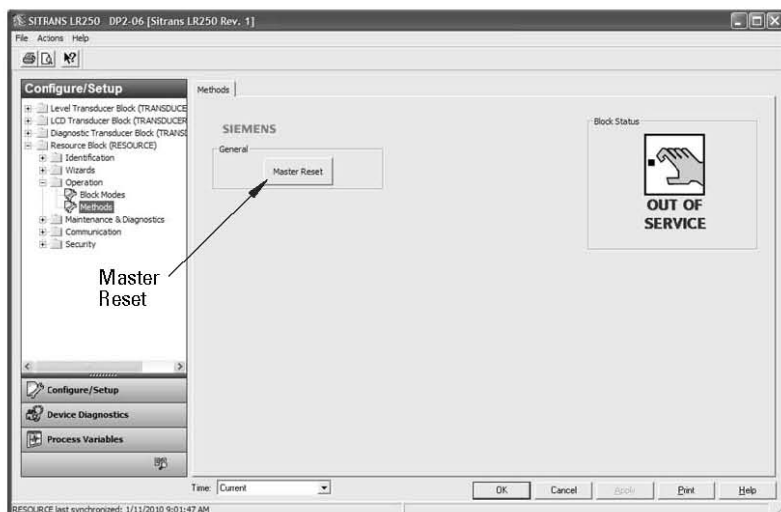


4. Next, complete a master reset.

Master Reset

A master reset is recommended before first configuring a new device. (Block Status must be Out of Service to perform a Master Reset.)

1. Navigate to **Configure/Setup > Resource > Operation > Methods** and click to open the dialog window.
2. In the **General** field, click on **Master Reset** and click Next to perform reset to factory defaults. Click Next to accept default reset to **Factory Defaults**.



3. Click FINISH then restart AMS to reload settings. Next, scan the device.

Scan Device

Scan Device uploads parameters from the device (synchronizes parameters) to AMS Device Manager.

1. Open the pull-down menu **Actions – Scan Device** (upload parameters from the device to AMS).
2. The next step when adding a new device is to configure and calibrate the device via the Quick Start Wizard.

Sensor calibration

The LR250 FF does not need to be calibrated, only configured using the Quick Start Wizard below.

Configuring a new device

Configure a new device using the Quick Start Wizard, found in the **Resource Block** of the function group **Configure/Setup**.

Quick Start Wizard via AMS Device Manager

The Quick Start Wizard groups together all the settings you need to configure a device for most applications.

Please consult the operating instructions or online help for details on using AMS Device Manager.

Note: Use Quick Start Wizard via AMS Device Manager for initial configuration of a device on an FF network. If device is not on an FF network, initial configuration should be completed via the Quick Start Wizard from the LUI. (See *Quick Start* on page 30.)

Quick Start Wizard steps

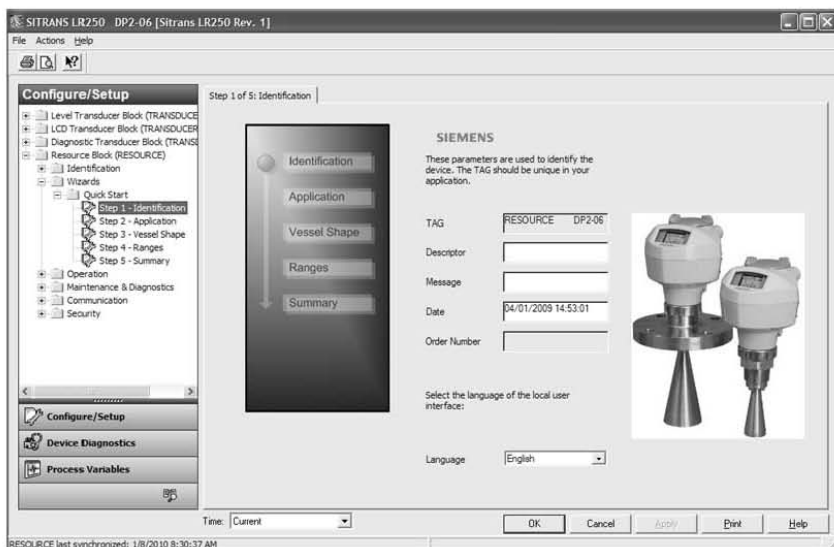
Notes:

- Complete the steps in order. Click on **Apply** after revising parameters in each step, or **CANCEL** to exit step without saving changes. (Note: **Apply** will write changes to the device. **OK** will write changes to the device and exit to the Device Connection View. **CANCEL** will exit to the Device Connection View without applying changes.)
- Do not use the Quick Start Wizard to modify individual parameters: see instead *Changing parameter settings using AMS Device Manager* on page 49. (Perform customization only after the Quick Start has been completed.)
- Values set using the Quick Start Wizard via AMS Device Manager are saved and recalled each time it is initiated (unlike the Quick Start Wizard initiated via the handheld programmer).
- To run the Quick Start Wizard for this device, the RESOURCE block must first be set to Out of Service (OOS) mode, before any configuration changes (changes to parameters affecting block output) can be written. (Setting RESOURCE block to OOS also sets LTB to OOS.)
- After completing steps 1-4, review all settings in *Step 5 - Summary*. Return to steps 1-4 if further changes are required.
- After completing the Quick Start Wizard from AMS, you must manually place the RESOURCE block in Automatic mode.

Launch **AMS Device Manager** and double-click the device icon from the Device Connection View to open the startup screen. Navigate to **Configure/Setup > Resource Block > Wizards > Quick Start**, and click on **Step 1 - Identification**.

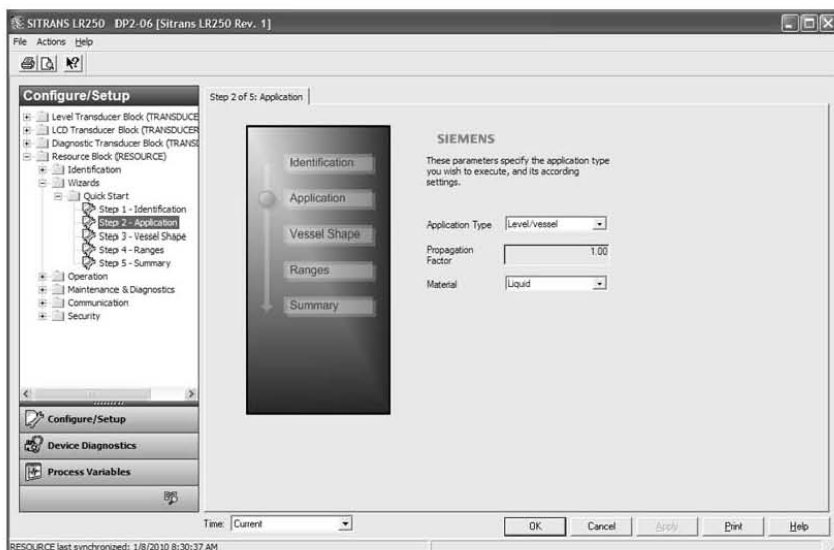
Step 1 – Identification

You can accept the default values without modification. (**Descriptor**, **Message**, and **Installation Date** fields can be left blank.) If desired, make changes then click on **Apply**. (The **Apply** button is activated when a parameter is modified.) Go to Step 2.



Step 2 – Application Type

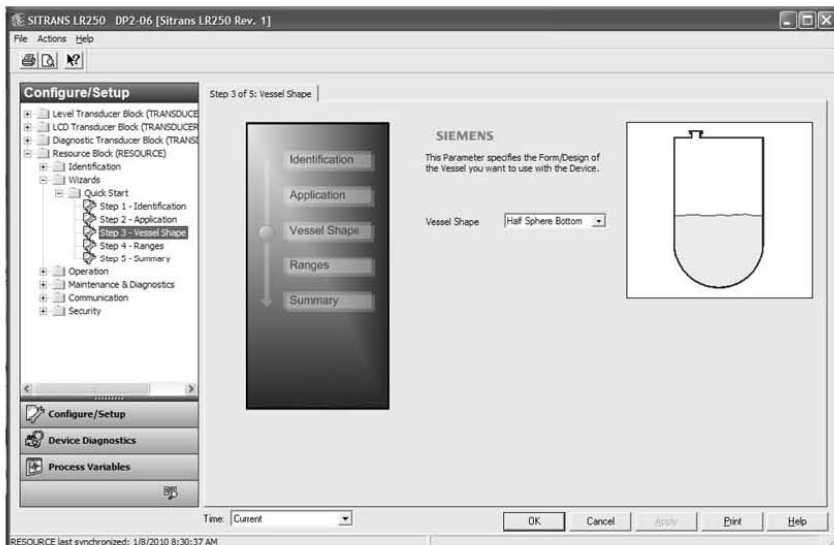
Click on **Step 2 - Application Type** in the navigation window. Select the Application Type (level or volume), Propagation Factor (if using a stillpipe application), and the Material¹. Click on **Apply** to save settings then go to Step 3.



¹ For a Low Dielectric Liquid application in a stilling well, see example *Application with Stillpipe* on page 158.

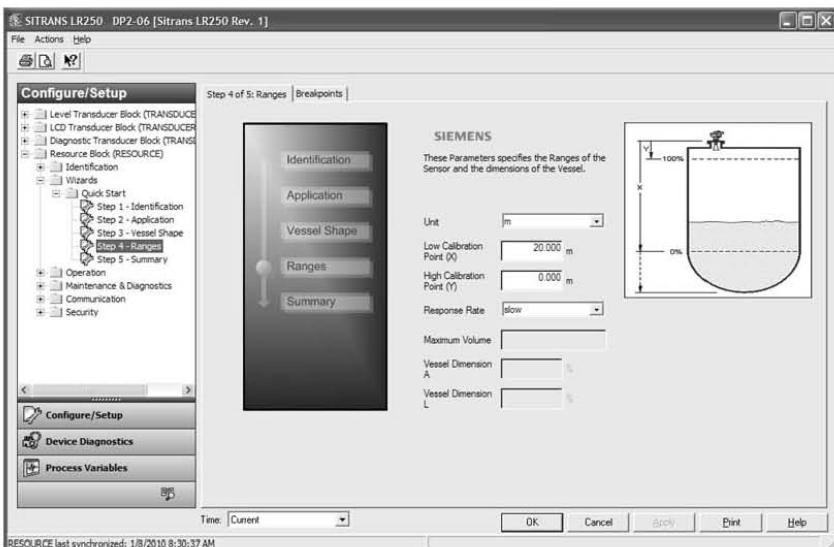
Step 3 – Vessel Shape

Click on **Step 3 – Vessel Shape** in the navigation window. Select the vessel shape. To describe a more complex shape, select **Linearization Table** in the Vessel Shape field and see *Linearization (LTB) on page 53* for more details. Click on **Apply** to save settings then go to Step 4.



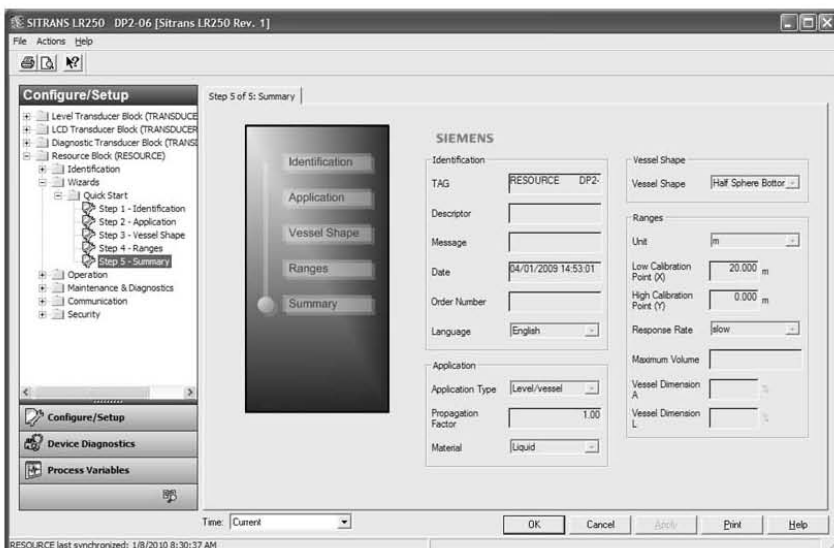
Step 4 – Ranges

Click on **Step 4 – Ranges** in the navigation window. On the tab Step 4 of 5 Ranges: set the parameters, and click on **Apply** to save settings. If necessary, click on the Breakpoints tab, set the parameters, and click on **Apply** to save settings. Go to Step 5.



Step 5 – Summary

Click on **Step 5 - Summary** in the navigation window. Check parameter settings. Return to individual steps if further changes are necessary.



The Quick Start Wizard is now complete.

Changing parameter settings using AMS Device Manager

Notes:

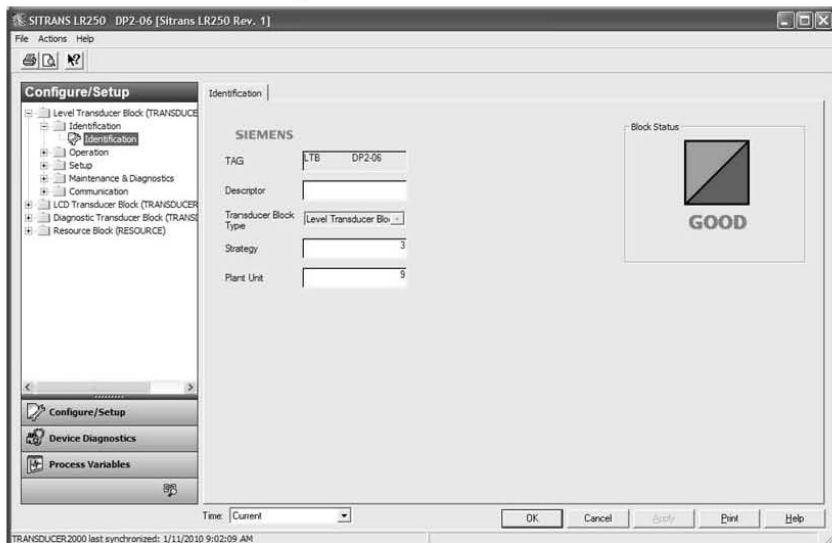
- For a complete list of parameters, see *Parameter Reference (LUI)* on page 96.
 - For more detailed explanations of the parameters listed below see the pages referenced.
- 1) Adjust parameter values in the parameter value field in **Configure/Setup** view, then click on **Apply** to write the new values to the device. The parameter field will display in yellow until the value has been written to the device.
 - 2) Click on **OK** only if you wish to update all parameters and exit device view.

Configure/Setup (Level Transducer Block-LTB) Identification (LTB)

Navigate to **Configure/Setup > LTB > Identification**.

Identification:

- TAG
Read only. Description for the associated block: device tag prefixed by block type.
- Descriptor (see *Descriptor* on page 97)
- Transducer Block Type
Read only. Identifies the type of transducer block.
- Strategy
Used to identify grouping of blocks.
- Plant Unit
The identification number of the plant unit. For example, can be used in the host for sorting alarms.



Operation (LTB)

Navigate to **Configure/Setup > LTB > Operation**.

Click on **Block Modes** to open the dialog window for access to:

Block Modes:

- Actual Mode *(read only)*

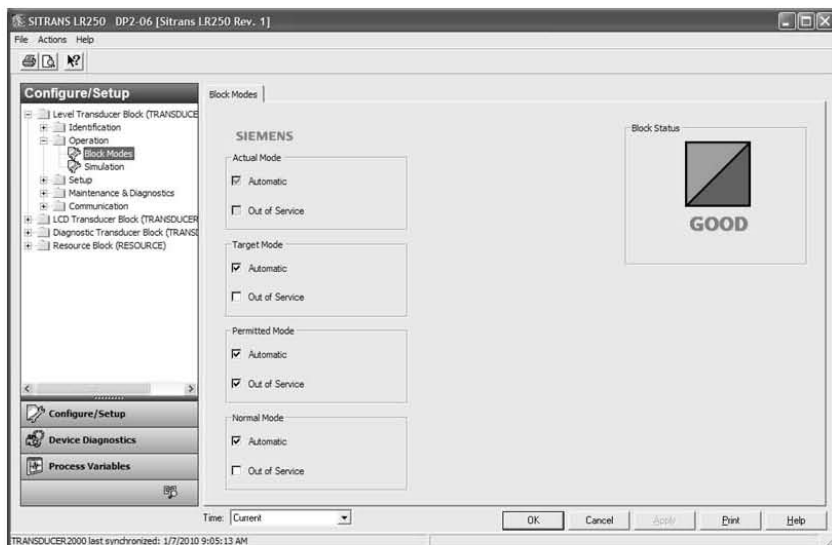
This is the current mode of the block, which may differ from the target based on operating conditions. Its value is calculated as part of the block execution.

- Target Mode (see 2.6.2. Mode on page 113)
- Permitted Mode

Defines the modes that are allowed for an instance of the block. The permitted mode is configured based on application requirements.

- Normal Mode

This is the mode that the block should be set to during normal operating conditions.



Click on **Simulation** to open the dialog window for access to:

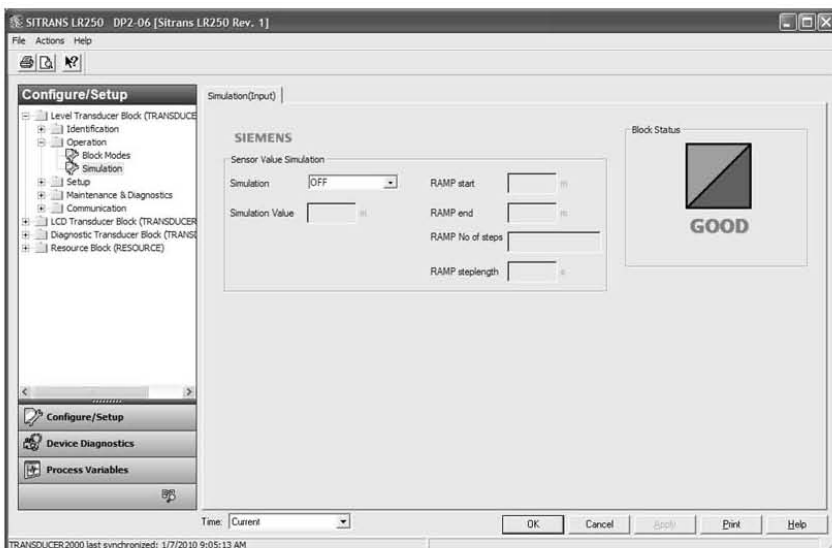
Simulation (Input)

Allows you to simulate the sensor value which is input to the Level Transducer Block. This tests everything between the Level Transducer Block and Output

Note: To activate simulation via AMS Device Manager or the 375 Field Communicator, simulation must also be set to Enabled on the device. See 4.12. *Simulate Enable* on page 128.

- Simulation
- Simulation Value
- RAMP start
- RAMP end
- RAMP No of steps

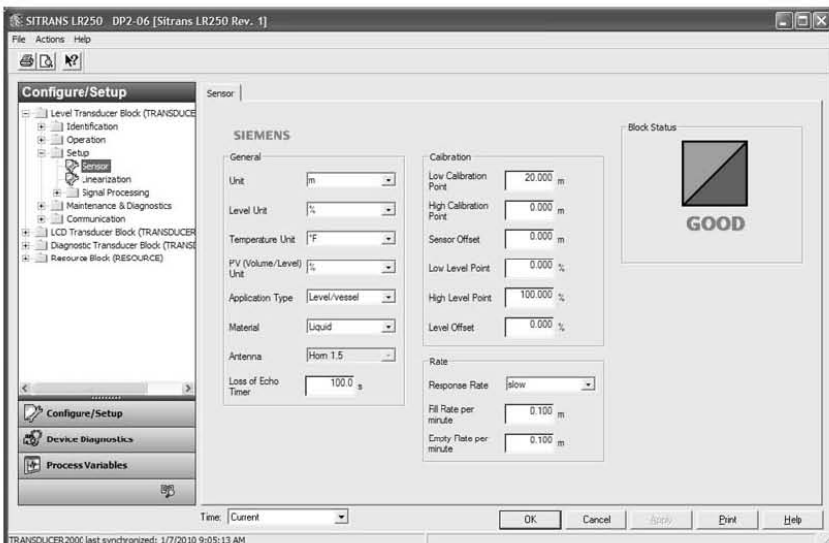
- RAMP steplength



- To enable simulation select **Fixed value** or **Ramp** in the Simulation field.
- If you select Fixed value, enter a Simulation Value.
- If you select Ramp, enter the ramp start, end, number of steps, and steplength.
- Click **Apply**.
- After simulation is complete, set Simulation to **OFF** and click **Apply**.

Setup (LTB)

Sensor (LTB)



Navigate to **Configure/Setup > LTB > Setup** and click on **Sensor** for access to:

General

[see **Sensor (2.3.)** on page 97]

- Unit (see *2.3.1. Unit* on page 97)
- Level Unit (see *2.3.2. Level Unit* on page 98)
- Temperature Unit (see *2.3.4. Temperature Units* on page 98)
- PV (Volume/Level) Unit (see *2.3.3. PV (volume/level) Units* on page 98)
- Application Type (available only via AMS Device Manager)

Defines the application type.

Values	Level/vessel (default)
	Level/stillpipe
	Level/bypass pipe
	Volume/vessel
	Volume/stillpipe
	Volume/bypass pipe

- Material (see *2.3.5. Material* on page 98)
- Antenna (see *2.3.7.7. Antenna* on page 100)
- Loss of Echo Timer (see *2.3.6. Loss of Echo (LOE) Timer* on page 99)

Calibration

[see **Calibration (2.3.7.)** on page 99 for details]

- Low Calibration Point (see *2.3.7.1. Low Calibration Point* on page 99)
- High Calibration Point (see *2.3.7.2. High Calibration Point* on page 99)
- Sensor Offset (see *2.3.7.3. Sensor Offset* on page 99)
- Low Level Point (see *2.3.7.4. Low Level Point* on page 100)
- High Level Point (see *2.3.7.5. High Level Point* on page 100)
- Level Offset (see *2.3.7.6. Level Offset* on page 100)

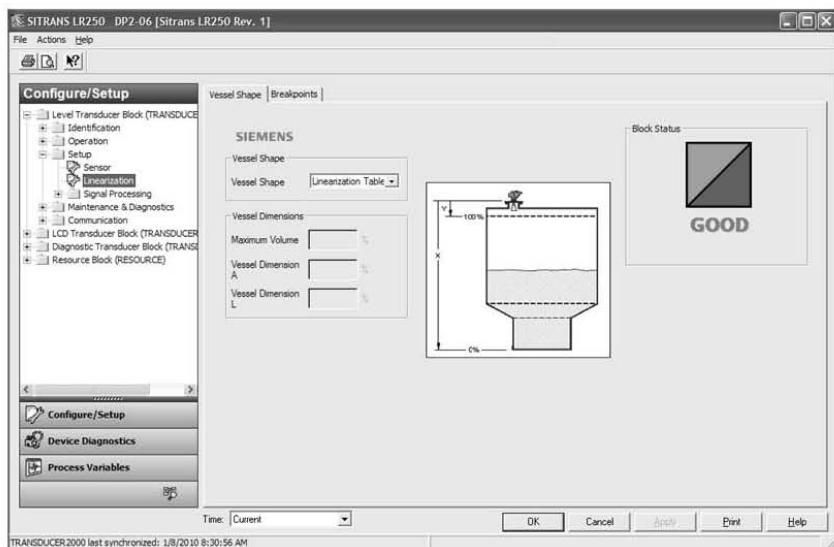
Rate

[see **Rate (2.3.8.)** on page 100]

- Response Rate (see *2.3.8.1. Response Rate* on page 100)
- Fill Rate per minute (see *2.3.8.2. Fill Rate per Minute* on page 101)
- Empty Rate per minute (see *2.3.8.3. Empty Rate per Minute* on page 101)

Linearization (LTB)

You can use the linearization feature to define a more complex vessel shape and enter up to 32 level breakpoints where the corresponding volume is known. (See 2.4. Linearization on page 101.)



