Wiring Validator

'BT-5

com Inc.
N | WIRING COMPONENTS AND TESTERS
221 Yew St.
ove, OR 97116 USA
507 Fax: (503) 357-0491
:relcominc.com

Fieldbus wiring can be tested using the FBT-5 Wiring Validator. It puts a DC voltage and fieldbus signals on the wire pair. A Fieldbus Monitor, FBT-3, is used to test the voltage, signal levels and noise on the wiring. These tests can be performed on existing instrumentation wiring, newly installed fieldbus cable or a fieldbus wiring system with wiring blocks and terminators already installed.

Connection

Connect the FBT-5 using the clip leads at one end of the cable.
Connect the Terminator using the clip leads to the other end of the cable.
Connect the FBT-3 to the Terminator. The red clips should connect to the positive Fieldbus wire and the black clip to the negative Fieldbus wire. If the wires are reversed, the Monitor will not turn on.

Operation

The Wiring Validator has a push-button Power switch that turns it on or off. If the Wiring Validator is turned on with a single click of the Power button, it stays on for about 5 minutes and then turns itself off to save battery power. If the Wiring Validator needs to be on indefinitely, push and hold down the Power button for about 3 seconds.

The green light shows that the Wiring Validator is on.

- If the green light blinks rapidly (about 3 times per second) the Wiring Validator or the Monitor is not attached to the wire pair being tested or the connection is backwards.
- If the green light blinks slowly (about once a second) there is a good connection to the wire pair, the Wiring Validator is in the battery save mode and will automatically power down in five minutes.
- If the green indicator light is on continuously there is a good connection and the Wiring Validator will stay on until it is turned off.

When the Wiring Validator is turned on, the Monitor powers up and shows the following readings.

- Voltage should be between 9 and 10 Volts
- Push the Monitor's mode button once to get the LAS function. The LAS signal level reading should say "OK" and show the signal level.

Signal Level	Wire Condition
350 or more	Excellent
200 - 350	Good
150 - 200	Marginal
150 or less	Not Good

nitor's mode button three
ıe NOISE AVerage function.
should say "OK" and show a
g.

el	Wire Condition
	Excellent
	Good
	Marginal
	Not Good

n Testing
ire system with two
and other wiring blocks
be tested before devices are
This is done the same way as
ing described above. The
ıce is that the Test
s not used.

wiring system cannot have
ices or power supply
t during the test. The Wiring
n not power the fieldbus
its signal generator will
h any data transmission that
devices might initiate.

If the wiring system has the two terminators required for fieldbus operation, the wiring system test will have results comparable to the testing the wire by itself. If, however, not enough terminators or too many terminators have been installed, the measured signal levels will be different. The chart below show the relative changes:

Number of Terminators	LAS Signal Level
0	999
1	961
2 (required number)	760
3	637

Error Conditions
If the outputs of the Wiring Validator are shorted, the red Low Battery light blinks on and off. (As the Wire Validator is attached to wires, the Low Battery indicator may blink on momentarily). If the battery is low, the red light is on continuously.

Self Test
To check if the Wiring Validator and the Monitor are working correctly, connect them to each other through the Test Terminator.

Function	Indication
Voltage	9.5 or more
LAS	650 or more
NOISE AV	20 or less

Battery
Under continuous use, the Wiring Validator's batteries last about 12 hours. When the batteries are low, the red light is on continuously.

The Wiring Validator's uses four replaceable AA-cell alkaline batteries. To change the batteries, unscrew the four screws at the bottom of the Wiring Validator to remove the back cover and replace the batteries.

Caution
The Wiring Validator must not be used in hazardous areas or to power wiring that runs into hazardous areas.

Operating temperature range
0 to 50 °C.

Additional Wiring Test
To get a complete characterization of the fieldbus wire, test the resistance between wires in the cable with an ordinary ohmmeter:

- The resistance between the two twisted-pair wires
- The resistance between each of the wires and the drain/shield (if any)
- The resistance between the drain/shield and instrument ground bar.

Readings of 100K ohms or higher are acceptable.

