Radar Transmitters

SITRANS LR560 (Foundation Fieldbus)

Operating Instructions · 10/2010

Draft_Rev. 1.0-02
Firmware 1.00.00-32

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.
- 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.

Contact SMPI Technical Publications at the following address:
Technical Publications
Siemens AG
Siemens Milltronics Process Instruments
1954 Technology Drive, P.O. Box 4225
Peterborough, Ontario, Canada, K9J 7B1
Email: techpubs.smpi@siemens.com

European Authorized Representative

Siemens AG
Industry Sector
76181 Karlsruhe
Deutschland

- For a selection of Siemens Milltronics level measurement manuals, go to: **www. siemens.com/processautomation**. Under Process Instrumentation, select *Level Measurement* and then go to the manual archive listed under the product family.
- For a selection of Siemens Milltronics weighing manuals, go to: **www. siemens.com/processautomation**. Under Weighing Technology, select *Continuous Weighing Systems* and then go to the manual archive listed under the product family.

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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 symbol 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.

WARNING symbol, used when there is no corresponding caution symbol on the product, 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 B 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

a) 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.

b) 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.

c) 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.

d) This level probing device is only permitted for installation inside enclosed containers. The installer/user of this device shall ensure that it is at least 10 km from the Penticton radio astronomy station (British Columbia latitude: 49° 19' 12" N, longitude: 119° 37'12" W). For devices not meeting this 10 km separation (e.g. the Okanagan Valley, British Columbia) the installer/ user must coordinate with and obtain the written concurrence of the Director of the Penticton radio astronomy station before the equipment can be installed or operated. The Penticton contact is Tel: 250-493-2277/ fax: 250-493-7767. (In case of difficulty, the Manager, Radio Equipment Standards, Industry Canada, may also be contacted.)

The Manual

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 LR560.
- This manual applies to the SITRANS LR560 (FOUNDATION™ Fieldbus)[1)] only.

This manual will help you set up your SITRANS LR560 for optimum performance. *Foundation Fieldbus for Level instruments (7ML19985MP01)* manual 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 Example

The application example used in this manual illustrates a typical installation using SITRANS LR560. (See *Level application example* on page 40.) 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 example does not apply to your application, check the applicable parameter reference for the available options.

1) FOUNDATION™ Fieldbus is a trademark of Fieldbus Foundation.

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 **Contact**, select **Service,** then click **Service** again to find your product group **(+Automation Technology > +Sensor Systems >+Process Instrumentation > +Level Measurement > +Continous)**. Select **Radar**.
- Select the country followed by the City/Region.
- Select **Technical Support** under **Service**.

For on-line technical support go to:

www.siemens.com/automation/support-request

- Enter the device name (SITRANS LR560) 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 email a detailed description of your issue to Siemens Technical Support staff.

Siemens IA/DT Technical Support Center: phone +49 (0)911 895 7 222

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	
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	
FMCW	Frequency Modulated Continous Wave	radar principle	

Short form	Long Form	Description	Units (cont'd)
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
LAS	Link Active Scheduler		
LCD	Liquid Crystal Display		
LDI	Local Display Interface	removable display with push buttons	
LTB	Level Transducer Block		
LUI	Local User Interface	view outputs via LCD display; make modifications via push buttons or handheld programmer	
µs	microsecond	10^{-6}	Second
PED	Pressure Equipment Directive	safety approval	
PID FB	Proportional Integral Derivative Function Block		
ppm	parts per million		
PV	Primary Value	measured value	
RES	Resource Block		
SELV	Safety extra low voltage		
SV	Secondary Value	equivalent value	
TVT	Time Varying Threshold	sensitivity threshold	
U_i	Input voltage		V
U_o	Output voltage		V

SITRANS LR560 Overview

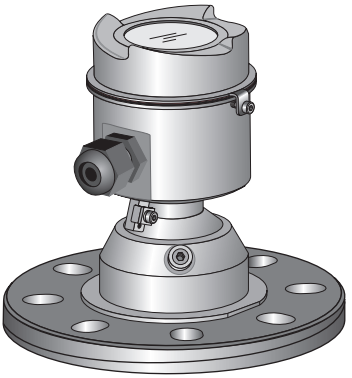
SITRANS LR560 is a 2-wire, 78 GHz FMCW radar level transmitter for continuous monitoring of solids in vessels to a range of 100 m (329 ft). The plug and play performance is ideal for all solids applications, including those with extreme dust and high temperatures to +200 °C (+392 °F). The device consists of an electronic circuit coupled to a lens antenna and flange for quick and easy positioning.

The main benefits of using 78 GHz over devices using lower frequency are:

- very narrow beam, so device is insensitive to mounting nozzle interference and vessel obstructions.
- short wavelength yields very good reflection properties on sloped solids, so aiming towards material angle of repose is usually not necessary.

The technology is very tolerant of buildup on the lens antenna, however an air purge inlet is provided for periodic cleaning if required.

SITRANS LR560 supports Foundation Fieldbus communication protocol, and AMS Device Manager software. 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 LR560 is very easy to install and configure via an optional graphical local display interface (LDI). You can modify the built-in parameters either locally, using the control buttons or the infrared handheld programmer, or from a remote location using one of the following options:

- **PROFIBUS PA** [using SIMATIC PDM, or FDT (such as PACTware). See SITRANS LR560 (PROFIBUS PA) Instruction Manual for more information.]
- **HART** [using handheld 375 Field Communicator, SIMATIC PDM, AMS, or FDT (such as PACTware). See SITRANS LR560 (mA/HART) Instruction Manual for more information.]
- **Foundation Fieldbus (FF)** [using handheld 375 Field Communicator, an FF host system, or AMS].

Once programmed, the graphic Local Display Interface (LDI) can be removed if desired and used to transfer parameters to multiple SITRANS LR560s.

Local Display Interface (LDI)

- LDI may be ordered installed or added later as an option
- can be mounted in 1 of 4 positions at 90 degree intervals, for easy viewing after installation
- displays level and diagnostic information including echo profile and trend over time
- backlit for easy viewing in dimly lit areas
- allows you to copy parameters from one device to another
- provides high speed firmware transfer capabilities for future upgrades

Versions

Two different versions of the LR560 are available:

- 40 m range, 100 °C maximum process temperature
- 100 m range, 200 °C maximum process temperature

Applications

- cement powder, plastic powder/pellets, grain, flour, coal, and other applications
- solids bulk storage vessels

Approvals and Certificates

SITRANS LR560 is available with General Purpose or Hazardous approvals. For details see *Approvals* on page 10.

Application Type	LR560 Version	Approval Rating	Valid for:	Wiring
Non-hazardous	General Purpose	$CSA_{US/C}$, FM, CE, C-TICK	N. America, Europe	See page 23
Hazardous	Non-Sparking/ Energy Limited	ATEX II 3G Ex nA/nL IIC T4 Gc	Europe	See page 28
	Dust Ignition Proof	ATEX II 1D, 1/2D, 2D IECEx SIR 09.0149X Ex ta IIIC T139 ^{0}C Da	Europe and International	See page 28
		FM/CSA: Class II, Div. 1, Groups E, F, G Class III T4	US/Canada	See page 28
	Non-incendive	FM/CSA: Class I, Div. 2, Groups A, B, C, D T4	US/Canada	See page 28

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

Bus powered	9 to 32 V DC, per IEC 61158-2 (Foundation Fieldbus)
Current consumed	13.5 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/m^2 g)

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

• Maximum measured error	Greater of 25 mm (1") or 0.25% of range from minimum detectable distance to full range
Frequency	78 to 79 GHz FMCW
Max. measurement range[2]	
• 40 m version	40 m (131 ft)
• 100 m version	100 m (328 ft)
Min. detectable distance	300 mm (11.8") from sensor reference point
Update time[3]	Maximum 10 seconds, depending on setting for **Response Rate (2.3.6.1.)**
Influence of ambient temperature	<0.003%/K (average over full temperature range, referenced to maximum range)

Dielectric constant of material measured

• Minimum dK	= 1.6 for ranges to 20 m (65.6 ft) range = 2.5 for ranges to 100 m (328 ft) range

Memory
- non-volatile EEPROM
- no battery required

1) Reference conditions: **Position Detect (2.4.5.2.)** set to Center and **Algorithm (2.4.5.1.)** set to True First Echo.

2) From sensor reference point.

3) Reference conditions: **Response Rate (2.3.6.1.)** set to **FAST**.

Interface

Communication	
• Foundation Fieldbus	
• ITK version 5	Blocks supported: RESOURCE, LTB, AIFB1, AIFB2, PID, LCD, DIAG Block execution time: AIFB - 30 ms, PID - 100 ms
Configuration	
• remote	FF host system or Emerson AMS version 9.0 (PC)
• local	Siemens Milltronics infrared handheld programmer [see *Programmer (infrared keypad)* on page 11], or Field Communicator 375 [see *Field Communicator 375 (FC375)* on page 147], or local control buttons
Optional removable local display interface (LDI)[1)]	graphic LCD, with bar graph representing level

Mechanical

Process Connections:	
• universal flat-faced flanges[2)] 3"/80 mm, 4"/100 mm, 6"/150 mm	
- materials	stainless steel 316L (1.4404 or 1.4435), or 304
• Aimer flanges[2)]	3"/80 mm, 4"/100 mm, 6"/150 mm
- material	polyurethane powder-coated cast aluminum
Enclosure	
• construction	316L/1.4404 stainless steel
• conduit entry	M20x1.5, or ½" NPT
• conduit entry connector (optional)	M12 connector (shipped with M20 to M12 adaptor) or 7/8" connector (shipped with 1/2" NPT to 7/8" adaptor)
• ingress protection	Type 4X/NEMA 4X, Type 6/NEMA 6, IP68
• lid with window	polycarbonate (window material)
Lens antenna material	
• construction	
- 40 m version	PEI
- 100 m version	PEEK

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

2) Universal flange mates with EN 1092-1 (PN16)/ASME B16.5 (150 lb)/JIS 2220 (10K) bolt hole pattern.

Air Purge Connection

- equipped with female 1/8" NPT fitting

Weight

- 3" stainless steel flange model 3.15 kg (6.94 lb)

Environmental

Note: 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 4, 4X/NEMA 4, 4X, Type 6/NEMA 6, IP68 enclosure (see note above)
- installation category I
- pollution degree 4

Process

- temperature and pressure[1)]

Versions	Stainless steel flange	Aimer flange 0.5 bar max.	Aimer flange 3.0 bar max
40 m	–40 to +100 °C (–40 to +212 °F)	–40 to +100 °C (–40 to +212 °F)	–40 to +100 °C (–40 to +212 °F)
100 m	–40 to +200 °C (–40 to +392 °F)	–40 to +200 °C (–40 to +392 °F)	–40 to +120 °C (–40 to +248 °F)

Approvals

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

- General $CSA_{US/C}$, FM, CE
- Radio R&TTE (Europe), FCC, Industry Canada, C-TICK

1) Maximum and minimum process temperatures are dependent on the process connection, O-ring materials, and vessel pressure. Use of the Easy Aimer limits maximum temperature.

- Hazardous

Non-sparking/ Energy Limited[1)]	(Europe)	ATEX II 3G Ex nA/nL IIC T4 Gc
Dust Ignition Proof [1)]	(Europe/International)	ATEX II 1D, 1/2D, 2D IECEx SIR 09.0149X Ex tD A20 IP67 T100 °C
Dust Ignition Proof [2)]	(US/Canada)	FM/CSA: Class II, Div. 1, Groups E, F, G Class III T4
Non-incendive [2)]	(US/Canada)	FM/CSA Class I, Div. 2, Groups A, B, C, D, T4

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, serial number 032608101V.

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

• approval	FM/CSA Class I, II, III, Div. 1, Gr. A to G T6 CE ATEX II 1GD Ex ia IIC T4 Ga Ex iaD 20 T135 °C IECEx SIR 09.0073 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

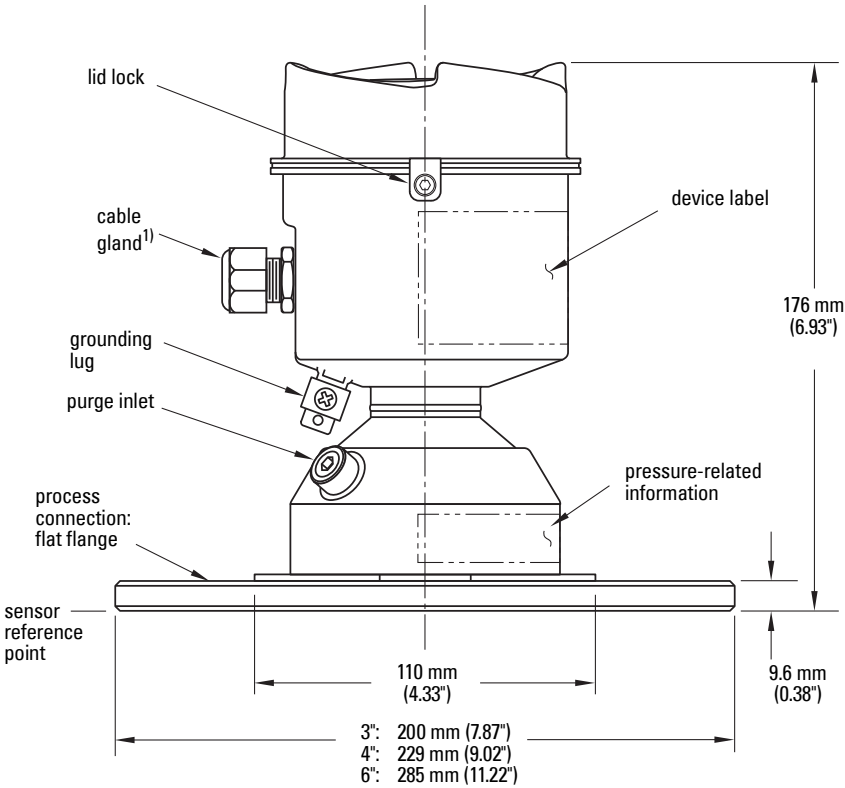
1) See *Non-Sparking/Energy Limited wiring (Europe) and Dust Ignition Proof wiring (Europe/International)* on page 28 for more details.

2) See *Non-incendive and Dust Ignition Proof wiring (US/Canada)* on page 28

Dimensions

Notes:
- Process temperature and pressure capabilities are dependent upon information displayed on the process device markings.
- Refer to *Universal Slotted Flange* on page 16 for bolt hole pattern and dimensions.

SITRANS LR560 with stainless steel universal flat flange

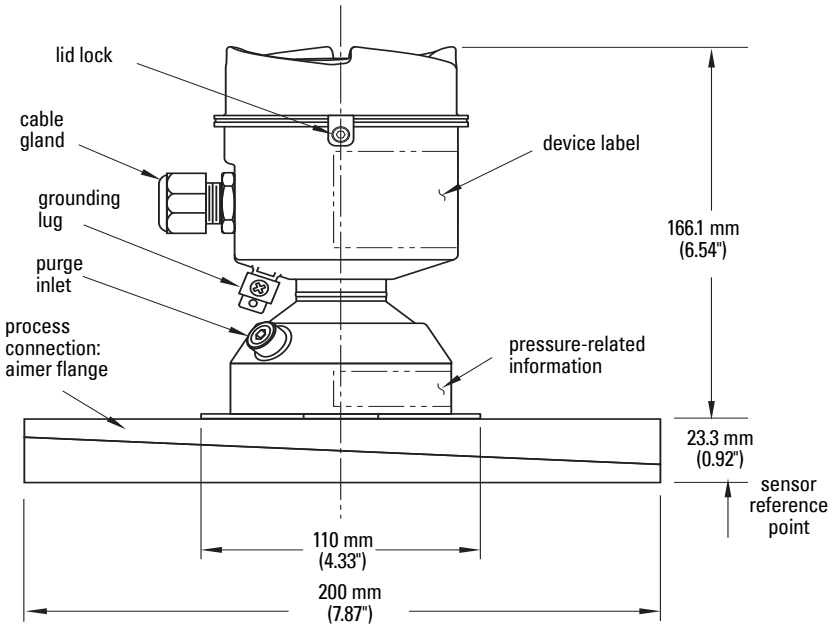


1) Shipped with product, packed in a separate bag.

SITRANS LR560 with 3" Aimer Flange

Notes:

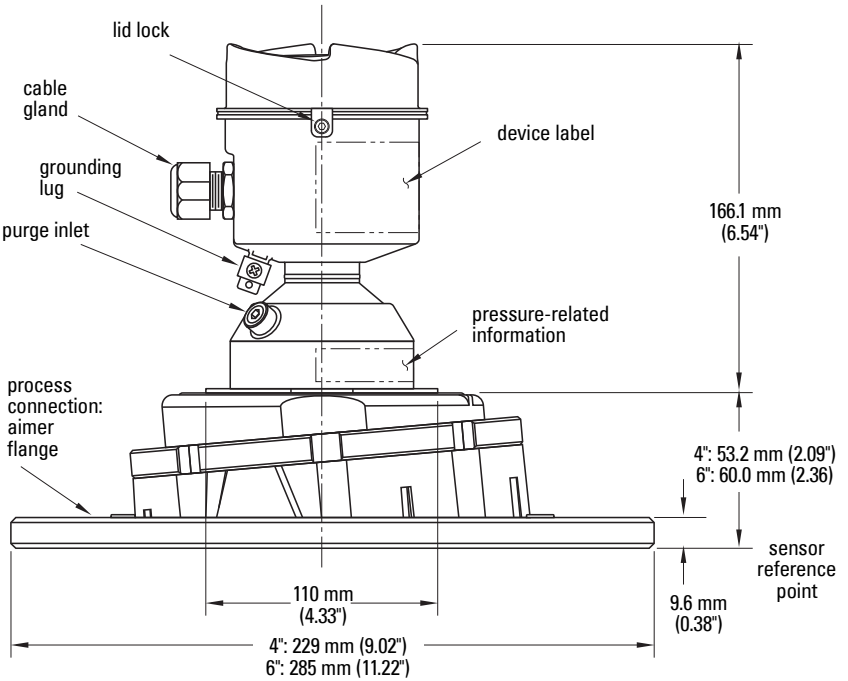
- Process temperature and pressure capabilities are dependent upon information displayed on the process device markings.
- Refer to *Universal Slotted Flange* on page 16 for bolt hole pattern and dimensions.



SITRANS LR560 with 4" and 6" Aimer Flange

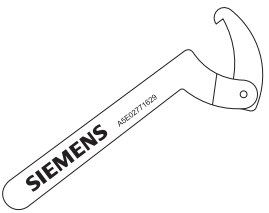
Notes:

- Process temperature and pressure capabilities are dependent upon information displayed on the process device markings.
- Refer to *Universal Slotted Flange* on page 16 for bolt hole pattern and dimensions.



C Spanner

A C spanner, used to loosen the aimer locking ring, is shipped with the device.



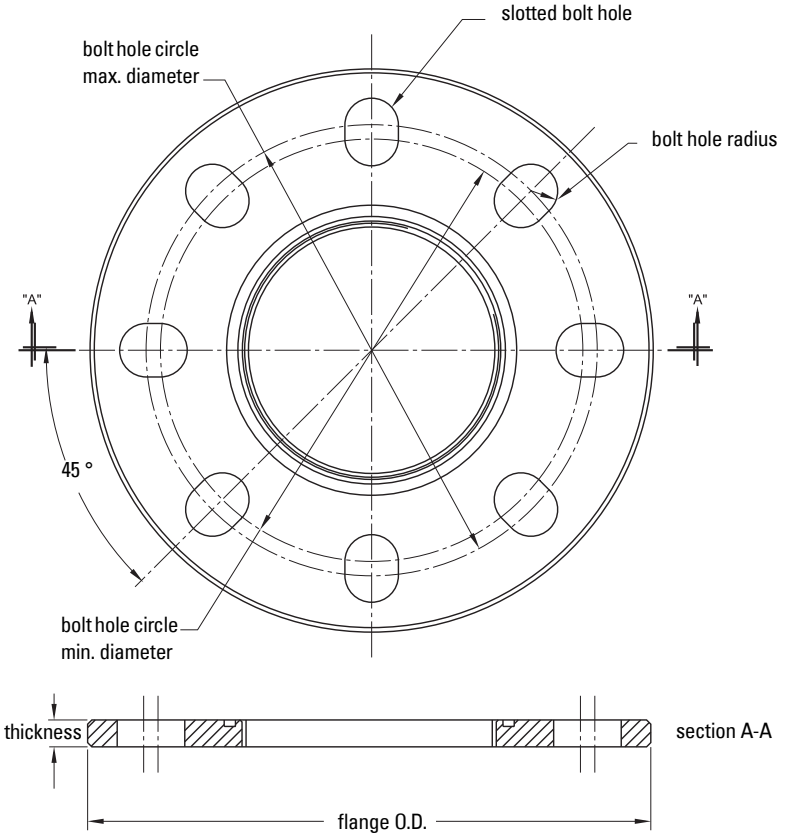
Process Connection Label (Pressure Rated Versions)

For pressure-rated versions only, the process connection label lists the following information:

Item	Sample Text	Comments/Explanation
CONNECTION SERIES	ASME B16.5 / EN 1092-1 / JIS B 2220	Flange Series: dimensional pattern based on ASME B16.5/EN 1092-1/JIS B 2220 flange standards
NOM. PIPE SIZE (DN)	4 INCH / 100mm	Nominal Pipe Size: based on 150#/PN16/10K flange pressure classes
MAWP (PS)	3 BAR	Maximum Allowable Working Pressure at Design Temperature
DESIGN TEMP. (TS)	100 °C	Maximum Allowable Working Temperature
MIN. PROCESS	3 BAR AT -40 °C	Minimum Wetted Process Conditions
0F13589.5		Canadian Registration Number (CRN)
TEST PRESSURE (PT)	5.2 BAR	Production Test Pressure
TEST DATE	10/01/04	Date of Pressure Test (Year/Month/Day)
PROCESS SERIES	25785	Pressure Tag Family Series
WETTED NON-METALLIC	PEI	Sensor Lens Material
WETTED METALLICS	304L	Process Connection Material(s)
WETTED SEALS	FKM / VQM	Seal Material(s)

Universal Slotted Flange

! WARNING: 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.



Slotted Flange Dimensions and Aimer[1)]

Pipe Size	Flange O.D.	Thick-ness (s)	Bolt Hole Circle Max Ø	Bolt Hole Circle Min Ø	Bolt Hole radius	No. of Slotted Holes
3" or 80 mm	7.87" (200 mm)	0.38" (9.65 mm)	6.30" (160 mm)	5.91" (150 mm)	0.38" (9.65 mm)	8
4" or 100 mm	9.00" (229 mm)	0.38" (9.65 mm)	7.52" (191 mm)	6.89" (175 mm)	0.38" (9.65 mm)	8
6" or 150 mm	11.22" (285 mm)	0.38" (9.65 mm)	9.53" (242 mm)	9.45" (240 mm)	0.45" (11.5 mm)	8

1) Universal flange mates with EN 1092-1 (PN16)/ASME B16.5 (150 lb)/JIS 2220 (10K) bolt hole pattern.

Installation

! WARNINGS:

- **Installation shall be performed only by qualified personnel and in accordance with local governing regulations.**
- **SITRANS LR560 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.**
- **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.
- Pressure rated versions of the SITRANS LR560 are pressure 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.

Pressure Equipment Directive, PED, 97/23/EC

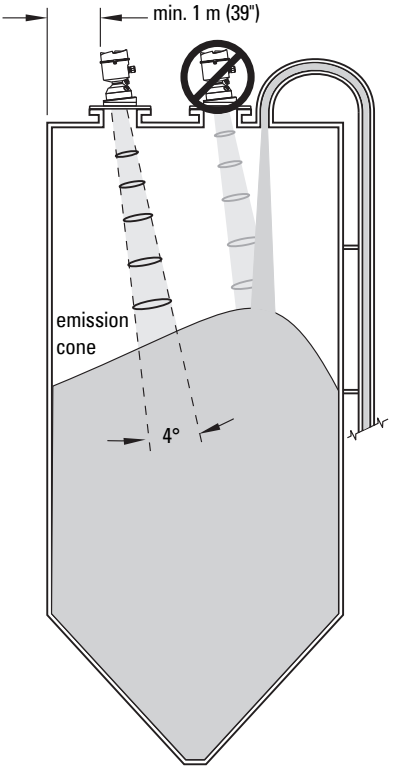
SITRANS LR560 Radar Level Measurement instrument falls below the limits of Article 3, sections 1 & 2 of the Pressure Equipment Directive (PED, 97/23/EC) as a category I pressure accessory. However, in accordance with PED, 97/23/EC, Article 3, section 3, this equipment has been designed and manufactured in accordance with Sound Engineering Practice (SEP) (see EU Commission Guideline 1/5).

Mounting location

Notes:
- Correct location is key to a successful application.
- Avoid reflective interference from vessel walls and obstructions by following the guidelines below.

Nozzle location

Notes:
- For details on avoiding false echoes, see *Auto False Echo Suppression (2.4.8.1.)* on page 142.