Navigate to **Configure/Setup > LTB > Setup > Linearization** and click on **Linearization**. Click on the **Vessel Shape** tab to access the parameters listed:

Vessel Shape

- Vessel Shape (see 2.4.1.1. *Vessel Shape* on page 101)

Vessel Dimensions

- Maximum Volume (see 2.4.1.2. *Maximum Volume* on page 103)
- Vessel Dimension A (see 2.4.1.3. *Dimension A* on page 103)
- Vessel Dimension L (see 2.4.1.4. *Dimension L* on page 103)

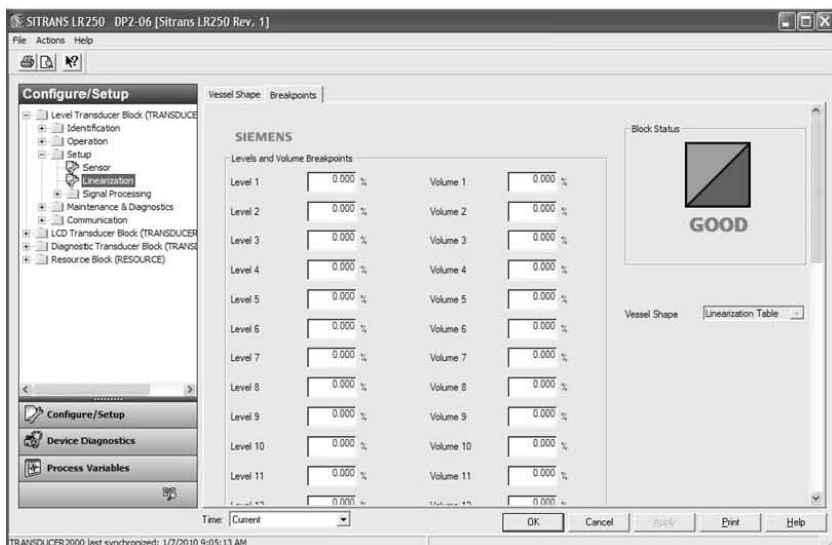
OR

Click on **Breakpoints** tab for access to level and volume breakpoints.

Note: This parameter becomes accessible only after **Linearization Table** has been selected in **Vessel Shape** above.

Level and Volume Breakpoints (see XY Index (2.4.1.5.) on page 103)

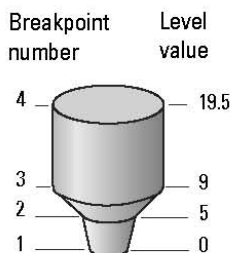
- Level 1 Level 32
- Volume 1 ... Volume 32
- Vessel Shape



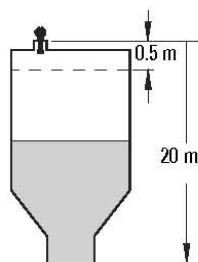
- The default for level values is percent: if you want to select units instead, go to **Configure/Setup > LTB > Setup > Sensor > Level Unit**, and select the desired unit.
- Go to **Configure/Setup > LTB > Setup > Sensor > PV (Volume/Level) Unit**, and select the desired volume units.
- From the Vessel Shape tab of **Configure/Setup > LTB > Setup > Linearization**, select **Linearization Table** option in the Vessel Shape field.
- Click on the Breakpoints tab and enter values for level and volume breakpoints in table.

The values corresponding to 100% and 0% levels must be entered. The breakpoints can be ordered from top to bottom, or the reverse.

Example:



Break-point no.	Level value (m)	Volume value (l)
1	0	0
2	5	500
3	9	3000
4	19.5	8000

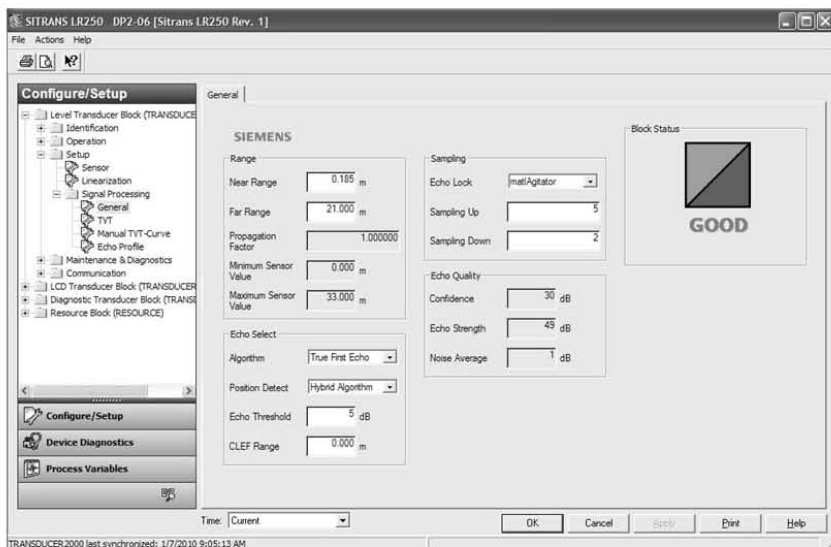


Note: Values are for example purposes only.

After completing the above steps you will need to configure AIFB 1 and/or AIFB 2. (See 2.6. AIFB 1 on page 113 and 2.7. AIFB 2 on page 116 for details.)

Signal Processing (LTB)

Note: For more detailed explanations of the parameters listed below see the pages referenced.



General

Navigate to **Configure/Setup > LTB > Setup > Signal Processing** and click on **General** for access to:

Range

[see **Signal Processing (2.5.)** on page 104]

- Near Range (see 2.5.1. *Near Range* on page 105)
- Far Range (see 2.5.2. *Far Range* on page 105)
- Propagation Factor (see 2.5.3. *Propagation Factor* on page 105)
- Minimum Sensor Value (see 2.5.4. *Minimum Sensor Value* on page 106)
- Maximum Sensor Value (see 2.5.5. *Maximum Sensor Value* on page 106)

Echo Select

[see **Echo Select (2.5.7.)** on page 106]

- Algorithm (see 2.5.7.1. *Algorithm* on page 106)
- Position Detect (see 2.5.7.2. *Position Detect* on page 107)
- Echo Threshold (see 2.5.7.3. *Echo Threshold* on page 107)
- CLEF Range (see 2.5.7.4. *CLEF (Constrained Leading Edge Fit) Range* on page 108)

Sampling

[see **Sampling (2.5.8.)** on page 108]

- Echo Lock (see *2.5.8.1. Echo Lock* on page 109)
- Sampling Up (see *2.5.8.2. Up Sampling* on page 109)
- Sampling Down (see *2.5.8.3. Down Sampling* on page 109)

Echo Quality

[see **Echo Quality (2.5.9.)** on page 109]

- Confidence (see *2.5.9.1. Confidence* on page 109)
- Echo Strength (see *2.5.9.2. Echo Strength* on page 109)
- Noise Average

Displays the average ambient noise (in dB above 1 μ V rms) of a noise profile. Noise level is a combination of transient noise and receiving circuitry. After a measurement, the values from the previous noise shot will be displayed.

TVT (time varying threshold)

A time-varying curve that determines the threshold level above which echoes are determined to be valid.

Modify the TVT to screen out false echoes [see *Time Varying Threshold (TVT)* on page 146, and *Auto False Echo Suppression (2.5.10.1.)* on page 148].

Navigate to **Configure/Setup > LTB > Setup > Signal Processing** and click on **TVT**. Click on one of the two tabs to access the parameters listed:

TVT Setup

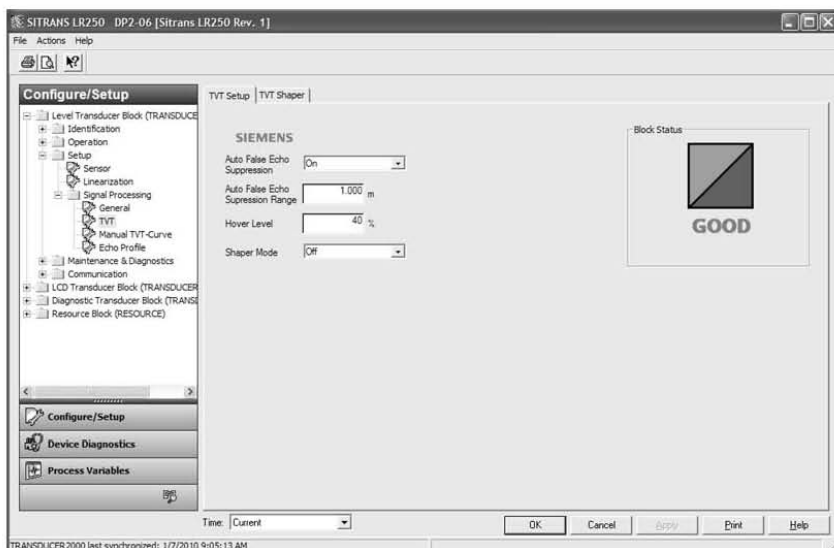
- Auto False Echo Suppression (see *2.5.10.1. Auto False Echo Suppression* on page 110)
- Auto False Echo Suppression Range (see *2.5.10.2. Auto False Echo Suppression Range* on page 111)
- Hover Level (see *2.5.10.3. Hover Level* on page 112)
- Shaper Mode (see *2.5.10.4. Shaper Mode* on page 112)

Auto False Echo Suppression

After determining values as described in steps a) and b) of **2.5.10.1. Auto False Echo Suppression** on page 110,

- Open the menu **Configure/Setup > LTB > Setup > Signal Processing > TVT** and set Auto False Echo Suppression Range.

- d) From the same menu, set Auto False Echo Suppression to **learn**. The device will automatically revert to **On** (Use Learned TVT) after a few seconds.



TVT Shaper

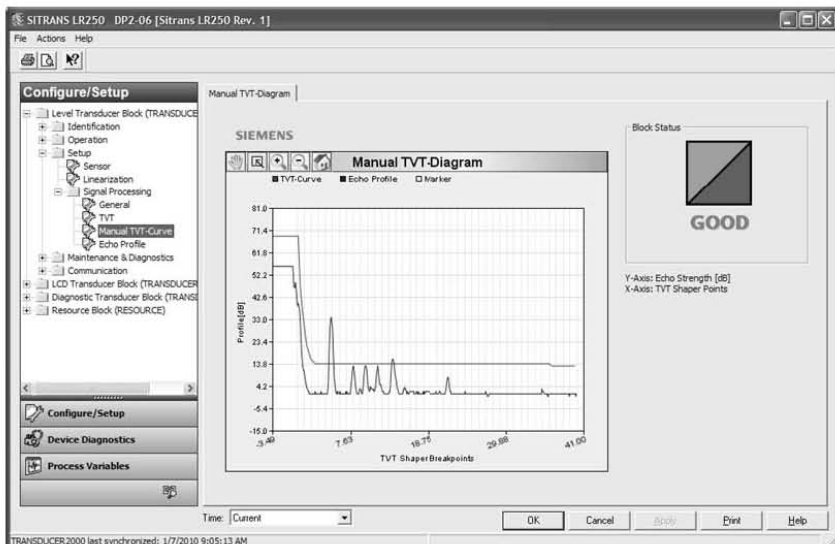
[see **TVT Shaper (2.5.11.)** on page 112]

- Breakpoints 1 to 40
 - Shaper Mode
- a) Open the menu **Configure/Setup > LTB > Setup > Signal Processing > TVT** and click on the TVT Setup tab
 - b) Turn Shaper Mode to **On** to activate Breakpoints 1 to 40 on the TVT Shaper tab

Manual TVT Curve

Displays the effects of the TVT shaper modifications.

Navigate to **Configure/Setup > LTB > Setup > Signal Processing** and click on **Manual TVT-Curve**.



Echo Profile

Displays the current echo profile.

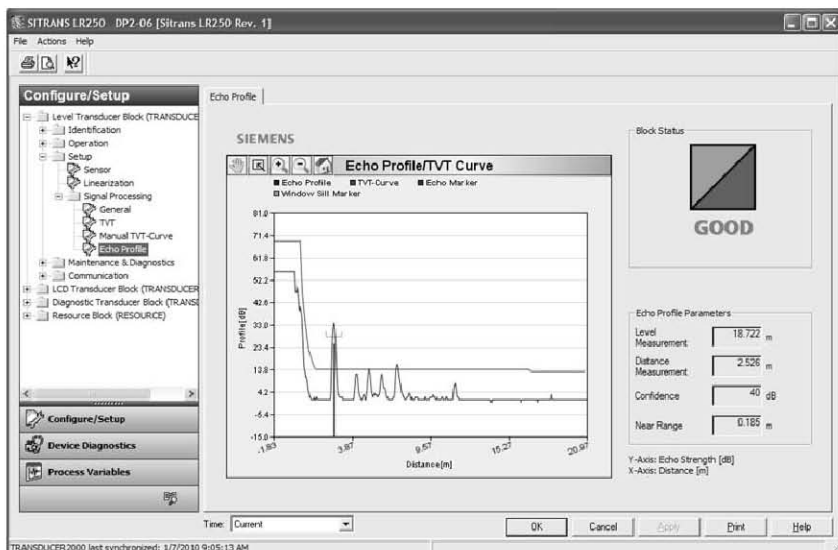
Navigate to **Configure/Setup > LTB > Setup > Signal Processing** and click on **Echo Profile** to view the current echo profile and to access:

Echo Profile Parameters

[see **Echo Profile (3.1.)** on page 117]

- Level Measurement (see *2.8. Measured Values* on page 116)
- Distance Measurement (see *2.8. Measured Values* on page 116)
- Confidence (see *2.5.9.1. Confidence* on page 109)
- Near Range (see *2.5.1. Near Range* on page 105)

- a) To view a previous profile, click the drop-down arrow on the **Time** field and select the desired profile (note: available only using AMS version 10.1 or later).



Maintenance & Diagnostics (LTB)

Note: For more detailed explanations of the parameters listed below see the pages referenced.

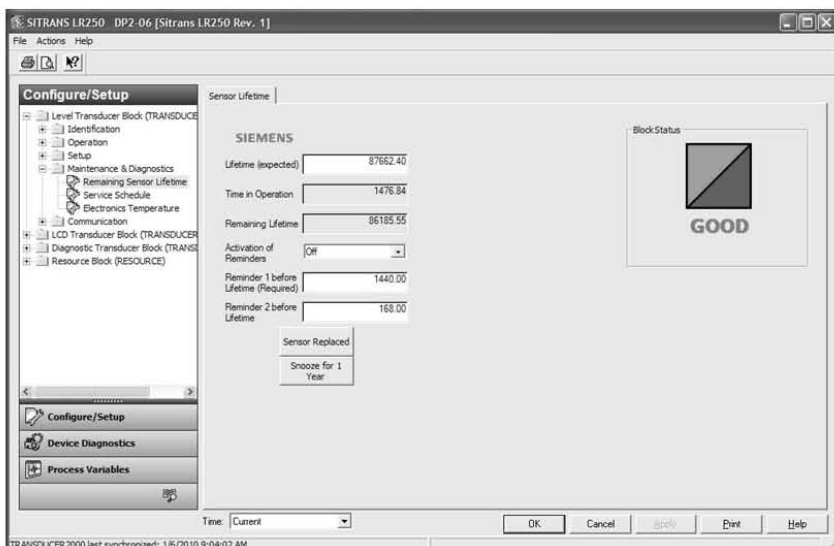
Navigate to **Configure/Setup > LTB > Maintenance and Diagnostics** for access to:

Remaining Sensor Lifetime

[see **Remaining Sensor Lifetime (4.3.)** on page 121]

- Lifetime (expected) (see *4.3.1. Lifetime Expected* on page 122)
 - Time in Operation (see *4.3.2. Time in Operation* on page 122)
 - Remaining Lifetime (see *4.3.3. Remaining Lifetime* on page 122)
 - Activation of Reminders (see *4.3.4. Reminder Activation* on page 122)
 - Reminder 1 before Lifetime (Required) [see *4.3.5. Reminder 1 (Required)* on page 122]
 - Reminder 2 before Lifetime (Demanded) [see *4.3.6. Reminder 2 (Demanded)* on page 123]
- a) Open the window **Remaining Sensor Lifetime**
 - b) After modifying values/units as required, click on **Apply** to accept the change.

- Click on **Sensor Replaced** to reset *Time in Operation* to 0 hours
- Click on **Snooze for 1 Year** to add a year to the Total Expected Sensor Life

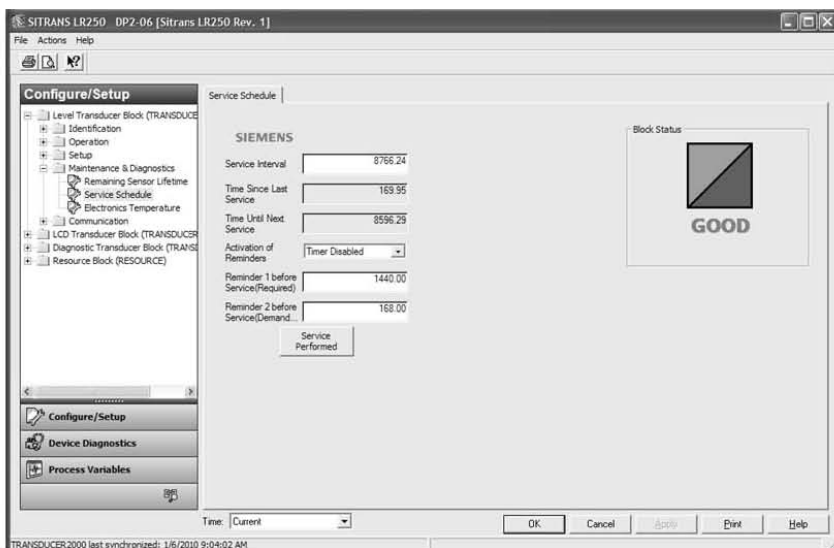


Service Schedule

[see **Service Schedule (4.4.)** on page 123]

- Service Interval (see *4.4.1. Service Interval* on page 124)
- Time Since Last Service (see *4.4.2. Time Last Serviced* on page 124)
- Time Until Next Service (see *4.4.3. Time Next Serviced* on page 124)
- Activation of Reminders (see *4.4.4. Reminder Activation* on page 124)
- Reminder 1 before Service (Required) (see *4.4.5. Reminder 1 (Required)* on page 124)
- Reminder 2 before Service (Demanded) (see *4.4.6. Reminder 2 (Demanded)* on page 124)

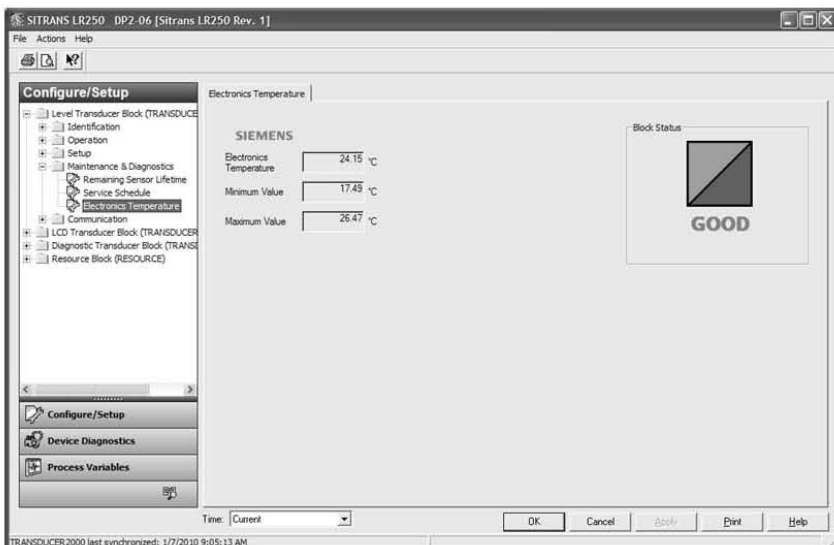
- Click on **Service Performed** to reset Time Since Last Service to 0 hours



Electronics Temperature

[see **Electronics Temperature (3.3.)** on page 118]

- Electronics Temperature
Displays the current internal temperature of the device
- Minimum Value (see 3.3.1. Minimum Value on page 118)
- Maximum Value (see 3.3.2. Maximum Value on page 118)

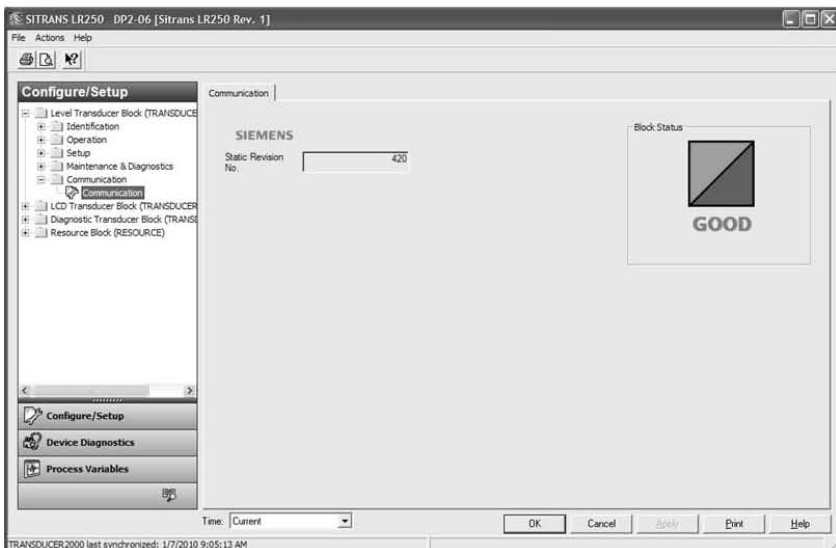


Communication (LTB)

Navigate to **Configure/Setup > LTB > Communication** for access to:

Communication:

- Static Revision No. (see *26.1. Static Revision Number* on page 113)



Configure/Setup (Liquid Crystal Display Block-LCD)

Identification (LCD)

Navigate to **Configure/Setup > LCD > Identification**.

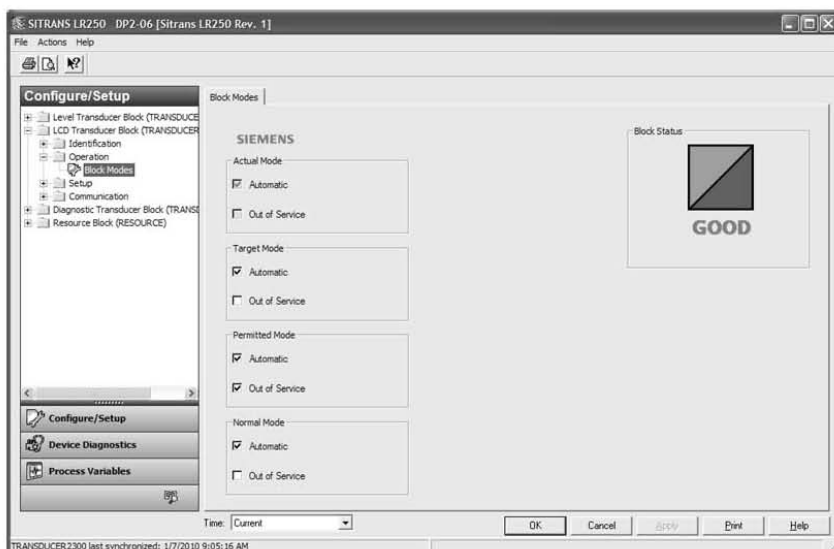
Identification:

- TAG
- Descriptor
- Transducer Block Type
- Strategy
- Plant Unit

Note: For descriptions of Identification parameters see *Identification: on page 49*.

Operation (LCD)

Note: For more detailed explanations of the parameters listed below see the pages referenced.



Navigate to **Configure/Setup > LCD > Operation**.

Click on **Block Modes** to open the dialog window for access to:

Block Modes:

- Actual Mode
- Target Mode
- Permitted Mode
- Normal Mode

Note: For descriptions of Block Modes see *Block Modes: on page 50*.

To disable updating of the LCD remotely, Actual Mode of this block should read **Out of Service**. This is done by setting Target Mode to **Out of Service**.

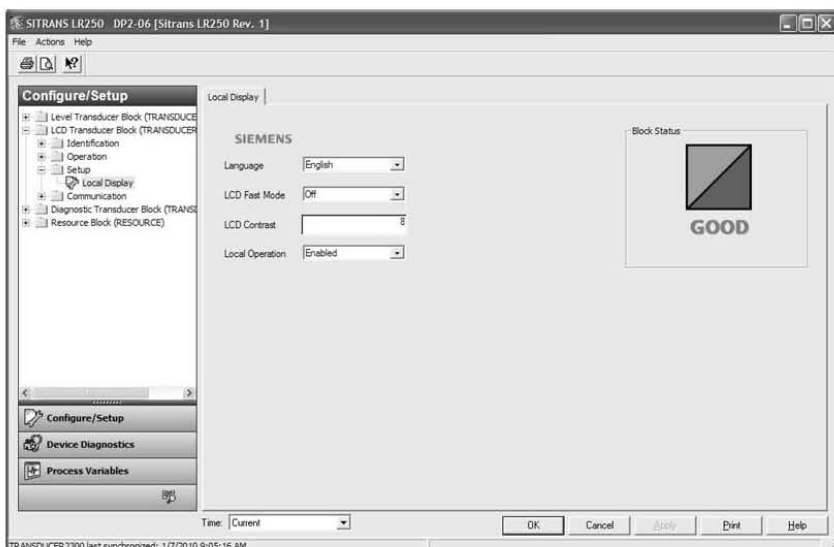
Setup (LCD)

Navigate to **Configure/Setup > LCD > Setup > Local display** for access to:

Local Display

- Language (see 7. *Language* on page 130)
- LCD Fast Mode (see 4.9. *LCD Fast Mode* on page 127)
- LCD Contrast (see 4.10. *LCD Contrast* on page 127)
- Local Operation (see 6.2.3. *Local Operation* on page 130)

If local operation is disabled remotely and no communication activity exists for 30 seconds, the parameter is made visible again locally.