Document: 500-052 Rev: 0

Product Insert — FBT-6 and FBT-6-PA — Fieldbus Monitor

1010.1 Equipment Information

Equipment Class II, Pollution Degree 2, Installation Category II
Maximum Altitude: 2000m
Humidity: 0 to 90% (non-condensing)
Operating Temperature: -20°C to 50°C

Electrical Ratings (see Drawing for connection information and certified devices)

Area Classification	Ratings	Agency	Drawing
General Purpose; Class I, Div 2/Zone 2 NIFW, FNICO	See drawing	FM	501-353
Class I, Div 1/Zone 1/Zone 0 (Ex ia IIC T4) Entity IS, FISCO	See drawing	FM, LCIE	501-353
General Purpose; Class I, Div 2/Zone 2 (ATEX Ex nL IIC T4, Ex ic IIC T4)	See ATEX category 3 instructions	Relcom	Page 4
Class I, Zone 1/Zone 0 (Ex ia IIC T4) Entity IS, FISCO; Class I, Zone 2 (Ex ic IIC T4)	See drawing	IECEx	502-409

General Information

The FBT-6 and FBT-6-PA Fieldbus Monitors are hand-held electronic devices for determining the health of Foundation Fieldbus and Profibus PA networks, respectively. In this document, FBT-6(-PA) is used to refer to either the FBT-6 or the FBT-6-PA. They can be used in safe (non-hazardous) locations as well as Class I Division 2/Zone2 and Class I Division1/Zone 1/Zone 0 areas. For use in hazardous areas, refer to drawing 501-353 on the following page.

⚠ **The FBT-6(-PA) carrying case is not approved for use in hazardous areas.**

Special Conditions of Use

⚠ **The USB connector shall only be connected to other apparatus when the FBT-6(-PA) is located in an unclassified (a.k.a. safe or non-hazardous) location.**

The Fieldbus and USB connections shall not be connected to electrical circuits at the same time.

For IECEx, all connections must be supplied from a galvanically isolated intrinsically safe supply.

Operation

See the FBT-6 User Manual or FBT-6-PA User Manual for operating instructions and software installation instructions.

Maintenance

The FBT-6(-PA) contains no user serviceable parts and must be returned to the manufacturer for repair.

Check for frayed or broken wires, missing insulation, case damage, LCD damage and connector damage before use. Replace a damaged FBT-6(-PA) or damaged cables.

The FBT-6(-PA) may be cleaned with a slightly damp cloth. Do not use any chemicals or abrasives to clean the FBT-6(-PA).