Beam angle

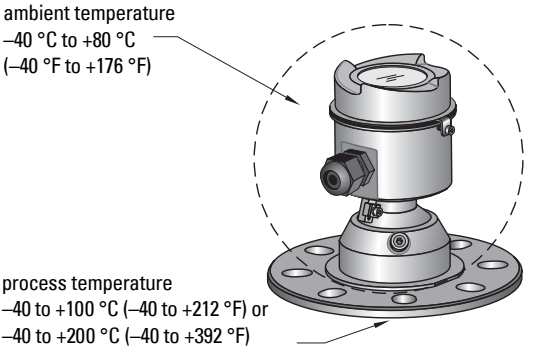
- Beam angle is the width of the cone where the energy density is half of the peak energy density
- Peak energy density is directly in front of and in line with the antenna.
- Signal is transmitted outside the beam angle; therefore false targets may be detected.

Emission cone

- Keep emission cone free of interference from ladders, pipes, I-beams or filling streams.
- Avoid central locations on tall, narrow vessels.
- LR560 uses circular polarization. Rotation of device is not required to optimize signal.

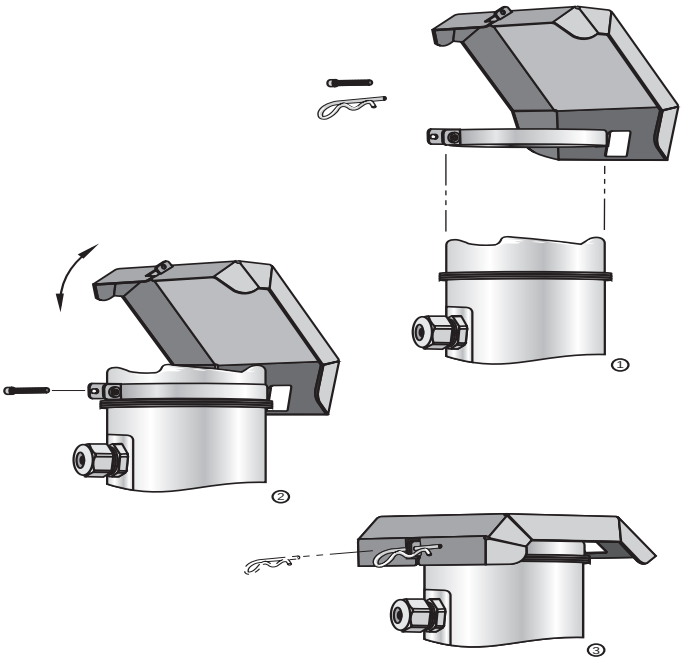
Environment

- Provide easy access for viewing the display and programming via the handheld programmer.
- Provide an environment suitable to the ambient temperature rating.
- Use a sunshield if the instrument will be mounted in direct sunlight.



Sunshield

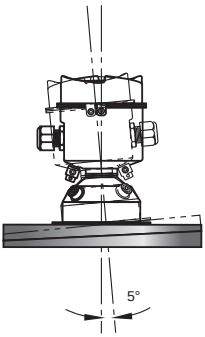
The LR560 display can be protected by an optional sunshield if the instrument will be mounted in direct sunlight.



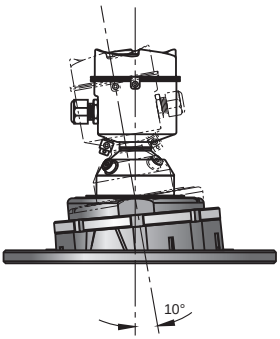
Aimer Adjustment

Note: Aiming will assist in measuring material in the cone.

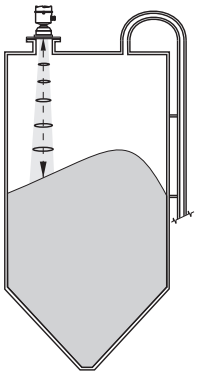
3" flange



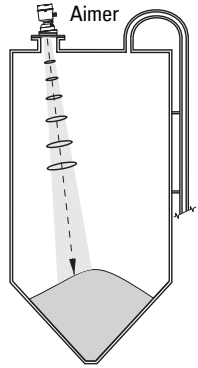
4 and 6" flange



Aiming is not required for signal optimization with 78 GHz frequency.



Aiming will assist in measuring material in the cone.



1) For 4" and 6" Aimer: loosen the set screws in the locking ring.
   Holding the electronics enclosure firmly, loosen the Aimer locking ring using the C spanner supplied, until the LR560 drops down slightly. The enclosure can then be turned freely.
2) Direct SITRANS LR560 so the antenna is pointed at an angle perpendicular to the material surface, if possible.
3) When the desired position is reached, re-tighten the locking ring using the C spanner, and tighten set screws.
4) For the 3" Aimer flange, tapered split washers with pressure rated versions are provided to keep nuts and bolts perpendicular to the flange surface.

Air Purging System

For convenient cleaning, a purging inlet is provided above the antenna. The system provides an 1/8" inlet (female thread) above the antenna where clean, dry air passes to the face of the antenna lens to clean it. The customer will supply the purging air by a manual or automatic valve system.

Notes:

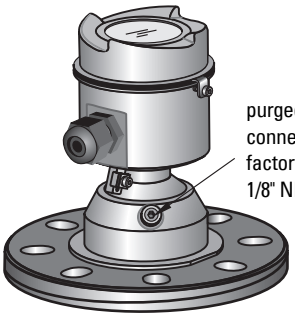
- Purge duration, pressure, and interval, will vary with each application. It is the user's responsibility to determine the requirements depending on the application and cleaning required.
- Short duration bursts of high pressure provide more effective cleaning than continuous low pressure air.
- It is the customer's responsibility to ensure that any vacuum or pressure in the measured vessel is maintained, considering the hole that passes through the process connection and SITRANS LR560 antenna system.

Air Consumption (Flow rate versus applied pressure)	
Air Pressure (psi)	Approx. inlet volume flow rate (SCFM)[a)]
20	5
40	10
50	15
80	20
100	25
110	30
Recommended 90 to 110 psi for effective cleaning.	

a) SCFM (standard cubic feet/minute) referenced to 14.7 psia, +68 °F and 36% relative humidity (RH).

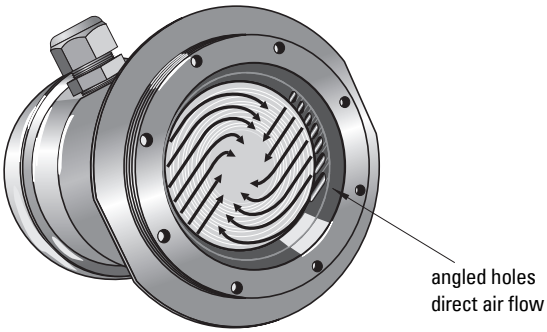
Purge Connection

- The purge connection is closed by the manufacturer, using a 1/8" plug.
- When the plug is removed to connect a purging system, the operator is responsible for ensuring that the purging circuit conforms to "Ex" requirements: for example, by fitting an NRV valve. [1)]



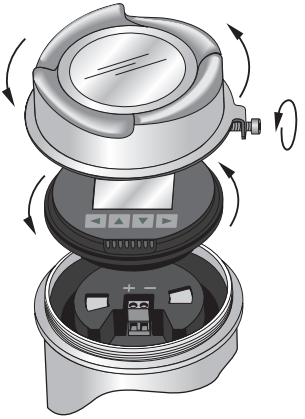
Purge airflow

- The purge airflow is designed to create a strong vortex of air that rapidly cleans the face of the lens.
- The air purge system can clean both dust and moisture off the lens.
- It can be used for periodic cleaning.



1) Air pressure in vessel can affect purge operation.

Removable Display



- The optional display can be rotated as required, to one of 4 positions, 90 degrees apart (see *Connecting SITRANS LR560* on page 23 for instructions).
- It can also be used to transfer parameters from one device to another (see *Copy Parameters to Display1.3.* on page 88.)

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 LR560

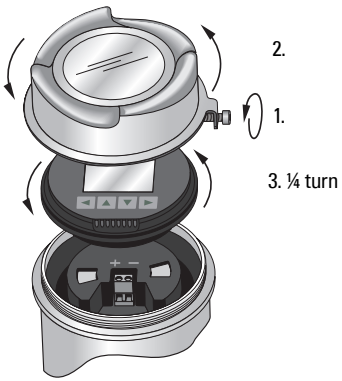
WARNINGS:

- **Check the device label on your instrument, to verify the approval rating.**
- **Use appropriate conduit seals to maintain IP or NEMA rating.**
- **Read *Wiring Setups for hazardous area installations* on page 26.**

Notes:

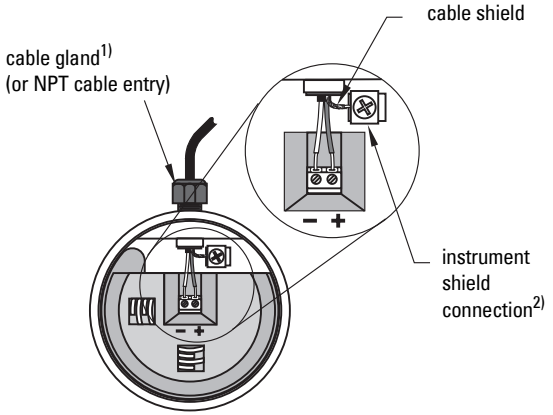
- Separate cables and conduits may be required to conform to standard instrumentation wiring practices or electrical codes.
- The optional display can be rotated as required, to 1 of 4 positions at 90 degree intervals.

1) Loosen locking screw.
2) Remove LR560 lid.
3) Remove optional display by gently turning the display a quarter turn counter-clockwise until it is free.
4) Strip the cable jacket for approximately 70 mm (2.75") from the end of the shielded fieldbus cable, and thread the wires through the gland[1)].



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

5) Connect the wires to the terminals as shown (SITRANS LR560 FF is not polarity-sensitive).



6) Ground the instrument according to local regulations.
7) Tighten the gland to form a good seal.
8) Replace optional display. .
9) After programming and device configuration, secure the locking screw and replace device lid.

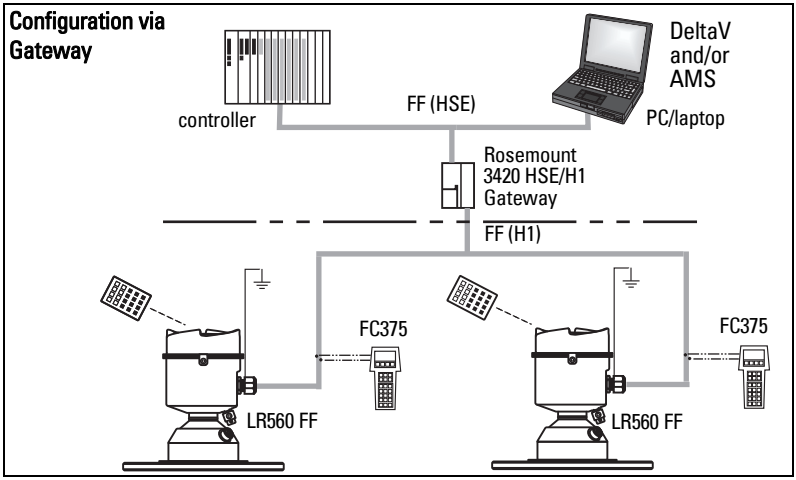
Notes:

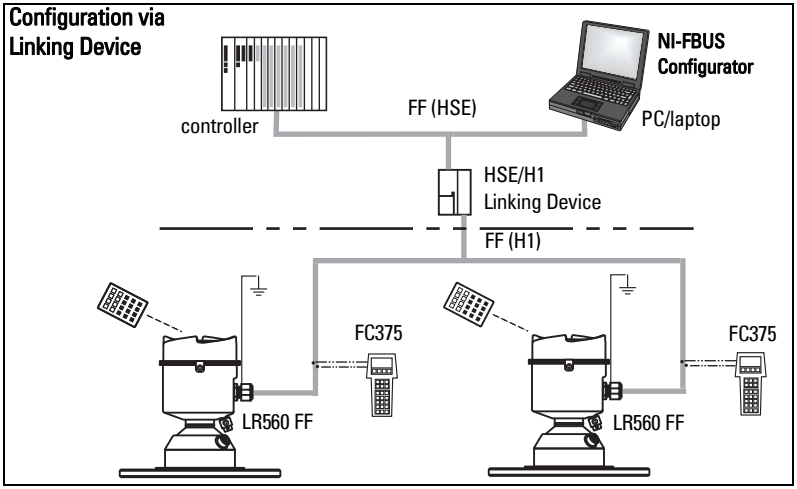
- Foundation Fieldbus (HI) must be terminated at both extreme ends of the cable for it to work properly.
- Please refer to the *Foundation Fieldbus System Engineering Guidelines (AG-181) Revision 2.0*, available from www.fieldbus.org, for information on installing FF (H1) devices.

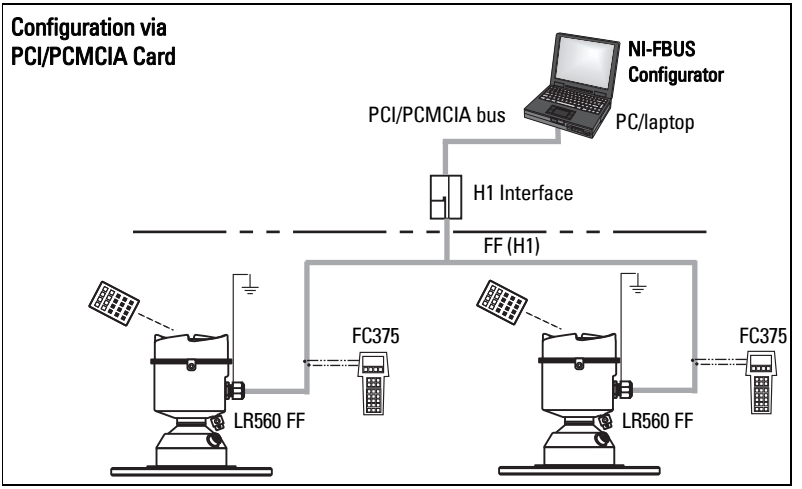
1) May be shipped with the device.

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

Basic Configuration with Foundation Fieldbus (H1)







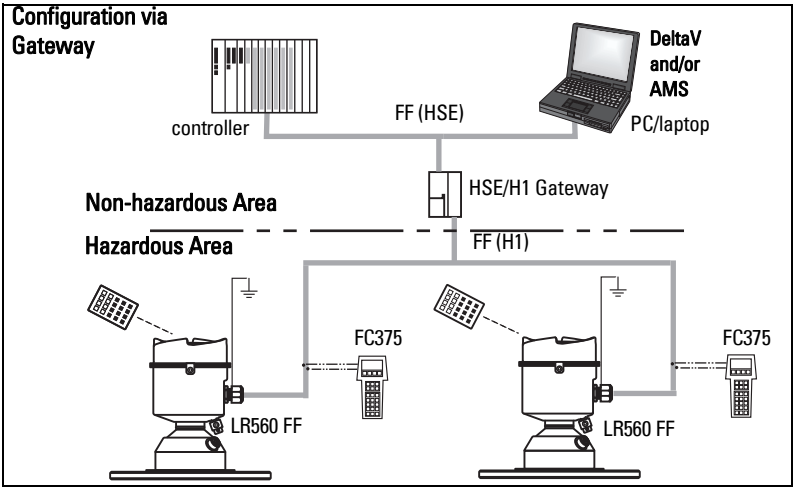
Wiring Setups for hazardous area installations

The following wiring options are available for hazardous area installations:

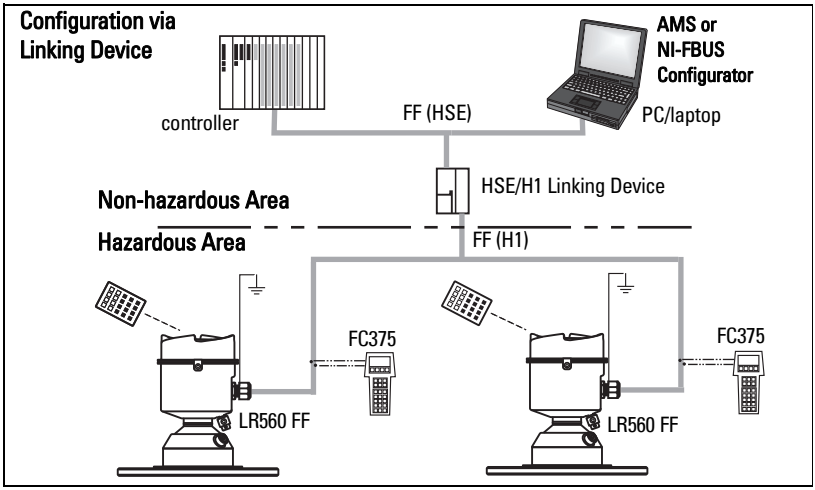
- *Non-Sparking/Energy Limited wiring (Europe) and Dust Ignition Proof wiring (Europe/International)* on page 28
- *Non-incendive and Dust Ignition Proof wiring (US/Canada)* on page 28

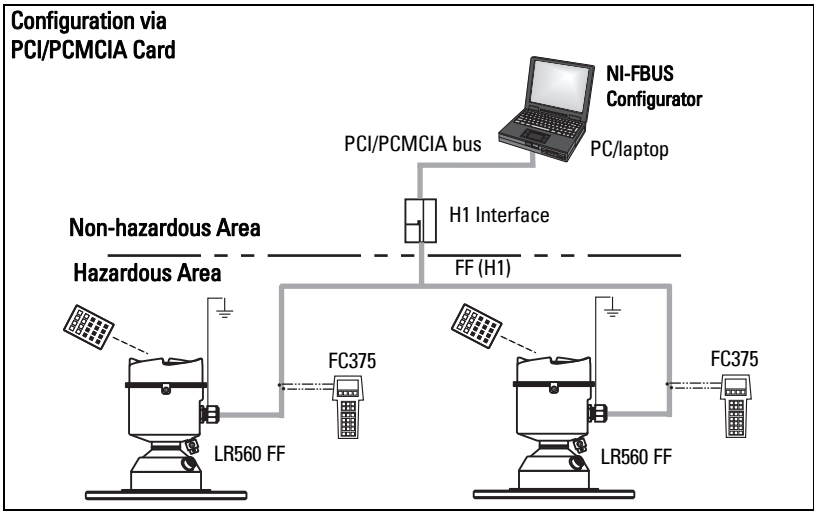
In all cases, check the nameplate on your instrument, and confirm the approval rating.

Configuration with Foundation Fieldbus for hazardous areas



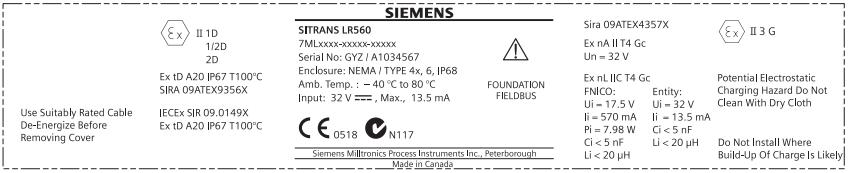
Configuration for hazardous areas (continued)





1. Non-Sparking/Energy Limited wiring (Europe) and Dust Ignition Proof wiring (Europe/International)

Device label (ATEX/IECEx/C-TICK)

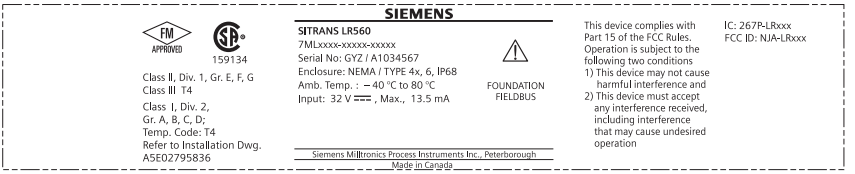


The ATEX certificate listed on the nameplate can be downloaded from the product page of our website at: www.siemens.com/LR560. Go to **Support > Approvals/Certificates.**
The IECEx certificate listed on the nameplate can be viewed on the IECEx website. Go to: http://iecex.iec.ch and click on **Ex Equipment Certificates of Conformity** then enter the certificate number IECEx SIR 09.0149X.

- For power demands see *Temperature De-Rating* on page 146.
- For wiring requirements follow local regulations.
- See also *Instructions specific to hazardous area installations* on page 29.

2. Non-incendive and Dust Ignition Proof wiring (US/ Canada)

Device label (FM/CSA)



FM/CSA Class 1, Div 2 installation drawing number A5E02795836.
can be downloaded from the product page of our website at: www.siemens.com/LR560 under **Support**.

- For power demands see *Temperature De-Rating* on page 146.

Instructions specific to hazardous area installations

(Reference European ATEX Directive 94/9/EC, Annex II, 1.0.6)

Note: Installation shall be performed only by qualified personnel and in accordance with local governing regulations.

The following instructions apply to equipment covered by certificate numbers Sira 09ATEX9356X and Sira 09ATEX4357X:

1) For use and assembly and details of marking/coding, refer to the main instructions.
2) The equipment is certified for use as Category 1D, 1/2D and 2D equipment per certificate Sira 09ATEX9356X and may be used in hazardous zones 20, 21 and 22. The equipment is also certified for use as Category 3G equipment per certificate Sira 09ATEX4357X and may be used in hazardous zone 2.
3) This equipment has a maximum surface temperature of 139 °C (in an 80 °C ambient). Refer to the applicable code of practice for selection of this equipment with respect to specific dust ignition temperatures.
4) The equipment is certified for use in an ambient temperature range of –40 °C to 80 °C.
5) The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
6) Installation and inspection of this equipment shall be carried out by suitably trained and authorized personnel in accordance with the applicable code of practice.
7) The equipment shall be installed such that the supply cable is protected from mechanical damage. The cable shall not be subjected to tension or torque. The equipment manufacturer is not responsible for providing the supply cable.
8) Repair of this equipment shall be carried out by suitably trained and authorized personnel in accordance with the applicable code of practice.

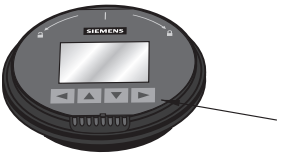
Special Conditions for Safe Use

The 'X' suffix to the certificate number relates to the following special condition(s) for safe use:

- Parts of the enclosure may be non-conducting and may generate an ignition-capable level of electrostatic charge under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam), which might cause a build-up of electrostatic charge on non-conducting surfaces.
- The end user must ensure that an ingress protection of at least IP65 is maintained at each entry to the enclosure by use of a blanking element or cable entry device that meets the requirements of the protection concepts type 'n' or increased safety 'e' or flameproof 'd'.
- The supply to the equipment shall be rated for a prospective short-circuit current of not more than 10 kA and shall be protected by a suitably-rated fuse

Local Operation

SITRANS LR560 carries out its level measurement tasks according to settings made via parameters. The settings can be modified locally using the Local Display Interface (LDI) which consists of an LCD display with push buttons, or using the LDI in combination with an infrared 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 LDI push buttons* on page 36 or *Quick Start Wizard via the handheld programmer* on page 36)
- from a remote location (See *Quick Start Wizard via AMS Device Manager* on page 46)

See *Level application example* on page 40 for an illustration, and for the complete range of parameters, see *Parameter Reference* on page 86.

Activating SITRANS LR560

Notes:
- To enter Program mode using the push buttons, press ▶. Press ◀ to return to Measurement mode.
- To toggle between Measurement and Program Mode using the handheld programmer, press **Mode**.

Power up the device. At initial startup, SITRANS LR560 will not begin measurements and all blocks will be **Out of Service** until the instrument has been configured[1]. Completing the Quick Start Wizard or writing any configuration parameter via the local user interface causes the device to begin measuring. The Resource Block (RES) and Level Transducer Block (LTB) will move to Automatic mode[2].

A transition screen showing first the Siemens logo and then the current firmware revision is displayed while the first measurement is being processed.

The first time the device is configured you will be prompted to select a language (English, German, French, Spanish or Chinese). To change the language again, see **Language (7.)** on page 122.

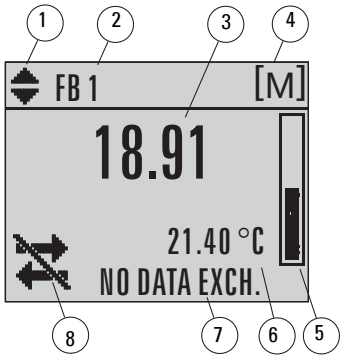
1) See *To configure a device via the local user interface* on page 35. (To configure using a network configuration tool see *Quick Start Wizard via AMS Device Manager* on page 46.)

2) 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).

The LCD Display

Measurement mode

Normal operation



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

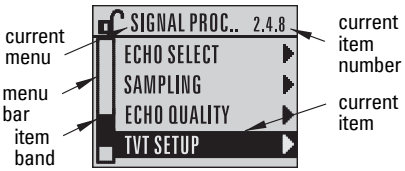
Fault present

S: 0 LOE

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

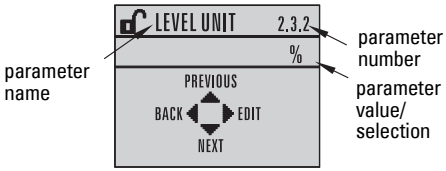
Program mode

Navigation view

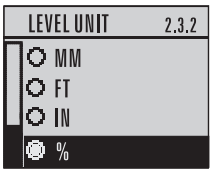


- A visible menu bar indicates the menu list is too long to display all items.
- The depth of the item band on the menu bar indicates the length of the menu list: a deeper band indicates fewer items.
- The position of the item band indicates the approximate position of the current item in the list. A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

Parameter view



Edit view



1) Press **UP** or **DOWN** arrow to switch.
2) In response to a key press request. For details, see *Key functions in Measurement mode* on page 32.