Communication (LCD)

Navigate to **Configure/Setup > LCD > Communication** for access to:

Communication:

- Static Revision No. (see 2.6.1. *Static Revision Number* on page 113)

Configure/Setup (Diagnostic Transducer Block-DIAG)

Note: Parameters in the Diagnostic Transducer Block used solely by factory personnel.

Identification (DIAG)

Navigate to **Configure/Setup > DIAG > Identification**.

Identification:

- TAG
- Descriptor
- Transducer Block Type
- Strategy
- Plant Unit

Note: For descriptions of Identification parameters see *Identification: on page 49*.

Operation (DIAG)

Navigate to **Configure/Setup > DIAG > Operation**.

Block Modes:

- Actual Mode
- Target Mode
- Permitted Mode
- Normal Mode

Note: For descriptions of Block Modes see *Block Modes: on page 50*.

Communication (DIAG)

Navigate to **Configure/Setup > DIAG > Communication**.

Communication:

- Static Revision No. (see *2.6.1. Static Revision Number* on page 113)

Configure/Setup (Resource Block - RESOURCE)

Note: For more detailed explanations of the parameters listed below see the pages referenced.

Identification (RESOURCE)

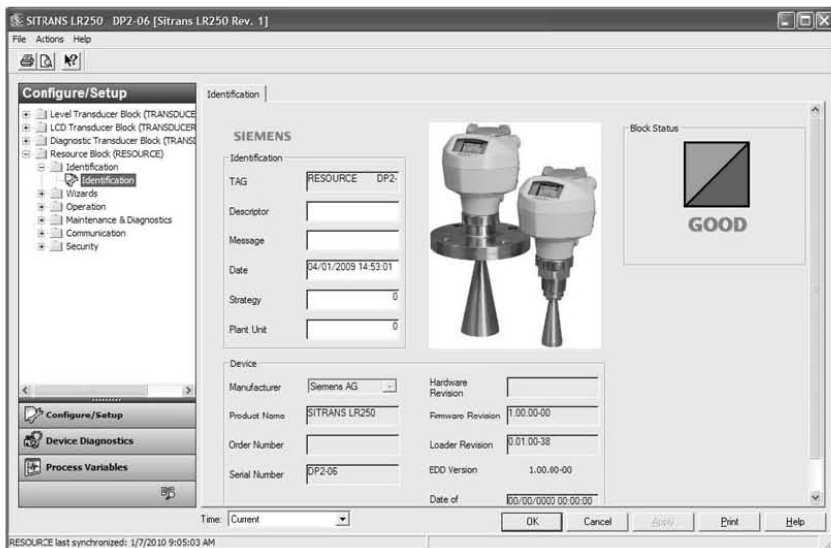
Navigate to **Configure/Setup > RESOURCE > Identification** for access to:

Identification

- TAG
Read only. Description for the associated block: device tag prefixed by block type.
- Descriptor (see 21.2 *Descriptor* on page 97)
- Message (see 21.3 *Message* on page 97)
- Date (Installation Date)
The user entered date on which the device was installed in the system.
- Strategy
Used to identify grouping of blocks.
- Plant Unit
The identification number of the plant unit. For example, can be used in the host for sorting alarms.

Device (read only)

- Manufacturer (see 5.3 *Manufacturer* on page 128)
- Product Name
The manufacturer's product name for this device.
- Order Number
The manufacturer's order number (MLFB) for this device.
- Serial Number
The manufacturer's unique serial number for this device.
- Hardware Revision (see 2.2.1 *Hardware Revision* on page 97)
- Firmware Revision (see 2.2.2 *Firmware Revision* on page 97)
- Loader Revision (see 2.2.3 *Loader Revision* on page 97)
- EDD Version
The version of the EDD currently installed.
- Date of Manufacturing (see *Manufacture Date* on page 127)



Wizards (RESOURCE)

Navigate to **Configure/Setup > RESOURCE > Wizards > Quick Start** for access to Quick Start steps (see *Quick Start Wizard via AMS Device Manager on page 45*).

Operation (RESOURCE)

Navigate to **Configure/Setup > RESOURCE > Operation**.

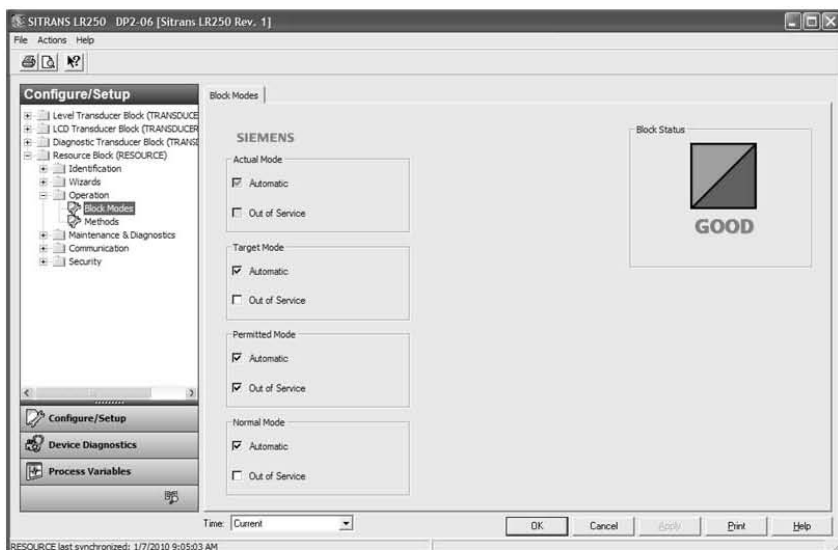
Click on **Block Modes** to open the dialog window for access to:

Block Modes:

- Actual Mode
- Target Mode
- Permitted Mode
- Normal Mode

Notes:

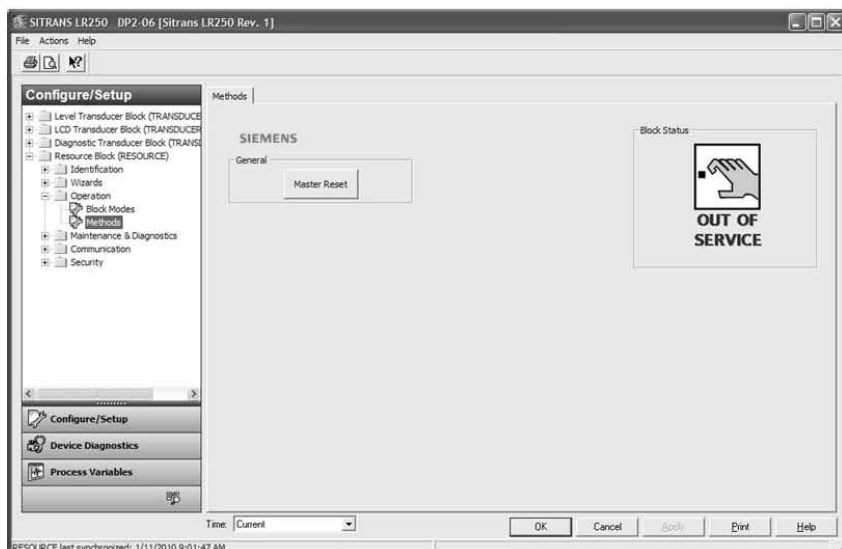
- For descriptions of Block Modes see *Block Modes: on page 50*.
- If the RESOURCE block is set to Out of Service, the LTB, and AIFB blocks are forced to Out of Service also, but the LCD and DIAG blocks remain in Automatic mode.



Click on **Methods** to open the dialog window for access to:

General:

- Master Reset
(see 4.1. *Master Reset* on page 119)



- Ensure the Block Status is Out of Service.
- Click the Master Reset button, then click Next to perform a reset.

- c) Select the Reset Type:

Note: The following parameters are not reset by any reset type: Write Protection, PIN to Unlock, Auto False Echo Suppression Range, Learned TVT.

Reset Type	Result
Factory Defaults ^{a)}	Default. Resets all user parameters to the manufacturer's default settings. Following this type of reset, complete reprogramming is required.
Standard Defaults	Resets all parameters to standard default settings.
Informational	Resets parameters such as Block Descriptor, Strategy, Device Install Date, Device Message.
Functional ¹⁾	Resets parameters that control device behavior and functionality (such as Low Calibration Point).
Warm Start	Has the same effect as recycling power to the device.
FF Object Dictionary	Resets the FF standard block profile parameters (such as block tags) to their specified defaults. This option also clears any function block parameters and device schedule ^{b)} set by the user.

- a) The only difference between Factory Defaults and Functional reset is that Factory Defaults resets maintenance parameters, such as device and sensor wear, calibration and maintenance timers. Functional reset does not reset these parameters.
- b) See **Data transmission** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for further details.

- d) Click Next, then FINISH to complete the Master Reset.

Maintenance & Diagnostics (RESOURCE)

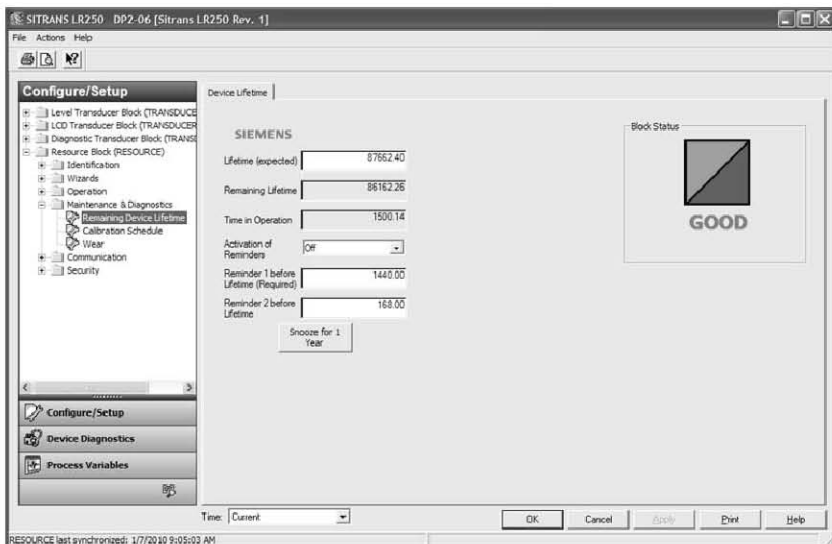
Navigate to **Configure/Setup > RESOURCE > Maintenance & Diagnostics** for access to:

Remaining Device Lifetime

[see **Remaining Device Lifetime (4.2.)** on page 120]

- Lifetime Expected (see *4.2.1. Lifetime Expected* on page 120)
 - Remaining Lifetime (*read only*) (see *4.2.3. Remaining Lifetime* on page 120)
 - Time in Operation (*read only*) (see *4.2.2. Time in Operation* on page 120)
 - Activation of Reminders (see *4.2.4. Reminder Activation* on page 120)
 - Reminder 1 before Lifetime (Required) (see *4.2.5. Reminder 1 (Required)* on page 121)
 - Reminder 2 before Lifetime (Demanded) (see *4.2.6. Reminder 2 (Demanded)* on page 121)
- a) Open the window **Remaining Device Lifetime**
- b) After modifying values/units as required, click on **Apply** to accept the change.

- Click on **Snooze for 1 Year** to add a year to the Total Expected Device Life

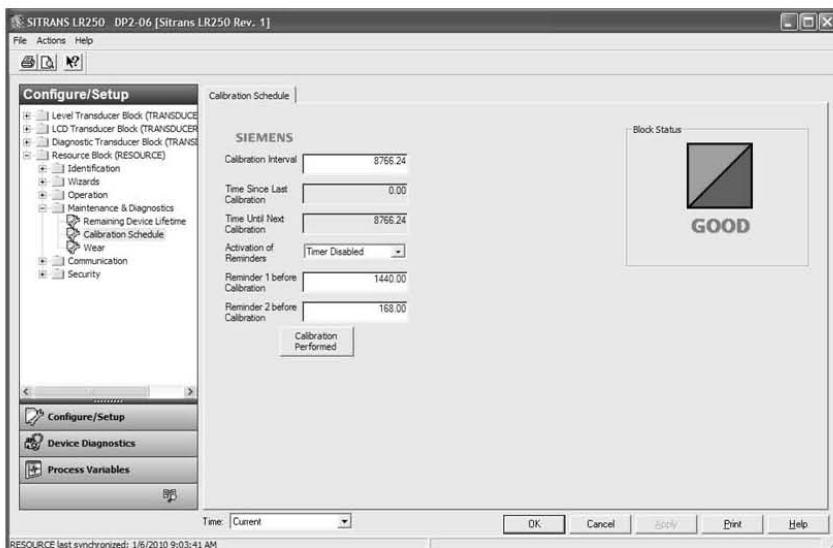


Calibration Schedule

[see **Calibration Schedule (4.5.)** on page 125]

- Calibration Interval (see *4.5.1. Calibration Interval* on page 125)
- Time Since Last Calibration (see *4.5.2. Time Last Calibrated* on page 125)
- Time Until Next Calibration (*read only*) (see *4.5.3. Time Next Calibrated* on page 126)
- Activation of Reminders (see *4.5.4. Reminder Activation* on page 126)
- Reminder 1 before Calibration (Required) (see *4.5.5. Reminder 1 (Required)* on page 126)
- Reminder 2 before Calibration (Demanded) (see *4.5.6. Reminder 2 (Demanded)* on page 126)

- Click on **Calibration Performed** to reset Time Since Last Calibration to 0 hours



Wear

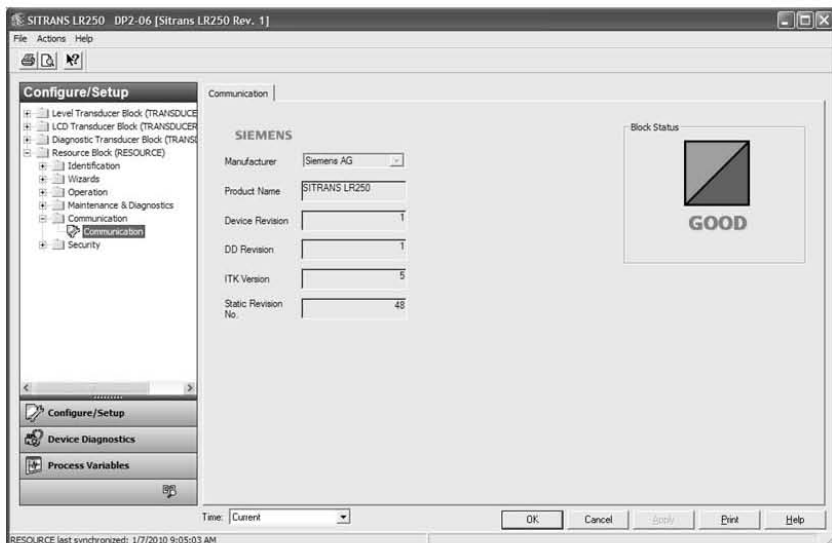
- Powered Days (*read only*) (see 4.7. *Powered Hours* on page 127)
- Poweron Resets (*read only*) (see 4.8. *Power-on Resets* on page 127)



Communication (RESOURCE)

Navigate to **Configure/Setup > RESOURCE > Communication** to read the following:

- Manufacturer (see *Manufacturer* on page 128)
- Product Name
The manufacturer's product name for this device.
- Device Revision (see *5.5. Device Revision* on page 129)
- DD Revision
Revision of the DD (also called EDD) associated with this device.
- ITK Version (see *5.6. ITK Version* on page 129)
- Static Revision No. (see *Static Revision Number* on page 113)

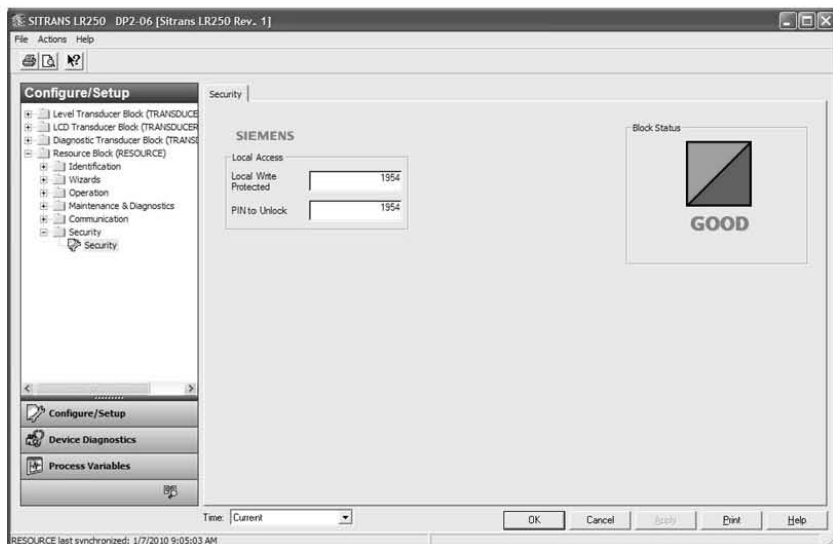


Security (RESOURCE)

Navigate to **Configure/Setup > RESOURCE > Security** to access:

Local Access

- Local Write Protected (see *6.2.1. Write Protection* on page 129)
- PIN to Unlock (see *6.2.2. PIN to Unlock* on page 130)



Device Diagnostics (Level Transducer Block - LTB)

Note: For explanations of the alarms and errors listed below, see Parameter Description charts for the respective block in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01).

Alarms & Errors (LTB)

Navigate to **Device Diagnostics > LTB > Alarms & Errors**.

Click on **Block Error** to open the dialog window to read the following:

Failures

- Input Failure
- Output Failure
- Memory Failure
- Lost Static Data
- Lost Non-Volatile Data
- Readback Check
- Device Fault State
- Block Configuration
- Link Configuration
- Other

Maintenance

- Maintenance Required
- Maintenance Demanded

Information

- Simulation Active
- Local Override
- Power Up
- Out of Service

XD Error

- Transducer Error

Click on **Block Alarm** to open the dialog window to read the following:

Unacknowledged

- Unacknowledged

Alarm State

- Alarm State

Time Stamp

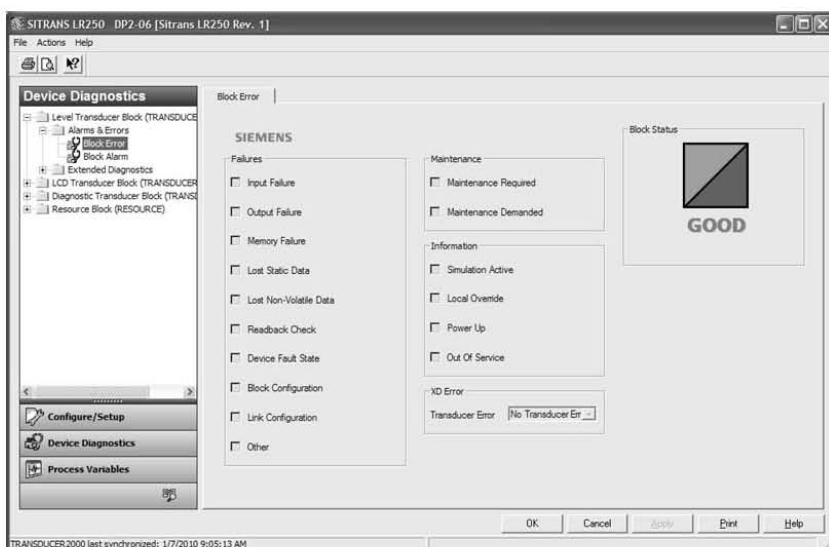
- Time Stamp

Subcode

- Subcode

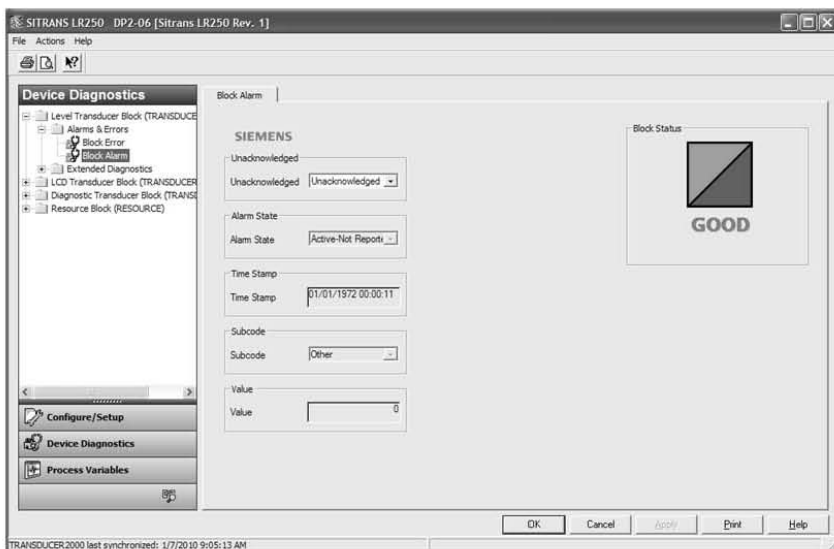
Value

- Value



- From the **Block Error** tab, check the **Maintenance** window to display the level of maintenance alarm that is active.
- From the **Block Alarm** tab, check the **Alarm State** window to display the level of maintenance alarm that has been acknowledged.

- c) From the **Block Alarm** tab, in the **Unacknowledged** window, select **Acknowledged** to acknowledge an alert.



Note: Acknowledging a maintenance reminder from the device (see *Acknowledge* 4.29., 4.3.9., 4.4.9., 4.5.9.) will not set the Block Alarm to *Acknowledged* in AMS. The maintenance alarm will cause an FF block alert, and the block alert can only be acknowledged via a remote host such as NI-FBUS Configurator or AMS Device Manager (as in step c above).

Extended Diagnostics (LTB)

Navigate to **Device Diagnostics > LTB > Extended Diagnostics** to read the following:

Detailed Error Info

- Loss of Echo
- No Tech Power
- Sensor Lifetime Limit1
- Sensor Lifetime Limit2
- Device Service Limit1
- Device Service Limit2
- LTB Scale
- Internal Temp Sensor
- Internal Temp High
- Internal Temperature Calibration
- Velocity Calibration
- Receiver Init Calibration
- Receiver Calibration
- Tech Module Hardware
- Tech Module Ramp
- Receiver Frequency Calibration
- Safe Process Data Corrupt
- Profile Clipped
- Too Few Shots Taken
- Measurement Error
- No Shots Taken
- Measurement Was Corrupted
- DMA Error
- Sensor Value too High
- Sensor Value too Low

Device Diagnostics (Liquid Crystal Display Block - LCD)

Alarms & Errors (LCD)

Navigate to **Device Diagnostics > LCD > Alarms & Errors** to read Block and Alarm errors. [Errors displayed are the same for each block (LTB, LCD, DIAG, RESOURCE). See *Alarms & Errors (LTB)* on page 73 for full listing.]

Device Diagnostics (Diagnostic Transducer Block - DIAG)

Alarms & Errors (DIAG)

Navigate to **Device Diagnostics > DIAG > Alarms & Errors** to read Block and Alarm errors. [Errors displayed are the same for each block (LTB, LCD, DIAG, RESOURCE). See *Alarms & Errors (LTB)* on page 73 for full listing. See AMS Device Manager instruction manual to work with alarms and errors.]

Device Diagnostics (Resource Block - RESOURCE)

Alarms & Errors (RESOURCE)

Navigate to **Device Diagnostics > RESOURCE > Alarms & Errors**.

Click on **Block Error** tab to open the dialog window to read the following:

Failures

- Input Failure
- Output Failure
- Memory Failure
- Lost Static Data
- Lost Non-Volatile Data
- Readback Check
- Device Fault State
- Block Configuration
- Link Configuration
- Other

Maintenance

- Maintenance Required
- Maintenance Demanded

Information

- Simulation Active
- Local Override
- Power Up
- Out of Service

Click on **Block Alarm** tab to open the dialog window to read the following:

Unacknowledged

- Unacknowledged

Alarm State

- Alarm State

Time Stamp

- Time Stamp

Subcode

- Subcode

Value

- Value

Values available on **Block Alarm** tab are also available for **Write Alarm** with one exception: the Value parameter on the Write Alarm tab is a **Discrete Value**.