Handheld Programmer

(Part No. 7ML1930-1BK)

The programmer is ordered separately.

Key functions in Measurement mode

Key	Function	
6	Displays internal enclosure temperature reading.	New value is displayed in LCD secondary region.
8	Displays echo confidence value[2].	
	Displays distance measurement.	New value is displayed in LCD secondary region
	Mode opens PROGRAM 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 PROGRAM 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 LR560

Notes:

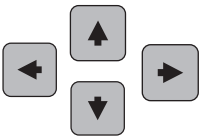
- While the device is in PROGRAM mode the output remains active and continues to respond to changes in the device.
- SITRANS LR560 automatically returns to Measurement mode after a period of inactivity in PROGRAM mode (between 15 seconds and 10 minutes, depending on the menu level).

Change parameter settings and set operating conditions to suit your specific application. (For remote operation see *Operating via AMS Device Manager* on page 41.)

Parameter menus

Note: For the complete list of parameters see *Parameter Reference* on page 86.

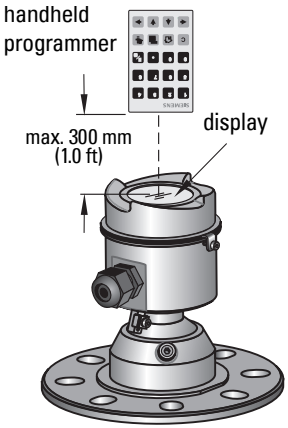
Parameters are identified by name and organized into function groups, then arranged in a 5-level menu structure (see *LCD menu structure* on page 155).



1. QUICK START
2. SETUP
2.1. IDENTIFICATION
2.2. DEVICE
.....
2.5. AIFB 1
2.5.1. STATIC REV. NO.
2.5.2. MODE
2.5.3. CHANNEL
2.5.4. INPUT SCALING
2.5.4. 1. LOWER VALUE

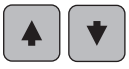
1. Enter PROGRAM mode

- 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 , and then enter the menu number. For example, to access parameter **Temperature Units (2.3.3.)**, press **2.3.3.**

Key	Name	Menu level	Function in Navigation Mode
	**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

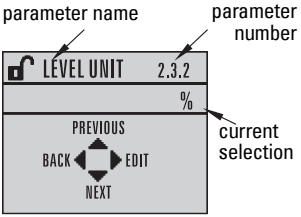
a) Navigate to the desired parameter.

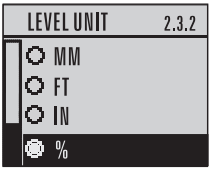
b) Press **RIGHT arrow**  to open parameter view.

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

d) Scroll to a new selection.

e) Press **RIGHT arrow**  to accept it.
The LCD returns to parameter view and displays the new selection.





Changing a numeric value

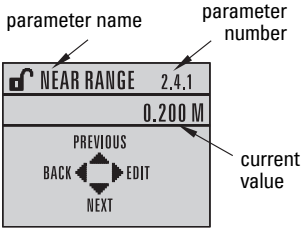
a) Navigate to the desired parameter.

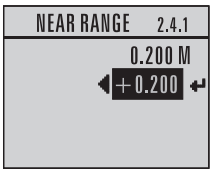
b) Press **RIGHT arrow**  to open parameter view. The current value is displayed.

c) Press **RIGHT arrow**  again to open **Edit** mode. The current value is highlighted.

d) Key in a new value.

e) 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.
		Alpha-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
C	**Clear**	Numeric editing	Erases the display.
•	**Decimal point**	Numeric editing	- In Edit mode, enters a decimal point. - In Parameter View, press • to store menu path to that parameter, and create custom Secondary Value to be displayed in secondary region of LCD.
−/+	**Plus or minus sign**	Numeric editing	Changes the sign of the entered value.
0 to 9	**Numeral**	Numeric editing	Enters the corresponding character.

To configure a device via the local user interface

Notes:
- Completing the last step of the Quick Start via the local user interface places the RESOURCE block (RES) and Level Transducer Block (LTB) in *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, refer to manual *Foundation Fieldbus for Level instruments (7ML19985MP01)*.

Configure the device via the Quick Start Wizard.

- See *Quick Start Wizard via the LDI push buttons* on page 36
- See *Quick Start Wizard via the handheld programmer* on page 36

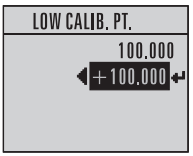
Quick Start Wizard via the LDI push buttons

1) Press ▶ to enter Program mode.
2) Choose **Quick Start (1.)**, and then **Quick Start Wizard (1.1.)**.
3) Follow the steps then choose **Finish** to save Quick Start parameter changes and return to Program menu, or press ◀ to return to Measurement mode.

To add or delete digits using the push buttons:

Note: When the Enter icon ↵ is highlighted, press ▲ to insert a digit on the right, ▼ to delete the right-most digit, ▶ to accept the value, or ◀ to cancel.

1) Navigate to the parameter you wish to modify and press ▶ to edit it. The value will be highlighted.
2) Press ▲ or ▼ to delete the highlighted value, or ◀ to modify the value from the left-most digit, starting with the plus/minus sign.



3) With the plus or minus sign highlighted, press ▲ or ▼ to change it. Press ▶ to highlight the next digit to the right.
4) Use ▲ or ▼ to modify the highlighted digit. Scroll past 9 to reach the decimal point.
5) When the value is complete, press ▶ until the Enter icon is highlighted ↵, then press ▶ to accept the value.

To modify a text string:

1) Navigate to the parameter you wish to modify and press ▶ to edit it. The string will be highlighted.
2) Follow the same steps as above, to add, delete, or modify characters.

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* on page 86. (Perform customization only after the Quick Start has been completed.)

1. Quick Start

1.1. Quick Start Wizard

a) Point the programmer at the display from a maximum distance of 300 mm (1 ft) and press **RIGHT arrow** to activate PROGRAM mode and open menu level 1.

b) Press **RIGHT arrow** twice, to navigate to menu item 1.1 and open the Quick Start Wizard.

c) At each step, press **DOWN arrow** to accept default values and move directly to the next item,

or **RIGHT arrow** to open Edit mode: the current selection is highlighted.

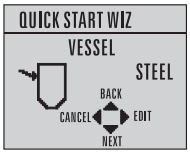
d) Scroll to desired item and press **RIGHT arrow** to store the change, then press **DOWN arrow** to continue.

e) At any time you can press **UP arrow** to go back, or **LEFT** arrow to cancel and return to Measurement mode.

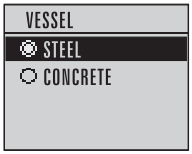
Vessel

Select vessel construction material.

Parameter View



Edit mode

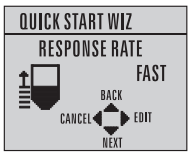


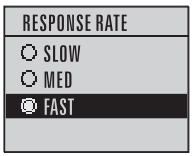
- Selecting either STEEL or CONCRETE does a functional reset (see **Master Reset (4.1.)** on page 110).
- Selecting STEEL changes the setting for **Position Detect (2.4.5.2.)** to Rising Edge, and for **Algorithm (2.4.5.1.)** to F.
- Selecting CONCRETE changes the setting for **Position Detect (2.4.5.2.)** to Rising Edge and for **Algorithm (2.4.5.1.)** to ALF.

Options	*	STEEL
		CONCRETE

Response Rate

Sets the reaction speed of the device to measurement changes in the target range.
*Selecting SLOW changes setting for **Average amount (2.8.3.)** to 0.9.*





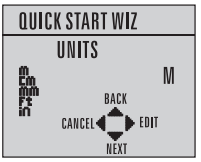
Response Rate		Fill Rate/Min (2.3.6.2.)/Empty rate/Min (2.3.6.3.)
SLOW		0.1 m/min (0.32 ft/min)
MED	*	1.0 m/min (3.28 ft/min)
FAST		10.0 m/min (32.8 ft/min)

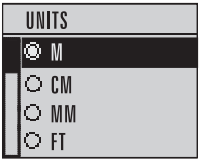
Use a setting just faster than the maximum filling or emptying rate (whichever is greater).

Units

Sensor measurement units.

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

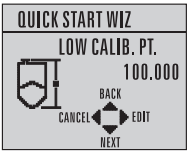


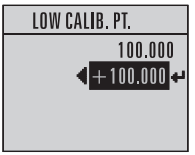


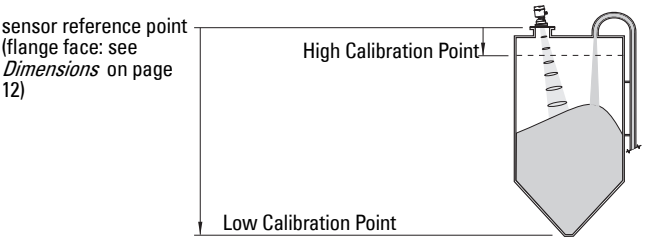
Low Calibration Point

Distance from Sensor Reference Point to Low Calibration Point: usually process empty level

Values	Range: 0.000 to 40.000 m or 0.000 to 100.000 m
	Default: 100.000 m



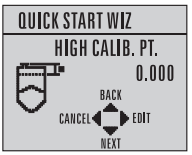


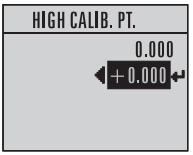


High Calibration Point

Distance from Sensor Reference Point to High Calibration Point: usually process full level.

Values	Range: 0.000 to 40.000 m or 0.000 to 100.000 m
	Default: 0.000 m





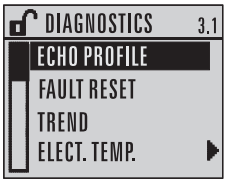
Wizard Complete

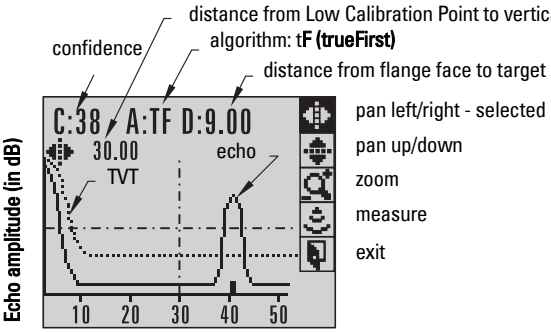
Options	BACK, CANCEL, FINISH (Display returns to 1.1 Quick Start Wizard menu when Quick Start is successfully completed.)

To transfer Quick Start values to the device and return to Program menu, press **DOWN arrow** ▼ **(Finish)**. Then press **LEFT arrow** ◄ to return to Measurement mode.

Requesting an Echo Profile

- In PROGRAM mode, navigate to: **Level Meter > Diagnostics (3.) > Echo Profile (3.1.)**.
- Press **RIGHT arrow** to request a profile.





- Use **UP** or **DOWN arrow** to scroll to an icon. When an icon is highlighted that feature becomes active.
- To move a cross-hair, press **RIGHT arrow** to increase the value, **LEFT arrow** to decrease.
- To Zoom into an area, position the intersection of the cross-hairs at the center of that area, select **Zoom**, and press **RIGHT arrow**. Press **LEFT arrow** to Zoom out.
- To update the profile, select **Measure** and press **RIGHT arrow**.
- To return to the previous menu, select **Exit** then press **RIGHT arrow**

Device Address

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

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

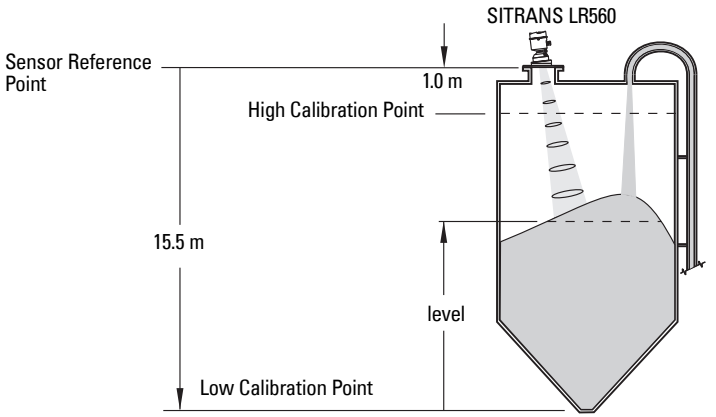
- In PROGRAM mode, navigate to: **Level Meter > Communication (5.) > Device Address (5.2.)** to view the device address.
- Press **Mode** to return to Measurement mode.

Level application example

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

Fill rate = 0.08 m/minute [(Low Cal Pt. minus High Cal Pt.) / fastest of fill or empty time]
= (15.5 m – 1 m) / 180 min.
= 14.5 m /180 min. = 0.08 m/min.

Therefore SLOW response rate (0.1 m/minute) can be selected.



Quick Start Parameter	Setting	Description
Vessel	STEEL	
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 LR560 and other process devices. Please consult the operating instructions or online help for details on using AMS Device Manager version 9.0. (You can find more information at http://www.emersonprocess.com/AMS/.)

Functions in AMS Device Manager

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

Device configuration and monitoring is performed via parameters organized into three function groups:

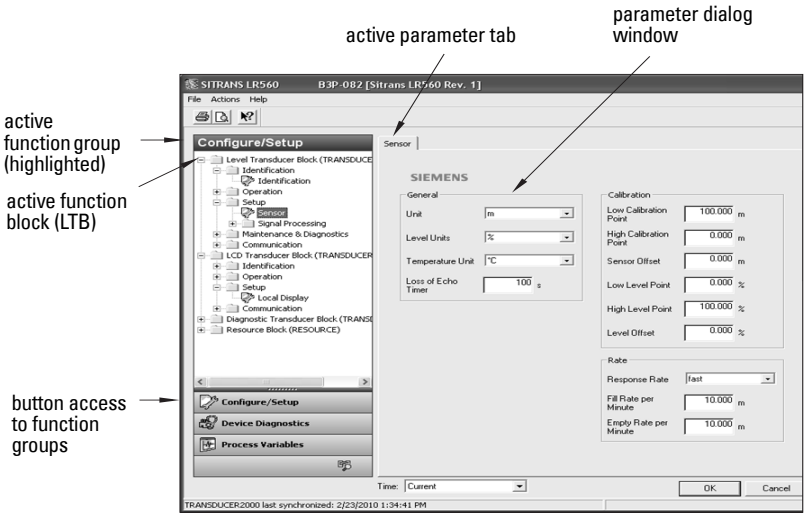
- Configure/Setup
- Device Diagnostics
- Process Variables

The way the device handles these parameters is described in terms of a Block Model. See the manual, *Foundation Fieldbus for Level instruments (7ML19985MP01)*, for details.

Four blocks have responsibility for handling these parameters:

- Level Transducer Block (LTB)
- LCD Transducer Block (LCD)
- Diagnostic Transducer Block (DIAG)
- Resource Block (RES)

Within each function group, parameters are associated with a particular Function Block.



Key Features of AMS Device Manager version 9.0.

Notes:
- For details on using the features below, see the page listed.
- In the table below, (LTB) or (RESOURCE) following the parameter name indicates which block handles the feature in question.

Feature	Page	Description
Quick Start Wizard via AMS Device Manager	46	Device configuration for simple applications
Echo Profile	56	Echo profile viewing
TVT (Auto False Echo Suppression)	54	Screen out false echoes automatically
Maintenance & Diagnostics (LTB)	56	Set schedules and reminders for sensor maintenance and service
Maintenance & Diagnostics (RESOURCE)	65	Set schedules and reminders for device maintenance and calibration
Security (RESOURCE)	67	Protect security and communication parameters from modification by the maintenance user
Alarms & Errors (LTB)	68	Monitor process errors and alarms
Alarms & Errors (RESOURCE)	70	Monitor device errors and alarms
Process Variables (Level Transducer Block - LTB)	73	Monitor process variables and level trend

Block location of features

Feature	Function Group	Block
Quick Start Wizard via AMS Device Manager	Configure/setup	RESOURCE
Echo Profile		LTB
TVT (Auto False Echo Suppression)		LTB
Maintenance & Diagnostics (LTB)		LTB
Maintenance & Diagnostics (RESOURCE)		RESOURCE
Security (RESOURCE)		RESOURCE
Alarms & Errors (LTB)	Device Diagnostics	LTB
Alarms & Errors (RESOURCE)		RESOURCE
Process Variables (Level Transducer Block - LTB)	Process Variables	LTB

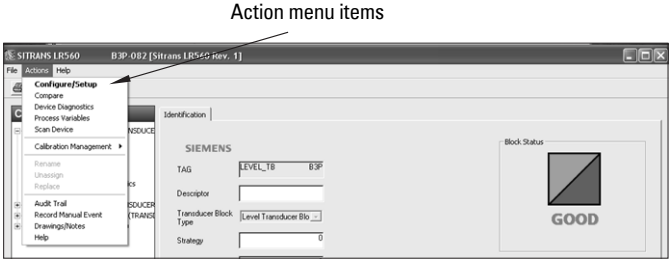
Programming via AMS Device Manager

Notes:
- While the device is in PROGRAM mode the output remains active and continues to respond to changes in the device.
- 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 (6.2.2.)** on page 122.)

Navigating through the parameters

- A navigation window on the left-hand side of the screen allows you to navigate through the parameter menu structure (see *AMS Menu Structure* on page 75.)
- Some parameters are accessed from within the dialog window that opens when you click on an icon in the navigation window.
- In general, process parameters are accessed through the Level Transducer Block, and device parameters are accessed through the Resource Block.

Pull-down menu access



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

Changing parameter settings

Notes:
- For a complete list of parameters accessible via AMS, see *AMS Menu Structure* on page 75.
- For parameters followed by a reference number, additional information is available in *Parameter Reference* on page 86.

1) Modify parameter values in the parameter value field in **Configure/Setup** view, then click **Apply** to write the new values to the device. (The Apply button is activated when a parameter is modified.) The parameter field will display in yellow until the value has been written to the device.
2) Click **OK** if you wish to update all parameters and exit to Device Connection View. Click **CANCEL** to exit without saving changes.

Adding a new device

Electronic Device Description (EDD)

Note: SITRANS LR560 requires the EDD for AMS Device Manager version 9.0.

Check the product page of our website at: www.siemens.com/LR560, under **Support > Software Downloads**, for the latest version of EDD: SITRANS LR560 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 (2.2.2.)** on page 90 to access it via the local user interface). If necessary download the EDD from the product page listed above.
2) Save the files to your computer, and extract the zipped file to an easily accessed location.
3) Launch **AMS Device Manager – Add Device Type**, browse to the unzipped EDD file and select it.
4) If desired, enter a new device tag. The device is shipped with a unique tag, consisting of a manufacturer id and serial number[1)]. It is not necessary to change the device tag to make the device operational.

   To change Device Tag:

   a) Launch **AMS Device Manager – AMS Device Manager.**
   b) From 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 distinct from the Tag that describes each block type (located in the *Identification* folder of each block).

Startup

1) Launch AMS Device Manager

a) Launch **AMS Device Manager – AMS Device Manager.**
b) From Device Connection View, right click on the FF Network icon and select **Rebuild Hierarchy.**
c) If you wish to rename the device, right-click on the device icon and select **Rename** from the menu, enter a new device tag, and click **Enter.**
d) Double-click the device icon. The **Configure/Setup** menu opens at the device Identification dialog window. At initial startup, the Block Status is Out of Service.

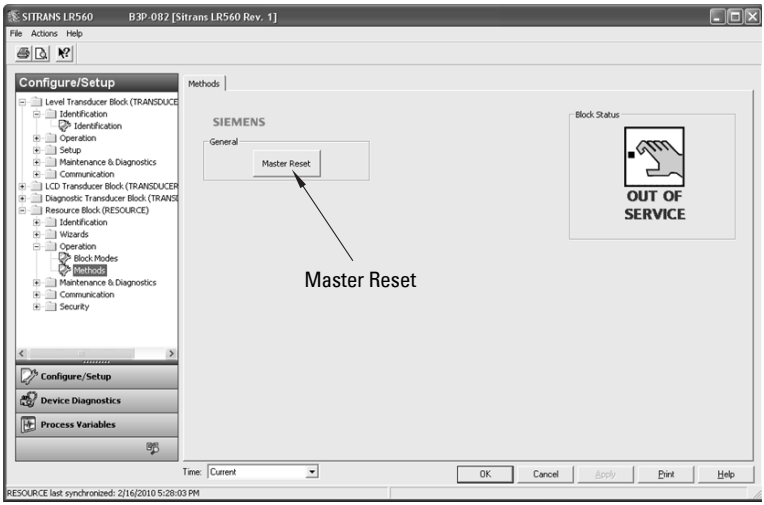
1) The device tag is read-only via local operation.

2) Master Reset

Notes:
- We recommend performing a Master Reset before configuring a new device.
- RESOURCE and LTB Blocks must be in Out of Service Mode before a Master Reset can be performed.

a) Navigate to **Configure/Setup > Resource Block > Operation** and click **Methods** to open the dialog window.

b) In the **General** field, click **Master Reset** then click **Next** to perform a reset to factory defaults. Click **Next** to accept the default reset to **Factory Defaults**.



c) Click **FINISH**, then scan the device (see step 3).

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

3) Scan Device

Scan Device uploads parameters from the device to AMS Device Manager. This synchronizes parameters between the device and AMS.

a) From the menu bar, open the pull-down menu **Actions – Scan Device**.

b) If you are adding a new device, configure the device via the Quick Start wizard.

Configuring a new device

Notes:
- The LR560 FF is shipped with RESOURCE and LTB blocks in Out of Service mode.
- If you complete the Quick Start Wizard via local operation the first time it is used, it will automatically put the RESOURCE and LTB blocks into AUTO mode. (See *Quick Start Wizard via the LDI push buttons* on page 36.)
- Except for the first time it is used, after completing the Quick Start wizard via local operation, you must manually put the RESOURCE and LTB blocks into AUTO mode.
- After completing the Quick Start Wizard via AMS, you must manually put the RESOURCE and LTB blocks into AUTO mode.

Configure a new device using the Quick Start Wizard**.** The Quick Start Wizard provides an easy step-by-step procedure that configures the device for a simple application.

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

Quick Start Wizard via AMS Device Manager

Quick Start Wizard steps

Notes:
- When performing a Quick Start via AMS, the Resource and LTB blocks must be in **Out of Service mode** before any configuration changes[1)] can be written. (See *Changing Block Modes* on page 49.)
- After completing the Quick Start wizard via AMS, you must manually place the RESOURCE block in **Automatic** mode. This will also change LTB to **Automatic** mode.
- Values set using the Quick Start Wizard via AMS are saved and recalled each time it is initiated.

Launch **AMS Device Manager** and double-click the device icon from Device Connection View to open the startup screen.

Navigate to **Configure/Setup > Resource Block > Wizards > Quick Start**.

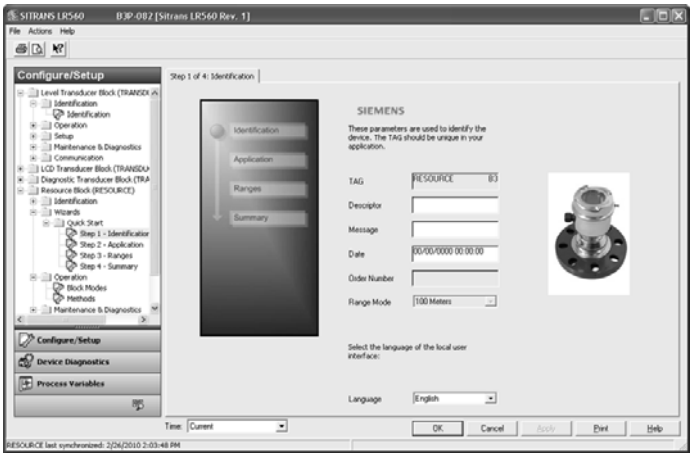
- In the navigation window, click on the Quick Start steps in order.
- At each step, if you do not wish to change the default values in the dialog window that opens, click on the icon for the next Quick Start step.
- If you modify a parameter in any step, the **Apply** button is activated. Click **Apply** to write changes to the device.

1) Changes to parameters that affect the block output.

Step 1 – Identification

Click **Step 1 - Identification**.

If you wish to accept the default values, go directly to Step 2 (**Descriptor**, **Message**, and **Date** fields can be left blank). Or if desired, make changes then click **Apply**.



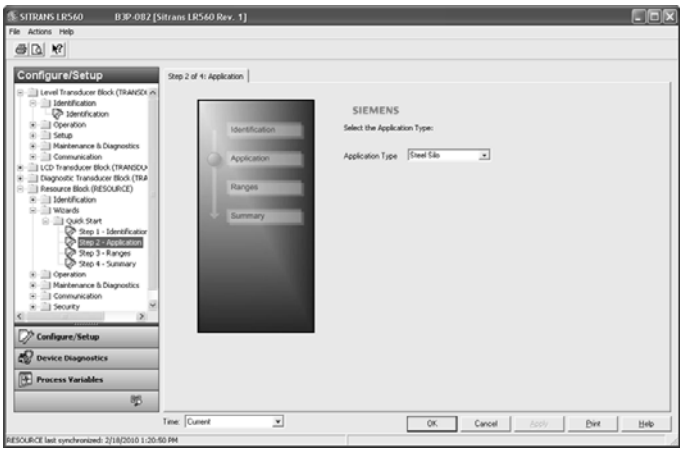
Step 2 – Application

Notes:

- Selecting either STEEL or CONCRETE does a functional reset (see **Master Reset (4.1.)** on page 110).
- Selecting STEEL changes the setting for **Position Detect (2.7.3.3.)** to Rising Edge. and for **Algorithm (2.7.3.1.)** to F.
- Selecting CONCRETE changes the setting for **Position Detect (2.7.3.3.)** to Rising Edge and for **Algorithm (2.7.3.1.)** to ALF.

Click **Step 2 - Application**. If you wish to accept the default values, go directly to Step 3.

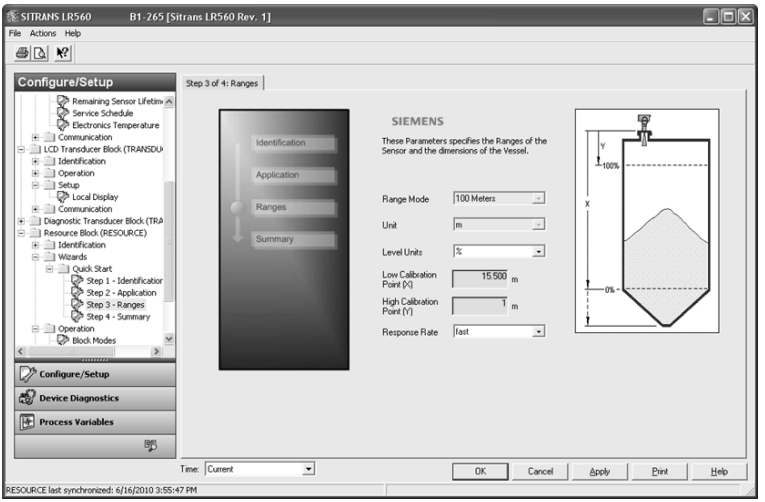
Or select a different vessel type (steel or concrete). [This changes the setting for **Position Detect (2.4.5.2.)** to Rising Edge.] Then click **Apply**.



Step 3 – Ranges

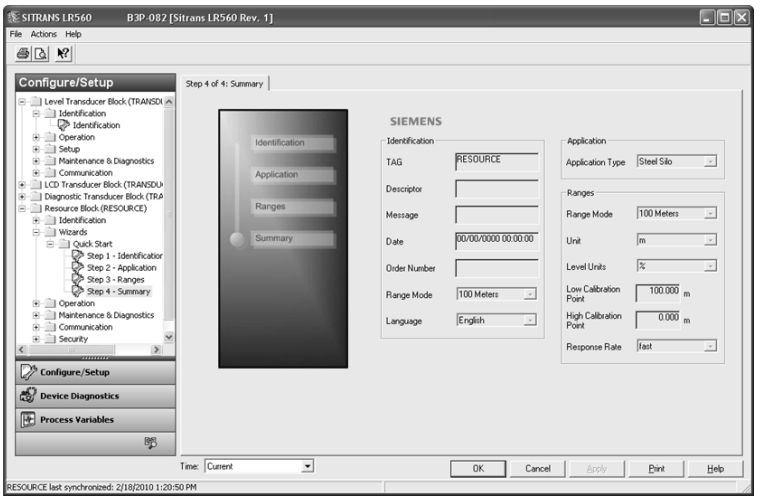
Note: Selecting SLOW Response Rate changes setting for ***Average amount (2.8.3.)*** to 0.9.

Click **Step 3 - Ranges**. If you wish to accept the default values, go directly to step 4. Or make changes as desired, then click **Apply**.



Step 4 – Summary

Click **Step 4 - Summary**. Check parameter settings. Return to individual steps if further changes are necessary.



The Quick Start is now complete. Put Resource Block into Automatic Mode (see *Changing Block Modes* on page 49.)

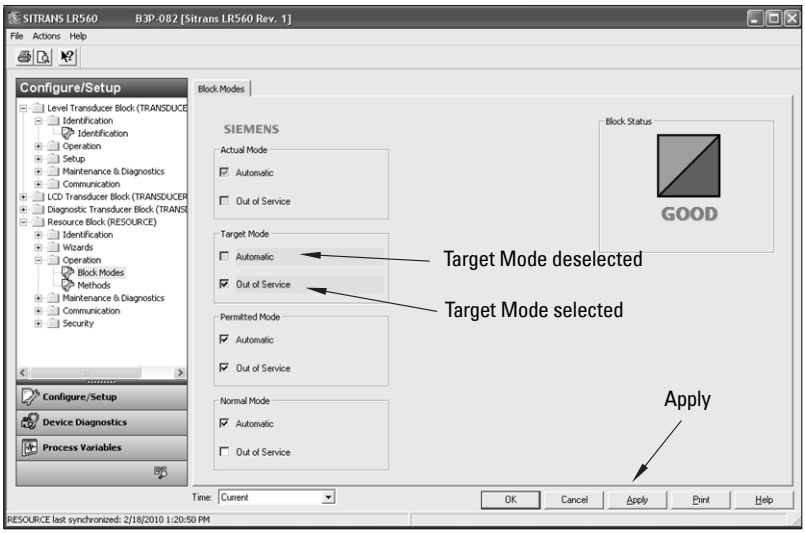
Changing Block Modes

Note: Resource Block overrides Level Transducer Block. Changing Resource Block mode will also change Level Transducer Block mode.

To change any block mode follow the same procedure as for changing Resource Block mode.

To change Resource Block mode

1) Navigate to **Configure/Setup > Resource Block > Operation > Block Mode** and click **Block Mode** to open the dialog window.
2) Select the desired Target mode and deselect the other option. Click **Apply** (the Apply button is activated when a change is made).



3) Return to the main menu.

Configure/Setup Parameters

Transducer Block Parameters

Identification and Operation are common to all three Transducer Blocks: Level Transducer Block, LCD Transducer Block, and Diagnostic Transducer Block.

Identification (LTB, LCD, DIAG)

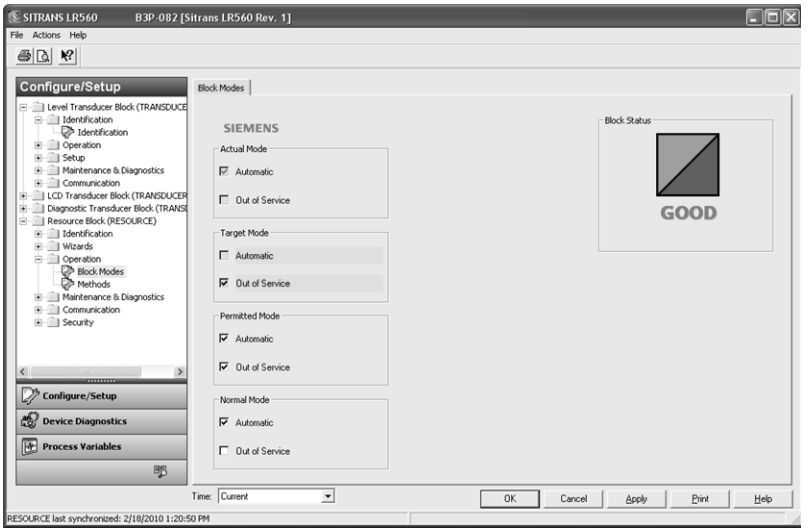
Navigate to **Configure/Setup > LTB** and click **Identification** to open the dialog window for access to:

Identification:

- TAG
  Read only. Description for the associated block: device tag prefixed by block type.

- Descriptor
  Text that can be used in any way. Limited to 32 ASCII characters. No specific recommended use.
- 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, LCD, DIAG)



Navigate to **Configure/Setup > LTB > Operation** and click **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
  Used to request an operating mode.
- Permitted Mode
  Defines the modes that are allowed. 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.

Level Transducer Block Parameters

Operation (LTB)

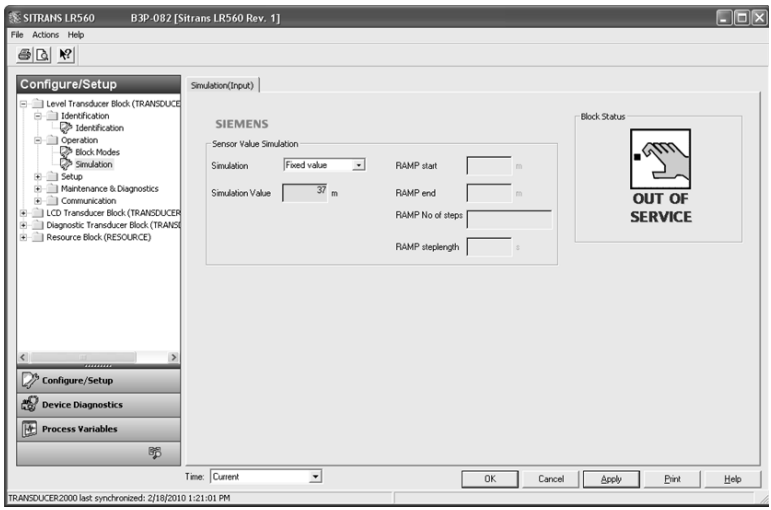
Navigate to **Configure/Setup > LTB > Operation** and click **Simulation** to open the dialog window for access to:

Simulation (Input)

Notes:

- To activate simulation via AMS Device Manager or the 375 Field Communicator, simulation must also be set to Enabled on the device. See **Simulate Enable (4.12.)** on page 120.
- Before enabling or disabling **Simulation**, put LTB Block into OOS mode (see *Changing Block Modes* on page 49).
- After changes have been made, LTB must be returned to AUTO mode.

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.



- Simulation
- Simulation Value

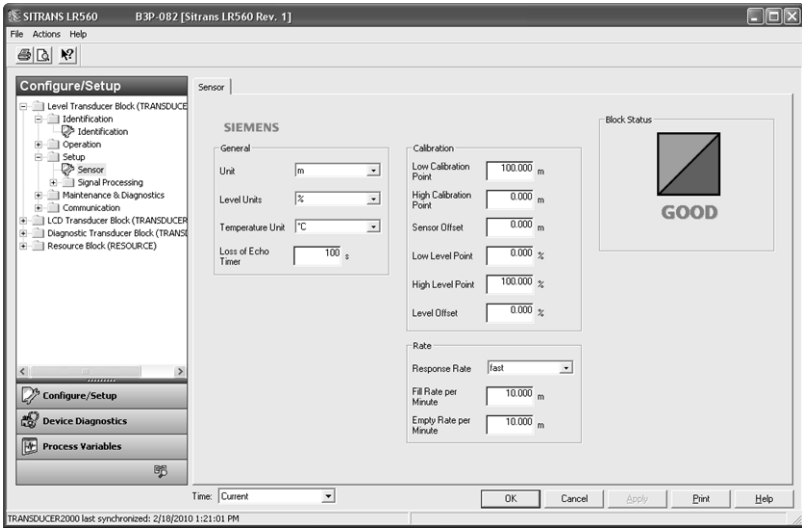
Ramp start	Range: –999999 to 999999. Default: 0 m
Ramp end	Range: –999999 to 999999. Default: 0 m
Number of steps	Range: 1 to 65535. Default: 10
Step length	Range: 1 to 65535. Default: 5 s

1) Set **Simulation** to **Fixed value** or **Ramp**, and click **Apply.**
2) If you select **Fixed value**, enter a Simulation Value and click **Apply.**
3) Or select **Ramp**, enter the RAMP start, end, number of steps, and step length, and click **Apply.**
4) After simulation is complete, set Simulation to **OFF** and click **Apply**.

Setup (LTB)

Note: See *AMS Menu Structure* on page 75 and for parameters followed by a reference number, more detailed descriptions can be found in *Parameter Reference* on page 86.

Sensor (LTB)



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

General

- Unit
- Level Units
- Temperature Unit
- Loss of Echo Timer

Calibration

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

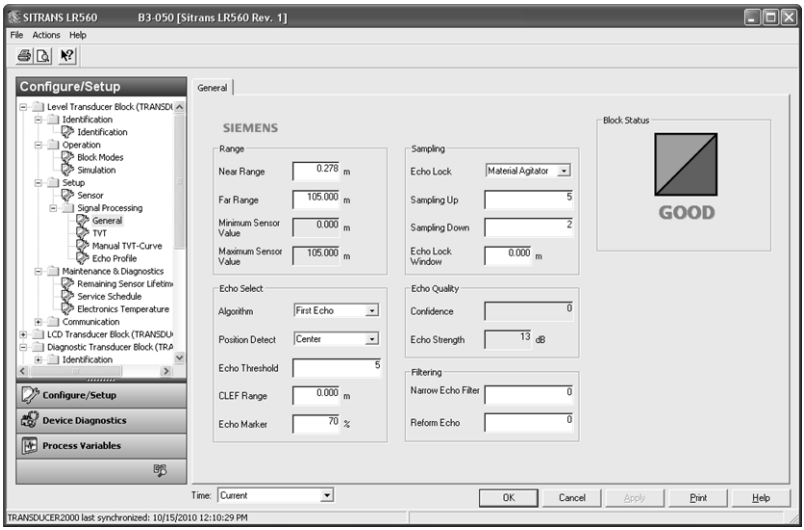
Rate

Note: Selecting SLOW Response Rate changes setting for ***Average amount (2.8.3.)*** to 0.9.

- Response Rate
- Fill Rate per Minute
- Empty Rate per Minute

Signal Processing (LTB)

Note: See *AMS Menu Structure* on page 75 and for parameters followed by a reference number, more detailed descriptions can be found in *Parameter Reference* on page 86.



General

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

Range

- Near Range
- Far Range
- Minimum Sensor Value
- Maximum Sensor Value

Echo Select

- Algorithm
- Position Detect
- Echo Threshold
- CLEF Range
- Echo Marker

Sampling

- Echo Lock
- Sampling Up
- Sampling Down
- Echo Lock Window

Echo Quality

- Confidence
- Echo Strength

Filtering

- Narrow Echo Filter
- Reform Echo

TVT

A custom Time Varying Threshold (TVT) allows you to screen out false echoes, for example, in a tank with obstructions. See *Auto False Echo Suppression (2.4.8.1.)* on page 142 for more information.

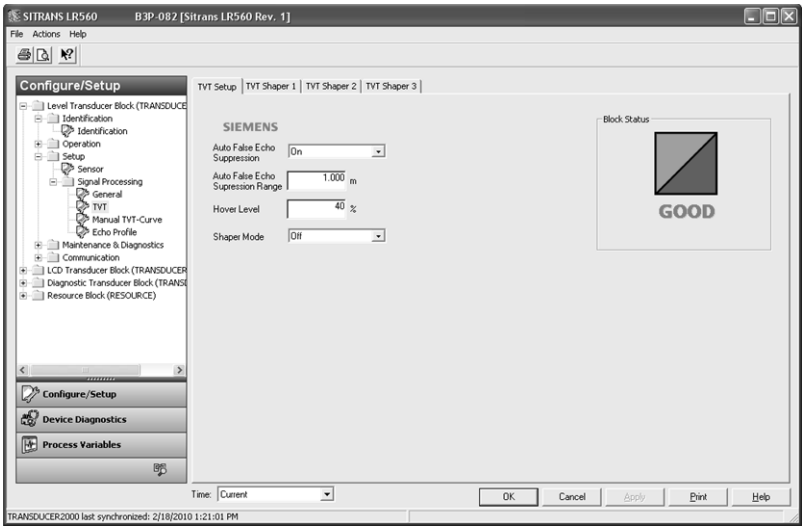
There are two options:

- Auto False Echo Suppression automatically calculates the position of the TVT.
- TVT shaper breakpoints allow you to manually modify the TVT

TVT (Auto False Echo Suppression)

Notes:

- We recommend using the Auto False Echo Suppression Wizard. See *AFES (Auto False Echo Suppression) Wizard* on page 87.
- Put LTB Block into OOS Mode before changing settings, then back into AUTO mode to display TVT.



Navigate to **Configure/Setup > LTB > Setup > Signal Processing > TVT.**

TVT Setup

Click **TVT Setup** to access:

- Auto False Echo Suppression
  For more details see **TVT (Auto False Echo Suppression) Setup (2.4.8.)** on page 100.
- Auto False Echo Suppression Range
- Hover Level
- Shaper Mode
  Allows you to modify breakpoints under the TVT Shaper tabs, and view Manual TVT-Curve.
  1) Turn Shaper Mode **On** and turn Auto False Echo Suppression **Off**.
  2) Click the appropriate TVT Shaper tab and modify breakpoints as desired.
  3) Click **Apply**.

TVT Shaper 1

- Shaper breakpoints 1 to 40

TVT Shaper 2

- Shaper breakpoints 41 to 80

TVT Shaper 3

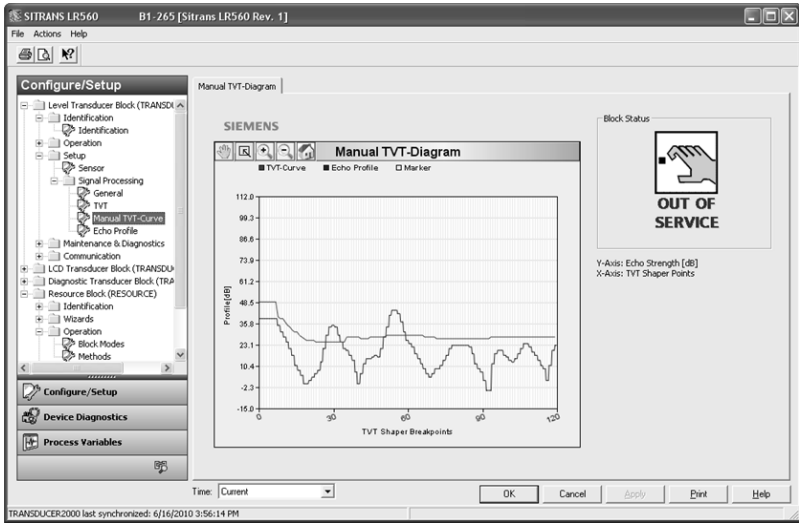
- Shaper breakpoints 81 to 120

Manual TVT-Curve

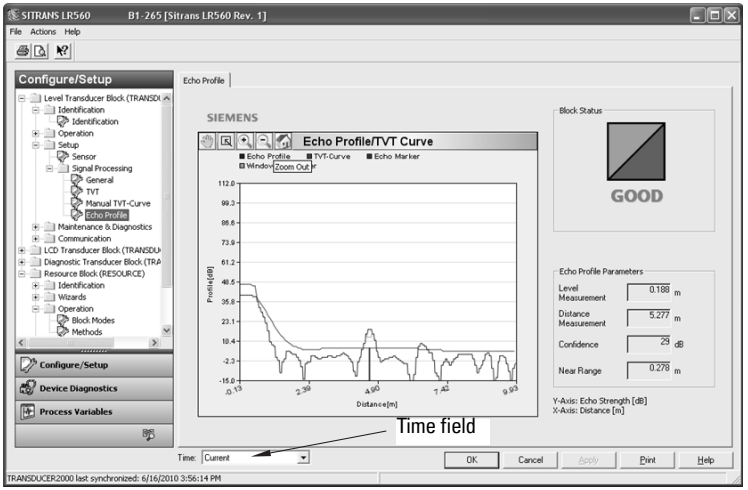
Note: Put LTB Block into OOS Mode before changing settings, then back into AUTO mode to display TVT.

Displays the effects of the TVT shaper modifications. (Shaper Mode must be On.)

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



Echo Profile



Navigate to **Configure/Setup > LTB > Setup > Signal Processing > Echo Profile** to view the current echo profile and to access Echo Profile Parameters (view only).

Echo Profile Parameters (view only)

- Level Measurement
- Distance Measurement
- Confidence
- Near Range

For an illustration showing Level and Distance see **Channel (2.5.3.)** on page 104. For an explanation of the use of offsets, see *Level Transducer Block (LTB) on page 6* of Foundation Fieldbus for Level Instruments manual.

To view a previous profile:

Click the drop-down arrow on the **Time** field and select the desired profile, (available only using AMS version 10.1 or later)

Maintenance & Diagnostics (LTB)

Note: Maintenance parameters are listed in *AMS Menu Structure* on page 75. The parameter reference number allows you to locate more detailed information in *Parameter Reference*, starting on page 86.

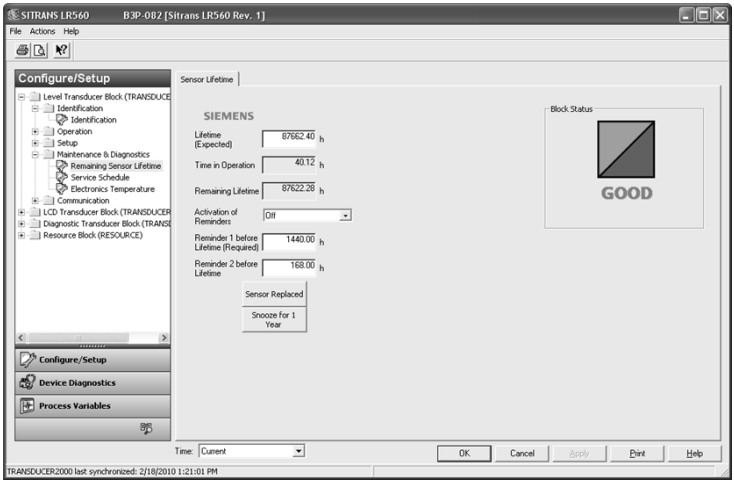
Remaining Sensor Lifetime

Navigate to **Configure/Setup > LTB > Maintenance and Diagnostics > Remaining Sensor Lifetime**.

Sensor Lifetime

Click **Sensor Lifetime** tab for access to:

- Lifetime (Expected)
- Time in Operation
- Remaining Lifetime
- Activation of Reminders
- Reminder 1 before Lifetime (Required)
- Reminder 2 before Lifetime (Demanded)



- Click **Sensor Replaced** to reset Time in Operation to 0 hours
- Click **Snooze for 1 Year** to add a year to the Expected Sensor Lifetime.
- Click **Apply** to write changes to the device.

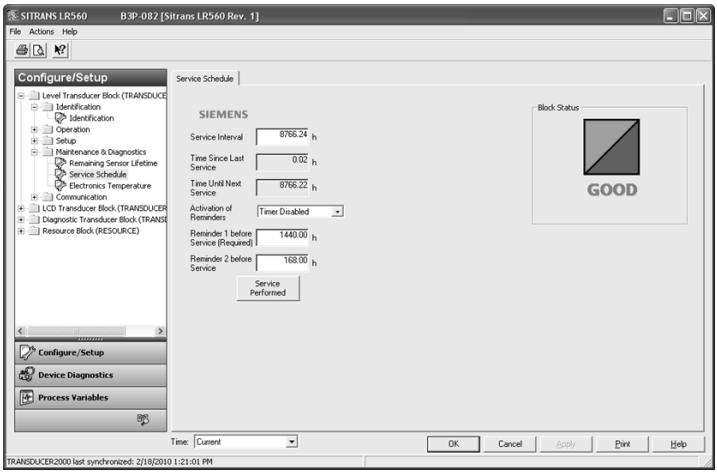
Service Schedule

Navigate to **Configure/Setup > LTB > Maintenance and Diagnostics > Service Schedule.**

Service Schedule

Click **Service Schedule** tab for access to

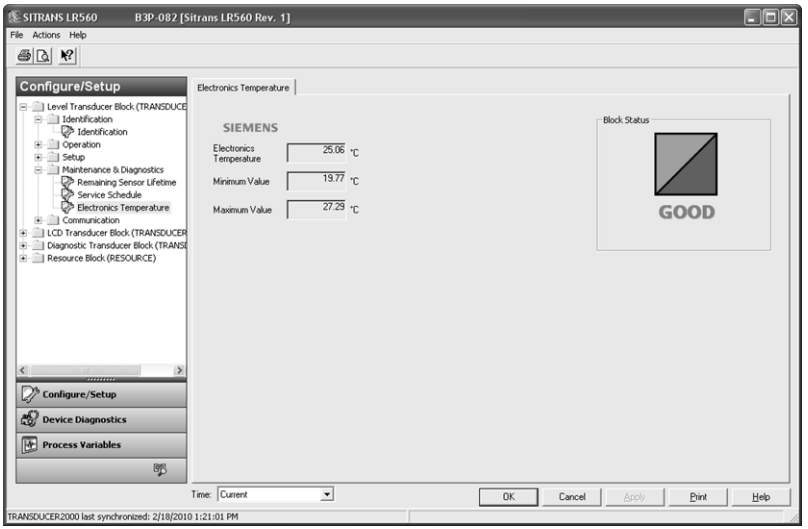
- Service Interval
- Time Since Last Service
- Time Until Next Service
- Activation of Reminders
- Reminder 1 before Lifetime (Required)
- Reminder 2 before Lifetime (Demanded)



- Click on **Service Performed** to reset Time Since Last Service to 0 hours.
- Click **Apply** to write changes to the device.