Click on **Alarm Summary** tab to open the dialog window to read the following:

Current

- Discrete Alarm
- Block Alarm

Unacknowledged

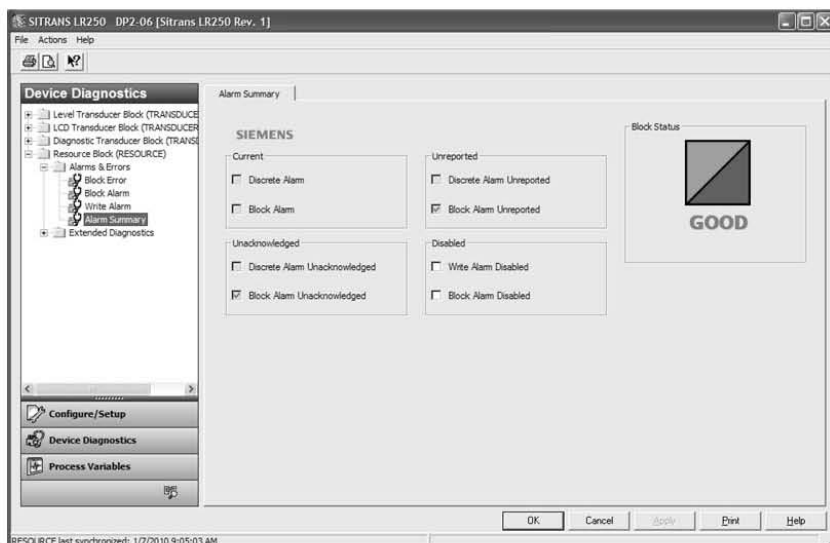
- Discrete Alarm Unacknowledged
- Block Alarm Unacknowledged

Unreported

- Discrete Alarm Unreported
- Block Alarm Unreported

Disabled

- Write Alarm Disabled
- Block Alarm Disabled



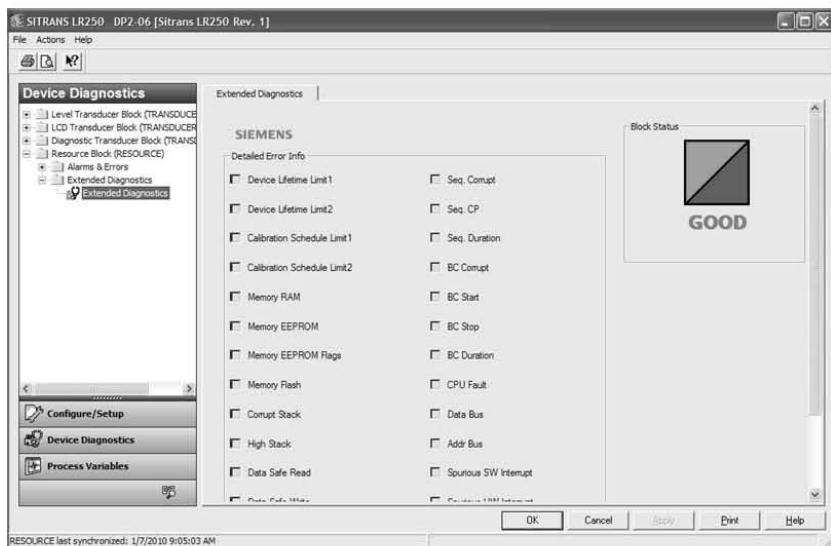
Extended Diagnostics (RESOURCE)

Navigate to **Device Diagnostics > RESOURCE > Extended Diagnostics** to read the following:

Detailed Error Info

- Device Lifetime Limit1
- Device Lifetime Limit2
- Calibration Schedule Limit1
- Calibration Schedule Limit2
- Memory RAM
- Memory EEPROM
- Memory EEPROM Flags
- Memory Flash
- Corrupt Stack
- High Stack

- Data Safe Read
- Data Safe Write
- Board Voltage
- ADC Failed
- Seq. Corrupt
- Seq. CP
- Seq. Duration
- BC Corrupt
- BC Start
- BC Stop
- BC Duration
- CPU Fault
- Data Bus
- Addr Bus
- Spurious SW Interrupt
- Spurious HW Interrupt
- Time Base Failure



Process Variables (Level Transducer Block-LTB)

To compare outputs in real time navigate to **Process Variables > LTB**.

Click on **Process Variables** then the **Values** tab to read the following:

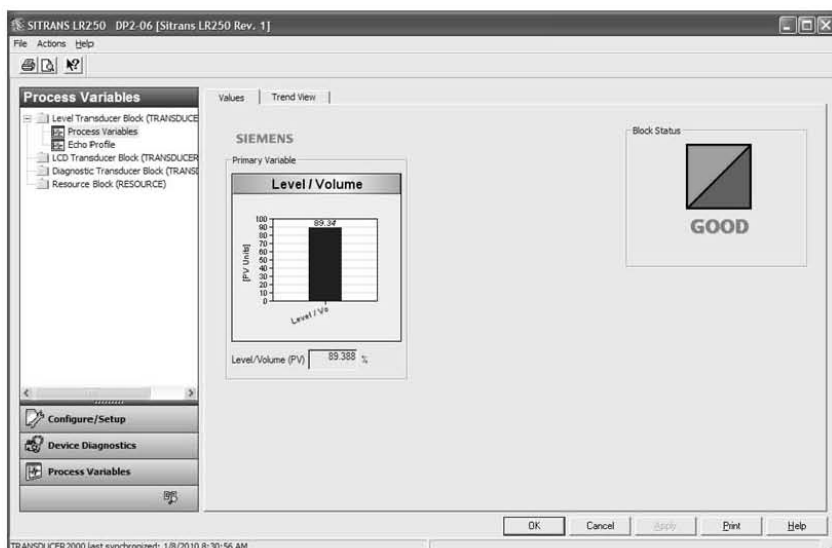
Primary Variable (see 2.8.1. Main Output (PV- Primary Value) on page 116)

- Level/Volume (PV)

The primary variable and the channel 1 output from the transducer block.

For level applications, chart range is affected by High and Low Level Point values set in **Configure/Setup > LTB > Setup > Sensor**. For volume

applications, chart range is 0 to Max. Volume, set in **Configure/Setup > LTB > Setup > Linearization**.



Click on **Trend View** tab to read the following:

Trend Values

- Level/Volume (PV)

The primary variable and the channel 1 output from the transducer block.

Click on **Echo Profile** to open the dialog window to read the following:

Echo Profile

- Level Measurement (see 2.8. *Measured Values* on page 116)
- Distance Measurement (see 2.8. *Measured Values* on page 116)
- Confidence (see 2.5.9.1. *Confidence* on page 109)
- Near Range (see 2.5.1. *Near Range* on page 105)

Password Protection

An AMS Device Manager administrator can configure the user to require a password. The use of passwords is recommended. A password should be assigned to the 'admin' username immediately after installing AMS Device Manager.

Each user is given an AMS Device Manager username and password and required to enter them when they start AMS Device Manager. Access to functions depends on the level of permissions granted.

Login types

- standard, local, or domain

A standard user can change their password in AMS Device Manager. A Local or Domain Windows user cannot change their password using AMS Device Manager and must request their network administrator to do so.

User Manager utility

Username, password, and permissions, are assigned to users by an AMS Device Manager administrator, using the User Manager utility on the Server Plus Station. Only a user with AMS Device Manager System Administration rights can log in to User Manager.

To configure a new user/edit existing user:

- 1) From the Windows taskbar select: **Start > AMS Device Manager > User Manager.**
- 2) In the User Manager window click on **Add User.**

The Add User Wizard dialog allows you to:

- select a user type, Standard User (AMS Device Manager) or Window User
- enter the username and password, and set permissions
- edit existing users.

Edit User

Username:

Password:

Confirm Password:

☐ Make inactive

Device ☒ Write ☒ SIS Write ☒ Assignment	Calibration Management ☒ Administration ☒ Test Results Write
System ☒ Administration	SNAP-ON Applications ☒ ValveLink

Help OK Cancel

AMS Menu Structure

CONFIGURE/SETUP

LEVEL TRANSDUCER BLOCK

IDENTIFICATION

Identification

Identification (tab)

TAG
Descriptor
Transducer Block Type
Strategy
Plant Unit

OPERATION

Block Modes

Block Modes (tab)

Actual Mode

Automatic
Out of Service

Target Mode

Automatic
Out of Service

Permitted Mode

Automatic
Out of Service

Normal Mode

Automatic
Out of Service

Simulation

Simulation(Input) (tab)

Sensor Value Simulation

Simulation
Simulation Value
RAMP start
RAMP end
RAMP No of steps
RAMP steplength

SETUP

Sensor

Sensor (tab)

General

Unit
Level Unit
Temperature Unit

PV (Volume/Level) Unit
 Application Type
 Material
 Antenna
 Loss of Echo Timer

Calibration

Low Calibration Point
 High Calibration Point
 Sensor Offset
 Low Level Point
 High Level Point
 Level Offset

Rate

Response Rate
 Fill Rate per minute
 Empty Rate per minute

Linearization

Vessel Shape (tab)

Vessel Shape

Vessel Shape

Vessel Dimensions

Maximum Volume
 Vessel Dimension A
 Vessel Dimension L

Breakpoints (tab)

Levels and Volume Breakpoints

Level 1
 Level 2
 ...
 Level 32
 Volume 1
 Volume 2
 ...
 Volume 32
 Vessel Shape

Signal Processing

General

General (tab)

Range

Near Range
 Far Range
 Propagation Factor
 Minimum Sensor Value
 Maximum Sensor Value

Echo Select

Algorithm

Position Detect

Echo Threshold

CLEF Range

Sampling

Echo Lock

Sampling Up

Sampling Down

Echo Quality

Confidence

Echo Strength

Noise Average

TVT

TVT Setup (tab)

Auto False Echo Suppression

Auto False Echo Suppression Range

Hover Level

Shaper Mode

TVT Shaper (tab)

Breakpoints

Breakpoint 1

Breakpoint 2

...

Breakpoint 40

Shaper Mode

Manual TVT-Curve

Manual TVT-Diagram (tab)

Echo Profile

Echo Profile (tab)

Echo Profile Parameters

Level Measurement

Distance Measurement

Confidence

Near Range

MAINTENANCE & DIAGNOSTICS

Remaining Sensor Lifetime

Sensor Lifetime (tab)

Lifetime (expected)

Time in Operation

Remaining Lifetime

Activation of Reminders

Reminder 1 before Lifetime (Required)

Reminder 2 before Lifetime (Demanded)

Service Schedule

Service Schedule (tab)

Service Interval

Time Since Last Service

Time Until Next Service
 Activation of Reminders
 Reminder 1 before Service (Required)
 Reminder 2 before Service (Demanded)

Electronics Temperature

Electronics Temperature (tab)

Electronics Temperature
 Minimum Value
 Maximum Value

COMMUNICATION

Communication

Communication (tab)

Static Revision No.

LCD TRANSDUCER BLOCK

IDENTIFICATION

Identification

Identification (tab)

TAG
 Descriptor
 Transducer Block Type
 Strategy
 Plant Unit

OPERATION

Block Modes

Block Modes (tab)

Actual Mode

Automatic
 Out of Service

Target Mode

Automatic
 Out of Service

Permitted Mode

Automatic
 Out of Service

Normal Mode

Automatic
 Out of Service

SETUP

Local Display

Local Display (tab)

Language
 LCD Fast Mode
 LCD Contrast
 Local Operation

COMMUNICATION**Communication***Communication (tab)*

Static Revision No.

DIAGNOSTIC TRANSDUCER BLOCK**IDENTIFICATION****Identification***Identification (tab)*

TAG

Descriptor

Transducer Block Type

Strategy

Plant Unit

OPERATION**Block Modes***Block Modes (tab)*Actual Mode

Automatic

Out of Service

Target Mode

Automatic

Out of Service

Permitted Mode

Automatic

Out of Service

Normal Mode

Automatic

Out of Service

COMMUNICATION**Communication***Communication (tab)*

Static Revision No.

RESOURCE BLOCK**IDENTIFICATION****Identification***Identification (tab)*Identification

TAG

Descriptor

Message

Date

Strategy

Plant Unit

Device

Manufacturer

Product Name

Order Number

Serial Number

Hardware Revision

Firmware Revision

Loader Revision

EDD Version

Date of Manufacturing

WIZARDS

Quick Start

Step 1 - Identification

Step 1 of 5: Identification (tab)

TAG

Descriptor

Message

Date

Order Number

Language

Step 2 - Application

Step 2 of 5: Application (tab)

Application Type

Propagation Factor

Material

Step 3 - Vessel Shape

Step 3 of 5: Vessel Shape (tab)

Vessel Shape

Step 4 - Ranges

Step 4 of 5: Ranges (tab)

Unit

Low Calibration Point (X)

High Calibration Point (Y)

Response Rate

Maximum Volume

Vessel Dimension A

Vessel Dimension L

Breakpoints (tab)

Levels and Volume Units

Level Unit

PV (Volume/Level) Unit

Levels and Volume Breakpoints

Level 1

Level 2

...

Level 32
 Volume 1
 Volume 2
 ...
 Volume 32

Step 5 - Summary

Step 5 of 5: Summary (tab)

Identification

TAG
 Descriptor
 Message
 Date
 Order Number
 Language

Application

Application Type
 Propagation Factor
 Material

Vessel Shape

Vessel Shape

Ranges

Unit
 Low Calibration Point (X)
 High Calibration Point (Y)
 Response Rate
 Maximum Volume
 Vessel Dimension A
 Vessel Dimension L

OPERATION

Block Modes

Block Modes (tab)

Actual Mode

Automatic
 Out of Service

Target Mode

Automatic
 Out of Service

Permitted Mode

Automatic
 Out of Service

Normal Mode

Automatic
 Out of Service

Methods*Methods (tab)*General

Master Reset

MAINTENANCE & DIAGNOSTICS**Remaining Device Lifetime***Device Lifetime (tab)*

Lifetime (expected)

Remaining Lifetime

Time in Operation

Activation of Reminders

Reminder 1 before Lifetime (Required)

Reminder 2 before Lifetime (Demanded)

Calibration Schedule*Calibration Schedule (tab)*

Calibration Interval

Time Since Last Calibration

Time Until Next Calibration

Activation of Reminders

Reminder1 before Calibration (Required)

Reminder2 before Calibration(Demanded)

Wear*Wear (tab)*

Powered Days

Poweron Resets

COMMUNICATION**Communication***Communication (tab)*

Manufacturer

Product Name

Device Revision

DD Revision

ITK Version

Static Revision No.

SECURITY**Security***Security (tab)*Local Access

Local Write Protected

PIN to Unlock

DEVICE DIAGNOSTICS

LEVEL TRANSDUCER BLOCK

ALARMS & ERRORS

Block Error

Block Error (tab)

Failures

Input Failure
Output Failure
Memory Failure
Lost Static Data
Lost Non-Volatile Data
Readback Check
Device Fault State
Block Configuration
Link Configuration
Other

Maintenance

Maintenance Required
Maintenance Demanded

Information

Simulation Active
Local Override
Power Up
Out Of Service

XD Error

Transducer Error

Block Alarm

Block Alarm (tab)

Unacknowledged

Unacknowledged

Alarm State

Alarm State

Time Stamp

Time Stamp

Subcode

Subcode

Value

Value

EXTENDED DIAGNOSTICS

Extended Diagnostics

Extended Diagnostics (tab)

Detailed Error Info

Loss of Echo
No Tech Power

Sensor Lifetime Limit1
 Sensor Lifetime Limit2
 Device Service Limit1
 Device Service Limit2
 LTB Scale
 Internal Temp Sensor
 Internal Temp High
 Internal Temperature Calibration
 Velocity Calibration
 Receiver Init Calibration
 Receiver Calibration
 Tech Module Hardware
 Tech Module Ramp
 Receiver Frequency Calibration
 Safe Process Data Corrupt
 Profile Clipped
 Too Few Shots Taken
 Measurement Error
 No Shots Taken
 Measurement Was Corrupted
 DMA Error
 Sensor Value too High
 Sensor Value too Low

LCD TRANSDUCER BLOCK

ALARMS & ERRORS

Block Error

Block Error (tab)

Failures

Input Failure
 Output Failure
 Memory Failure
 Lost Static Data
 Lost Non-Volatile Data
 Readback Check
 Device Fault State
 Block Configuration
 Link Configuration
 Other

Maintenance

Maintenance Required
 Maintenance Demanded

Information

Simulation Active
 Local Override
 Power Up

Out Of Service

XD Error

Transducer Error

Block Alarm

Block Alarm (tab)

Unacknowledged

Unacknowledged

Alarm State

Alarm State

Time Stamp

Time Stamp

Subcode

Subcode

Value

Value

DIAGNOSTIC TRANSDUCER BLOCK

ALARMS & ERRORS

Block Error

Block Error (tab)

Failures

Input Failure

Output Failure

Memory Failure

Lost Static Data

Lost Non-Volatile Data

Readback Check

Device Fault State

Block Configuration

Link Configuration

Other

Maintenance

Maintenance Required

Maintenance Demanded

Information

Simulation Active

Local Override

Power Up

Out Of Service

XD Error

Transducer Error

Block Alarm

Block Alarm (tab)

Unacknowledged

Unacknowledged

Alarm State
Alarm State
Time Stamp
Time Stamp
Subcode
Subcode
Value
Value

RESOURCE BLOCK

ALARMS & ERRORS

Block Error

Block Error (tab)

Failures

Input Failure
Output Failure
Memory Failure
Lost Static Data
Lost Non-Volatile Data
Readback Check
Device Fault State
Block Configuration
Link Configuration
Other

Maintenance

Maintenance Required
Maintenance Demanded

Information

Simulation Active
Local Override
Power Up
Out Of Service

Block Alarm

Block Alarm (tab)

Unacknowledged

Unacknowledged

Alarm State

Alarm State

Time Stamp

Time Stamp

Subcode

Subcode

Value

Value

Write Alarm*Write Alarm (tab)*Unacknowledged

Unacknowledged

Alarm State

Alarm State

Time Stamp

Time Stamp

Subcode

Subcode

Value

Discrete Value

Alarm Summary*Alarm Summary (tab)*Current

Discrete Alarm

Block Alarm

Unacknowledged

Discrete Alarm Unacknowledged

Block Alarm Unacknowledged

Unreported

Discrete Alarm Unreported

Block Alarm Unreported

Disabled

Write Alarm Disabled

Block Alarm Disabled

EXTENDED DIAGNOSTICS**Extended Diagnostics***Extended Diagnostics (tab)*Detailed Error Info

Device Lifetime Limit1

Device Lifetime Limit2

Calibration Schedule Limit1

Calibration Schedule Limit2

Memory RAM

Memory EEPROM

Memory EEPROM Flags

Memory Flash

Corrupt Stack

High Stack

Data Safe Read

Data Safe Write

Board Voltage

ADC Failed

Seq. Corrupt

Seq. CP

Seq. Duration
 BC Corrupt
 BC Start
 BC Stop
 BC Duration
 CPU Fault
 Data Bus
 Addr Bus
 Spurious SW Interrupt
 Spurious HW Interrupt
 Time Base Failure

PROCESS VARIABLES

LEVEL TRANSDUCER BLOCK

PROCESS VARIABLES

Process Variables

Values (tab)

Primary Variable

Level/Volume (PV)

Trend View (tab)

Trend Values

Level/Volume (PV)

Echo Profile

Echo Profile (tab)

Echo Profile Parameters

Level Measurement

Distance Measurement

Confidence

Near Range

Parameter Reference (LUI)

Notes:

- See *Enter PROGRAM mode* on page 33 for detailed instructions.
- To view a particular parameter in AMS, see *Operating via AMS Device Manager* on page 40.
- Do not use the handheld programmer at the same time as AMS Device Manager, or erratic operation may result.
- **Mode**  toggles between **PROGRAM** and **Measurement** Modes.
- For Quick Access to parameters in Navigation mode, press **Home** , then enter the menu number, for example enter **2.2.1** to access parameter *2.2.1 Hardware Revision*.



- In Navigation mode, **ARROW keys** navigate the menu in the direction of the arrow.
- Press **RIGHT arrow**  to open **Edit Mode**, or to save a modification.

Parameters are identified by name and organized into function groups. Menus arranged on up to four levels give access to associated features and options. (See **LCD Menu Structure** on page 169 for a chart.)

Parameters noted as *Read Only* in this section of the manual can not be written via the LUI, however they may be accessible via other tools. For those accessible via AMS Device Manager, directions are shown in section *Operating via AMS Device Manager* on the pages referenced.

Quick Start Wizard

The Quick Start Wizard groups together all the settings you need to configure a device for a simple application. You can access it either via AMS Device Manager or via the handheld programmer.

- Do not use the Quick Start Wizard via the handheld programmer to modify individual parameters. (Perform customization only after the Quick Start has been completed.)
- Each time the Quick Start Wizard is initiated via the handheld programmer, the start-up settings are factory defaults. The Wizard will not recall previous user-defined settings. (Note: Values set using the Quick Start Wizard via AMS Device Manager are saved and recalled each time it is initiated.)
- When using AMS Device Manager, the Resource and LTB Blocks must be set to Out of Service mode before any configuration changes (changes to parameters affecting block output) can be written. The blocks do not need to be set to Out of Service when the Quick Start Wizard is initiated via the handheld programmer.

1. Quick Start

Note: For detailed instructions see **Quick Start Wizard via the handheld programmer** on page 36 or **Quick Start Wizard via AMS Device Manager** on page 45.

2. Setup

Notes:

- See **Enter PROGRAM mode** on page 33 or **Operating via AMS Device Manager** on page 40 for instructions.
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Values shown in the following tables can be entered via the handheld programmer.

2.1. Identification

2.1.1. Tag

Read only. Text that can be used in any way. A recommended use is as a unique label for a field device in a plant. Limited to 32 ASCII characters.

Note: The tag can only be changed from a remote master such as NIFBUS-Configurator or DeltaV.

2.1.2. Descriptor

Read only. Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.

To access this parameter via AMS Device Manager see **Identification** under **Identification (RESOURCE)** on page 66.

2.1.3. Message

Read only. Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.

To access this parameter via AMS Device Manager see **Identification** under **Identification (RESOURCE)** on page 66.

2.2. Device

2.2.1. Hardware Revision

Read only. Corresponds to the electronics hardware of the Field Device.

2.2.2. Firmware Revision

Read only. Corresponds to the software or firmware that is embedded in the Field Device.

2.2.3. Loader Revision

Read only. Corresponds to the software used to update the Field Device.

2.3. Sensor

2.3.1. Unit

Sensor measurement unit

Values		m, cm, mm, ft, in
	*	m

2.3.2. Level Unit

Select engineering units for Level.

Options		m, cm, mm, ft, in, %
	*	%

2.3.3. PV¹⁾ (volume/level) Units

Notes:

- Default unit of AIFB 1 or 2 is percent.
- You can select a different unit for your application.

Select units for either volume or level.

Level Values		m, cm, mm, ft, in, %
Volume Values		liter, gal, ImpGal, %
Percent Value	*	%

2.3.4. Temperature Units

Selects the engineering unit to be displayed with the value representing temperature.

Options		DEGC, DEGF, DEGR, K
	*	DEGC

2.3.5. Material

Automatically configures the device to operate in the chosen application type, by changing one or more of the following parameters: Propagation Factor (2.5.3.), Position Detect (2.5.7.2.), and/or CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.).

Options	*	LIQUID
		LIQUID LOW DK ^{a)} (low dielectric liquid – CLEF algorithm enabled)
Related parameters	Propagation Factor (2.5.3.) Position Detect (2.5.7.2.) CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.)	

a) $dK < 3.0$

You can configure each of the related parameters, to suit your particular application.

¹⁾ PV (Primary Value): the output from the Level Transducer Block. See **Level Transducer Block (LTB)** and **How the LTB works:** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for more details.

2.3.6. Loss of Echo (LOE) Timer

Note: See **Loss of Echo (LOE)** on page 150 for more detail.

Sets the time to elapse since the last valid reading, before a fault code is reported.

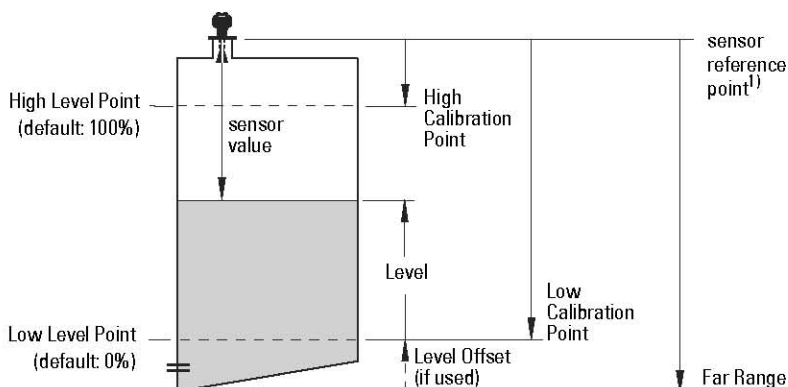
Values	Range: 0 to 7200 seconds
	Default: 100 seconds

2.3.7. Calibration

2.3.7.1. Low Calibration Point

Distance from sensor reference point¹⁾ to Low Calibration Point (corresponding to Low Level Point). Unit is defined in Unit (2.3.1.)

Values	Range: 0 to 30 m. Default: 20.000 m
Related parameters	Unit (2.3.1.) Far Range (2.5.2.)



2.3.7.2. High Calibration Point

Distance from sensor reference point¹⁾ to High Calibration Point (corresponding to High Level Point). Unit is defined in Unit (2.3.1.).

Values	Range: 0 to 30 m. Default: 0.00 m
---------------	-----------------------------------

2.3.7.3. Sensor Offset

A constant offset (negative or positive) that can be added to the sensor value²⁾ to compensate if the sensor reference point has shifted. (For example, this could result from adding a thicker gasket or reducing the standoff/nozzle height.) The units are defined in Unit (2.3.1.).

¹⁾ The point from which **level** measurement is referenced (see **Flat Faced Flange** on page 16 and **Threaded Horn Antenna with extension** on page 12).

²⁾ See **Low Calibration Point (2.3.7.1.)** for an illustration.

Values	Range: -99.999 to 99.999. Default: 0.000 m
Related parameters	Unit (2.3.1.)

See **How the LTB works:** in manual *Foundation Fieldbus for Level Instruments (7ML19985MP01)* for more details on sensor offset.

2.3.7.4. Low Level Point

The level when the material is at Low Calibration Point. The unit is defined in Level Unit (2.3.2.).

Values	Range: -999999 to +999999
	Default: 0%

2.3.7.5. High Level Point

The level when the material is at High Calibration Point. The unit is defined in Level Unit (2.3.2.).

Values	Range: -999999 to +999999
	Default: 100%

2.3.7.6. Level Offset

A constant offset that can be added to Level. The unit is defined in Level Unit (2.3.2.).

Values	Range: -999999 to +999999
	Default: 0%

2.3.7.7. Antenna

Read only. Identifies horn configuration [Near Range (2.5.1.) is automatically adjusted to suit].

2.3.8. Rate

2.3.8.1. Response Rate

Sets the reaction speed of the device to measurement changes.

Note: Changing Response Rate resets Fill Rate per Minute (2.3.8.2.), Empty Rate per Minute (2.3.8.3.), and Shots (2.5.6.).

Response Rate (2.3.8.1.)	Fill Rate per Minute (2.3.8.2.)/ Empty Rate per Minute (2.3.8.3.)	Shots (2.5.6.)
* Slow	0.1 m/min (0.32 ft/min)	25
Medium	1.0 m/min (3.28 ft/min)	10
Fast	10.0 m/min (32.8 ft/min)	5

Use a setting just faster than the maximum filling or emptying rate (whichever is faster).

2.3.8.2. Fill Rate per Minute

Defines the maximum rate at which the reported sensor value¹⁾ is allowed to increase. Allows you to further adjust the SITRANS LR250 response to increases in the actual material level. Fill Rate is automatically updated whenever **Response Rate (2.3.8.1.)** is altered.

Options	Range: 0 to 999999 m / min.		
	Response Rate (2.3.8.1.)		Fill Rate
	*	Slow	0.1 m/min (0.32 ft/min)
		Medium	1.0 m/min (3.28 ft/min)
		Fast	10.0 m/min (32.8 ft/min)
Altered by:	Response Rate (2.3.8.1.)		
Related parameters	Level Unit (2.3.2.)		

Enter a value slightly greater than the maximum vessel-filling rate, in units per minute.

2.3.8.3. Empty Rate per Minute

Defines the maximum rate at which the reported sensor value¹⁾ is allowed to decrease. Adjusts the SITRANS LR250 response to decreases in the actual material level. Empty Rate is automatically updated whenever **Response Rate (2.3.8.1.)** is altered.

Options	Range: 0 to 999999 m / min.		
	Response Rate (2.3.8.1.)		Empty Rate
	*	Slow	0.1 m/min (0.32 ft/min)
		Medium	1.0 m/min (3.28 ft/min)
		Fast	10.0 m/min (32.8 ft/min)
Altered by:	Response Rate (2.3.8.1.)		
Related parameters	Level Unit (2.3.2.)		

Enter a value slightly greater than the vessel's maximum emptying rate, in units per minute.

2.4. Linearization

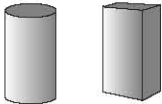
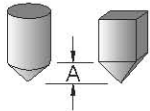
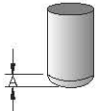
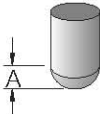
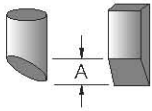
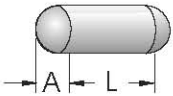
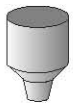
2.4.1. Volume

Carries out a volume conversion from a level value.

2.4.1.1. Vessel Shape

Defines the vessel shape and allows the LR250 to calculate volume instead of level. If **None** is selected, no volume conversion is performed. Select the vessel shape matching the monitored vessel or reservoir (see table on following page.)

¹⁾ The value produced by the echo processing which represents the distance from sensor reference point to the target (see **Low Calibration Point (2.3.7.1.)** on page 99 for an illustration).

Vessel Shape		LCD DISPLAY/ Description	Also required
*	None	NONE/ No volume calculation required	N/A
		CYLINDER/ Flat end horizontal cylinder	maximum volume
		SPHERE/ Sphere	maximum volume
		LINEAR/ Upright, linear (flat bottom)	maximum volume
		CONICAL BOT/ Conical or pyramidal bottom	maximum volume, dimension A
		PARABOLIC BOT/Parabolic bottom	maximum volume, dimension A
		HALF SPHERE BOT/ Half-sphere bottom	maximum volume, dimension A
		FLAT SLOPED BOT/ Flat sloped bottom	maximum volume, dimension A
		PARABOLIC ENDS/ Parabolic end horizontal cylinder	maximum volume, dimension A, dimension L
		LINEAR TABLE ^{a)} / Linearization table (level/volume breakpoints)	maximum volume, level breakpoints, volume breakpoints

^{a)} Linearization Table must be selected in order for level/volume values [see **XY Index (2.4.1.5.)**] to be transferred.

24.1.2. Maximum Volume

*The maximum volume of the vessel. Units are defined in **PV (volume/level) Units (2.3.3.)**. Enter the vessel volume corresponding to High Calibration Point. The volume calculation is based on the maximum volume and scaled according to the vessel shape selected. If no vessel shape is entered, the default is 100, and the reading will be a percentage value.*

Values	Range: 0.0000 to 999999
	Default: 100.0
Related Parameters	Low Calibration Point (2.3.7.1.) High Calibration Point (2.3.7.2.) Vessel Shape (2.4.1.1.)

For readings in volumetric units instead of percentage values:

- Select a volumetric unit from **PV (volume/level) Units (2.3.3.)**.
- Enter the vessel volume corresponding to High Calibration Point.

24.1.3. Dimension A

*The height of the vessel bottom in Level Units when the bottom is conical, pyramidal, parabolic, spherical, or flat-sloped. If the vessel is horizontal with parabolic ends, the depth of the end. See **Vessel Shape (2.4.1.1.)** for an illustration.*

Values	Range: 0.0000 to 999999 in Level Units
	Default: 0.0
Related Parameters	Vessel Shape (2.4.1.1.)

24.1.4. Dimension L

*Length of the cylindrical section of a horizontal parabolic end vessel, in Level Units. See **Vessel Shape (2.4.1.1.)** for an illustration.*

Values	Range: 0.0000 to 999999 in Level Units
	Default: 0.0
Related Parameters	Vessel Shape (2.4.1.1.)

24.1.5. XY Index

Level/Volume breakpoints allow you to define a complex vessel shape as a series of segments. A value is assigned to each level breakpoint and a corresponding value is assigned to each volume breakpoint. Volume values are defined in volume units and can be percent or volumetric; level values are defined in level units, and can be percent or linear.

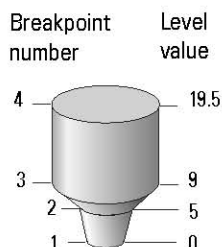
Level Values¹	Range: 0.0000 to 999999 (m, cm, mm, ft, in, %)
	Default: 0.0
Volume Values²	Range: 0.0000 to 999999 (% or volumetric units)
	Default: 0.0

¹) See **Level Unit** on page 98.

²) See **PV (volume/level) Units** on page 98.

Enter up to 32 level breakpoints, where the corresponding volume is known. The values corresponding to 100% and 0% levels must be entered. The breakpoints can be ordered from top to bottom, or the reverse.

Example (values are for example purposes only)



Breakpoint Number	Level value (m)	Volume value (l)
1	0	0
2	5	500
3	9	3000
4	19.5	8000

Entering breakpoints via the hand-held programmer:

- The default for level values is percent: if you want to select units instead, navigate to **Sensor (2.3.) > Level Unit (2.3.2.)**, and select the desired unit.
- Navigate to **Sensor (2.3.) > PV (volume/level) Units (2.3.3.)**, and select the desired volume units.
- Go to **XY Index (2.4.1.5.)** and enter the number of the breakpoint you wish to adjust for example, for breakpoint 1 enter 1.
- Go to **X Value (2.4.1.6.)** and enter the level value for the breakpoint just identified.
- Go to **Y Value (2.4.1.7.)** and enter the volume value for the breakpoint just identified.
- Repeat steps (c) to (e) until values have been entered for all required breakpoints.

2.4.1.6. X Value

See XY Index (2.4.1.5.) on page 103.

2.4.1.7. Y Value

See XY Index (2.4.1.5.) on page 103.

Entering breakpoints via AMS: See Linearization (LTB) on page 53.

After completing the above steps you will need to configure AIFB 1 and/or AIFB 2. (See **AIFB 1 (2.6.)** and **AIFB 2 (2.7.)** for details.)

2.5. Signal Processing

*In AMS Device Manager, see the General tab under **Signal Processing (LTB)** on page 55.*

2.5.1. Near Range

The range in front of the device (measured from the sensor reference point¹⁾) within which any echoes will be ignored. (This is sometimes referred to as "Blanking" or "Dead Zone.") The factory setting is 50 mm past the end of the horn, and the range is dependent on the horn type.

Values	Range: 0 to 33 m (0 to 108.27 ft)
	Default depends on antenna. Examples: 1.5" horn, Default = 0.185 m (7.28") 4" horn, Default = 0.270 m (10.62")
Related parameters	Unit (2.3.1.)

2.5.2. Far Range

Note: Far Range can extend beyond the bottom of the vessel.

*Allows the material level to drop below Low Calibration Point without generating a Loss of Echo (LOE) state. See **Low Calibration Point (2.3.7.1.)** on page 99 for an illustration.*

Values	Range: min. = Low Calibration Point max. = 33 m (108.27 ft) Default: Low Calibration Point + 1 m (3.28 ft)
Related Parameters	Unit (2.3.1.) CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.) ^{a)}

- a) The value set for Far Range becomes the CLEF Range maximum. If the value for Far Range is changed after a CLEF Range value is entered, CLEF Range is reset to its default (0.00 m).

Use this feature if the measured surface can drop below the Low Cal. Point in normal operation.

2.5.3. Propagation Factor

Notes:

- When operating in a stillpipe, values for **CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.)**, and for the Propagation Factor, should be set according to the pipe size. See the table below.
- For reliable results the horn size must be close to the pipe size.

Compensates for the change in microwave velocity due to propagation within a metal stillpipe instead of in free space.

Values	Range: 0.3 to 1.5 depending on pipe size.
	Default: 1.000

¹⁾ See **Flat Faced Flange** on page 16 and **Threaded Horn Antenna with extension** on page 12.

Nominal Pipe Size ^{a)}	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation Factor	0.9828	0.990	0.991	0.9965
CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.) settings	Low Cal Pt. minus 700 mm (2.29 ft)	Low Cal Pt. minus 700 mm (2.29 ft)	Low Cal Pt. minus 1000 mm (3.28 ft)	Low Cal Pt. minus 1000 mm (3.28 ft)

a) Since pipe dimensions may vary slightly, the propagation factor may also vary.

2.5.4. Minimum Sensor Value

*The minimum usable value for the measuring range, in units defined in **Unit (2.3.1.)**. (Default = 0.0 m)*

To view this parameter via AMS Device Manager see **Range** under **Signal Processing (LTB)** on page 55.

2.5.5. Maximum Sensor Value

*The maximum usable value for the measuring range, in units defined in **Unit (2.3.1.)**. (Default = 33.0 m)*

To view this parameter via AMS Device Manager see **Range** under **Signal Processing (LTB)** on page 55.

2.5.6. Shots

The number of echo profile samples averaged to produce a measurement

Values	Range: 1 to 25
	Default: 25 ^{a)}

a) To meet accuracy specification, the number of shots must be set to 25 (see **Performance** on page 7).

2.5.7. Echo Select

2.5.7.1. Algorithm

Selects the algorithm to be applied to the echo profile to extract the true echo.

Options	TF	*	True First echo
	F		First echo
	L		Largest echo
	BLF		Best of Largest and First echo

25.7.2. Position Detect

*Defines where on the echo the distance measurement is determined. (See **Position Detect (25.7.2)** on page 146 for more detail.)*

Options		Center
	*	Hybrid (Center and CLEF)
		CLEF (Constrained Leading Edge Fit)
Related parameters	CLEF (Constrained Leading Edge Fit) Range (25.7.4.)	

If the vessel bottom is being reported as the level instead of the actual material level (at low level conditions), or if the dielectric constant of the liquid to be monitored is less than 3, we recommend setting Position Detect to **Hybrid** and **CLEF (Constrained Leading Edge Fit) Range (25.7.4.)** to 0.5 m (1.64 ft).

25.7.3. Echo Threshold

*Sets the minimum echo confidence that the echo must meet in order to prevent a Loss of Echo condition and the expiration of the LOE timer. When **Confidence (25.9.1.)** exceeds **Echo Threshold (25.7.3.)**, the echo is accepted as a valid echo and is evaluated.*

Values	Range: 0 to 99
	Default: 5
Related Parameters	Loss of Echo (LOE) Timer (2.3.6.) Confidence (25.9.1.)

Use this feature when an incorrect material level is reported.

25.7.4. CLEF (Constrained Leading Edge Ft) Range

Used mainly to allow correct level reporting for low dK materials which may otherwise cause an incorrect reading in an empty or almost empty vessel.

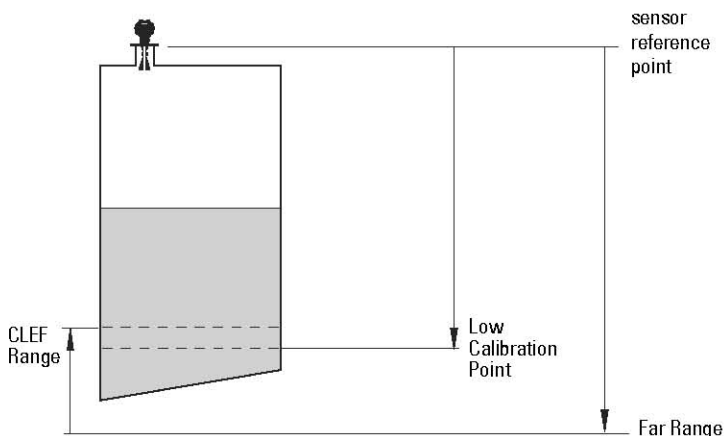
CLEF Range is the region where the CLEF algorithm is used when **Hybrid** is selected in **Position Detect (25.7.2)**. Above that point the Center algorithm is used. (For more detail see **Position Detect (25.7.2)** on page 146).

When **Material (23.5.)** is set to **Liquid Low dK**, CLEF Range is reset to 0.5 m (1.64 ft), and we recommend **Position Detect (25.7.2.)** be set to **Hybrid**.

Note: The CLEF algorithm is used from tank empty level up to the level defined by the CLEF range (see illustration below). The CLEF algorithm uses Far Range value as empty level, therefore the value for CLEF Range must include the difference between Far Range and Low Calibration Point, plus any level to be managed by the CLEF algorithm above the Low Calibration Point.

Values	Range: 0 to Far Range (25.2)
	Default: 0.00 m
Related parameters	Position Detect (25.7.2.) Far Range (25.2.) ^{a)}

- a) If the value for Far Range is changed after a CLEF Range value is entered, CLEF Range is reset to its default (0.00 m).



25.8. Sampling

Provides a method of checking the reliability of a new echo before accepting it as the valid reading, based on numbers of samples above or below the currently selected echo.

25.8.1. Echo Lock

Note: Ensure the agitator is always running while SITRANS LR250 is monitoring the vessel, to avoid stationary blade detection.

*Selects the measurement verification process. See **Echo Lock (25.8.1.)** on page 148 for more details.*

Options	Lock Off (no verification)
	Maximum Verification
	* Material Agitator
	Total Lock
Related parameters	Fill Rate per Minute (2.3.8.2.) Empty Rate per Minute (2.3.8.3.) Up Sampling (2.5.8.2.) Down Sampling (2.5.8.3.)

For radar applications, Material Agitator is the most often used setting, to avoid agitator blade detection.

25.8.2. Up Sampling

Specifies the number of consecutive echoes that must appear above the echo currently selected, before the measurement is accepted as valid.

Values	Range: 1 to 50
	Default: 5

25.8.3. Down Sampling

Specifies the number of consecutive echoes that must appear below the echo currently selected, before the measurement is accepted as valid.

Values	Range: 1 to 50
	Default: 2 (see Related parameters)
Related parameters	Echo Lock (2.5.8.1.) If Echo Lock set to any value other than its default (2), then Down Sampling default = 5.

2.5.9. Echo Quality

25.9.1. Confidence

Indicates echo reliability: higher values represent better echo quality. The display shows the echo confidence of the last measurement. **Echo Threshold (25.7.3.)** defines the minimum criterion for echo confidence.

Values (view only)	Range: 0 to 99
Related Parameters	Echo Threshold (2.5.7.3.)

25.9.2. Echo Strength

Displays the absolute strength (in dB above 1 μ V rms) of the echo selected as the measurement echo.

Values (view only)	Range: -20 to 99
---------------------------	------------------

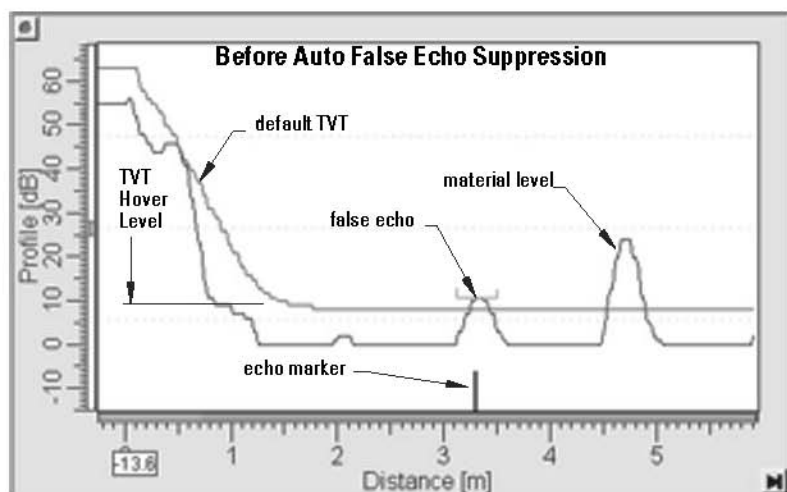
2.5.10. TVT (Auto False Echo Suppression) Setup

2.5.10.1. Auto False Echo Suppression

Used together with **Auto False Echo Suppression Range (2.5.10.2.)** to screen out false echoes in a vessel with known obstructions. A 'learned TVT' (time varying threshold) replaces the default TVT over a specified range. See **Auto False Echo Suppression (2.5.10.1.)** on page 148 for a more detailed explanation.

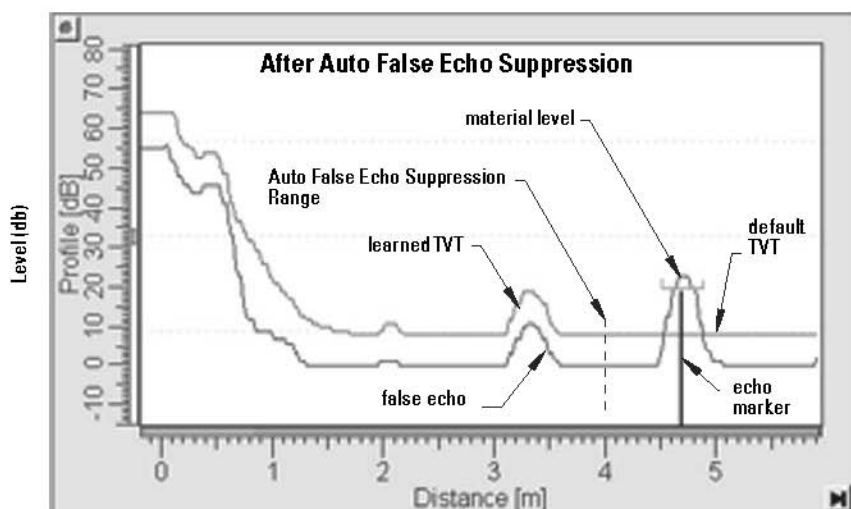
Notes:

- Make sure material level is below all known obstructions when Auto False Echo Suppression is used to learn the echo profile. (An empty or almost empty vessel is recommended.)
- Note the distance to material level when Auto False Echo learns the environment. Set Auto False Echo Suppression Range to a shorter distance to avoid the material echo being screened out.
- Set Auto False Echo Suppression and Auto False Echo Suppression Range during startup, if possible.
- If the vessel contains an agitator it should be running.
- Before adjusting these parameters, rotate the instrument for best signal (lower false-echo amplitude).



- a) Determine Auto False Echo Suppression Range. Measure the actual distance from the sensor reference point to the material surface using a rope or tape measure.

- b) Subtract 0.5 m (20°) from this distance, and use the resulting value.



To use **Auto False Echo Suppression** via **AMS Device Manager** note value calculated in step b) and see **Auto False Echo Suppression** on page 56.

To set **Auto False Echo Suppression** via the handheld programmer:

Options	OFF	Default TVT will be used.
	* ON	'Learned' TVT will be used.
	LEARN	'Learn' the TVT.

- Go to **Auto False Echo Suppression Range (2.5.10.2.)** and enter the value calculated in step b).
- Go to **Auto False Echo Suppression (2.5.10.1.)** and press **RIGHT arrow** to open Edit Mode
- Select **Learn**. The device will automatically revert to **On** (Use Learned TVT) after a few seconds.

2.5.10.2. Auto False Echo Suppression Range

Defines the endpoint of the Learned TVT distance. Units are defined in Unit (2.3.1.).

Values	Range: 0.00 to 30.00 m
	Default: 1.00 m

- Press **RIGHT arrow** to open Edit mode.
- Enter the new value and press **RIGHT arrow** to accept it.
- Set **Auto False Echo Suppression (2.5.10.1.)**

2.5.10.3. Hover Level¹⁾

*Defines how high the TVT (Time Varying Threshold) curve is placed above the noise floor of the echo profile, as a percentage of the difference between the peak of the largest echo in the profile and the noise floor. See **Before Auto False Echo Suppression** on page 110 for an illustration.)*

Values	Range: 0 to 100%
	Default: 40%

When the device is located in the center of the vessel, the TVT hover level may be lowered to increase the confidence level of the largest echo.

2.5.10.4. Shaper Mode

*Enables/disables **TVT Shaper (2.5.11.)**.*

Options	*	OFF
		ON

2.5.11. TVT Shaper

Notes:

- The range is -50 to +50 dB.
- Shaper Mode (2.5.10.4.)** must be turned ON in order for TVT shaper points to be transferred

Adjusts the TVT (Time Varying Threshold) at a specified range (breakpoint on the TVT). This allows you to reshape the TVT to avoid unwanted echoes. There are 40 breakpoints arranged in 5 groups. (We recommend using AMS Device Manager to access this feature.)

To use TVT shaper via LUI (local user interface):

- Go to **Shaper Mode (2.5.10.4.)** and select option **ON**.
- In TVT shaper, go to **Breakpoints 1-9 (2.5.11.1.)**.
- Open TVT Breakpoint 1 and enter the TVT Offset value (between -50 and +50 dB).
- Go to the next Breakpoint and repeat step (c) until all desired breakpoint values have been entered.

2.5.11.1. Breakpoints 1-9

Values	Range: -50 to +50 dB
	Default: 0 dB

2.5.11.2 Breakpoints 10-18

Values	Range: -50 to +50 dB
	Default: 0 dB

¹⁾ For an illustration, see **Before Auto False Echo Suppression** and **After Auto False Echo Suppression** on page 111.

25.11.3. Breakpoints 19-27

Values	Range: -50 to +50 dB
	Default: 0 dB

25.11.4. Breakpoints 28-36

Values	Range: -50 to +50 dB
	Default: 0 dB

25.11.5. Breakpoints 37 - 40

Values	Range: -50 to +50 dB
	Default: 0 dB

To access **TVT Shaper** via AMS Device Manager see **TVT Shaper** on page 57.