Electronics Temperature

- Electronics Temperature
  Displays the current internal temperature of the device
- Minimum Value
- Maximum Value

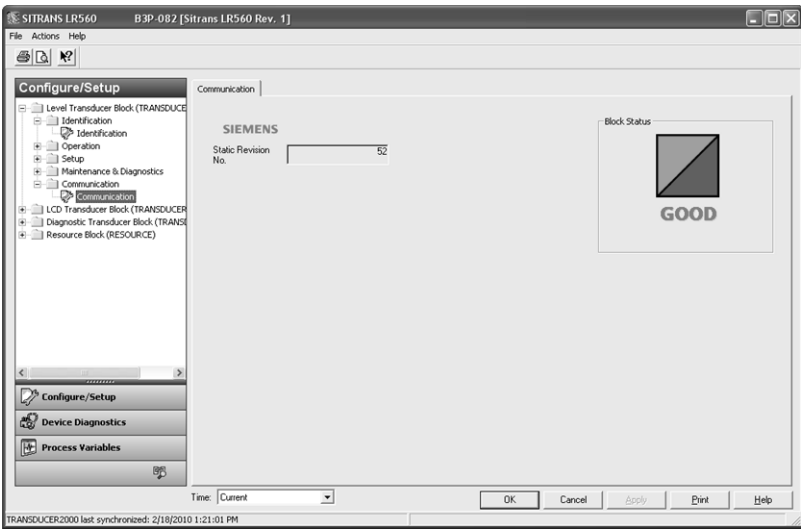


Communication (LTB)

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

Communication:

- Static Revision No.
  [see **Static Revision Number (2.5.1.)** on page 103]



Configure/Setup (Liquid Crystal Display Block-LCD)

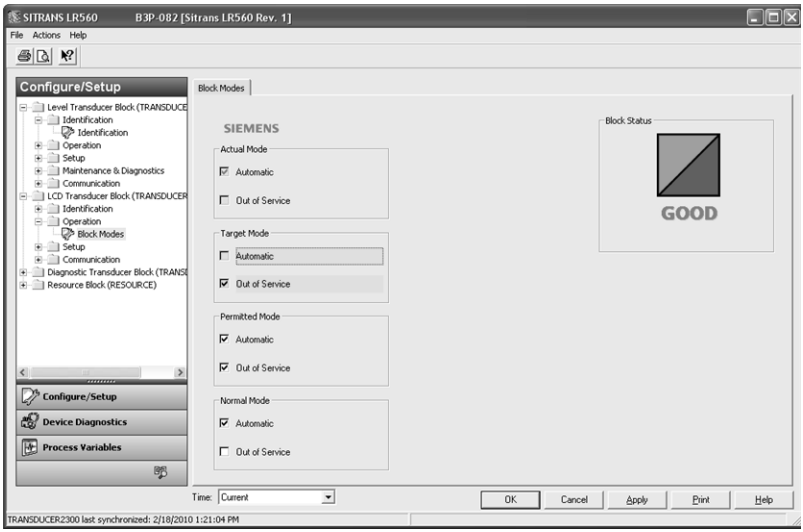
Identification (LCD)

(see *Identification (LTB, LCD, DIAG)* on page 49):

Operation (LCD)

(see *Operation (LTB, LCD, DIAG)* on page 50):

Block Modes



Navigate to **Configure/Setup > LCD > Operation** and click **Block Modes** to open the dialog window for access to:

- Actual Mode *(read only)*
- Target Mode
- Permitted Mode
- Normal Mode

See *Block Modes:* on page 50 for more detail.

To remotely disable updating of the LCD:

LCD Transducer Block must be put into **Out of Service** mode.

1) Select Target Mode **Out of Service** and deselect **Automatic.**
2) Click **Apply.**

Setup (LCD)

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

Local Display

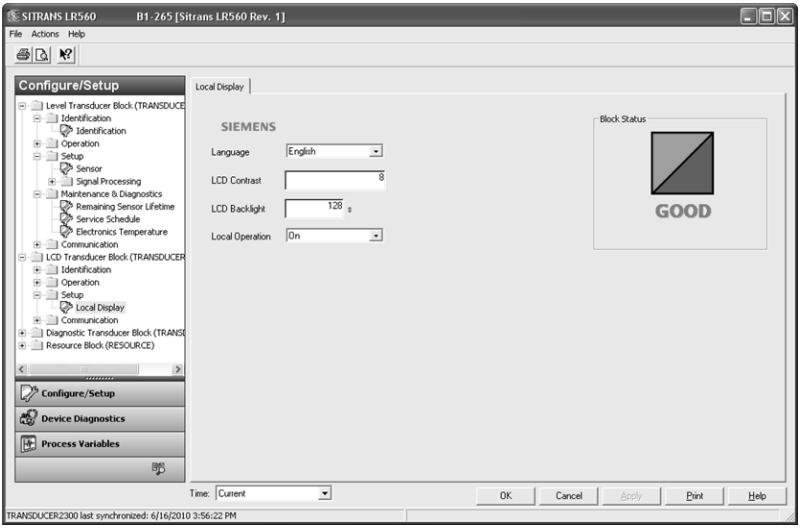
- Language
- LCD Contrast
- LCD Backlight

(continued on next page)

Local Display (continued)

- Local Operation

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

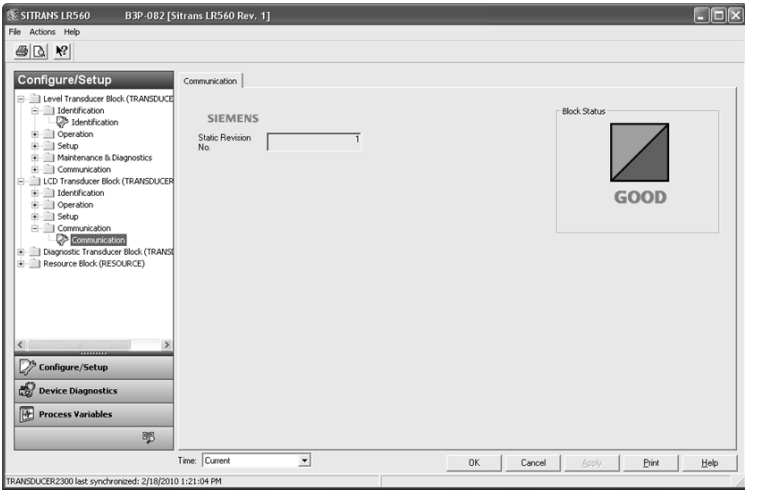


Communication (LCD)

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

Communication:

- Static Revision No.
  [see **Static Revision Number (2.5.1.)** on page 103]



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 (see *Identification (LTB, LCD, DIAG)* on page 49):

Operation (DIAG)

Navigate to **Configure/Setup > DIAG > Operation. (See** *Operation (LTB, LCD, DIAG)* on page 50**.)**

Communication (DIAG)

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

Communication:

- Static Revision No.
  [see **Static Revision Number (2.5.1.)** on page 103]

Configure/Setup (Resource Block - RESOURCE)

Notes:

- For a complete list of parameters accessible via AMS, see *AMS Menu Structure* on page 75.
- For parameters followed by a reference number, additional information is available in *Parameter Reference* on page 86.

Identification (RESOURCE)

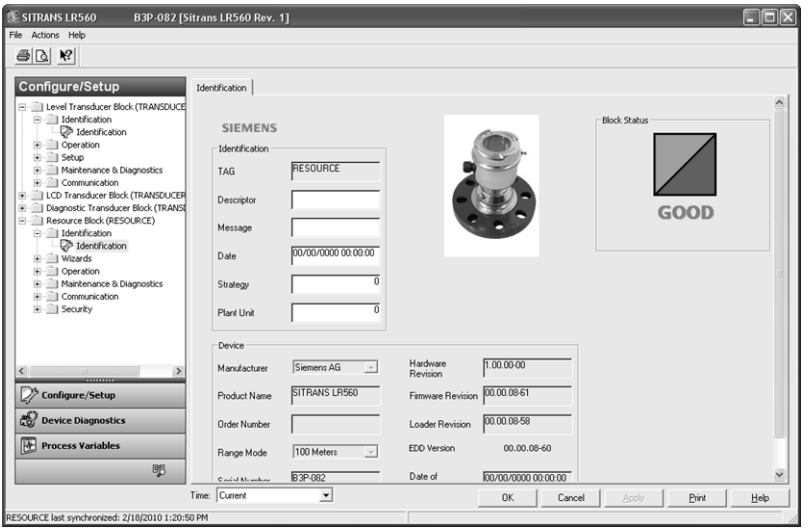
Navigate to **Configure/Setup > RESOURCE > Identification** for access to**:**

Identification

- TAG
  Read only. Description for the associated block: device tag prefixed by block type.
- Descriptor
- Message
- 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
- Product Name
  The manufacturer's product name for this device.
- Order Number
  The manufacturer's order number (MLFB) for this device.
- Range Mode
  Measuring range of the device.
- Serial Number
  The manufacturer's unique serial number for this device.
- Hardware Revision
- Firmware Revision
- Loader Revision
- EDD Version
  Revision of the EDD associated with this device.
- Date of Manufacturing



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 46*.)

Operation (RESOURCE)

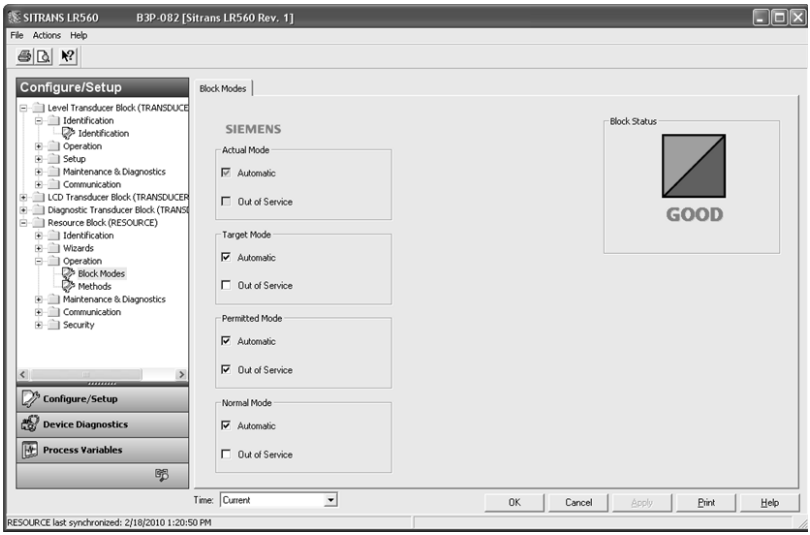
Navigate to **Configure/Setup > RESOURCE > Operation.**

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

Block Modes

NOTE: 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.

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



Methods

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

Master Reset

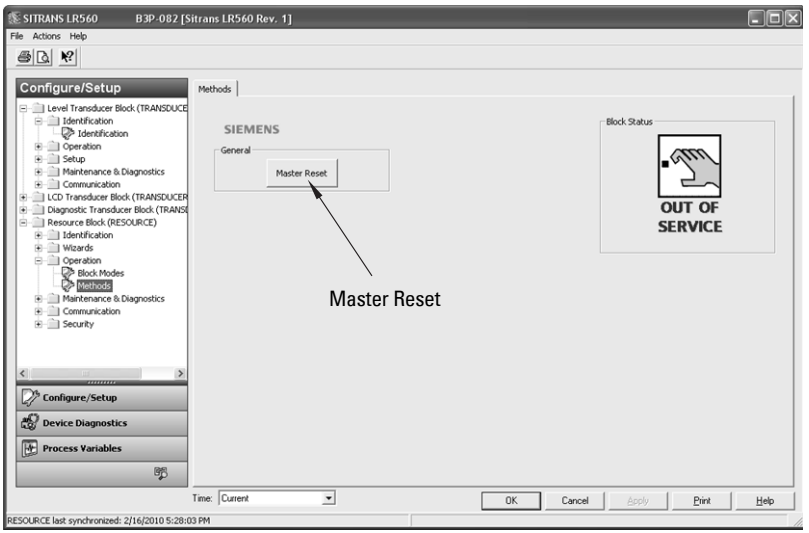
Notes:

- RESOURCE and LTB Block Status must be Out of Service before a Master Reset can be performed (see *Changing Block Modes* on page 49).
- The following parameters are not reset by any reset type: Write Protection, Auto False Echo Suppression Range, Learned TVT.
- While an FF Object Dictionary Reset is in progress, the Master Reset Parameter View showing PREVIOUS/NEXT/BACK/EDIT options will be displayed. Do not perform an action using the local display interface until the reset is complete[1)]. This could cause a temporary loss of communications.

(continued on next page)

1) FF Object Dictionary reset completes with an automatic power cycle.

Master Reset (continued)



1) Click the Master Reset button, then click **Next** to perform a reset.
2) Select the Reset Type:

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[b)]	Resets all user parameters except for calibration to Factory Defaults. This option also clears any function block parameters and device schedule[c)] 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) FF Object Dictionary reset completes with an automatic power cycle.

c) See the manual *Foundation Fieldbus for Level instruments (7ML19985MP01)*, Data Transmission, for more details.

3) Click **Next**, then **FINISH** to complete the Master Reset.

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

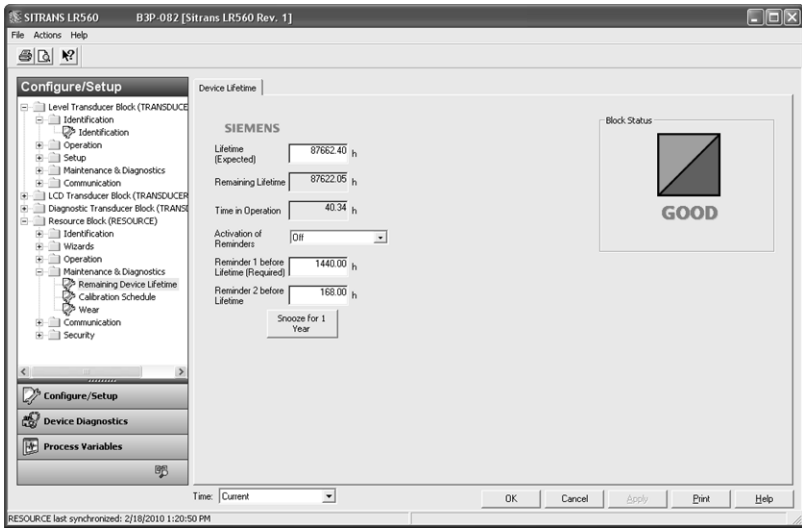
Maintenance & Diagnostics (RESOURCE)

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

Remaining Device Lifetime

- Lifetime (Expected)
- Remaining Lifetime *(read only)*
- Time in Operation *(read only)*
- Activation of Reminders
- Reminder 1 before Lifetime (Required)
- Reminder 2 before Lifetime (Demanded)

1) Open the window **Remaining Device Lifetime**

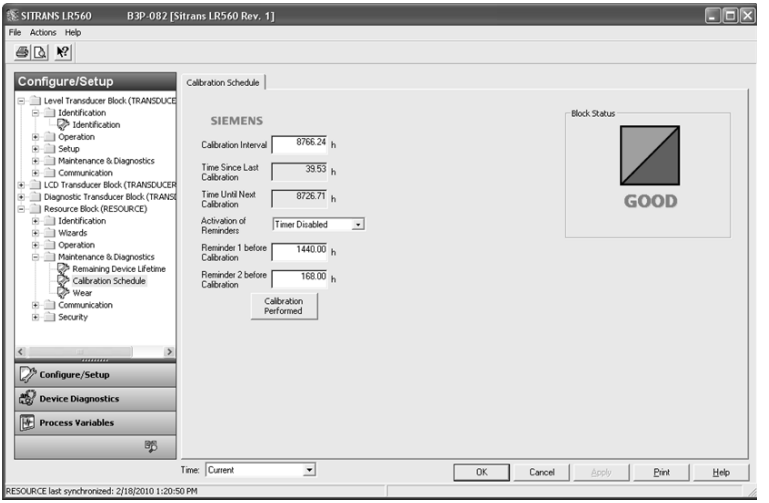


2) After modifying values/units as required, click **Apply** to accept the change.

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

Calibration Schedule

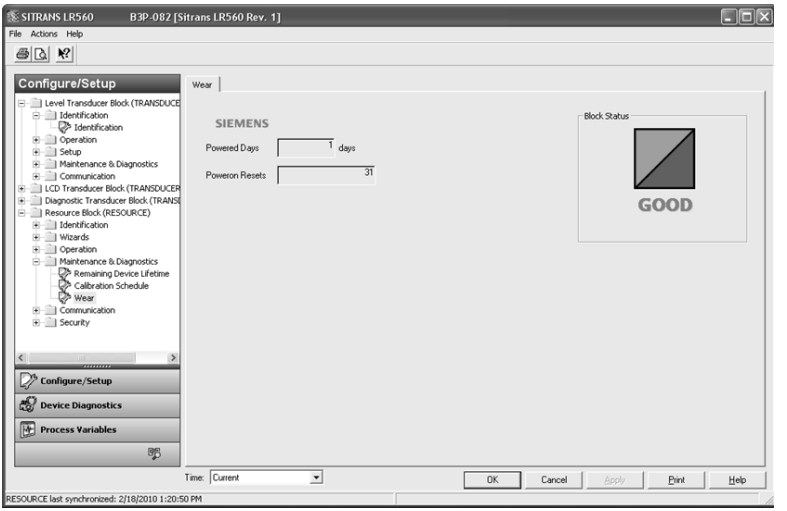
- Calibration Interval
- Time Since Last Calibration
- Time Until Next Calibration
- Activation of Reminders
- Reminder 1 before Calibration (Required)
- Reminder 2 before Calibration (Demanded)



Click on **Calibration Performed** to reset Time Since Last Calibration to 0 hours. Click **Apply** to accept the change.

Wear

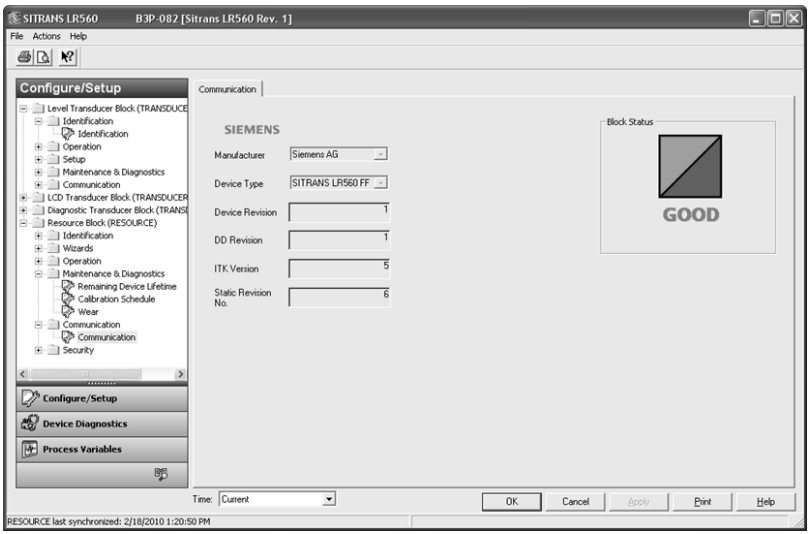
- Powered Days *(read only)*
- Power-on resets *(read only)*



Communication (RESOURCE)

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

- Manufacturer
- Device Type
  Manufacturer's model number associated with the device
- Device Revision
- DD Revision
  Revision of the DD (also called EDD) associated with this device.
- ITK Version
- Static Revision No.
  [see **Static Revision Number (2.5.1.)** on page 103]



Security (RESOURCE)

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

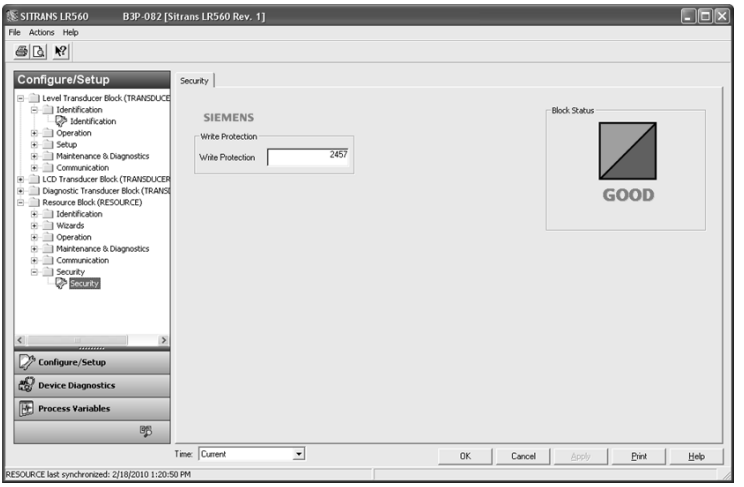
Security

- Write Protection
  [see *Security (continued)* on page 68]

See also *Password Protection* on page 74.

(continued on next page)

Security (continued)



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 the manual *Foundation Fieldbus for Level instruments (7ML19985MP01).*

Alarms & Errors (LTB)

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

Block Error

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

Block Alarm

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

Unacknowledged

- Unacknowledged

Alarm State

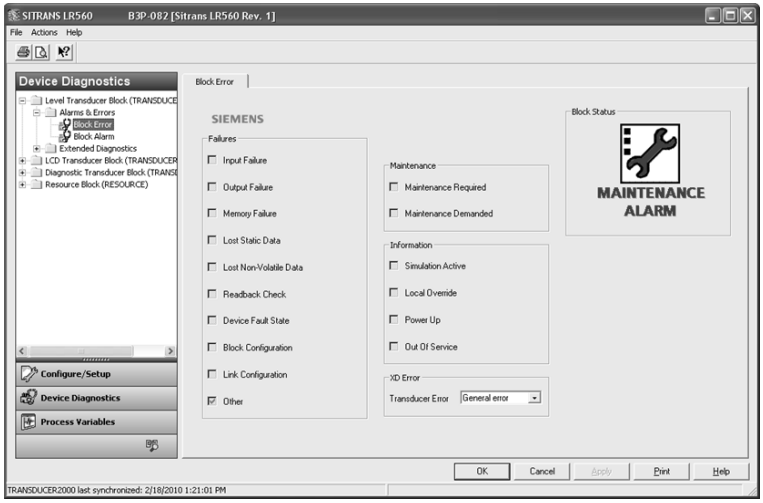
- Alarm State

Subcode

- Subcode

Value

- Value



1) From the **Block Error** tab, check the **Maintenance** window to display the level of maintenance alarm that is active.
2) From the **Block Alarm** tab, check the **Alarm State** window to display the level of maintenance alarm that has been acknowledged.
3) 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 (4.2.9.)**, **Acknowledge (4.3.9.)**, **Acknowledge (4.4.9.)**, **Acknowledge (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 3 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 Reminder 1
- Sensor Lifetime Reminder 2
- Service Schedule Reminder 1
- Service Schedule Reminder 2
- LTB Scale
- Internal Temperature Sensor
- Internal Temperature High
- Internal Temperature Calibration
- Velocity Calibration
- Transducer Temperature Sensor
- Transducer Temperature High
- Transducer Temperature Low

Device Diagnostics (Level Control Device 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 68* 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 68* 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.**

Block Error

Click **Block Error** tab to read:

Failures

- Input Failure
- Output Failure
- Memory Failure

Failures

Failures (continued)

- 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

Click **Block Alarm** tab to read:

Unacknowledged

- Unacknowledged

Alarm State

- Alarm State

Subcode

- Subcode

Value

- Value

Write Alarm

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**.