2.6. AIFB 1

Notes:

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- All AIFB parameters are *read only* via LUI and AMS Device Manager, and can only be changed using a remote host such as DeltaV or NI-FBUS Configurator.
- AIFB 1 and AIFB 2 are not active out of the box. These blocks will show Out of Service on the LCD at startup. If these blocks are needed for an FF application, use a tool such as DeltaV or NI-FBUS Configurator to configure and schedule the blocks. See **Configuration** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for further details.

2.6.1. Static Revision Number

The revision level of the static data associated with Analog Input Function Block 1. The Static Revision No. is updated whenever a configuration parameter is changed.

2.6.2. Mode

Used to request an operating mode from the Analog Input Function Block.

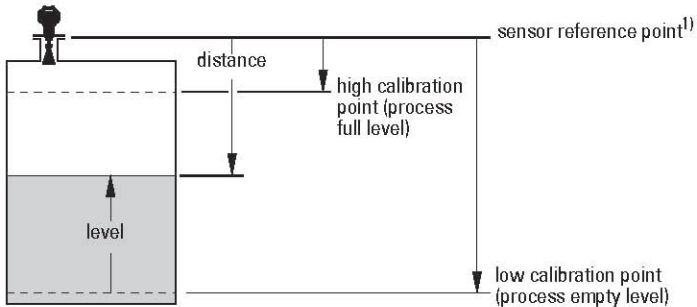
Options	Automatic Mode (AUTO)
	Manual Mode (MAN)
	Out of Service (OOS)

Allows you to put the SITRANS LR250 into Out of Service Mode and then reset it to Automatic Mode. Manual Mode can be used when simulating output. See **Simulation** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for more details.

2.6.3. Channel

Used to select between the different Level Transducer Block outputs.

Options		Description	Reference point
LEVEL/VOLUME		Level value converted to Volume [through Linearization (2.4.)]	Low Calibration Point
LEVEL	*	Level value	Low Calibration Point
DISTANCE		Distance value	Sensor Reference Point



2.6.4. Input Scaling

2.6.4.1. Lower Value

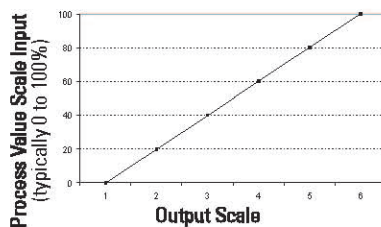
Defines the operational lower range value of the input value (Process Value Scale) in PV (volume/level) Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: -999999 to 999999
	Default: 0 %

2.6.4.2. Upper Value

Defines the operational upper range value of the input value (Process Value Scale) in PV (volume/level) Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: -999999 to 999999
	Default: 100 %



Provides Output values (Out) to AIFB 1 or AIFB 2

¹⁾ The point from which High and Low Calibration points are referenced: see **Dimensions** on page 11 and **Threaded Horn Antenna with extension** on page 12.

26.4.3. Unit

Engineering unit to be displayed with the output value.

Options		m, cm, mm, ft, in, cu m, L, HL, cu in, cu ft, cu yd, gal, imp gal, bushels, Bbl, Bbl liquid, %, PA, Follow out unit
	*	%

26.4.4. Decimal Point

Read only. The number of digits to display after the decimal point (set to 0 decimal places).

2.6.5. Output Scaling

Scales the Process Variable. The function block parameter OUT SCALE contains the values of the lower limit and upper limit effective range in AIFB 1 units.

26.5.1. Lower Value

Defines the operational lower range value of the output value in AIFB 1 units.

Values	Range: -999999 to 999999
	Default: 0 %

26.5.2. Upper Value

Defines the operational upper range value of the output value in AIFB 1 units.

Values	Range: -999999 to 999999
	Default: 100 %

26.5.3. Unit

Engineering unit to be displayed with the output value

Options		m, cm, mm, ft, in, cu m, L, HL, cu in, cu ft, cu yd, gal, imp gal, bushels, Bbl, Bbl liquid, %, PA, Follow out unit
	*	%

26.5.4. Decimal Point

Read only. The number of digits to display after the decimal point (set to two decimal places).

2.6.6. Alarms & Warnings**26.6.1. High Limit Alarm**

The setting for the upper alarm limit in AIFB 1 units.

Options	Range: -Infinity to Infinity
	Default: Inf

26.6.2. High Limit Warning

The setting for the upper warning limit in AIFB 1 units.

Options	Range: -Infinity to Infinity
	Default: Inf

26.6.3. Low Limit Warning

The setting for the lower warning limit in AIFB 1 units.

Options	Range: -Infinity to Infinity
	Default: -Inf

26.6.4. Low Limit Alarm

The setting for the lower alarm limit in AIFB 1 units.

Options	Range: -Infinity to Infinity
	Default: -Inf

26.6.5. Limit Hysteresis

Hysteresis is used to adjust the sensitivity of the trigger for alarm messages. It is used to compensate when a process variable fluctuates around the same value as a limit. A high level alarm occurs when a value exceeds an upper limit. The alarm's status remains true until the value drops below the limit minus the alarm hysteresis. The directions are reversed for low limit detection.

Options	Range: 0 to 50
	Default: 0.50

Enter a value for the hysteresis here, to be used for all warnings and alarms. The units are the same as the Output scale, i.e. AIFB 1 units.

2.6.7. Display

26.7.1. Filter Time Constant

*The time constant for the damping filter. The damping filter smooths out the response to a sudden change in level. This is an exponential filter and the engineering unit is always in seconds. See **Damping** on page 150 for more detail.)*

Values	Range 0 to 600 s
	Default: 0 ^{a)}

- a) To meet accuracy specification, Filter Time Constant (PV_FTIME) must be changed from default of 0.0 s to a minimum of 10.0 seconds (see **Performance** on page 7).

2.7. AIFB 2

See AIFB 1 (2.6.): the parameters for AIFB 2 are identical to AIFB 1.

2.8. Measured Values

(for diagnostic purposes)

Read only. Allows you to view measured values for diagnostic purposes.

2.8.1. Main Output (PV– Primary Value)

The value for level, or volume (if volume conversion is selected).

In AMS Device Manager, see **Process Variables (Level Transducer Block-LTB)** on page 79.

2.8.2. Output, no linearization (SV1 – Secondary Value 1)

The value for level.

2.8.3. Output, no level offsets (SV2 – Secondary Value 2)

The value for distance.

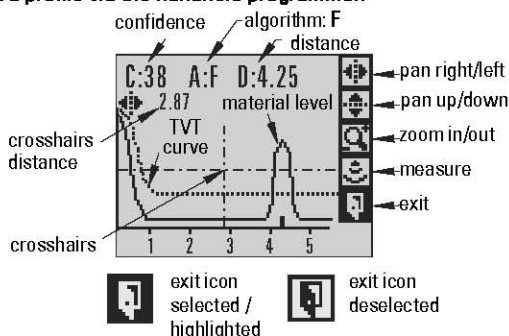
3. Diagnostics

3.1. Echo Profile

Allows you to request the current echo profile via the handheld programmer, or via AMS Device Manager. For more detail see **Echo Processing** on page 145.

To request a profile via AMS Device Manager see **Echo Profile** on page 58.

To request a profile via the handheld programmer:



- In PROGRAM mode, navigate to **Level Meter > DIAG > Echo Profile (3.1)**
- Press **RIGHT arrow** to request a profile.
- In the Profile screen, press **UP arrow** to select the **Measure** icon, and **RIGHT arrow** to update the profile.
- Press **DOWN arrow** to select the **Exit** icon, then **RIGHT arrow** to return to previous menu.

3.2. Fault Reset

Clears faults (see chart below).

Clearing a fault in one parameter of a 'maintenance pair', automatically clears a fault in the second parameter of the pair. For example, entering S3 or S4 will clear a fault on Device Lifetime Reminder 1 (Maintenance Required), and on Device Lifetime Reminder 2 (Maintenance Demanded). This applies when clearing faults via the handheld programmer, or the 375 Field Communicator.

Fault Code	Description
S3	Device Lifetime Reminder 1 (Maintenance Required)
S4	Device Lifetime Reminder 2 (Maintenance Demanded)
S6	Sensor Lifetime Reminder 1 (Maintenance Required)
S7	Sensor Lifetime Reminder 2 (Maintenance Demanded)

Fault Code	Description (cont'd)
S8	Device Service Reminder 1 (Maintenance Required)
S9	Device Service Reminder 2 (Maintenance Demanded)
S12	Internal Temperature High
S17	Calibration Schedule Reminder 1 (Maintenance Required)
S18	Calibration Schedule Reminder 2 (Maintenance Demanded)

To clear a fault using the handheld programmer:

- a) Enter the fault code number then press **RIGHT arrow** .

3.3. Electronics Temperature

To access the following parameters via AMS Device Manager see **Electronics Temperature** under **Maintenance & Diagnostics (LTB)** on page 59.

3.3.1. Minimum Value

*The minimum recorded internal electronics temperature, reported in units defined in **Temperature Units (2.3.4.)**.*

3.3.2. Maximum Value

*The maximum recorded internal electronics temperature, reported in units defined in **Temperature Units (2.3.4.)**.*

3.4. Peak Values

3.4.1. Minimum Measured Value

*The minimum recorded Sensor value, reported in units defined in **Unit (2.3.1.)**.*

3.4.2. Maximum Measured Value

*The maximum recorded Sensor value, reported in units defined in **Unit (2.3.1.)**.*

4. Service

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

4.1. Master Reset

Notes:

- The following parameters are not reset by any reset type: Write Protection, PIN to Unlock, Auto False Echo Suppression Range, Learned TVT.
- While an FF Object Dictionary Reset is in progress, do not perform an action using the local display interface until the reset is complete. This could cause a temporary loss of communications

Reset Type	Result
Factory Defaults ^{a)}	Default. Resets all user parameters to the manufacturer's default settings. Following this type of reset, complete reprogramming is required.
Standard Defaults	Resets all parameters to standard default settings.
Informational	Resets parameters such as Block Descriptor, Strategy, Device Install Date, Device Message.
Functional ^{a)}	Resets parameters that control device behavior and functionality (such as Low Calibration Point).
Warm Start	Has the same effect as recycling power to the device.
FF Object Dictionary	Resets the FF standard block profile parameters (such as block tags) to their specified defaults. This option also clears any function block parameters and device schedule ^{b)} set by the user.

- a) The only difference between Factory Defaults and Functional reset is that Factory Defaults resets maintenance parameters, such as device and sensor wear, calibration and maintenance timers. Functional reset does not reset these parameters.
- b) See **Data transmission** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for further details.

To access via AMS Device Manager see **Master Reset** under **Operation (RESOURCE)** on page 67.

To perform a reset via the handheld programmer:

- Press **RIGHT arrow**  to open Edit Mode then scroll down to the desired reset type and press **RIGHT arrow**  to select it.
- Press **LEFT arrow**  to exit.

After performing a master reset, the device will stop measuring, the Resource and Level Transducer Blocks will go to **Out of Service**, and the LUI will show the **Quick Start Wizard** until the device is configured.

4.2. Remaining Device Lifetime

Notes:

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Sensor Lifetime (4.3.)**, **Service Schedule (4.4.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Remaining Device Lifetime parameters in hours (via AMS Device Manager only) see **Remaining Device Lifetime** on page 69.

The device tracks itself based on operating hours and monitors its predicted lifetime. You can modify the expected device lifetime, set up schedules for maintenance alerts, and acknowledge them.

The maintenance warnings and alarms are communicated to the end user through status information. This information can be integrated into any Asset Management system.

To access these parameters via AMS Device Manager see **Remaining Device Lifetime** under **Maintenance & Diagnostics (RESOURCE)** on page 69.

4.2.1. Lifetime Expected

Allows you to override the factory default

Values	Units: years
	Range: 0 to 20 years
	Default: 10.00 years

4.2.2. Time in Operation

Read only. The amount of time the device has been operating.

4.2.3. Remaining Lifetime

*Read only. **Lifetime Expected (4.2.1.)** less **Time in Operation (4.2.2.)***

4.2.4. Reminder Activation

Allows you to enable a maintenance reminder.

Options	REMInder 1 (Maintenance REQuired)
	REMInder 2 (Maintenance DEManded)
	REMInder 1 AND 2 (Maintenance Required and Maintenance Demanded)
	* OFF

- a) First set the reminder values in **Reminder 1 (Required) (4.2.5.)**/**Reminder 2 (Demanded) (4.2.6.)**.
- b) Select the desired **Reminder Activation** option.

4.2.5. Reminder 1 (Required)

*If **Remaining Lifetime (4.2.3.)** is equal to or less than this value, the device generates a Maintenance Required reminder.*

Values	Range: 0 to 20 years
	Default: 0.164 years

- Modify limit values as required.
- Set **Reminder Activation (4.2.4.)** to the desired option.

4.2.6. Reminder 2 (Demanded)

*If **Remaining Lifetime (4.2.3.)** is equal to or less than this value, the device generates a Maintenance Demanded reminder.*

Values	Range: 0 to 20 years
	Default: 0.019 years

- Modify limit values as required.
- Set **Reminder Activation (4.2.4.)** to the desired option.

4.2.7. Maintenance Status

Indicates which level of maintenance reminder is active.

To display the level of maintenance reminder that is active in AMS Device Manager see **Extended Diagnostics** under **Device Diagnostics (Resource Block - RESOURCE)** on page 77.

4.2.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

4.2.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge an alert via the handheld programmer:

- Press **RIGHT arrow**  twice to open parameter view and activate **Edit Mode**.
- Press **RIGHT arrow**  to acknowledge the alert.

4.3. Remaining Sensor Lifetime

Notes:

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2.)**, **Service Schedule (4.4.)**, and **Calibration Schedule (4.5.)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Remaining Sensor Lifetime parameters in hours (via AMS Device Manager only) see **Remaining Sensor Lifetime** on page 59.

The device monitors the predicted lifetime of the sensor (the components exposed to the vessel environment). You can modify the expected sensor lifetime, set up schedules for maintenance alerts, and acknowledge them.

To access these parameters via AMS Device Manager see **Remaining Sensor Lifetime** under **Maintenance & Diagnostics (LTB)** on page 59.

4.3.1. Lifetime Expected

Allows you to override the factory default

Values	Units: years
	Range: 0 to 20 years
	Default: 10.00 years

4.3.2. Time in Operation

The amount of time the sensor has been operating. Can be reset to zero after performing a service or replacing the sensor.

To reset to zero:

- Via the handheld programmer, manually reset **Time in Operation (4.3.2)** to zero.

4.3.3. Remaining Lifetime

*Read only. **Lifetime Expected (4.3.1.)** less **Time in Operation (4.3.2.)**.*

4.3.4. Reminder Activation

Allows you to enable a maintenance reminder.

Options	REminder 1 (Maintenance REQuired)
	REminder 2 (Maintenance DEManded)
	REminders 1 AND 2 (Maintenance Required and Maintenance Demanded)
	* OFF

- First set the limit values in **Reminder 1 (Required) (4.3.5.)**/**Reminder 2 (Demanded) (4.3.6.)**.
- Select the desired **Reminder Activation** option.

4.3.5. Reminder 1 (Required)

*If **Remaining Lifetime (4.3.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.*

Values	Range: 0 to 20 years
	Default: 0.164 years

- Modify limit values as required.
- Set **Reminder Activation (4.3.4.)** to the desired option.

4.3.6. Reminder 2 (Demanded)

If **Remaining Lifetime (4.3.3)** is equal to or less than this value, the device generates a **Maintenance Demanded** reminder.

Values	Range: 0 to 20 years
	Default: 0.019 years

- Modify limit values as required.
- Set **Reminder Activation (4.3.4.)** to the desired option.

4.3.7. Maintenance Status

Indicates which level of maintenance reminder is active.

To display the level of maintenance reminder in AMS Device Manager see **Extended Diagnostics** under **Device Diagnostics (Level Transducer Block - LTB)** on page 73.

4.3.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

4.3.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge an alert via the handheld programmer:

- Press **RIGHT arrow**  twice to open parameter view and activate **Edit Mode**.
- Press **RIGHT arrow**  to acknowledge the alert.

4.4. Service Schedule

Notes:

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2)**, **Remaining Sensor Lifetime (4.3)**, and **Calibration Schedule (4.5)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Service Interval parameters in hours (via AMS Device Manager only) see **Service Schedule** on page 60.

The device tracks service intervals based on operating hours and monitors the predicted lifetime to the next service. You can modify the Total Service Interval, set schedules for Maintenance Alerts, and acknowledge them.

The maintenance warnings and alarms are communicated to the end user through status information. This information can be integrated into any Asset Management system.

To access these parameters via AMS Device Manager see **Service Schedule** under **Maintenance & Diagnostics (LTB)** on page 59.

4.4.1. Service Interval

User-configurable recommended time between product inspections.

Values	Units: years
	Range: 0 to 20 years
	Default: 1.0 year

4.4.2. Time Last Serviced

Time elapsed since last service. Can be reset to zero after performing a service.

To reset to zero:

- Via the handheld programmer, manually reset **Time Last Serviced (4.4.2)** to zero.

4.4.3. Time Next Serviced

*Read only. **Service Interval (4.4.1.)** less **Time Last Serviced (4.4.2.)**.*

4.4.4. Reminder Activation

Allows you to enable a maintenance reminder.

Values	*	TIMER OFF
		ON NO LIMITS
		ON REMinder 1 (Maintenance Required) checked
		ON REMinders 1 - 2 checked
		ON - REMinder 2 (Maintenance Demanded) checked

- First set the limit values in **Reminder 1 (Required) (4.4.5.)**/**Reminder 2 (Demanded) (4.4.6.)**.
- Select the desired **Reminder Activation** option.

4.4.5. Reminder 1 (Required)

*If **Time Next Serviced (4.4.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.*

Values	Range: 0 to 20 years
	Default: 0.164 years

- Modify limit values as required.
- Set **Reminder Activation (4.4.4.)** to the desired option.

4.4.6. Reminder 2 (Demanded)

*If **Time Next Serviced (4.4.3.)** is equal to or less than this value, the device generates a **Maintenance Demanded** reminder.*

Values	Range: 0 to 20 years
	Default: 0.019 years

- Modify limit values as required.
- Set **Reminder Activation (4.4.4.)** to the desired option.

4.4.7. Maintenance Status

Indicates which level of maintenance reminder is active.

To display the level of maintenance reminder in AMS Device Manager see **Extended Diagnostics** under **Device Diagnostics (Level Transducer Block - LTB)** on page 73.

4.4.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

4.4.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge an alert via the handheld programmer:

- Press **RIGHT arrow**  twice to open parameter view and activate **Edit Mode**.
- Press **RIGHT arrow**  to acknowledge the alert.

4.5. Calibration Schedule

Notes:

- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- Four sets of parameters allow you to monitor the Device/Sensor Lifetimes and set up Maintenance/Service schedules, based on operating hours instead of a calendar-based schedule. See also **Remaining Device Lifetime (4.2)**, **Remaining Sensor Lifetime (4.3)**, and **Service Schedule (4.4)**.
- Performing a reset to **Factory Defaults** will reset all the Maintenance Schedule parameters to their factory defaults.
- The device operates in years. To view Calibration Interval parameters in hours (via AMS Device Manager only) see **Calibration Schedule** on page 70.

The device tracks calibration intervals based on operating hours and monitors the predicted lifetime to the next calibration. You can modify the Total Calibration Interval, set schedules for Maintenance Alerts, and acknowledge them.

To access these parameters via AMS Device Manager see **Calibration Schedule** under **Maintenance & Diagnostics (RESOURCE)** on page 69.

4.5.1. Calibration Interval

User-configurable recommended time between product calibrations.

Values	Units: years
	Range: 0 to 20 years
	Default: 1.0 year

4.5.2. Time Last Calibrated

Time elapsed since last calibration. Can be reset to zero after performing a calibration.

To reset to zero:

- Via the handheld programmer, manually reset **Time Last Calibrated (4.5.2)** to zero.

4.5.3. Time Next Calibrated

Read only. **Calibration Interval (4.5.1.)** less **Time Last Calibrated (4.5.2.)**.

4.5.4. Reminder Activation

Allows you to enable a maintenance reminder.

Values	*	TIMER OFF
		ON NO LIMITS
		ON REMinder 1 (Maintenance Required) checked
		ON REMinders 1 - 2 checked
		ON - REMinder 2 (Maintenance Demanded) checked

- First set the limit values in **Reminder 1 (Required) (4.5.5.)**/**Reminder 2 (Demanded) (4.5.6.)**.
- Select the desired **Reminder Activation** option.

4.5.5. Reminder 1 (Required)

If **Time Next Calibrated (4.5.3.)** is equal to or less than this value, the device generates a **Maintenance Required** reminder.

Values	Range: 0 to 20 years
	Default: 0.164 years

- Modify limit values as required.
- Set **Reminder Activation (4.5.4.)** to the desired option.

4.5.6. Reminder 2 (Demanded)

If **Time Next Calibrated (4.5.3.)** is equal to or less than this value, the device generates a **Maintenance Demanded** reminder.

Values	Range: 0 to 20 years
	Default: 0.019 years

- Modify limit values as required.
- Set **Reminder Activation (4.5.4.)** to the desired option.

4.5.7. Maintenance Status

Indicates which level of maintenance reminder is active.

To display the level of maintenance reminder that is active in AMS Device Manager see **Extended Diagnostics** under **Device Diagnostics (Resource Block - RESOURCE)** on page 77.

4.5.8. Acknowledge Status

Indicates which level of maintenance reminder has been acknowledged.

4.5.9. Acknowledge

Acknowledges the current maintenance reminder.

To acknowledge an alert via the handheld programmer:

- Press **RIGHT arrow**  twice to open parameter view and activate **Edit Mode**.
- Press **RIGHT arrow**  to acknowledge the alert.

4.6. Manufacture Date

The date of manufacture of the SITRANS LR250 (mm/dd/yyyy/hh.mm).

4.7. Powered Hours

Displays the number of hours the unit has been powered up since manufacture.

To view via AMS Device Manager see **Wear** under **Maintenance & Diagnostics (RESOURCE)** on page 69.

4.8. Power-on Resets

The number of power cycles that have occurred since manufacture.

To view via AMS Device Manager see **Wear** under **Maintenance & Diagnostics (RESOURCE)** on page 69.

4.9. LCD Fast Mode

Notes:

- LCD Fast Mode takes effect only after 30 minutes of inactivity. (Each time the device is powered up, a further 30 minutes of inactivity is required.)
- LCD Fast Mode affects Measurement mode only; it has no effect on Navigation mode.

Enables a faster rate of measurement from the device by disabling most of the display area. Only the bar graph will be refreshed when LCD Fast Mode is set to ON.

Values	*	OFF
		ON

4.10. LCD Contrast

The factory setting is for optimum visibility at room temperature and in average light conditions. Extremes of temperature will lessen the contrast.

Values	Range: 0 (High contrast) to 20 (Low contrast), Default: 10
---------------	--

Adjust the value to improve visibility in different temperatures and light conditions. Change the value in small steps to ensure you can continue to read the display.

4.11. Secondary Value

Use the secondary value to capture the menu navigation path to currently viewed parameter, and store it as the path to the custom secondary value.

While in Parameter View of the current parameter (see **Parameter view** on page 32), press the decimal point key. This stores the path to the current parameter in the Secondary Value, and displays the value for that parameter on the LCD display when in Measurement Mode. [See **The LCD Display** on page 31, area (6) under **Normal operation**.]

4.12. Simulate Enable

Replaces a physical jumper switch found on some FF devices to enable simulation when set to ON. (Available only via LUI.)

Options	*	OFF	Simulation Disabled
		ON	Simulation Enabled

For more information on Simulation, see **Simulation (Input)** on page 50 in AMS Device Manager. [See also **Simulation** under **How the AIFB works** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01)].

5. Communication

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

5.1. Tag

Note: The tag can only be changed from a remote master such as NIFBUS-Configurator or DeltaV.

Read only. Text that can be used in any way. A recommended use is as a unique label for a field device in a plant. Limited to 32 ASCII characters.

5.2. Device Address

Note: The address can only be changed from a remote master such as NIFBUS-Configurator or DeltaV. See **Addressing** in manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01) for further details.

Read only. The unique address of the device on the network.

Values	Temporary range during initial commissioning: 248 - 251. Permanent range after commissioning complete (written to non-volatile memory in the device): 16-247
--------	---

5.3. Manufacturer

Name of manufacturer associated with this device.

5.4. Device Type Identification

Hexadecimal integer defined by Siemens to uniquely identify each product with manufacturer's Id. (LR250 FF device=0x1954.)

5.5. Device Revision

Manufacturer's revision number associated with this device.

5.6. ITK Version

Major revision number of the interoperability test case used to register this device.

6. Security

Note: Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

6.1. Remote Access

6.1.1. Remote Lockout

Note: If remote lockout control is changed to limit remote access, it can be reset only via the handheld programmer.