Alarm Summary

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

Current

- Discrete Alarm
- Block Alarm

Unacknowledged

- Discrete Alarm Unacknowledged
- Block Alarm Unacknowledged

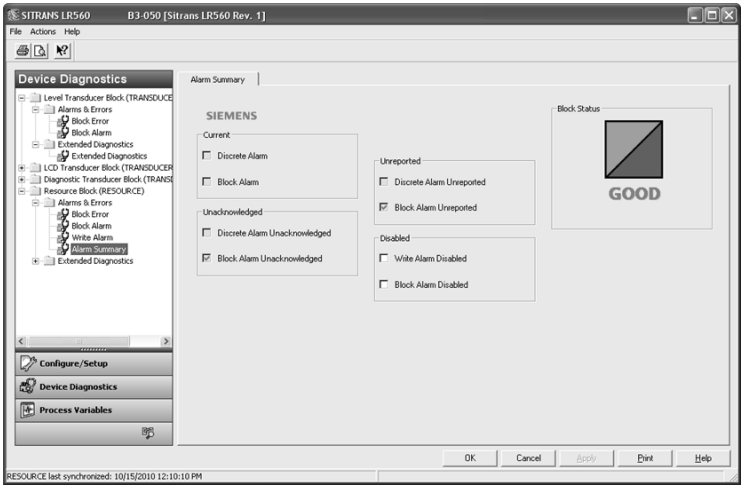
Unreported

- Discrete Alarm Unreported
- Block Alarm Unreported

Disabled

- Write Alarm Disabled
- Block Alarm Disabled

Alarm Summary (continued)

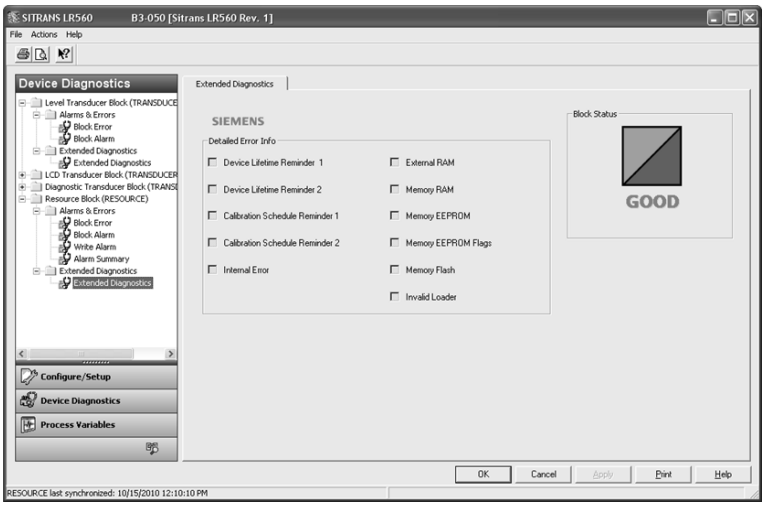


Extended Diagnostics (RESOURCE)

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

Detailed Error Info

- Device Lifetime Reminder 1
- Device Lifetime Reminder 2
- Calibration Schedule Reminder 1
- Calibration Schedule Reminder 2
- Internal Error
- External RAM
- Memory RAM
- Memory EEPROM
- Memory EEPROM Flags
- Memory Flash
- Invalid Loader



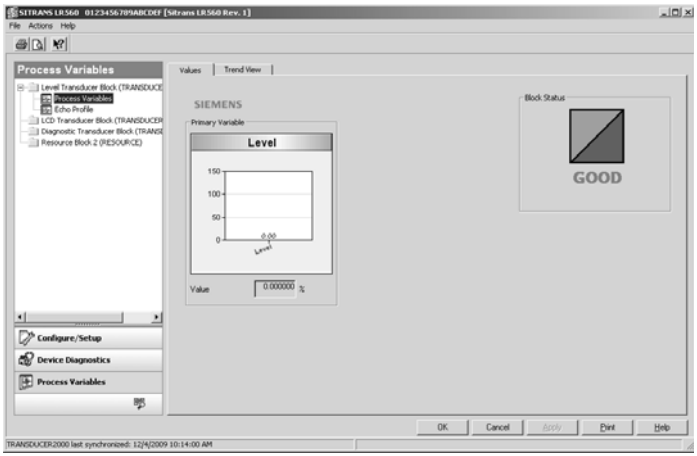
Process Variables (Level Transducer Block - LTB)

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

Values

Click **Values** tab to view:

- Primary Variable
  View a chart showing level value.
- Value
  The primary variable and the channel 1 output from the transducer block as a number.

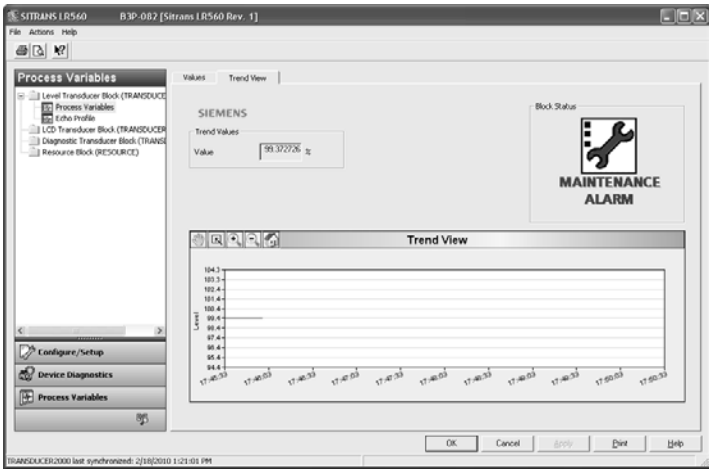


For level applications, chart range is affected by High and Low Level Point values set in **Configure/Setup > LTB > Setup > Sensor.**

Trend View

Click **Trend View** tab to view:

- Trend Values
- Trend View
  The primary variable and the channel 1 output from the transducer block.



Echo Profile

Click **Echo Profile** to read:

Echo Profile Parameters

- Level Measurement
- Distance Measurement
- Confidence
- Near Range

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

Usernames, passwords, 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

AMS Menu Structure

Note: Where a parameter number is listed, more information is available for that parameter in *Parameter Reference* on page 86.

Configure/Setup Function Group	parameter number
LEVEL TRANSDUCER BLOCK	
IDENTIFICATION	
Identification	
Identification (tab)	
TAG	
Descriptor	2.1.2
Transducer Block Type	
Strategy	
Plant Unit	
OPERATION	
Block Modes	
Block Modes (tab)	
Actual Mode	
Target Mode	2.5.2
Permitted Mode	
Normal Mode	
Simulation	
Simulation (Input) (tab)	
Sensor Value Simulation	
Simulation	
Simulation value	
RAMP start	
RAMP end	
RAMP No. of step	
RAMP step length	
SETUP	
Sensor	2.3
Sensor (tab)	
General	
Unit	2.3.1
Level Units	2.3.2
Temperature Unit	2.3.3
Loss of Echo Timer	2.3.4
Calibration	2.3.5
Low Cal. Point	2.3.5.1
High Cal. Point	2.3.5.2
Sensor Offset	2.3.5.3

Configure/Setup Function Group (continued)								parameter number
	LEVEL TRANSDUCER BLOCK (CONTINUED)							
					Calibration (continued)			
						Low Level Point		2.3.5.4
						High Level Point		2.3.5.5
						Level Offset		2.3.5.6
					Rate			2.3.6
						Response Rate		2.3.6.1
						Fill Rate per Minute		2.3.6.2
						Empty Rate per Minute		2.3.6.3
			Signal Processing					2.4
				General				
					General (tab)			
						Range		
							Near Range	2.4.1
							Far Range	2.4.2
							Min. Sensor Value	2.4.3
							Max. Sensor Value	2.4.4
						Echo Select		2.4.5
							Algorithm	2.4.5.1
							Position Detect	2.4.5.2
							Echo Threshold	2.4.5.3
							CLEF Range	2.4.5.4
							Echo Marker	2.4.5.5
						Sampling		2.4.6
							Echo Lock	2.4.6.1
							Sampling Up	2.4.6.2
							Sampling Down	2.4.6.3
							Echo Lock Window	2.4.6.4
						Echo Quality		2.4.7
							Confidence	2.4.7.1
							Echo Strength	2.4.7.2
				TVT				2.4.8
					TVT Setup (tab)			
						Auto False Echo Suppression		2.4.8.1
						Auto False Echo Suppression Range		2.4.8.2
						Hover Level		2.4.8.3
						Shaper Mode		2.4.8.4
					TVT Shaper 1 (tab)			2.4.9
						Breakpoints 1-40		
					TVT Shaper 2 (tab)			
						Breakpoints 41 - 80		

Configure/Setup Function Group (continued)							parameter number
	LEVEL TRANSDUCER BLOCK (CONTINUED)						
					TVT Shaper 3 (tab)		
						Breakpoint s 81 -120	
				Manual TVT-Curve			
					Manual TVT-Diagram (tab)		
		MAINTENANCE & DIAGNOSTICS					
			Remaining Sensor Lifetime				4.3
				Sensor Lifetime (tab)			
					Lifetime (Expected)		4.3.1
					Time in Operation		4.3.2
					Remaining Lifetime		4.3.3
					Activation of Reminders		4.3.4
					Reminder 1 before Lifetime (Required)		4.3.5
					Reminder 2 before Lifetime (Demanded)		4.3.6
			Service Schedule				4.4
				Service Schedule (tab)			
					Service Interval		4.4.1
					Time Since Last Service		4.4.2
					Time Until Next Service		4.4.3
					Activation of Reminders		4.4.4
					Reminder 1 before Service (Required)		4.4.5
					Reminder 2 before Service (Demanded)		4.4.6
			Electronics Temperature				3.4
				Electronics Temperature (tab)			
					Electronics Temperature		
					Minimum Value		3.4.1
					Maximum Value		3.4.2
		COMMUNICATION					
			Communication				
				Communication (tab)			
					Static Revision No.		2.5.1

Configure/Setup Function Group (continued)	parameter number
LCD TRANSDUCER BLOCK	
IDENTIFICATION	
Identification	
Identification (tab)	
TAG	
Descriptor	2.1.2
Transducer Block Type	
Strategy	
Plant Unit	
OPERATION	
Block Modes	
Block Modes (tab)	
Actual Mode	
Target Mode	
Permitted Mode	
Normal Mode	
SETUP	
Local Display	
Local Display (tab)	
Language	7
LCD Contrast	4.10
LCD Backlight	4.9
Local Operation	
COMMUNICATION	
Communication	
Communication (tab)	
Static Revision No.	2.5.1
DIAGNOSTIC TRANSDUCER BLOCK	
IDENTIFICATION	
Identification	
Identification (tab)	
TAG	
Descriptor	2.1.2
Transducer Block Type	
Strategy	
Plant Unit	
OPERATION	
Block Modes	
Block Modes (tab)	
Actual Mode	
Target Mode	
Permitted Mode	

Configure/Setup Function Group (continued)							parameter number
DIAGNOSTIC TRANSDUCER BLOCK (CONTINUED)							
		OPERATION Block Modes (continued)					
					Normal Mode		
			Communication				
				Communication (tab)			
					Static Revision No.		2.5.1
	RESOURCE BLOCK						
		IDENTIFICATION					
			Identification				
				Identification (tab)			
					Identification		
						TAG	
						Descriptor	2.1.2
						Message	2.1.3
						Date	2.1.4
						Strategy	
						Plant Unit	
					Device		
						Manufacturer	5.3
						Product Name	
						Order Number	
						Range Mode	
						Serial Number	
						Hardware Revision	2.2.1
						Firmware Revision	2.2.2
						Loader Revision	2.2.3
						EDD Version	
						Date of Manufacturing	2.2.4
		WIZARDS					
			Quick Start				
				Step 1 - Identification			
				Step 2 - Application			
				Step 3 - Ranges			
				Step 4 - Summary			
		OPERATION					
			Block Modes				
				Block Modes (tab)			
					Actual Mode		
					Target Mode		
					Permitted Mode		
					Normal Mode		

Configure/Setup Function Group (continued)	parameter number
Methods	
Methods (tab)	
General	
Master Reset	4.1
RESOURCE BLOCK (CONTINUED)	
MAINTENANCE & DIAGNOSTICS	
Remaining Device Lifetime	4.2
Device Lifetime (tab)	
Lifetime (Expected)	4.2.1
Remaining Lifetime	4.2.3
Time in Operation	4.2.2
Activation of Reminders	4.2.4
Reminder 1 before Lifetime (Required)	4.2.5
Reminder 2 before Lifetime (Demanded)	4.2.6
Calibration Schedule	4.5
Calibration Schedule (tab)	
Calibration Interval	4.5.1
Time Since Last Calibration	4.5.2
Time Until Next Calibration	4.5.3
Activation of Reminders	4.5.4
Reminder 1 before Calibration (Required)	4.5.5
Reminder 2 before Calibration (Demanded)	4.5.6
Wear	
Wear (tab)	
Powered Days	4.6
Poweron Resets	4.7
COMMUNICATION	
Communication	
Communication (tab)	
Manufacturer	5.3
Device Type	
Device Revision	5.5
DD Revision	
ITK Version	5.6
Static Revision No.	2.5.1
SECURITY	
Security	
Security (tab)	
Write Protection	
Write Protection	6.2.1

Device Diagnostics Function Group						
	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	
					Alarm State	
					Subcode	
					Value	
		EXTENDED DIAGNOSTICS				
			Extended Diagnostics			
				Extended Diagnostics (tab)		
					Detailed Error Info	
						Loss of Echo
						No Tech Power
						Sensor Lifetime Reminder 1
						Sensor Lifetime Reminder 2
						Service Schedule Reminder 1
						Service Schedule Reminder 2
						LTB Scale
						Internal Temp Sensor

Device Diagnostics Function Group (continued)						
	LEVEL TRANSDUCER BLOCK (CONTINUED)					
					Detailed Error Info (continued)	
						Internal Temp High
						Internal Temperature Calibration
						Velocity Calibration
						Transducer Temperature Sensor
						Transducer Temperature High
						Transducer Temperature 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	
					Alarm State	

Device Diagnostics Function Group (continued)						
	LCD TRANSDUCER BLOCK (CONTINUED)					
				Block Alarm (tab) continued		
					Subcode	
					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	
					Alarm State	
					Subcode	
					Value	
	RESOURCE BLOCK					
		ALARMS & ERRORS				
			Block Error			
				Block Error (tab)		
					Failures	
						Input Failure
						Output Failure

Device Diagnostics Function Group (continued)						
	RESOURCE BLOCK (CONTINUED)					
					Failures (continued)	
						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	
					Alarm State	
					Subcode	
					Value	
			Write Alarm			
				Write Alarm (tab)		
					Unacknowledged	
					Alarm State	
					Subcode	
					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

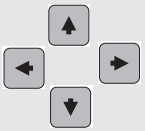
Device Diagnostics Function Group (continued)						
	RESOURCE BLOCK (CONTINUED)					
				Alarm Summary (tab) continued		
					Disabled	
						Write Alarm Disabled
						Block Alarm Disabled
		EXTENDED DIAGNOSTICS				
			Extended Diagnostics			
				Extended Diagnostics (tab)		
					Detailed Error Info	
						Device Lifetime Reminder 1
						Device Lifetime Reminder 2
						Calibration Schedule Reminder 1
						Service Schedule Reminder 2
						Internal Error
						External RAM
						Memory RAM
						Memory EEPROM
						Memory EEPROM Flags
						Memory Flash
						Invalid Loader

Process Variables Function Group							parameter number
	LEVEL TRANSDUCER BLOCK						
		PROCESS VARIABLES					
			Process Variables				
				Process Variables (tab)			
					Primary Variable		2.7.1
						Value	
				Trend View (tab)			
					Trend Values		
						Value	
			Echo Profile				
				Echo Profile (tab)			
					Echo Profile Parameters		
						Level Measurement	2.7.2
						Distance Measurement	2.7.3
						Confidence	2.4.7.1
						Near Range	2.4.1

Parameter Reference

Notes:

- Most parameters are common to both local and remote operation, and are listed below. For a complete list of AMS parameters, see *AMS Menu Structure* on page 75.
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- To enter Program mode using the device buttons, press ▶. Press ◀ to return to Measurement mode. Do not use the handheld programmer or local control buttons at the same time as AMS Device Manager, or erratic operation may result.
- For Quick Access to parameters via the handheld programmer, press **Home**, then enter the menu number, for example: **2.3.5.**



- 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. See *LCD menu structure* on page 155 for a chart.

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

1. Quick Start

Wizards provide step-by step procedures to configure the device, filter out false echoes, and upload and download parameters and firmware to the optional display for easy configuration of multiple LR560s.

Press **RIGHT arrow** twice to open the Wizards menu. Select a wizard, press **RIGHT arrow** to open the first step, and follow the instructions.

1.1. Quick Start Wizard

The Quick Start wizard provides an easy step-by-step procedure to configure the device for a simple application.

- See *Quick Start Wizard via the LDI push buttons on page 36*.
- See *Quick Start Wizard via the handheld programmer on page 36*.
- See *Quick Start Wizard via AMS Device Manager on page 46*.

1.2. AFES (Auto False Echo Suppression) Wizard

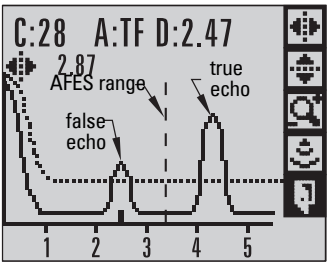
Notes:
- Before using AFES wizard, configure the device via the Quick Start wizard.
- Make sure material level is below all known obstructions at the moment Auto False Echo Suppression is used to learn a custom TVT (Time Varying Threshold). We recommend an empty or almost empty vessel.
- Note the distance to material level when the environment is learned, and set Auto False Echo Suppression Range to a shorter distance to avoid the material echo being screened out.

If you have a vessel with known obstructions, we recommend using AFES to prevent false echo detection.

This feature can also be used if SITRANS LR560 displays a false high level, or the reading is fluctuating between the correct level and a false high level.

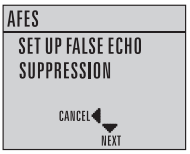
a) Make sure the material level is below all known obstructions.

b) Navigate to **Level Meter > Diagnostics (3.) > Echo Profile (3.1.)** and press **RIGHT arrow** to request a profile.

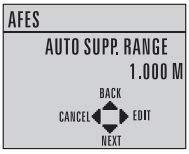


c) Determine a range that includes the false echo but not the true echo: in the example, 3.3 m.

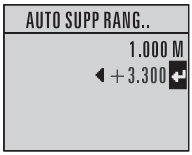
d) Open the AFES wizard and press **DOWN arrow** to continue.



e) Press **RIGHT arrow** to edit Auto False Echo Suppression Range.

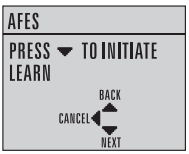


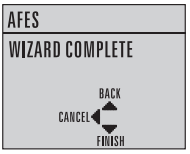
f) Enter the new range value and press **RIGHT arrow** to transfer it.



(continued on next page)

g) Press **DOWN arrow** to initiate Learn. A transition screen appears, followed by the message **Wizard Complete.**





h) Press **DOWN arrow (Finish)** to save AFES parameter changes and return to Program menu, then press **LEFT arrow** twice to return to Measurement mode.

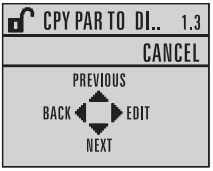
1.3. Copy Parameters to Display

See *Connecting SITRANS LR560* on page 23 for instructions on removing the local display interface.

Transfers parameter settings from a device to the local display interface.

Press **RIGHT arrow** to Edit.

Press DOWN arrow to select **Start** and **RIGHT arrow** to begin the transfer.



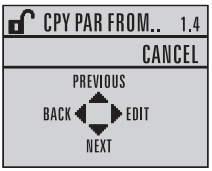
PARAM UPLOAD is displayed, then the device returns to Measurement mode.

1.4. Copy Parameters from Display

Transfers parameter settings from the local display interface to a device.

Press **RIGHT arrow** to Edit.

Press DOWN arrow to select **Start** and **RIGHT arrow** to begin the transfer.



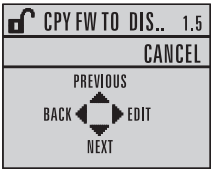
PARAM DOWNLOAD is displayed, then the device returns to Measurement mode.

1.5. Copy Firmware to Display

Transfers firmware from a device to the local display interface.

Press **RIGHT arrow** to Edit.

Press DOWN arrow to select **Start** and **RIGHT arrow** to begin the transfer.



SW UPLOAD is displayed, then the device returns to Measurement mode.

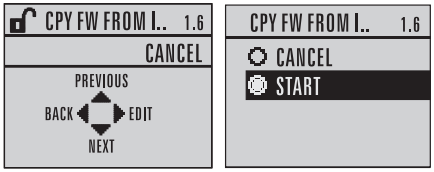
1.6. Copy Firmware from Display

Transfers firmware from the local display interface to a device.

Press **RIGHT arrow** to Edit.

Press DOWN arrow to select

Start and **RIGHT arrow** to begin the transfer.



SW DOWNLOAD is displayed at the beginning of the transfer. This is followed first by a blank screen (for approximately 2 minutes), then by a progress indicator, and then by the Siemens logo with the LOE icon. When the transfer is complete,the device returns to Measurement mode.

2. Setup

Notes:

- See *Local Operation* on page 30 or *Operating via AMS Device Manager* on page 41 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 or local control buttons.

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.

To access this parameter via AMS Device Manager see **Identification** under ***Identification (RESOURCE)*** *on page 61*.

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 61.

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 61.*

2.1.4. Installation date

Read only locally; can be written remotely. The date the device is first commissioned. (Local display format: YY-MM-DD hh:mm:ss)

2.2. Device

2.2.1. Hardware Revision

Read only. Revision corresponding to the electronics hardware of the Field Device.

2.2.2. Firmware Revision

Read only. Revision corresponding to the software or firmware that is embedded in the LR560.

2.2.3. Loader Revision

Read only. Revision corresponding to the software used to update the LR560.

2.2.4. Manufacture Date

Read only. The date of manufacture of the SITRANS LR560. (Local display format: YY-MM-DD hh:mm:ss)

2.3. Sensor

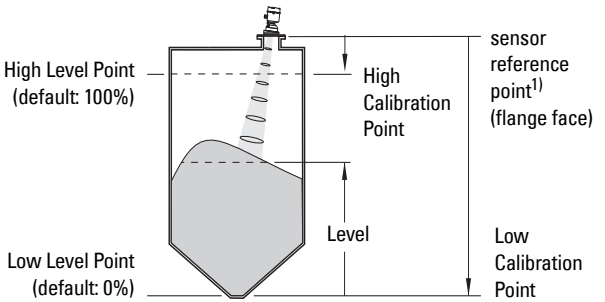
2.3.1. Unit

Sensor measurement unit.

Values	m, cm, mm, ft, in
	Default: m

2.3.2. Level Unit

*The engineering unit used for Level. High Level Point corresponds to **High Calibration Point (2.3.5.2.)** and Low Level Point corresponds to **Low Calibration Point (2.3.5.1.)**.*



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

2.3.3. Temperature Units

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

Options		K, DEGC, DEGF, DEGR
	*	DEG C

1) The point on the sensor from which measurements are referenced (see *Dimensions on page 12*).

2.3.4. Loss of Echo (LOE) Timer

Note: See *Loss of Echo (LOE) Timer (2.3.4.)* on page 145 for more detail.

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

Values	Range: 0 to 720 s
	Default: 100.000 s

2.3.5. Calibration

2.3.5.1. Low Calibration Point

Distance from sensor reference point[1] to Low Calibration Point (corresponding to Low Level Point). Unit is defined in ***Unit (2.3.1.)***

Values	Range: 0.000 to 40.000 m or 0.000 to 100.000 m. Default: 100.00 m
Related parameters	Unit (2.3.1.) Far Range (2.4.2.)

2.3.5.2. High Calibration Point

Distance from sensor reference point[1] to High Calibration Point (corresponding to High Level Point). Unit is defined in Unit (2.3.1.).

Values	Range: 0.000 to 40.000 m or 0.000 to 100.000 m. Default: 100.00 m

2.3.5.3. Sensor Offset

A constant offset (negative or positive) that can be added to the sensor value[2] 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.).

For more details see How the LTB works: in the manual, Foundation Fieldbus for Level instruments (7ML19985MP01).

Values	Range: -999999 to 999999 m. Default: 0.00 m
Related parameters	Unit (2.3.1.)

1) The point on the sensor from which measurements are referenced (see *SITRANS LR560 with stainless steel universal flat flange* on page 12 and *SITRANS LR560 with 3" Aimer Flange* on page 13).

2) See **Minimum Sensor Value (2.4.3.)** for an illustration.

2.3.5.4. 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%

2.3.5.5. 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%

2.3.5.6. 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%

2.3.6. Rate

2.3.6.1. Response Rate

Sets the reaction speed of the device to measurement changes.

Notes:
- Changing Response Rate resets Fill Rate/Min (2.3.6.2.), and Empty rate/Min (2.3.6.3.).
- Selecting SLOW Response Rate changes setting for ***Average amount (2.8.3.)*** to 0.9.

	Response Rate (2.3.6.1.)	**Fill Rate/Min (2.3.6.2.)/ Empty rate/Min (2.3.6.3.)**
	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)

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

2.3.6.2. Fill Rate/Min

Defines the maximum rate at which the reported sensor value[1] is allowed to increase. Allows you to adjust the SITRANS LR560 response to increases in the actual material level. Fill Rate is automatically updated whenever ***Response Rate (2.3.6.1.)*** *is altered.*

Options	Range: **0 to 999 999** m / min.		
	Response Rate (2.3.6.1.)		**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)
Related parameters	Level Unit (2.3.2.)		

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

2.3.6.3. Empty rate/Min

Defines the maximum rate at which the reported sensor value[1] is allowed to decrease. Adjusts the SITRANS LR560 response to decreases in the actual material level. Empty Rate is automatically updated whenever ***Response Rate (2.3.6.1.)*** *is altered.*

Options	Range: **0 to 999 999** m / min.		
	Response Rate (2.3.6.1.)		**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)
Related parameters	Level Unit (2.3.2.)		

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

1) The value produced by the echo processing which represents the distance from sensor reference point to the target (see **Minimum Sensor Value (2.4.3.)** on page 95 for an illustration).

2.4. Signal Processing

In AMS Device Manager, see the General tab under Signal Processing (LTB) on page 53.