Enables or disables programming via the network and AMS Device Manager.

Options	*	OFF	Remote operation enabled
		ON	Remote operation disabled

6.2. Local Access

6.2.1. Write Protection

Note: Do not lose this number value.

Prevents any changes to parameters via AMS Device Manager or the handheld programmer.

Options		Range: 0 to 9999	
	*	Unlock value (stored in PIN to Unlock (6.2.2))	Lock Off
		Any other value	Lock On

- To turn Lock On, key in any value other than the Unlock Value stored in **PIN to Unlock (6.2.2)**.
- To turn Lock Off, key in the Unlock Value stored in **PIN to Unlock (6.2.2)**.

To access this parameter via AMS Device Manager see **Local Access** under **Security (RESOURCE)** on page 72.

6.2.2. PIN to Unlock

Notes:

- Do not lose your Unlock Value: it cannot be displayed once **Write Protection (6.2.1.)** has been set to a different value.
- A reset to **Factory Defaults** will not restore the unlock value at time of shipping.

*Stores the value to be entered in **Write Protection (6.2.1.)** to unlock programming. If **Write Protection (6.2.1.)** is set to a different value **PIN to Unlock (6.2.2)** does not display the Unlock value*

Handheld Programmer Values	Range: 0 to 9999	
	Value when shipped: 1954. Not restored by a reset to Factory Defaults.	
	----	Display when Lock is on

To access this parameter via AMS Device Manager see **Local Access under Security (RESOURCE)** on page 72.

6.2.3. Local Operation

Enables or disables programming via the handheld programmer.

Options		DISABLED
	*	ENABLED

Note: Once disabled via the handheld programmer, the parameter is no longer visible via LUI and can only be reset using AMS Device Manager. However, if no communication exists for 30 seconds, the parameter will again be visible via LUI.

To access this parameter via AMS Device Manager see **Local Display under Setup (LCD)** on page 64.

7. Language

Selects the language to be used on the LCD.

Options	*	ENGLISH
		DEUTSCH
		FRANCAIS
		ESPANOL
		简体中文

To access this parameter via AMS Device Manager see **Local Display under Setup (LCD)** on page 64.

Appendix A: Alphabetical Parameter List

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Appendix B: Troubleshooting

1. Check the following:
 - There is power at the instrument.
 - The LCD shows the relevant data.
 - If any fault codes are being displayed see *General Fault Codes* on page 138 for a detailed list.
2. Verify that the wiring connections are correct.
3. See the table below for specific symptoms.

Symptom	Corrective action
The device cannot be programmed via FF.	• Make sure Remote Lockout (6.1.1.) on page 129 is set to the unlock value • Ensure block is Out of Service
You try to set a SITRANS LR250 parameter via remote communications but the parameter remains unchanged.	• Ensure Remote Lockout (6.1.1.) on page 129 is disabled • Ensure Write Protection (6.2.1.) on page 129 is set to the unlock value • Ensure block is Out of Service
The AIFB output equals the display value but does not correspond to actual material level.	• Ensure the Channel selection and Scaling in AIFB 1 are correctly entered • Ensure AIFBs are scheduled and in Auto mode • Ensure High Calibration Point is correctly entered • View the echo profile to see if the wrong echo is being selected. If so, see <i>Operation Troubleshooting</i> on page 142 for possible causes and corrective action
The AIFB output is not equal to the displayed value (regardless of actual material level).	• Confirm you are looking at the AIFB Output • Ensure AIFBs are scheduled and in Auto mode • Ensure scaling has not been programmed into the controller: all scaling should be performed by the LR250 • Check the network to ensure the controller is communicating with the LR250
Not able to change parameters via LUI.	• Ensure Local Operation (6.2.3.) on page 130 is enabled
Not able to change parameters, such as low calibration point.	• Ensure block is in Out of Service mode

If you continue to experience problems, go to our website at

www.siemens.com/LR250, and check the FAQs for SITRANS LR250, or contact your Siemens Milltronics representative.

Device Status Icons

Icon	Priority Level	Meaning
	1	- Maintenance alarm - Measurement values are not valid
	2	- Maintenance warning: maintenance demanded immediately - Measured signal still valid
	3	- Maintenance required - Measured signal still valid
	1	Process value has reached an alarm limit
	2	Process value has reached a warning limit
	3	Process value has reached a tolerance limit
	1	- Configuration error - Device will not work because one or more parameters/components is incorrectly configured
	2	- Configuration warning - Device can work but one or more parameters/components is incorrectly configured
	3	- Configuration changed - Device parameterization not consistent with parameterization in project. Look for info text.
	1	- Manual operation (local override) - Communication is good; device is in manual mode.
	2	- Simulation or substitute value - Communication is good; device is in simulation mode or works with substitute values.

Icon	Priority Level	Meaning (cont'd)
	3	• Out of operation • Communication is good; device is out of action.
		• No data exchange
		• Write access enabled
		• Write access disabled

General Fault Codes

Notes:

- If more than one fault is present, the device status indicator and text for each fault alternate at 2 second intervals.

General Fault Codes

Code / Icon	Meaning	Corrective Action
S: 0 	The device was unable to get a measurement within the LOE Timer period. Possible causes: faulty installation, antenna material buildup, foaming/other adverse process conditions, invalid calibration range.	- Ensure installation details are correct. - Ensure no material buildup. Clean if necessary. - Adjust process conditions to minimize foam or other adverse conditions. - Correct range calibration. - If fault persists, contact your local Siemens representative.
S: 2 	Unable to collect profile because of a power condition that is outside the operating range of the device.	Repair required. Contact your local Siemens representative.
S: 3 	Device is nearing its lifetime limit as defined in 4.2.3.Remaining Lifetime and has triggered a Maintenance Required reminder (4.2.5.) .	Replacement is recommended.
S: 4 	Device is nearing its lifetime limit as defined in 4.2.3.Remaining Lifetime and has triggered a Maintenance Demanded reminder (4.2.6.) .	Replacement is recommended.
S: 6 	Sensor is nearing its lifetime limit as defined in 4.3.3.Remaining Lifetime and has triggered a Maintenance Required reminder (4.3.5.) .	Replacement is recommended.
S: 7 	Sensor is nearing its lifetime limit as defined in 4.3.3.Remaining Lifetime and has triggered a Maintenance Demanded reminder (4.3.6.) .	Replacement is recommended.
S: 8 	Service interval as defined in 4.4.1. has expired and has triggered a Maintenance Required reminder (4.4.5.) .	Perform service.
S: 9 	Service interval as defined in 4.4.1. has expired and has triggered a Maintenance Demanded reminder (4.4.6.) .	Perform service.
S: 10 	Input parameters Low Calibration Point (2.3.7.1.) and High Calibration Point (2.3.7.2.) are the same.	- Check calibration settings of device. - Ensure settings for High Calibration Point and Low Calibration Point are different.
S: 11 	Internal temperature sensor failure.	Repair required: contact your local Siemens representative.

General Fault Codes (cont'd)

Code / Icon	Meaning	Corrective Action
S: 12 	Internal temperature of device has exceeded specifications: it is operating outside its temperature range.	- Relocate device and/or lower process temperature enough to cool device. - Inspect for heat-related damage and contact your local Siemens representative if repair is required. - Fault code will persist until a manual reset is performed using AMS or the LCD interface.
S: 17 	Calibration interval as defined in 4.5.1 has expired and has triggered a Maintenance Required reminder (4.5.5).	Perform calibration.
S: 18 	Calibration interval as defined in 4.5.1 has expired and has triggered a Maintenance Demanded reminder (4.5.6).	Perform calibration.
S: 22 	Time Base Fault	Hardware problem: contact your local Siemens representative.
S: 28 	Internal device failure caused by a RAM memory error.	Repair required: contact your local Siemens representative.
S: 29 	EEPROM damaged.	Repair required: contact your local Siemens representative.
S: 31 	Flash error.	Repair required: contact your local Siemens representative.
S: 33 	Factory calibration for the internal temperature sensor has been lost.	Repair required: contact your local Siemens representative.
S: 34 	Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.
S: 35 	Factory calibration for the device has been lost.	Repair required: contact your local Siemens representative.
S: 36 	Unable to start microwave module.	Cycle power. If fault persists, contact your local Siemens representative.
S: 37 	Measurement hardware problem.	Cycle power. If fault persists, contact your local Siemens representative.
S: 38 	Microwave module hardware failure: unable to calculate distance measurement.	Cycle power. If fault persists, contact your local Siemens representative: Repair required.

General Fault Codes (cont'd)

Code / Icon	Meaning	Corrective Action
S: 43 	Factory calibration for the radar receiver has been lost.	Repair required: contact your local Siemens representative.
S: 92 	Corrupt Stack	Contact your local Siemens representative and provide configuration file and FB schedule.
S: 93 	High Stack	Contact your local Siemens representative and provide configuration file and FB schedule.
S: 94 	Data Safe Read	Re-apply configuration and cycle power. If fault persists, contact your local Siemens representative.
S: 95 	Data Safe Write	Re-apply configuration and cycle power. If fault persists, contact your local Siemens representative.
S: 96 	Safe Process Data Corrupt	Contact your local Siemens representative and provide configuration file and FB schedule.
S: 97 	Board Voltage	Hardware problem: contact your local Siemens representative.
S: 98 	ADC Failed	Hardware problem: contact your local Siemens representative.
S: 99 	Prof. Clip	Hardware problem. If fault persists contact your local Siemens representative.
S: 100 	Few Shots	Hardware problem. If fault persists contact your local Siemens representative.
S: 101 	Meas. Err.	Reset configuration. If fault persists contact your local Siemens representative and provide configuration file and FB schedule.
S: 102 	No Shots	Hardware problem. If fault persists contact your local Siemens representative.
S: 103 	Meas. Corrupt	Contact your local Siemens representative and provide configuration file and FB schedule.
S: 104 	DMA Error	Hardware problem. If fault persists contact your local Siemens representative.

General Fault Codes (cont'd)		
Code / Icon	Meaning	Corrective Action
S: 105 	Seq. Corrupt	Contact your local Siemens representative and provide configuration file and FB schedule.
S: 106 	Seq. CP	Re-install firmware (firmware upgrade). If fault persists contact your local Siemens representative.
S: 107 	Seq. Duration	Increase update rate limit. If fault persists contact your local Siemens representative.
S: 108 	BC Corrupt	Contact your local Siemens representative and provide configuration file and FB schedule.
S: 109 	BC Start	Re-install firmware (firmware upgrade). If fault persists contact your local Siemens representative.
S: 110 	BC Stop	Re-install firmware (firmware upgrade). If fault persists contact your local Siemens representative.
S: 111 	BC Duration	Hardware problem. If fault persists contact your local Siemens representative.
S: 112 	CPU Fault	Hardware problem. If fault persists contact your local Siemens representative.
S: 113 	Data Bus	Hardware problem. If fault persists contact your local Siemens representative.
S: 114 	Addr Bus	Hardware problem. If fault persists contact your local Siemens representative.
S: 115 	Spur SW	Hardware problem. If fault persists contact your local Siemens representative.
S: 116 	Spur HW	Hardware problem. If fault persists contact your local Siemens representative.
S: 117 	SV High	Verify TB not in simulation mode. If fault persists contact your local Siemens representative.
S: 118 	SV Low	Verify TB not in simulation mode. If fault persists contact your local Siemens representative.

Operation Troubleshooting

Operating symptoms, probable causes, and resolutions (continued on next page).

Operation Troubleshooting		
Symptom	Cause	Action
Display shows  S: 0 LOE	Level or target is out of range	- check specifications - check Low Calibration Point (2.3.7.1.) - increase Confidence (2.5.9.1.)
Display shows  S: 0 LOE	Material build-up on antenna	- clean the antenna - re-locate SITRANS LR250
Display shows  S: 0 LOE	Location or aiming: - poor installation - flange not level - Auto False Echo Suppression may be incorrectly applied	- check to ensure nozzle is vertical - ensure end of antenna protrudes from end of nozzle - review Auto False Echo Suppression (2.5.10.1.) on page 110 - ensure Auto Suppression Range is set correctly
Display shows  S: 0 LOE	Antenna malfunction: - temperature too high - physical damage - excessive foam - multiple echoes	- check temperature in Maximum Value (3.3.2.) - use foam deflector or stillpipe - relocate - use a defoamer - set Algorithm (2.5.7.1.) to tF (trueFirst echo)
Reading does not change, but the level does	SITRANS LR250 processing wrong echo, i.e. vessel wall, or structural member	- re-locate SITRANS LR250 - check nozzle for internal burrs or welds - rotate instrument 90° - use Auto False Echo Suppression (2.5.10.1.) and Auto False Echo Suppression Range (2.5.10.2.)
Measurement is consistently off by a constant amount	- setting for Low Calibration Point (2.3.7.1.) not correct - setting for Sensor Offset (2.3.7.3.) not correct	- check distance from sensor reference point to Low Calibration Point (2.3.7.1.) - check Sensor Offset (2.3.7.3.)
Screen blank	Power error	- check nameplate rating against voltage supply - check power wiring or source

Operation Troubleshooting (cont'd)		
Symptom	Cause	Action
Reading erratic	Echo confidence weak	- refer to Confidence (25.9.1.) - use Auto False Echo Suppression (25.10.1.) and Auto False Echo Suppression Range (25.10.2.) - use foam deflector or stillpipe
	Liquid surface vortexed	- decrease Fill Rate per Minute (23.8.2.) - relocate instrument to side pipe - increase confidence threshold in Echo Threshold (25.7.3.)
	Material filling	re-locate SITRANS LR250
Reading response slow	Fill Rate per Minute (23.8.2.) setting is incorrect	increase measurement response if possible
Reads correctly but occasionally reads high when vessel is not full	- detecting close range echo - build up near top of vessel or nozzle - nozzle problem	- clean the antenna - use Auto False Echo Suppression (25.10.1.) and Auto False Echo Suppression Range (25.10.2.)
Level reading lower than material level	- material is within Near Range zone - multiple echoes processed	- decrease Near Range (25.1.): minimum value depends on antenna type - raise SITRANS LR250 - ensure Algorithm (25.7.1.) is set to tF (trueFirst echo)
	vessel near empty and low dK material	- ensure Material (23.5.) selection is LIQUID LOW DK - set Position Detect (25.7.2.) to Hybrid - check the setting for CLEF (Constrained Leading Edge Fit) Range (25.7.4.): see the table below Propagation Factor (25.3.) for recommended settings

Appendix C: Maintenance

SITRANS LR250 requires no maintenance or cleaning under normal operating conditions.

Under severe operating conditions, the antenna may require periodic cleaning. If cleaning becomes necessary:

- Note the antenna material and the process medium, and select a cleaning solution that will not react adversely with either.
- Remove the instrument from service and wipe the antenna clean using a cloth and suitable cleaning solution.

Unit Repair and Excluded Liability

All changes and repairs must be done by qualified personnel, and applicable safety regulations must be followed. Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

Replacing the antenna

- If the antenna requires replacement due to damage, it may be replaced without need for re-calibration.
- Changing to a different antenna type may be performed by a Siemens authorized repair center.

Appendix D: Technical Reference

Note: Where the number follows the parameter name [for example, **Algorithm (25.7.1.)**] this is the parameter access number via the handheld programmer. See *Parameter Reference (LUI)* on page 96 for a complete list of parameters.

Principles of Operation

SITRANS LR250 is a 2-wire 25 GHz pulse radar level transmitter for continuous monitoring of liquids and slurries¹⁾. Radar level measurement uses the time of flight principle to determine distance to a material surface. The device transmits a signal and waits for the return echo. The transit time is directly proportional to the distance from the material.

Pulse radar uses polarized electromagnetic waves. Microwave pulses are emitted from the antenna at a fixed repetition rate, and reflect off the interface between two materials with different dielectric constants (the atmosphere and the material being monitored).

Electromagnetic wave propagation is virtually unaffected by temperature or pressure changes, or by changes in the vapor levels inside a vessel. Electromagnetic waves are not attenuated by dust.

SITRANS LR250 consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal (25 GHz) that is directed to the horn.

The signal is emitted from the horn, and the reflected echoes are digitally converted to an echo profile. The profile is analyzed to determine the distance from the material surface to the sensor reference point²⁾. This distance is used as a basis for the display of material level.

Echo Processing

Process Intelligence

The signal processing technology embedded in Siemens radar level devices is known as **Process Intelligence**.

Process intelligence provides high measurement reliability regardless of the dynamically changing conditions within the vessel being monitored. The embedded Process Intelligence dynamically adjusts to the constantly changing material surfaces within these vessels.

¹⁾ The microwave output level is significantly less than that emitted from cellular phones.

²⁾ See *Threaded Horn Antenna with extension* on page 12 and *Flanged Horn* on page 13.

Process Intelligence is able to differentiate between the true microwave reflections from the surface of the material and unwanted reflections being returned from obstructions such as seam welds or supports within a vessel. The result is repeatable, fast and reliable measurement. This technology was developed as result of field data gained over some twenty years from more than 1,000,000 installations in many industries around the world.

Higher order mathematical techniques and algorithms are used to provide intelligent processing of microwave reflection profiles. This “knowledge based” technique produces superior performance and reliability.

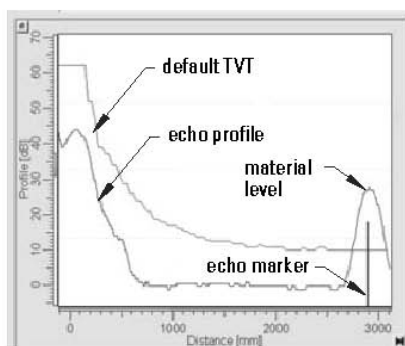
Echo Selection

Time Varying Threshold (TVT)

A Time Varying Threshold (TVT) hovers above the echo profile to screen out unwanted reflections (false echoes).

In most cases the material echo is the only one which rises above the default TVT.

In a vessel with obstructions, a false echo may occur. See *Auto False Echo Suppression (2.5.10.1.)* on page 148 for more details.



The device characterizes all echoes that rise above the TVT as potential good echoes. Each peak is assigned a rating based on its strength, area, height above the TVT, and reliability, amongst other characteristics.

Algorithm (2.5.7.1.)

The true echo is selected based on the setting for the Echo selection algorithm. Options are True First echo, First echo, Largest echo, or Best of Largest and First.

Position Detect (2.5.7.2.)

The echo position detection algorithm determines which point on the echo will be used to calculate the precise time of flight, and calculates the range using the calibrated propagation velocity [see **Propagation Factor (2.5.3.)** for values]. There are three options:

- **Center**
- **CLEF** (Constrained Leading Edge Fit)
- **Hybrid** (Center and CLEF)

Center

Uses center of the echo.

Hybrid

Uses the Center algorithm for the top part of the vessel, and the CLEF algorithm for the part nearest the vessel bottom, according to the setting for **CLEF range**.

CLEF (Constrained Leading Edge Fit)

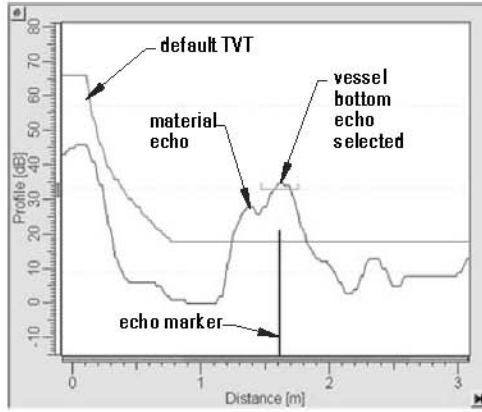
- Uses the leading edge of the echo.
- Is used mainly to process the echo from materials with a low dK value.

In an almost empty vessel, a low dK material may reflect an echo weaker than the echo from the vessel bottom. The echo profile shows these echoes merging. The device may then report a material level equal to or lower than empty.

The CLEF algorithm enables the device to report the level correctly.

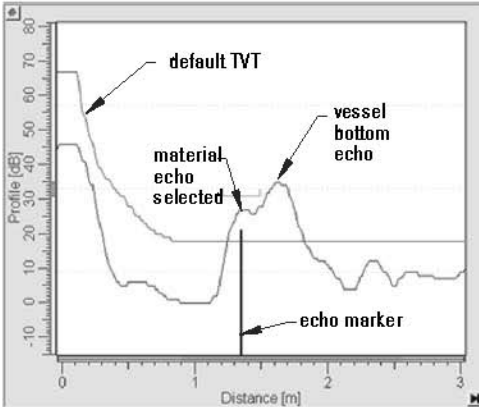
Example: CLEF off: Position set to Hybrid

Vessel height: 1.5 m; CLEF range set to 0 (**Center** algorithm gives the same result.)



Example: CLEF enabled

Vessel height: 1.5 m; CLEF range set to 0.5 m



CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.)

Determines the level below which the CLEF algorithm will be used. Above this level the Center algorithm is used.

Echo Threshold (2.5.7.3.)

Confidence (2.5.9.1.) describes the quality of an echo. Higher values represent higher quality. **Echo Threshold** defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

Echo Lock (2.5.8.1.)

If the echo selected by **Algorithm** is within the Echo Lock window, the window is centered about the echo, which is used to derive the measurement. In radar applications, two measurement verification options are used:

Lock Off

SITRANS LR 250 responds immediately to a new selected echo (within the restrictions set by the Maximum Fill / Empty Rate), but measurement reliability is affected.

Material Agitator

A new measurement outside the Echo Lock Window must meet the sampling criteria before the window will move to include it.

The other available options, **Maximum Verification** and **Total Lock** are not recommended for radar.

Auto False Echo Suppression (2.5.10.1.)

Notes:

- For detailed instructions on using this feature via AMS see *TVT (time varying threshold)* on page 56.
- For detailed instructions on using this feature via the handheld programmer see **Auto False Echo Suppression (2.5.10.1.)** on page 110.

Auto False Echo Suppression is designed to learn a specific environment (for example, a particular vessel with known obstructions), and in conjunction with Auto False Echo Suppression Range to remove false echoes appearing in front of the material echo.

The material level should be below all known obstructions at the moment when Auto False Echo Suppression learns the echo profile. Ideally the vessel should be empty or almost empty, and if an agitator is present, it should be running.

The device learns the echo profile over the whole measurement range and the TVT is shaped around all echoes present at that moment.

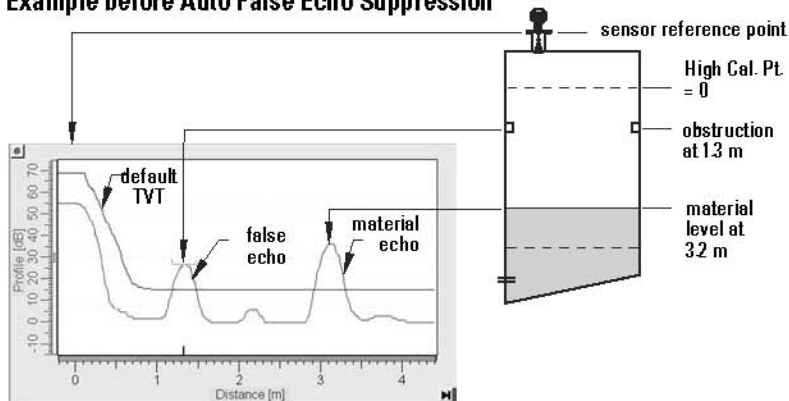
Auto False Echo Suppression Range (2.5.10.2.)

Auto False Echo Suppression Range specifies the range within which the learned TVT is applied. Default TVT is applied over the remainder of the range.

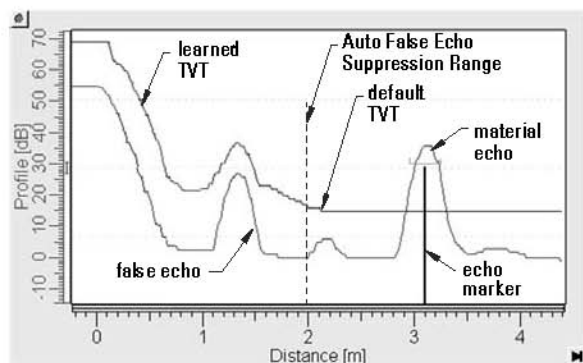
The learned TVT screens out the false echoes caused by obstructions. The default TVT allows the material echo to rise above it.

Auto False Echo Suppression Range must be set to a distance shorter than the distance to the material level when the environment was learned, to avoid the material echo being screened out.

Example before Auto False Echo Suppression



Example after Auto False Echo Suppression



Auto False Echo
Suppression
Range set to 2 m

Measurement Range

Near Range (2.5.1.)

Near Range programs SITRANS LR250 to ignore the zone in front of the antenna. The default blanking distance is 50 mm (1.97") from end of horn antenna.

Near Range allows you to increase the blanking value from its factory default. But Auto False Echo Suppression (2.5.10.1.) is generally recommended in preference to extending the blanking distance from factory values.

Far Range (2.5.2.)