2.4.1. Near Range

The range in front of the device (measured from the sensor reference point[1]) within which any echoes will be ignored. (This is sometimes referred to as "Blanking" or "Dead Zone".)

Values	Range: Min = 0 Max. = 45 m (40 m device) = 105 m (100 m device) Default: 0.278 m (0.91 ft)
Related parameters	Unit (2.3.1.)

2.4.2. Far Range

Notes:
- Far Range can extend beyond the bottom of the vessel.
- When Low Calibration is updated, Far Range will be updated to Low Calibration Pt. + 5 m (16.40 ft).

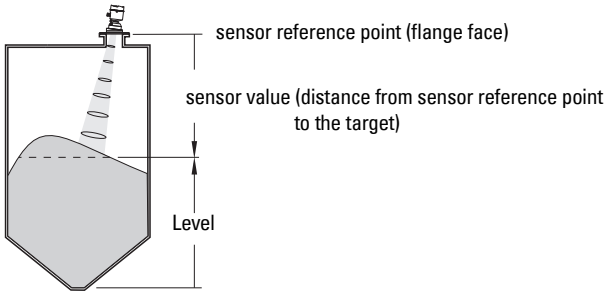
*Allows the material level to drop below Low Calibration Point without generating a Loss of Echo (LOE) state. See **CLEF Range (2.4.5.4.)** for an illustration.*

Values	Range: Min. = 0 Max. = 45 m (40 m device) = 105 m (100 m device) Default = Low Calibration Pt. + 5 m (16.40 ft)
Related Parameters	Unit (2.3.1.) CLEF Range (2.4.5.4.)

Use this feature if the measured surface can drop below the Low Cal. Point in normal operation. For more detail see *Far Range (2.4.2.)* on page 143.

[1] See *SITRANS LR560 with stainless steel universal flat flange* on page 12.

2.4.3. Minimum Sensor Value



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

For access via AMS Device Manager see **Range** under **Signal Processing (LTB)** *on page 53*.

2.4.4. Maximum Sensor Value

Read only. Defines the maximum usable value for the measuring range, in units defined in ***Unit (2.3.1.)****.*

Default depends on device:

40 m device default = 45.0 m
100 m device default = 105 m)

For access via AMS Device Manager see **Range** under **Signal Processing (LTB)** *on page 53*.

2.4.5. Echo Select

2.4.5.1. Algorithm

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

Options		**ALF**	**A**rea **L**argest **F**irst
		A	**E**cho **A**rea
		L	**L**argest Echo
	*	**F**	**F**irst Echo
		AL	**A**rea **L**argest
		AF	**A**rea **F**irst
		LF	**L**argest **F**irst
		BLF	**B**est of **F**irst or **L**argest echo
		BL	**B**est **L**argest
		BF	**B**est **F**irst
			LAST
		TF	**T**rue **F**irst

2.4.5.2. Position Detect

Note: Selecting Steel or Concrete vessel type in the Quick Start wizard changes the setting for **Position Detect (2.4.5.2.)** to Rising Edge.

Defines where on the echo the distance measurement is determined. (See ***Position Detect (2.4.5.2.)*** *on page 139 for more detail.)*

Options		Rising Edge (yields highest stability on sloped targets)
	*	Center (yields higher accuracy on flat, non-sloped targets)
		Hybrid (Center and CLEF)
		CLEF (Constrained Leading Edge Fit)
Related parameters	CLEF Range (2.4.5.4.)	

If the vessel bottom is being reported as the level instead of the actual material level (at low level conditions), we recommend setting **Position Detect** to **Hybrid** and using it in combination with **CLEF Range (2.4.5.4.)**.

2.4.5.3. 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 (2.4.7.1.)*** *exceeds* ***Echo Threshold (2.4.5.3.)****, 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 (2.3.4.)

Use this feature when an incorrect material level is reported.

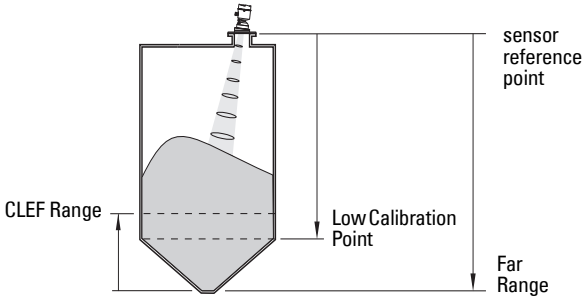
2.4.5.4. CLEF Range

Notes:
- CLEF Range is referenced from Far Range.
- The value for CLEF Range must include the difference between Far Range and Low Calibration Point, plus any level above the Low Calibration Point to be managed by the CLEF algorithm.

The CLEF (Constrained Leading Edge Fit) algorithm is 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.

It is used from Far Range up to the level defined by CLEF Range (see illustration below). Above that point the Center algorithm is used. For more detail see CLEF Range (2.4.5.4.) on page 141.

Values	Range: 0 to 45 m (40 m device) 0 to 105 m (100 m device)
	Default: 0.0 m
Related parameters	Position Detect (2.4.5.2.) Far Range (2.4.2.)



2.4.5.5. Echo Marker

The point on the primary echo on which the measured value is based.

Values	Range: 5 to 95%
	Default: 70%

Use this feature if the reported material level fluctuates slightly, due to a variable rise in the leading edge of the true echo on the Echo Profile.

Enter the value (in percent of echo height) to ensure the Echo Lock Window intersects the Echo Profile at the sharpest rising portion of the Echo Profile representing the true echo. This value is preset to 70%.

2.4.6. 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.

2.4.6.1. Echo Lock

Selects the measurement verification process. See ***Position Detect (2.4.5.2.)*** *on page 139 for more details.*

Echo Lock Options	0		Lock Off (no verification)
	1		Maximum Verification
	2	*	Material Agitator
	3		Total Lock
Related parameters	Fill Rate/Min (2.3.6.2.) Empty rate/Min (2.3.6.3.) Sampling Up (2.4.6.2.) Sampling Down (2.4.6.3.) Algorithm (2.4.5.1.)		

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

2.4.6.2. Sampling Up

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**

2.4.6.3. Sampling Down

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**
Related parameters	Echo Lock (2.4.6.1.) If Echo Lock set to any value other than its default (2), then Down Sampling default = 5.

2.4.6.4. Echo Lock Window

A "distance window" centered on the echo[1)] is used to derive the reading. When a new measurement is in the window, the window is re-centered and the reading is calculated.

Values	Range: 0 to 45 m (40 m device) or 0 to 105 m (100 m device)
	Default: 0 m

When the value is 0, the window is automatically calculated after each measurement.

- For slower Measurement Response values, the window is narrow.
- For faster Measurement Response values, the window becomes progressively wider.

Note: The Echo Lock window is stored as a standard sample, but displayed in sensor units. Any value entered for the Echo Lock window will be rounded to the nearest sample.

2.4.7. Echo Quality

2.4.7.1. Confidence

Read only. Indicates echo reliability: higher values represent better echo quality. The display shows the echo confidence of the last measurement. **Echo Threshold (2.4.5.3.)** defines the minimum criterion for echo confidence.

Values (view only)	**0** to **99**

Related Parameters	Echo Threshold (2.4.5.3.)

2.4.7.2. Echo Strength

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

Values (view only)	**–20** to **99**

1) See **Echo Lock (2.4.6.1.)** on page 118 for more detail.

2.4.8. TVT (Auto False Echo Suppression) Setup

Notes:
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.
- We recommend using AFES Wizard. See *AFES (Auto False Echo Suppression) Wizard1.2.* on page 87.

2.4.8.1. Auto False Echo Suppression

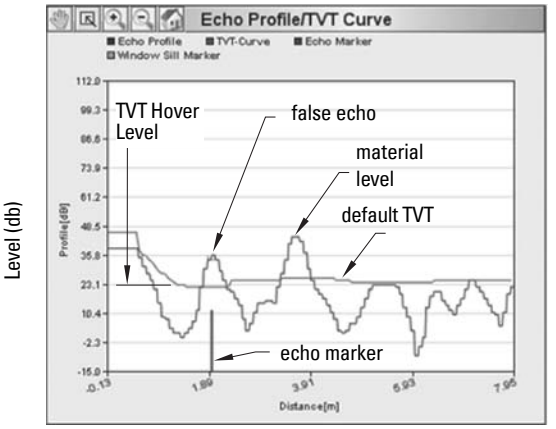
Used together with ***Auto False Echo Suppression Range (2.4.8.2.)*** *to screen out false echoes in a vessel with known obstructions. A 'learned TVT' (time varying threshold) replaces the default TVT over a specified range.*

a) 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.)

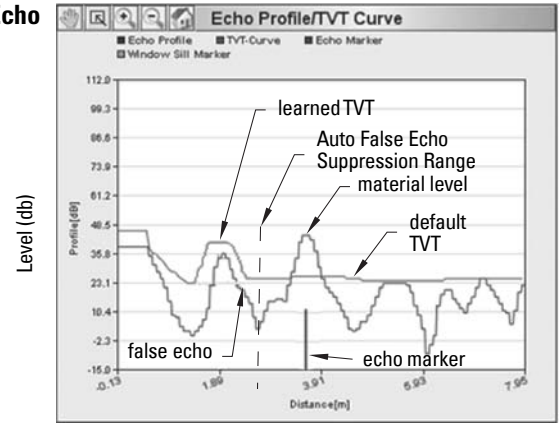
b) Determine **Auto False Echo Suppression Range**. Measure the actual distance from the sensor reference point to the material surface using a rope or tape measure.

c) Subtract 0.5 m (20") from this distance, and enter the resulting value in **Auto False Echo Suppression Range**.

Before Auto False Echo Suppression



After Auto False Echo Suppression



To use Auto False Echo Suppression via AMS Device Manager:
Note value calculated in step b) and see *TVT Setup* on page 54.

To set Auto False Echo Suppression via local operation:
See *AFES (Auto False Echo Suppression) Wizard1.2.* on page 87.

2.4.8.2. Auto False Echo Suppression Range

Note: 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.

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

Values	Range: 0.00 to 45.00 m (40 m device) or 0.00 to 105.00 m (100 m device)
	Default: 1.00 m

2.4.8.3. Hover Level

*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 100 for an illustration.)*

Values	Range: 0 to 100%
	Default: 40%

When SITRANS LR560 is located in the center of the vessel, the TVT hover level may be lowered to increase the confidence level of the largest echo.

2.4.8.4. Shaper Mode

*Enables/disables **TVT Shaper (2.4.9.)**.*

Options		ON
	*	OFF

2.4.9. TVT Shaper

Notes:

- **Shaper Mode (2.4.8.4.)** must be turned ON in order for TVT shaper breakpoints to be transferred
- We recommend using AMS Device Manager to access this feature.
- Put LTB Block into OOS Mode before changing settings, then back into AUTO mode to display TVT.

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 120 breakpoints arranged in 14 groups.

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

To access TVT shaper via AMS Device Manager see *TVT Shaper 1* on page 55.

To use TVT shaper via local operation:

a) Go to **Shaper Mode (2.4.8.4.)** and select option **ON**.
b) In TVT shaper, go to **Shaper 1-9 (2.4.9.1.)**.
c) Open Shaper 1 and enter the TVT Offset value (between –50 and +50 dB).
d) Go to the next Shaper point and repeat step (c) till all desired breakpoint values have been entered.

2.4.9.1. Shaper 1-9
2.4.9.2. Shaper 10-18
2.4.9.3. Shaper 19-27
2.4.9.4. Shaper 28-36
2.4.9.5. Shaper 37-45
2.4.9.6. Shaper 46-54
2.4.9.7. Shaper 55-63
2.4.9.8. Shaper 64-72
2.4.9.9. Shaper 73-81
2.4.9.10. Shaper 82-90
2.4.9.11. Shaper 91-99
2.4.9.12. Shaper 100-108
2.4.9.13. Shaper 109-117
2.4.9.14. Shaper 118-120

2.5. AIFB 1

Notes:

- All AIFB parameters are *read only* via local operation, and not visible to AMS Device Manager. They can be changed only by a remote host such as DeltaV or NI-FBUS-Configurator.
- AIFB 1 and AIFB 2 are not active upon initial startup. 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 the manual *Foundation Fieldbus for Level instruments (7ML19985MP01)* for details.
- Default settings in the parameter tables are indicated with an asterisk (*) unless explicitly stated.

2.5.1. 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.

2.5.2. Mode

Note: Ensure that Mode is returned to AUTO when simulation or maintenance are completed.

Used to request an operating mode from the Analog Input Function Block. It allows you to put SITRANS LR560 into Manual mode (used in conjunction with Simulation) or Out-of-Service mode for maintenance purposes.

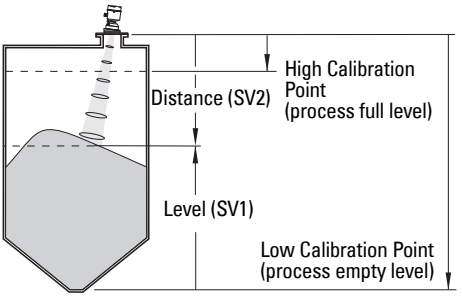
Setting	Description	Output value
AUTO	automatic	the automatically-recorded measured value
MAN	manual	a manually-set fixed simulation value
O/S	function block disabled	the preset safety value

Manual Mode can be used when simulating output.

2.5.3. Channel

Used to select the Transducer Block output. See the manual, Foundation Fieldbus for Level instruments (7ML19985MP01) for more detail.

	Options	Reference Point
*	Level (SV1 - Secondary Value 1)	Low Calibration Point
	Distance (SV2 - Secondary Value 2)	sensor reference point



2.5.4. Input Scaling

Input scaling should match the XD_scale from the Level Transducer Block. See the manual *Foundation Fieldbus for Level instruments (7ML19985MP01)* for more detail.

2.5.4.1. Lower Value

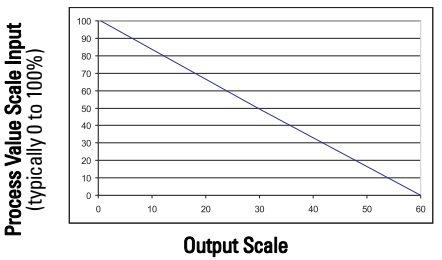
Defines the operational lower range value of the input value (Process Value Scale) in Level Units. Process Value Scale normalizes the input value to a customer-defined range.

Values	Range: -999999 to 999999
	Default: 0 %

2.5.4.2. Upper Value

Defines the operational upper range value of the input value (Process Value Scale) in 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

2.5.4.3. Unit

Engineering unit to be displayed with the output value.

Options		m, cm, mm, ft, in, %, Not Used, Unknown, Special
	*	%

2.5.4.4. Decimal Point

Read only. The number of digits to display after the decimal point (fixed to one).

2.5.5. 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.

2.5.5.1. Lower Value

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

Values	Range: -999999 to 999999
	Default: 0 %

2.5.5.2. Upper Value

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

Values	Range: -999999 to 999999
	Default: 100 %

2.5.5.3. Unit

Engineering unit to be displayed with the output value

Options		m, cm, mm, ft, in, %, Not Used, Unknown, Special
	*	%

2.5.5.4. Decimal Point

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

2.5.6. Alarms & Warnings

2.5.6.1. High Limit Alarm

The setting for the upper alarm limit in AIFB 1 units. (Corresponds to HI_HI_ALM.)

Options	Range: -999999 to 999999
	Default: – – – – – –

2.5.6.2. High Limit Warning

The setting for the upper warning limit in AIFB 1 units. (Corresponds to HI_ALM.)

Options	Range: -999999 to 999999
	Default: – – – – – –

2.5.6.3. Low Limit Warning

The setting for the lower warning limit in AIFB 1 units. (Corresponds to LO_ALM.)

Options	Range: -999999 to 999999
	Default: – – – – – –

2.5.6.4. Low Limit Alarm

The setting for the lower alarm limit in AIFB 1 units. (Corresponds to LO_LO_ALM.)

Options	Range: -999999 to 999999
	Default: – – – – – –

2.5.6.5. 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 always %.

2.5.7. Display

2.5.7.1. 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 a first order filter and the engineering unit is always in seconds. See ***Damping*** *on page 144 for more detail.)*

Values	Range: Any non-negative number can be entered Unit: 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 8.)

2.6. AIFB 2

See ***AIFB 1 (2.5.)****: the parameters for* ***AIFB 2*** *are identical to* ***AIFB 1****.*

2.7. Measured Values
(for diagnostic purposes)

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

2.7.1. Main Output (PV– Primary Value)

The value for Level.

In AMS Device Manager, see *Process Variables (Level Transducer Block - LTB)* on page 73.

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

The value for Level.

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

The value for Distance.

2.8. Filtering

2.8.1. Narrow Echo Filter

Filters out echoes of a specific width.

Values	Range: 0 to 255. Default: 0
	0 = OFF
	greater = wider

To remove a false echo from the Echo Profile, take its width in mm and multiply it by 0.013. Enter the result.

For example, to filter out a spike with 500 mm width, enter 6 or 7 (the closest integer product of 500 x 0.013).

When a value is keyed in, the nearest acceptable value is entered.

2.8.2. Reform Echo

Smooths jagged peaks in the echo profile. Reforms fragmented echoes into one echo.

Values	Range: 0 to 255 samples. Default: 0 (reset to 10 after a Quick Start has been completed)
	0 = OFF
	greater = wider
	Recommended: 5 to 20 samples. Wider is not recommended.

2.8.3. Average amount

The fraction of the old shot data that is kept for averaging purposes. A higher value will give a smoother profile at the expense of a slower echo profile response.

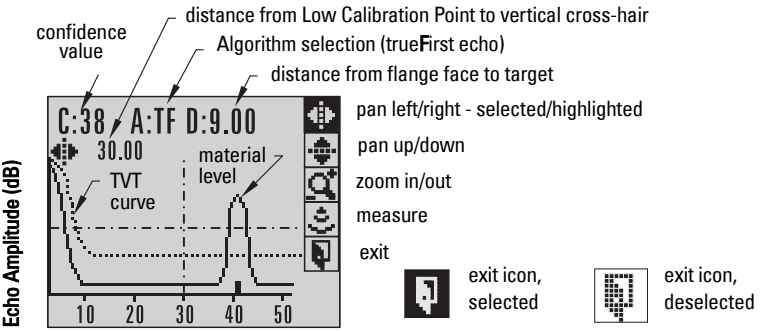
Values	0.0 to 1.0
	Default: 0.75

3. Diagnostics

3.1. Echo Profile

Notes:
- LTB Block must be put back to AUTO mode to display Echo Profile.
- Selected icon is highlighted.

Allows you to request the current echo profile either via the handheld programmer, the local buttons, or via AMS Device Manager. For more detail see Echo Processing on page 138.



Measurement Range (0 to 50 m for example purposes)

(continued on next page)

To request a profile via AMS Device Manager:
- see *Echo Profile* on page 56.

To request a profile via the handheld programmer or local control buttons:
In PROGRAM mode, navigate to **Echo Profile (3.1.).** (See ***Requesting an Echo Profile*** on page 39 for more details.)

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 (Maintenance Required), and on Device (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)
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:

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

3.3. Trend

Displays the trend of the Process Variables: sensor value, and outputs from AIFB 1/ AIFB 2. Samples are saved every minute up to 3200 samples.

In AMS Device Manager, see *Trend Values•* on page 73.

3.4. Electronics Temperature

To access the following parameters via AMS Device Manager see **Electronics Temperature** on page 58 under *Maintenance & Diagnostics (LTB).*

3.4.1. Minimum Value

*The minimum recorded internal electronics temperature, reported in units defined in **Temperature Units (2.3.3.)**.*

3.4.2. Maximum Value

*The maximum recorded internal electronics temperature, reported in units defined in **Temperature Units (2.3.3.)**.*

3.5. Peak Values

3.5.1. Minimum Measured Value

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

3.5.2. 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, Auto False Echo Suppression Range, Learned TVT.
- While an FF Object Dictionary Reset is in progress, the Master Reset Parameter View showing PREVIOUS/NEXT/BACK/EDIT options will be displayed. Do not perform an action using the local display interface until the reset is complete[b]. 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[b]	Resets all user parameters except for calibration to Factory Defaults. This option also clears any function block parameters and device schedule[c] 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) FF Object Dictionary reset completes with an automatic power cycle.

c) See the manual *Foundation Fieldbus for Level instruments (7ML19985MP01)*, Data Transmission, for more details.

To perform a reset via AMS Device Manager:

- see **Master Reset** on page 63 under *Operation (RESOURCE)* on page 62.

To perform a reset via local operation:

a) Press **RIGHT Arrow** to open Edit Mode then scroll down to the desired reset type and press **RIGHT Arrow** to select it.

b) Press **LEFT Arrow** to exit.

After a master reset is performed, the device will stop measuring, the Resource and Level Transducer Blocks will go to **Out of Service**, and the LCD will display 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 65.

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 on page 65** under *Maintenance & Diagnostics (RESOURCE)*.

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)
		REMinders 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

a) Modify limit values as required.
b) 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

a) Modify limit values as required.
b) 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 (RESOURCE)** on page 72 under *Device Diagnostics (Resource Block - RESOURCE)*.

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:

a) Press **RIGHT arrow** twice to open parameter view and activate **Edit** Mode.

b) 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 56.

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** on page 56 under *Maintenance & Diagnostics (LTB).*

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

a) First set the limit values in **Reminder 1 (Required) (4.3.5.)**/**Reminder 2 (Demanded) (4.3.6.)**.
b) 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

a) Modify limit values as required.
b) 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

a) Modify limit values as required.
b) 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 (LTB)** on page 70 under *Device Diagnostics (Level Transducer Block - LTB)*.

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:

a) Press **RIGHT arrow** twice to open parameter view and activate **Edit** Mode.

b) 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 57.

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** on page 57 under *Maintenance & Diagnostics (LTB)*.

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

a) First set the limit values in **Reminder 1 (Required) (4.4.5.)**/**Reminder 2 (Demanded) (4.4.6.)**.
b) 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

a) Modify limit values as required.
b) 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

a) Modify limit values as required.
b) 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 (LTB)** on page 70 under *Device Diagnostics (Level Transducer Block - LTB).*

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:

a) Press **RIGHT arrow** [→] twice to open parameter view and activate **Edit** Mode.

b) 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 66.

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** on page 66 under *Maintenance & Diagnostics (RESOURCE)*.

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

a) First set the limit values in **Reminder 1 (Required) (4.5.5.)**/**Reminder 2 (Demanded) (4.5.6.)**.

b) 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

a) Modify limit values as required.

b) 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

a) Modify limit values as required.

b) 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 (RESOURCE)** on page 72 under *Device Diagnostics (Resource Block - RESOURCE)*.

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:

a) Press **RIGHT arrow** [→] twice to open parameter view and activate **Edit** Mode.

b) Press **RIGHT arrow** [→] to acknowledge the alert.

4.6. Powered Hours

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

To view via AMS Device Manager see **Wear** on page 66 under *Maintenance & Diagnostics (RESOURCE)*.

4.7. Power-on Resets

The number of power cycles that have occurred since manufacture.

To view via AMS Device Manager see **Wear** *on page 66* under *Maintenance & Diagnostics (RESOURCE)*.

4.8. Menu Timeout

Time menu stays visible before switching back to Measurement view if no key is pressed.

Values	Range: 15 s to 65535 s. Default: 120 s

4.9. LCD Backlight

Time the backlight remains on.

Values	Range: **0** (backlight off) to **128** seconds (backlight always on) Default: **128** seconds

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** to **20** Default: **8**	Contrast setting will depend on ambient temperature.

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

The value displayed in the secondary region of the LCD, in Measurement Mode . [See The LCD Display on page 31, area (6) under Normal operation.]

Use **Secondary Value** to capture the menu navigation path to a selected parameter, and store a custom secondary value [for example, **Echo Strength (2.4.7.2.)**].

While in Parameter View[1)] mode of the selected parameter, press the decimal point key. This stores the path to the selected parameter in **Secondary Value**, and displays that value in the secondary region of the LCD display when in Measurement Mode.

4.12. Simulate Enable

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

Options	*	OFF	Simulation Disabled
		ON	Simulation Enabled

For more information on Simulation, see *Simulation (Input)* on page 51 in AMS Device Manager, or the manual, *Foundation Fieldbus for Level instruments (7ML19985MP01)*.

4.13. Demo Mode

Reduces the time between measurements and the accuracy for demonstration purposes.

5. Communication

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

5.1. Tag

The user-defined description for the device.

To access this parameter via AMS Device Manager see **Identification** under ***Identification (RESOURCE)*** on page 61.

1) See *Parameter view* on page 31, under *Program mode*.

5.2. Device Address

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

Device manufacturer: Siemens.

5.4. Device Type Identification

Hexadecimal integer defined by Siemens to uniquely identify each product with manufacturer's Id. (LR560 FF device= 00D7.)

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

Prevents any changes to parameters via remote or local access.

Options		Range: 0 to 9999	
	*	Unlock value 2457	Lock Off
		Any other value	Lock On

- To turn Lock On, key in any value other than the Unlock Value.
- To turn Lock Off, key in the Unlock Value.

To access this parameter via AMS Device Manager see **Write Protection** on page 67 under *Security (RESOURCE)*.