Far Range can be used in applications where the base of the vessel is conical or parabolic. A reliable echo may be available below the vessel empty distance, due to an indirect reflection path.

Increasing Far Range to 30% or 40% can provide stable empty vessel readings.

Measurement Response

Note: Units are defined in **Unit (2.3.1.)** and are in meters by default.

Response Rate (2.3.8.1.) limits the maximum rate at which the display and output respond to changes in the measurement. There are three preset options: slow, medium, and fast. Once the real process fill/empty rate (m/s by default) is established, a response rate can be selected that is slightly higher than the application rate.

Note: Changing Response Rate resets Fill Rate per Minute (2.3.8.2.), Empty Rate per Minute (2.3.8.3.), and Shots (2.5.6.).

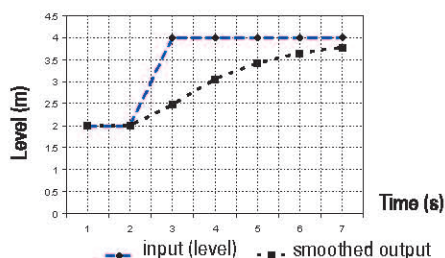
Response Rate (2.3.8.1.)	Fill Rate per Minute (2.3.8.2.)/ Empty Rate per Minute (2.3.8.3.)	Shots (2.5.6.)
* Slow	0.1 m/min (0.32 ft/min)	25
Medium	1.0 m/min (3.28 ft/min)	10
Fast	10.0 m/min (32.8 ft/min)	5

Damping

Filter Time Constant (2.6.7.1.) smooths out the response to a sudden change in level. This is an exponential filter and the engineering unit is always in seconds.

In 5 time constants the output rises exponentially: from 63.2% of the change in the first time constant, to almost 100% of the change by the end of the 5th time constant.

Damping example
time constant = 2 seconds
input (level) change = 2 m



Loss of Echo (LOE)

A loss of echo (LOE) occurs when the calculated measurement is judged to be unreliable because the echo confidence value has dropped below the echo confidence threshold.

Confidence (2.5.9.1.) describes the quality of an echo. Higher values represent higher quality.

Echo Threshold (2.5.7.3.) defines the minimum confidence value required for an echo to be accepted as valid and evaluated.

If the LOE condition persists beyond the time limit set in **Loss of Echo (LOE) Timer (2.3.6.)** the LCD displays the Service Required icon, and the text region displays the fault code **S: 0** and the text **LOE**.

If two faults are present at the same time, the fault code, error text, and error icon for each fault are displayed alternately. For example, Loss of Echo and faulty power supply:



S: 0 LOE



S: 2 NO TECH POWER

Upon receiving a reliable echo, the loss of echo condition is aborted, the Service Required icon and error message are cleared, and the reading returns to the current level.

LOE Timer

Loss of Echo (LOE) Timer (23.6.) determines the length of time a Loss of Echo (LOE) condition will persist before the function block will show a status of BAD or UNCERTAIN. The default is 100 seconds.

Maximum Process Temperature Chart

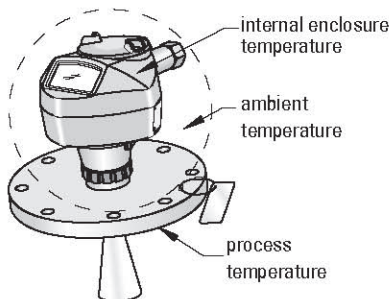
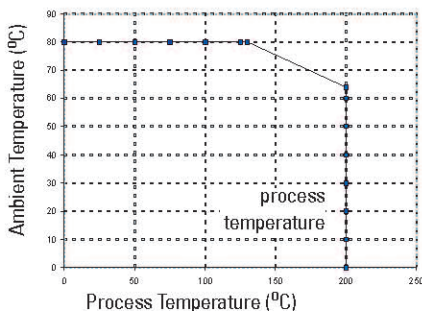
Flange Adapter versions of SITRANS LR250

! WARNING: Internal temperature must not exceed +80 °C (+176 °F).

Notes:

- The chart below is for guidance only:
- The chart does not represent every possible process connection arrangement. For example, it will NOT apply if you are mounting SITRANS LR250 directly on a metallic vessel surface.
- The chart does not take into consideration heating from direct sunshine exposure.

Maximum Process Temperatures versus allowable ambient



Where the chart does not apply, please use your own judgement regarding the use of SITRANS LR250.

See **Minimum Value (3.3.1.)** on page 118 and **Maximum Value (3.3.2.)** on page 118 to monitor the Internal Temperature.

If the internal temperature exceeds the maximum allowable limit, a sun shield or a longer nozzle may be required.

Process Pressure/Temperature derating curves



WARNINGS:

- **Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.**
- **Materials of construction are chosen based on their chemical compatibility (or inertness) for general purposes. For exposure to specific environments, check with chemical compatibility charts before installing.**
- **The user is responsible for the selection of bolting and gasket materials which will fall within the limits of the flange and its intended use and which are suitable for the service conditions.**
- **Improper installation may result in loss of process pressure and/or release of process fluids and/or gases.**

Notes:

- The Process Device Tag shall remain with the process pressure boundary assembly.¹⁾ In the event the instrument package is replaced, the Process Device Tag shall be transferred to the replacement unit.
- SITRANS LR250 units are hydrostatically tested, meeting or exceeding the requirements of the ASME Boiler and Pressure Vessel Code and the European Pressure Equipment Directive.
- The serial numbers stamped in each process connection body, (flange, threaded, or sanitary), provide a unique identification number indicating date of manufacture. Example: MMDDYY – XXX (where MM = month, DD = day, YY = year, and XXX = sequential unit produced)
- Further markings (space permitting) indicate flange configuration, size, pressure class, material, and material heat code.

Pressure Equipment Directive, PED, 97/23/EC

Siemens Level Transmitters with flanged, threaded, or sanitary clamp type process mounts have no pressure-bearing housing of their own, and therefore do not come under the Pressure Equipment Directive as pressure or safety accessories (see EU Commission Guideline 1/8 and 1/20).¹⁾

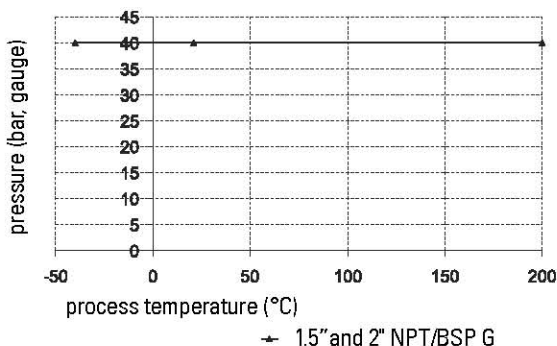
¹⁾ The process pressure boundary assembly comprises the components that act as a barrier against pressure loss from the process vessel: that is, the combination of process connection body and emitter, but normally excluding the electrical enclosure.

Horn Antenna or Wave Guide

- ! WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.**

Note: Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.

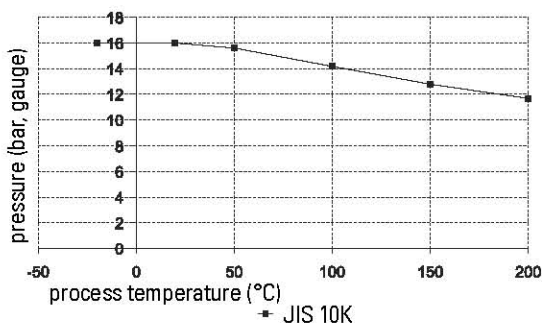
1.5" and 2" Threaded Versions



Process Connection Series:

- 51209 or 51251 series fittings.
- Ensure the process device tag identifies one of these series.
- 25517 or 25555 will be stamped on the threaded fitting.

50A, 80A and 100A Flanged Versions: JIS 10K



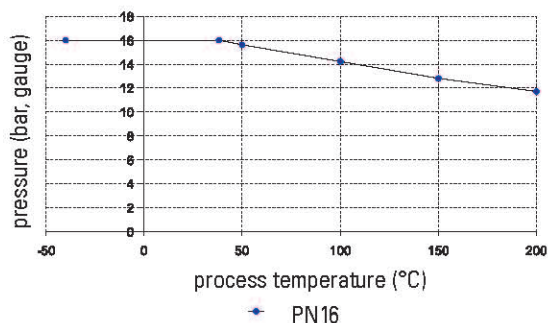
Process Connection Series:

- 51242 or 51252 series flange.
- Ensure the process device tag identifies one of these series.
- 25546 or 25547 will be stamped on a flat faced flange.
- 25580 or 25581 will be stamped on a raised face flange.

- ! WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.**

Note: Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.

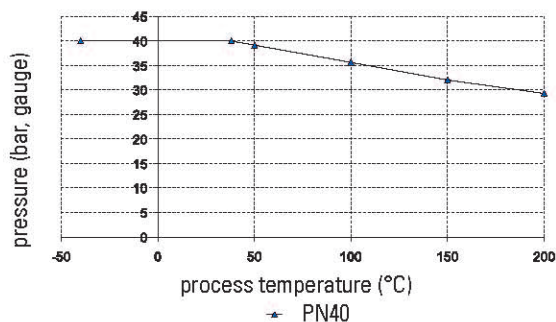
DN50, DN80, DN100, and DN150 Flanged Versions: PN16



Process Connection Series:

- 51242 or 51252 series flange.
- Ensure the process device tag identifies one of these series.
- 25547 will be stamped on a flat faced flange.
- 25581, 25656 or 25657 will be stamped on a raised face flange.

DN50, DN80, DN100, and DN150 Flanged Versions: PN40



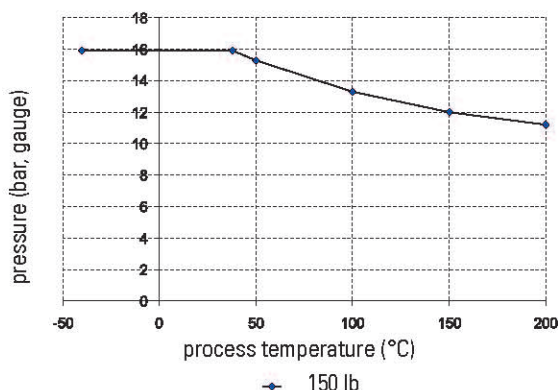
Process Connection Series:

- 51242 or 51252 series flange.
- Ensure the process device tag identifies one of these series.
- 25547 will be stamped on a flat faced flange.
- 25581, 25656 or 25657 will be stamped on a raised face flange.

- ! WARNING: Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.**

Note: Customer to provide adequate bolting and gasketing to retain vessel pressure and provide sufficient sealing.

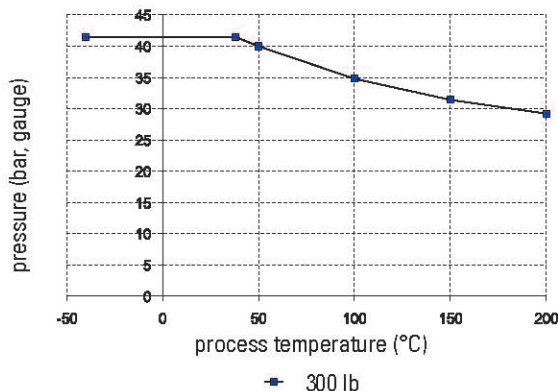
2", 3", and 4" Flanged Versions: 150 lb



Process Connection Series:

- 51242 or 51252 series flange.
- Ensure the process device tag identifies one of these series.
- 25546 will be stamped on a flat faced flange.
- 25580 will be stamped on a raised face flange.

2", 3", and 4" Flanged Versions: 300 lb



Process Connection Series:

- 51242 or 51252 series flange.
- Ensure the process device tag identifies one of these series.
- 25546 will be stamped on a flat faced flange.
- 25580 will be stamped on a raised face flange.

Appendix E: Application Examples

Note: In the applications illustrated below, values are for example purposes only.

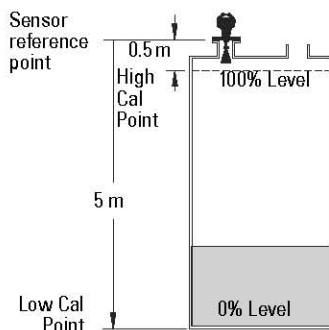
You can use these examples as setup references. Enter the values in the parameter tables to select the corresponding functions.

Configure the basic settings using the Quick Start wizard parameters. (These parameters are inter-related, and changes take effect only after you select **FINISH** in final step: Wizard Complete.)

In each example, after performing a Quick Start, navigate to the other required parameters (either via the handheld programmer, or via AMS Device Manager) and enter the appropriate values.

Liquid resin in storage vessel, level measurement

Note: Minimum distance from flange face to target is limited by **Near Range (25.1)**.



To obtain level measurement proportional to resin levels:

Low Calibration Pt. = 5 m (16.4 ft) from sensor reference point

High Calibration Pt. = 0.5 m (1.64 ft) from sensor reference point.

Max. fill/empty rate = 0.2 m/min. (0.65 ft/min)

In the event of a loss of echo:

SITRANS LR250 is to report a status of BAD or UNCERTAIN after 120 seconds (2 minutes).

Parameter type	Parameter Name	Options/Values	Function
Quick Start Wizard parameters	Introduction	NEXT	Continue with Wizard.
	Language	NEXT	Continue with current language.
	Material	LIQUID	
	Response Rate	MED	Medium = 1 m/minute
	Units	M	meters
	Low Calibration Point	5	5 m (16.4 ft)
	High Calibration Point	0.5	0.5 m (1.64 ft)
	Wizard Complete	FINISH	Transfers Quick Start settings to device.
Independent parameters	Loss of Echo (LOE) Timer (2.3.6.)	120	120 seconds

Press **Mode**  to return to **Measurement** mode.

Horizontal vessel with volume measurement

Note: The minimum distance from the flange face to the target is limited by **Near Range (25.1)**.

To obtain level measurement proportional to vessel volume in a chemical vessel:

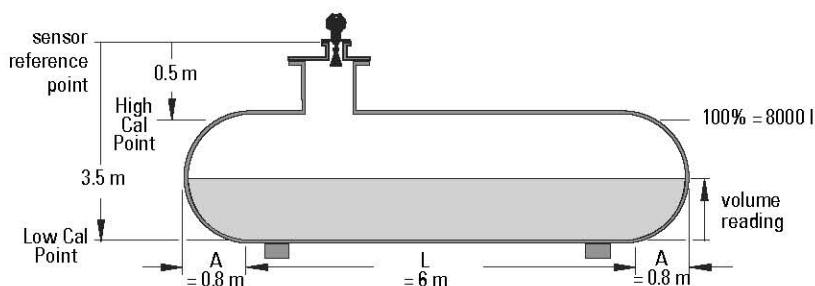
Low Calibration Point = 3.5 m (11.48 ft) from sensor reference point

High Calibration Point = 0.5 m (1.64 ft) from sensor reference point.

Max. fill/empty rate = 0.2 m/min. (0.65 ft/min.)

Select vessel shape, Parabolic Ends, and enter values for A and L, to obtain a volume reading instead of level.

In the event of a loss of echo: SITRANS LR250 is to report a status of BAD or UNCERTAIN after 120 seconds (2 minutes).



Parameter type	Parameter Name	Options/Values	Function
Quick Start Wizard parameters	Introduction	NEXT	Continue with Wizard.
	Language	NEXT	Continue with current language.
	Material	LIQUID	
	Response Rate	MED	Medium = 1 m/minute
	Units	M	meters
	Low Calibration Point	3.5	3.5 m (11.48 ft)
	High Calibration Point	0.5	0.5 m (1.64 ft)
Independent parameters	Wizard Complete	FINISH	Transfers Quick Start settings to device.
	Vessel Shape (2.4.1.1.)	PARABOLIC ENDS	Defines vessel shape.
	PV (volume/level) Units (2.3.3.)	L	litres
	Level Unit (2.3.2.)	M	meters
	Maximum Volume (2.4.1.2.)	8000	8000 liters
	Dimension A (2.4.1.3.)	0.8	0.8 m (2.62 ft)
	Dimension L (2.4.1.4.)	6	6 m (19.68 ft)
	Loss of Echo (LOE) Timer (2.3.6.)	120	120 seconds

Return to **Measurement**: press **Mode**  to start normal operation.

Application with Stillpipe

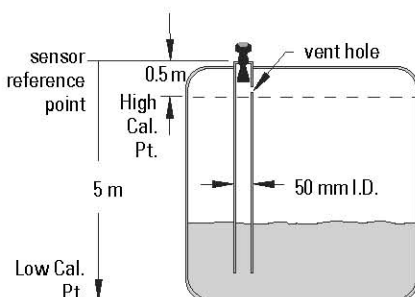
A stillpipe is recommended for products with a dK of less than 3, or if extremely turbulent or vortex conditions exist. This mounting arrangement can also be used to provide optimum signal conditions on foaming materials.

Notes:

- **Near Range (2.5.1.)** will be set at the factory. Check the Process Device Tag for specific values.
- Suitable pipe diameters are 40 mm (1.5") to 100 mm (4").
- The pipe diameter must be matched with the horn size. Use the largest horn size that will fit the stillpipe/bypass pipe (see *Flat Faced Flange* on page 16).
- See *Mounting on a Stillpipe or Bypass Pipe* on page 20 for installation guidelines.

This application is to obtain a level measurement proportional to the oil level in a fuel storage vessel.

- Low Calibration Pt. is 5 m (16.4 ft) from the sensor reference point.
- High Calibration Pt. is 0.5 m (1.64 ft) from the sensor reference point.
- The stillpipe inside diameter is 50 mm (1.96").
- The maximum rate of filling or emptying is about 0.1 m (4")/min.



Parameter type	Parameter Name	Options/Values	Function
Quick Start Wizard parameters	Introduction	NEXT	Continue with Wizard.
	Language	NEXT	Continue with current language.
	Material	LIQUID LOW DK	
	Response Rate	MED	Medium = 1 m/minute
	Units	M	meters
	Low Calibration Point	5	5 m (16.4 ft)
	High Calibration Point	0.5	0.5 m (1.64 ft)
Independent parameters	Wizard Complete	FINISH	Transfers Quick Start settings to device.
	Propagation Factor (2.5.3.) ^{a)}	0.990	P.F. for a 50 mm (1.96") I.D. stillpipe
	Position Detect (2.5.7.2.)	HYBRID	
	CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.) ^{a)}	5.5 m	5.5 m (18.04 ft)

^{a)} The recommended values for the propagation factor and for CLEF range are dependent on the stillpipe diameter. Refer to the next table for values.

Propagation Factor/Stillpipe Diameter

Nominal Pipe Size ^{a)}	40 mm (1.5")	50 mm (2")	80 mm (3")	100 mm (4")
Propagation Factor	0.9828	0.990	0.991	0.9965
CLEF (Constrained Leading Edge Fit) Range (2.5.7.4.) settings	Low Cal Pt. minus 700 mm (2.29 ft)	Low Cal Pt. minus 700 mm (2.29 ft)	Low Cal Pt. minus 1000 mm (3.28 ft)	Low Cal Pt. minus 1000 mm (3.28 ft)

^{a)} Since pipe dimensions may vary slightly, the propagation factor may also vary.

Appendix F: Communications via Foundation Fieldbus (FF)

SITRANS LR250 (Foundation Fieldbus) is an FF (H1) device of Class 31PS, and 32L. It supports publish and subscribe functionality as well as Backup LAS functionality. The full range of SITRANS LR250 functions is available only over an FF network.

Foundation Fieldbus (FF) is an open industrial protocol. Full details about FF can be obtained from Fieldbus Foundation at www.fieldbus.org.

For details on the use of Foundation Fieldbus protocol with Siemens FF level instruments, see manual *Foundation Fieldbus for Level Instruments* (7ML19985MP01). The manual is available on the CD of Siemens manuals, included in the box with your Siemens level instrument, or for other Siemens level measurement manuals, go to: www.siemens.com/level, and look under **Level Measurement**.

Field Communicator 375 (FC375)

SITRANS LR250 (FF) supports Field Communicator 375 (FC375). The FC375 menu structure is very similar to the menu structure for AMS Device Manager (see *AMS Menu Structure* on page 82).

Appendix G: Firmware Revision History

Firmware Rev.	DD Rev.	Date	Changes
1.01.00-00	1.01.00-00	February 25, 2010	Initial release.

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Note: Parameter names are capitalized.

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Glossary

accuracy: degree of conformity of a measure to a standard or a true value.

agitator: mechanical apparatus for mixing or aerating. A device for creating turbulence.

algorithm: a prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.

ambient temperature: the temperature of the surrounding air that comes in contact with the enclosure of the device.

antenna: an aerial which sends out and receives a signal in a specific direction. There are four basic types of antenna in radar level measurement, horn, parabolic, rod, and waveguide.

Auto False-Echo Suppression: a technique used to adjust the level of a TVT curve to avoid the reading of false echoes. (See TVT.)

Auto False-Echo Suppression Range: defines the endpoint of the Learned TVT distance. (See TVT.) This is used in conjunction with auto false echo suppression.

beam angle: the angle diametrically subtended by the one-half power limits (-3 dB) of the microwave beam.

blanking: a blind zone extending away from the reference point plus any additional shield length. The instrument is programmed to ignore this zone.

capacitance: the property of a system of conductors and dielectrics that permits the storage of electricity when potential differences exist between the conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference, and the unit is a Farad.

confidence: see **Echo Confidence**

damping: term applied to the performance of an instrument to denote the manner in which the measurement settles to its steady indication after a change in the value of the level.

dB (decibel): a unit used to measure the amplitude of signals.

derating: to decrease a rating suitable for normal conditions according to guidelines specified for different conditions.

dielectric: a nonconductor of direct electric current.¹⁾

dielectric constant (DK): the ability of a dielectric to store electrical potential energy under the influence of an electric field. Also known as Relative Permittivity. An increase in the dielectric constant is directly proportional to an increase in signal amplitude. The value is usually given relative to a vacuum /dry air: the dielectric constant of air is 1¹⁾.

1) Many conductive liquids/electrolytes exhibit dielectric properties; the relative dielectric constant of water is 80.

echo: a signal that has been reflected with sufficient magnitude and delay to be perceived in some manner as a signal distinct from that directly transmitted. Echoes are frequently measured in decibels relative to the directly transmitted signal.

Echo Confidence: describes the quality of an echo. Higher values represent higher quality. Echo threshold defines the minimum value required for an echo to be accepted as valid and evaluated.

Echo Lock Window: a window centered on an echo in order to locate and display the echo's position and true reading. Echoes outside the window are not immediately processed.

Echo Marker: a marker that points to the processed echo.

Echo Processing: the process by which the radar unit determines echoes.

Echo Strength: describes the strength of the selected echo in dB above 1 μ V rms.

Echo Profile: a graphical display of a processed echo.

false echo: any echo which is not the echo from the desired target. Generally, false echoes are created by vessel obstructions.

frequency: the number of periods occurring per unit time. Frequency may be stated in cycles per second.

hertz (Hz): unit of frequency, one cycle per second. 1 Gigahertz (GHz) is equal to 10^9 Hz.

horn antenna: a conical, horn-shaped antenna which focuses microwave signals. The larger the horn diameter, the more focused the radar beam.

inductance: the property of an electric circuit by virtue of which a varying current induces an electromotive force in that circuit or in a neighboring circuit. The unit is a Henry.

multiple echoes: secondary echoes that appear as double, triple, or quadruple echoes in the distance from the target echo.

Near Blanking: see Blanking

nozzle: a length of pipe mounted onto a vessel that supports the flange.

parameters: in programming, variables that are given constant values for specific purposes or processes.

polarization: the property of a radiated electromagnetic wave describing the time-varying direction and amplitude of the electric field vector.

propagation factor (pf): where the maximum velocity is 1.0, pf is a value that represents a reduction in propagation velocity as a result of the wave travelling through a pipe or medium.

pulse radar: a radar type that directly measures distance using short microwave pulses. Distance is determined by the return transit time.

radar: radar is an acronym for **RA**dio **D**etection **A**nd **R**anging. A device that radiates electromagnetic waves and utilizes the reflection of such waves from distant objects to determine their existence or position.

range: distance between a transmitter and a target.

range extension: the distance below the zero percent or empty point in a vessel.

repeatability: the closeness of agreement among repeated measurements of the same variable under the same conditions.

shot: one transmit pulse or measurement.

stillpipe: a pipe that is mounted inside a vessel parallel to the vessel wall, and is open to the vessel at the bottom.

stilling-well: see **stillpipe**.

TVT (time varying threshold): a time-varying curve that determines the threshold level above which echoes are determined to be valid.

LCD Menu Structure

LCD Menu Structure

Notes:

- In Navigation mode **ARROW** keys navigate the menu in the direction of the arrow.
- See *Parameter Reference* on page 47 for detailed information and instructions.



LEVEL METER

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For more information

www.siemens.com/level

www.siemens.com/continuous-weighing

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