6.2.2. 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 on the local display and can only be reset using AMS Device Manager. However, if no communication activity exists for 30 seconds, the parameter will again be visible on the local display.

To access this parameter via AMS Device Manager see **Local Display** on page 59 under *Setup (LCD)*.

7. Language

Selects the language to be used on the LCD.

Options	*	ENGLISH
		DEUTSCH
		FRANÇAIS
		ESPAÑOL
		简体中文

To access this parameter via AMS Device Manager, see ***Local Display*** on page 59.

Appendix A: Alphabetical Parameter List

Appendix B: Troubleshooting

Communication Troubleshooting

1. Check the following:
   - There is power at the instrument.
   - The LCD shows the relevant data.
   - The device can be programmed using the handheld programmer.
   - If any fault codes are being displayed see *General Fault Codes* on page 130 for a detailed list.
2. Verify that the wiring connections are correct.
3. See the table below for specific symptoms (continued on next page).

Symptom	Corrective action
The device cannot be programmed via the handheld programmer.	Make sure **Write Protection (6.2.1.)** is set to the unlock value, and that **Local Operation (6.2.2.)** is enabled.
You try to set a SITRANS LR560 parameter via remote communications but the parameter remains unchanged.	• Ensure **Remote Lockout (6.1.1.)** on page 121 is disabled. • Ensure **Write Protection (6.2.1.)** on page 122 is set to the unlock value.
The controller value equals the display value but does not correspond to actual material level.	• Ensure Scaling in AIFB 1 is correctly entered. • Ensure High Calibration Point is correctly entered. • View the echo profile to see if the wrong echo is being selected. If so, see *Operation Troubleshooting* on page 134 for possible causes and corrective action.
The controller value is not equal to the displayed value (regardless of actual material level).	• Confirm you are looking at the right spot in the controller. • Ensure scaling has not been programmed into the controller: all scaling should be performed by the LR560. • Check the network to ensure the controller is communicating with the LR560.
Only the AIFB 1 and AIFB 2 parameters are displayed via LUI	• Ensure **Local Operation (6.2.2.)** on page 122 is enabled

Symptom	Corrective action (cont'd)
Not able to change parameters, such as low calibration point	• Ensure block is set to Out of Service (O/S)

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

http://www.siemens.com/LR560, and check the FAQs for SITRANS LR560, 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.

Icon	Priority Level	Meaning (cont'd)
	2	• Simulation or substitute value • Communication is good; device is in simulation mode or works with substitute values.
	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.

General Fault Codes (cont'd)		
Code /Icon	**Meaning**	**Corrective Action**
S: 3 	Device is nearing its lifetime limit as defined in **Remaining Lifetime (4.2.3.)** and has triggered **Reminder 1 (Required) (4.2.5.)**.	Replacement is recommended.
S: 4 	Device is nearing its lifetime limit as defined in **Remaining Lifetime (4.2.3.)** and has triggered **Reminder 2 (Demanded) (4.2.6.)**.	Replacement is recommended.
S: 6 	Sensor is nearing its lifetime limit as defined in **Remaining Lifetime (4.3.3.)** and has triggered **Reminder 1 (Required) (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 (2.3.5.1.)** and **High Calibration Point (2.3.5.2.)** 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: 25 	Internal device error.	Reset power. If fault persists, contact your local Siemens representative.
S: 27 	Internal device failure caused by an External RAM memory error.	Repair required: 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: 30 	EEPROM corrupt.	Reset power. If fault persists, contact your local Siemens representative.

General Fault Codes (cont'd)		
Code /Icon	**Meaning**	**Corrective Action**
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:39 	Transducer temperature sensor failure.	Repair required: contact your local Siemens representative.
S:40 	Transducer temperature too high.	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.
S: 41 	Transducer temperature too low.	Relocate device and/or raise process temperature enough to warm device. Inspect for temperature-related damage and contact your local Siemens representative if repair is required.
S:64 	Device error. NOTE: Fault text and icon appear only on LCD.	Repair required. Contact your local Siemens representative.
S:66 to S:83 	Device error. NOTE: Fault text and icons appear only on LCD.	Repair required. Contact your local Siemens representative.

General Fault Codes (cont'd)		
Code /Icon	**Meaning**	**Corrective Action**
S:94 to S:97 	Device error. NOTE: Fault text and icons appear only on LCD.	Repair required. Contact your local Siemens representative.
S:98 to S:108 	Device error. NOTE: Fault text and icons appear only on LCD.	Repair required. 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 (2.3.5.1.)**
Display shows  **S: 0 LOE**	Material build-up on antenna	• use the air purge feature to clean the antenna • re-locate SITRANS LR560
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 (2.4.8.1.)** on page 100 • ensure Auto Suppression Range is set correctly
Display shows  **S: 0 LOE**	Antenna malfunction: • temperature too high • physical damage	• check temperature in **Maximum Value (3.4.2.)** • relocate

Operation Troubleshooting (cont'd)		
Symptom	**Cause**	**Action**
Reading does not change, but the level does	SITRANS LR560 processing wrong echo, i.e. vessel wall, or structural member	• re-locate SITRANS LR560 • check nozzle for internal burrs or welds • use **Auto False Echo Suppression (2.4.8.1.)** if necessary: see **Auto False Echo Suppression (2.4.8.1.)** on page 100
Measurement is consistently off by a constant amount	• setting for **Low Calibration Point (2.3.5.1.)** not correct • setting for **Sensor Offset (2.3.5.3.)** not correct	• check distance from sensor reference point to **Low Calibration Point (2.3.5.1.)** • check **Sensor Offset (2.3.5.3.)**
Screen blank	Power error	• check nameplate rating against voltage supply • check power wiring or source
Reading erratic	Echo confidence weak	• refer to **Confidence (2.4.7.1.)** • use **Auto False Echo Suppression (2.4.8.1.)** and **Auto False Echo Suppression Range (2.4.8.2.)** • use foam deflector or stillpipe
	Material filling	• re-locate SITRANS LR560
Reading response slow	**Fill Rate/Min (2.3.6.2.)** 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	• use the air purge feature to clean the antenna • use **Auto False Echo Suppression (2.4.8.1.)** and **Auto False Echo Suppression Range (2.4.8.2.)**
Level reading lower than material level	• material is within Near Range zone • multiple echoes processed	• decrease **Near Range (2.4.1.)**: minimum value depends on antenna type • raise SITRANS LR560 • ensure **Algorithm (2.4.5.1.)** is set to t**F** (trueFirst echo)
	• vessel near empty and low dK material	• set **Position Detect (2.4.5.2.)** to **Hybrid** • check the setting for **CLEF Range (2.4.5.4.)**

Appendix C: Maintenance

SITRANS LR560 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.

Appendix D: Technical Reference

Note: Where the number follows the parameter name [for example, **Algorithm (2.4.5.1.)**] this is the parameter access number via the handheld programmer. See *Parameter Reference* on page 86 for a complete list of parameters.

Principles of Operation

SITRANS LR560 is a 2-wire 78 GHz FMCW radar level transmitter for continuous monitoring of solids in vessels[1]. Radar level measurement uses the time of flight principle to determine distance to a material surface.

FMCW radar transmits a continuous wave. The frequency of the wave is constantly increasing: this is known as the sweep. By the time the first part of the wave has been reflected off the target and returned to the device, the part of the wave that is just being emitted is at a higher frequency. The difference in frequency between the transmitted and received signals is proportional to time of flight.

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 LR560 consists of an enclosed electronic circuit coupled to an antenna and process connection. The electronic circuit generates a radar signal (78 GHz) that is directed to the antenna.

The signal is emitted from the antenna, and the reflected echoes are digitally converted to an echo profile. The profile is analyzed to determine the distance from the sensor reference point[2] to the material surface. This value (sensor value) is used as a basis for calculating the display of material level.

Process Variables

The Process Variables are sensor value and measured value. Sensor value is the distance from the sensor reference point (flange face) to the material surface. Since LR560 does not support Volume, the Measured value can be either Level (distance from low calibration point to material surface), or Distance (distance from sensor reference point to the material surface).

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

2) See *Dimensions* on page 12.

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.

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.

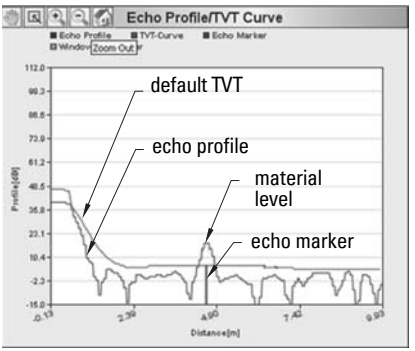
Echo Selection

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 (2.4.8.1.)* on page 142 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 (2.4.5.1.)

The true echo is selected based on the setting for the Echo selection algorithm. Options are **A**rea **L**argest **F**irst, **E**cho **A**rea, **L**argest **E**cho, **T**rue **F**irst, Area **L**argest, **A**rea **F**irst, **L**argest **F**irst, **B**est of **F**irst or **L**argest, **B**est **L**argest, **B**est **F**irst, or LAST.

Position Detect (2.4.5.2.)

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. There are four options:

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

Rising

Uses rising edge of the echo.

Center

Uses center of the echo.

Hybrid

Uses combination of Center and CLEF.

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.

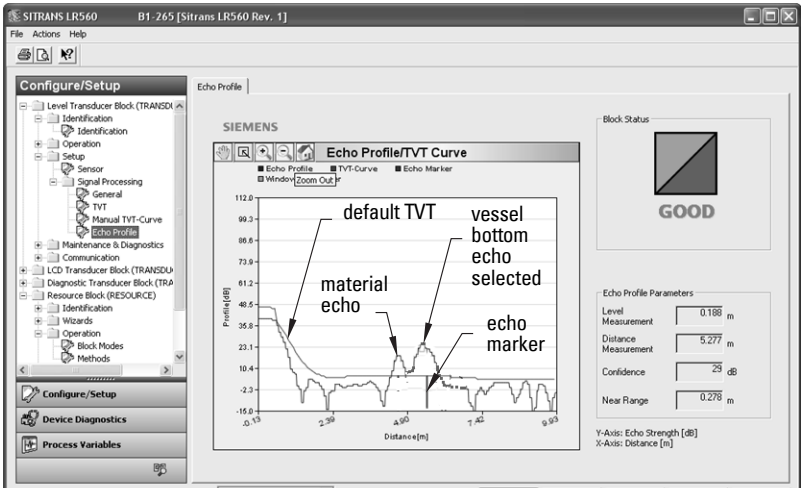
In an almost empty flat-bottomed vessel, a low dK material may reflect an echo weaker than the echo from the vessel bottom. The echo profile shows these echoes merging. The device may then report a material level equal to or lower than empty

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

See *Example: CLEF off: Position set to Hybrid* on page 140

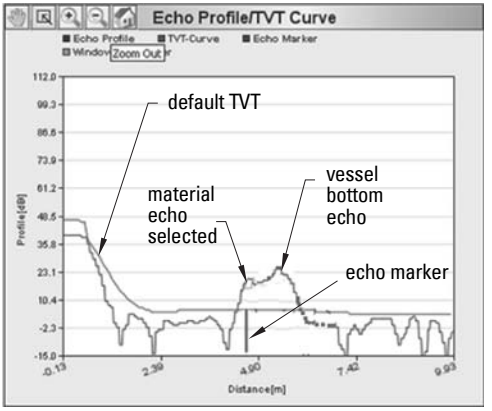
Example: CLEF off: Position set to Hybrid

Vessel height: 5 m; CLEF range set to 0 (**Center** algorithm gives the same result.)



Example: CLEF enabled

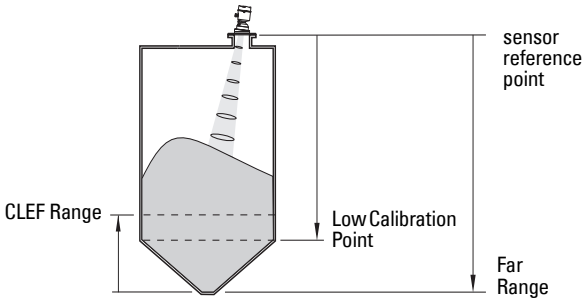
Vessel height: 5 m; Far Range 5.5 m; CLEF range set to 1 m



CLEF Range (2.4.5.4.)

Determines the level below which the CLEF algorithm will be used. Above this level the Center algorithm is used when Hybrid is selected in **Position Detect (2.4.5.2.)**.

CLEF Range is referenced from Far Range.96



Echo Threshold (2.4.5.3.)

Confidence (2.4.7.1.) 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 (2.4.6.1.)

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 LR560 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 (2.4.8.1.)

Notes:
- To access this feature via AMS see *TVT* on page 54.
- For detailed instructions on using this feature via the handheld programmer see **Auto False Echo Suppression (2.4.8.1.)** on page 100.

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.

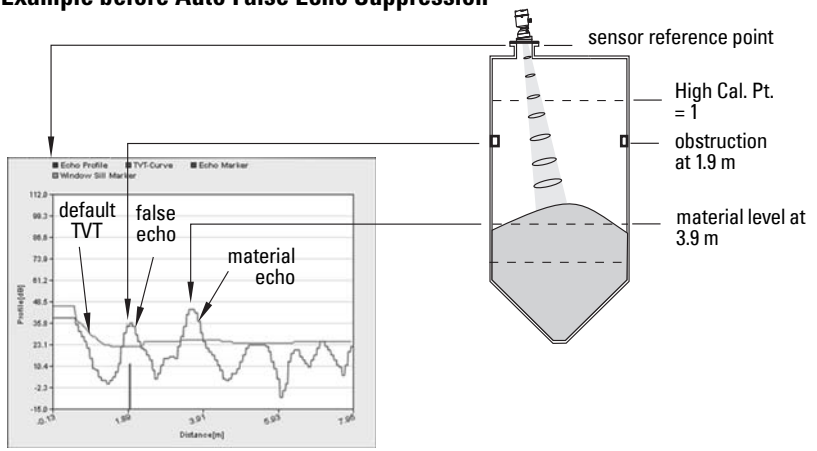
Auto False Echo Suppression Range (2.4.8.2.)

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.

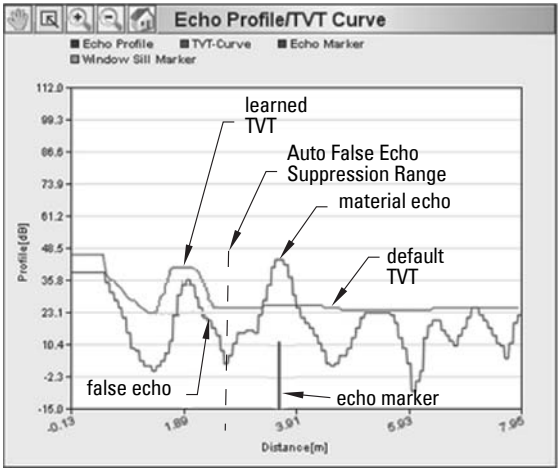
The learned TVT screens out the false echoes caused by obstructions. The default TVT allows the material echo to rise above it.

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 (2.4.1.)

Near Range programs SITRANS LR560 to ignore the zone in front of the antenna. The default blanking distance is 27.8 cm (0.91 ft) from the sensor reference point.

Near Range allows you to increase the blanking value from its factory default. But Auto False Echo Suppression (2.4.8.1.) is generally recommended in preference to extending the blanking distance from factory values.

Far Range (2.4.2.)

Far Range allows the echo processing to see and process signals that are lower than the Low Calibration setting.

Potential uses are:

- 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.
- Where Low Calibration setting is above vessel empty level, but the vessel is emptied occasionally. In this case the echo will be tracked below the Low Calibration setting and the device will maintain a zero level reading.

Measurement Response

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

Response Rate (2.3.6.1.) 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/min by default) is established, a response rate can be selected that is slightly higher than the application rate. Changing Response Rate resets Fill Rate/Min (2.3.6.2.), and Empty rate/Min (2.3.6.3.).

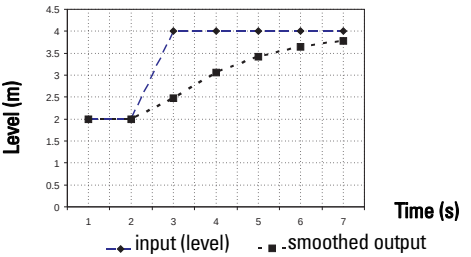
	Response Rate (2.3.6.1.)	Fill Rate/Min (2.3.6.2.)/Empty rate/Min (2.3.6.3.)
	Slow	0.1 m/min (0.32 ft/min)
*	Medium	1.0 m/min (3.28 ft/min)
	Fast	10.0 m/min (32.8 ft/min)

Damping

Filter Time Constant (2.5.7.1.) 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 (2.4.7.1.) describes the quality of an echo. Higher values represent higher quality.

Echo Threshold (2.4.5.3.) 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 (2.3.4.)** the LCD displays the Maintenance Alarm 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 Maintenance Alarm icon and error message are cleared, and the reading returns to the current level.

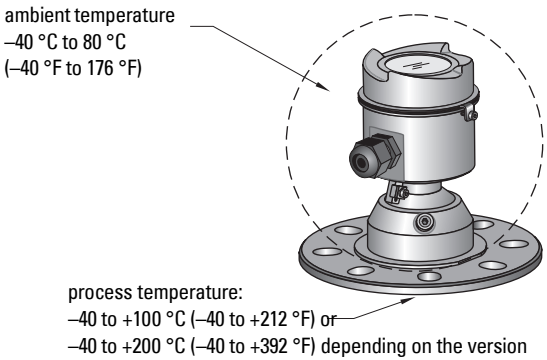
Loss of Echo (LOE) Timer (2.3.4.)

LOE Timer 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 100.000 seconds.

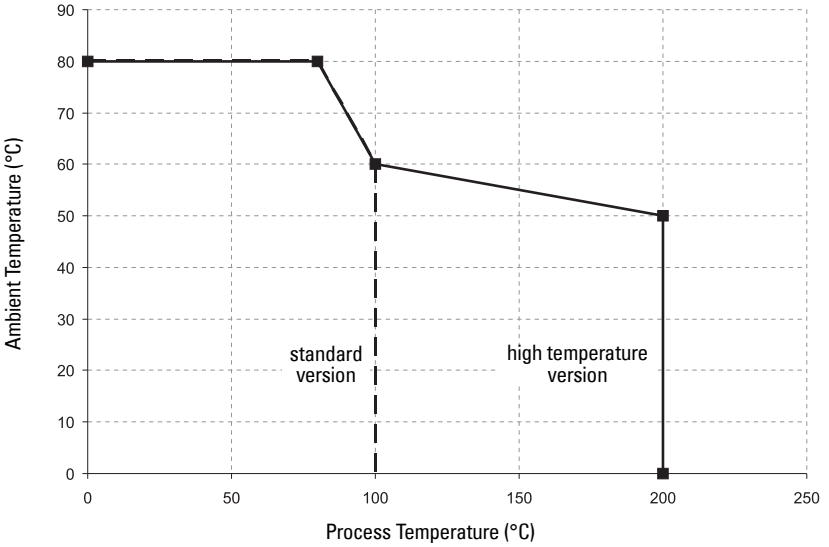
Temperature derating curves

! WARNINGS:

- **Never attempt to loosen, remove or disassemble process connection or instrument housing while vessel contents are under pressure.**
- **This product is <u>not</u> intended for use as a safety device per Directive 97/23/EC**
- **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.**



Temperature De-Rating



Appendix E: Communications

Foundation Fieldbus (FF) Protocol

SITRANS LR560 (FF) is a class 3IPS, 32L FF (H1) device. It supports publish and subscribe functionality as well as Backup LAS functionality. The full range of SITRANS LR560 functions is available only over an FF network.

Foundation Fieldbus 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 *Foundation Fieldbus (FF) Communications Instruction Manual* (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 LR560 (FF) supports Field Communicator 375 (FC375). The FC375 menu structure is almost identical to the menu structure for AMS Device Manager (see *AMS Menu Structure* on page 75.)

Appendix F: Firmware Revision History

Firmware Rev.	EDD Rev.	Date (EDD/MM/YYYY)	Changes
1.00.00	1.00.00	21 June, 2010	• Initial release.

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 custom 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.

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 1.[1)]

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 μV 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.

i**nductance:** 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.

Local Display Interface (LDI): the removable LCD display with push buttons

local user interface (LUI): view outputs via LCD display and make modifications using either the display push buttons or the handheld programmer

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.

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.

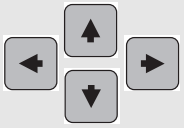
TVT (time varying threshold): a time-varying curve that determines the threshold level above which echoes are determined to be valid.

Notes

Index

LCD Menu Structure

LCD Menu Structure



Notes:

- In Navigation mode **ARROW keys** navigate the menu in the direction of the arrow..
- See *Parameter Reference (LUI)* on page 92 for detailed descriptions.

LEVEL METER

1. QUICK START

- 1.1 QUICK START WIZ
  - VESSEL
  - RESPONSE RATE
  - UNITS
  - LOW CALIB. PT.
  - HIGH CALIB. PT.
- 1.2 AFES WIZ
  - AUTO SUPP RANGE
  - LEARN TVT
- 1.3 CPY PAR TO DISPL..
- 1.4 CPY PAR FROM DIS..
- 1.5 CPY FW TO DISPL..
- 1.6 CPY FW FROM DIS..

2. SETUP

- 2.1 IDENTIFICATION
  - 2.1.1 TAG
  - 2.1.2 DESCRIPTOR
  - 2.1.3 MESSAGE
  - 2.1.4 INSTAL. DATE
- 2.2 DEVICE
  - 2.2.1 HARDWARE REV
  - 2.2.2 FIRMWARE REV
  - 2.2.3 LOADER REV
  - 2.2.4 MANUF. DATE
- 2.3 SENSOR
  - 2.3.1 UNIT
  - 2.3.2 LEVEL UNIT
  - 2.3.3 TEMP UNITS
  - 2.3.4 LOE TIMER
  - 2.3.5 CALIBRATION
    - 2.3.5.1 LOW CALIB. PT.
    - 2.3.5.2 HIGH CALIB. PT.
    - 2.3.5.3 SENSOR OFFSET
    - 2.3.5.4 LOW LEVEL POINT
    - 2.3.5.5 HIGH LEVEL POINT
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  - 2.3.6 RATE
    - 2.3.6.1 RESPONSE RATE
    - 2.3.6.2 FILL RATE/MIN
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  - 2.4.1 NEAR RANGE
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  - 2.4.3 MIN SENSOR VAL
  - 2.4.4 MAX SENSOR VAL

2. SETUP (cont'd)

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  - 2.4.5.1 ALGORITHM
  - 2.4.5.2 POS. DETECT
  - 2.4.5.3 ECHO THRESHOLD
  - 2.4.5.4 CLEF RANGE
  - 2.4.5.5 ECHO MARKER
- 2.4.6 SAMPLING
  - 2.4.6.1 ECHO LOCK
  - 2.4.6.2 UP SAMP.
  - 2.4.6.3 DOWN SAMP.
  - 2.4.6.4 ECHO LOCK WINDOW
- 2.4.7 ECHO QUALITY
  - 2.4.7.1 CONFIDENCE
  - 2.4.7.2 ECHO STRENGTH
- 2.4.8 TVT SETUP
  - 2.4.8.1 AUTO ECHO SUPP
  - 2.4.8.2 AUTO SUPP RANGE
  - 2.4.8.3 HOVER LEVEL
  - 2.4.8.4 SHAPER MODE
- 2.4.9 TVT SHAPER
  - 2.4.9.1 BRKPT. 1-9
  - 2.4.9.2 BRKPT. 10-18
  - 2.4.9.3 BRKPT. 19-27
  - 2.4.9.4 BRKPT. 28-36
  - 2.4.9.5 BRKPT. 37-45
  - 2.4.9.6 BRKPT. 46-54
  - 2.4.9.7 BRKPT. 55-63
  - 2.4.9.8 BRKPT. 64-72
  - 2.4.9.9 BRKPT. 73-81
  - 2.4.9.10 BRKPT. 82-90
  - 2.4.9.11 BRKPT. 91-99
  - 2.4.9.12 BRKPT. 100-108
  - 2.4.9.13 BRKPT. 109-117
  - 2.4.9.14 BRKPT. 118-120
- 2.5 AIFB 1
  - 2.5.1 STATIC REV. NO.
  - 2.5.2 MODE
  - 2.5.3 CHANNEL
  - 2.5.4 INPUT SCALING
    - 2.5.4.1 LOWER VALUE
    - 2.5.4.2 UPPER VALUE
    - 2.5.4.3 UNIT
    - 2.5.4.4 DECIMAL POINT
  - 2.5.5 OUTPUT SCALING
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  - 2.5.6 ALARMS & WARNI..
    - 2.5.6.1 HI LIMIT ALARM
    - 2.5.6.2 HI LIMIT WARN
    - 2.5.6.3 LO LIMIT WARN
    - 2.5.6.4 LO LIMIT ALARM
    - 2.5.6.5 LIMIT HYSTERESI..
  - 2.5.7 DISPLAY
    - 2.5.7.1 FILTER TIME CONS..

- **2. SETUP (cont'd)**
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    - 2.6.2 MODE
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