For Further Information

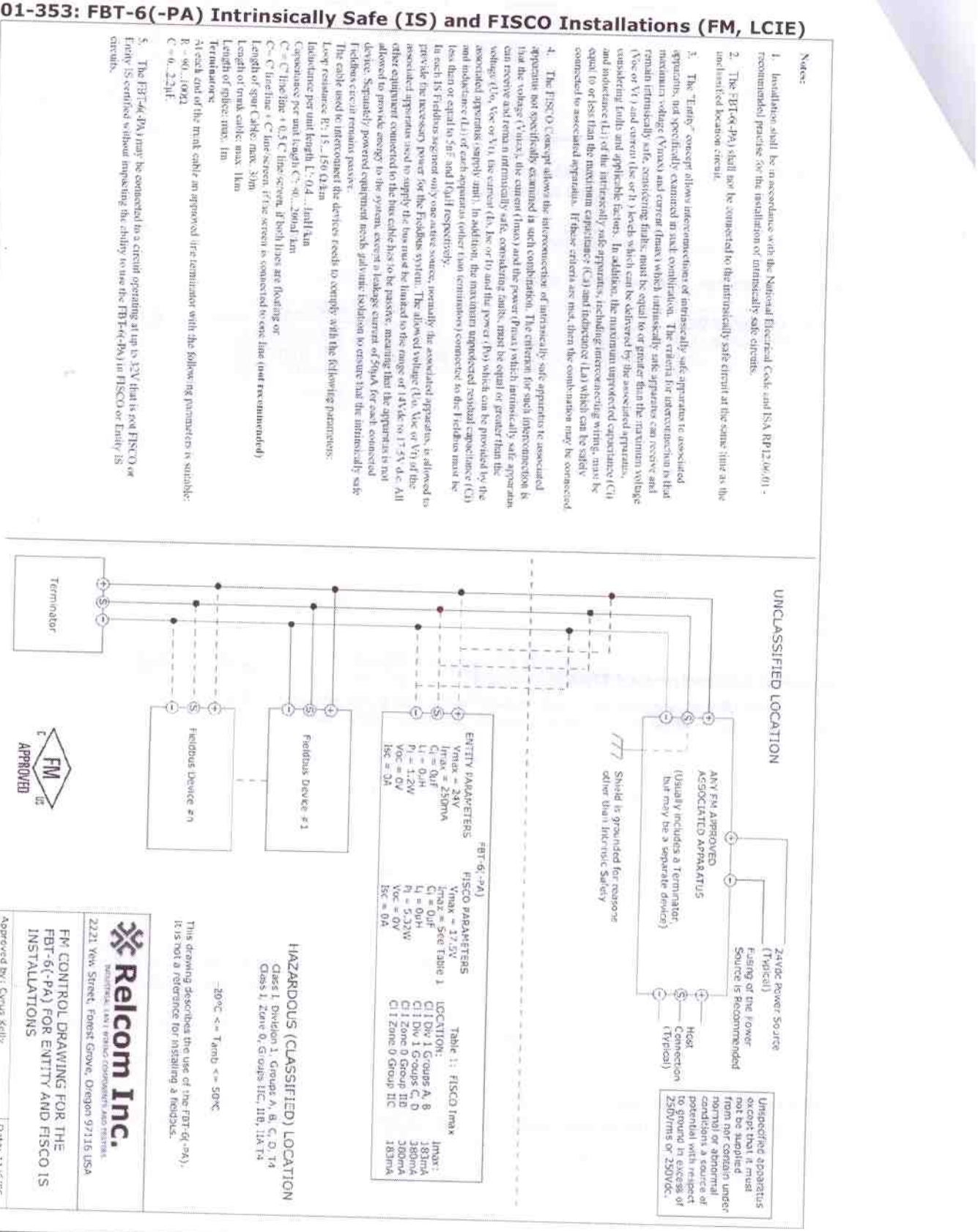
Contact your local MTL representative or Relcom Inc. as listed at the bottom of this page.

Relcom Inc.
INDUSTRIAL LAN | WIRING COMPONENTS AND TESTERS
2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com
501-315 Rev. D

501-353: FBT-6(-PA) Intrinsically Safe (IS) and FISCO Installations (FM, LCIE)

Notes:

1. Installation shall be in accordance with the National Electrical Code and ISA RP12.06.01 - recommended practice for the installation of intrinsically safe circuits.
2. The FBT-6(-PA) shall not be connected to the intrinsically safe circuit at the same time as the unclassified location circuit.
3. The "Entity" concept allows interconnection of intrinsically safe apparatus to associated apparatus, not specifically examined in such combination. The criteria for interconnection is that maximum voltage (Vmax) and current (Imax) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal to or greater than the maximum voltage (Voc or Vt) and current (Isc or It) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (Ci) and inductance (Li) of the intrinsically safe apparatus, including interconnecting wiring, must be equal to or less than the maximum capacitance (Ca) and inductance (La) which can be safely connected to associated apparatus. If these criteria are met, then the combination may be connected.
4. The FISCO concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Vmax), the current (Imax) and the power (Pmax) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the associated apparatus supply unit's maximum output voltage (Uo, Voc or Vt), the current (Io, Isc or It) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than terminators) connected to the Fieldbus must be less than or equal to 5nF and 10uH respectively.
In each IS Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo, Voc or Vt) of the associated apparatus used to supply the bus must be limited to the range of 14Vdc to 17.5V dc. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except a leakage current of 50uA for each connected device. Separately powered equipment needs galvanic isolation to ensure that the intrinsically safe Fieldbus circuit remains passive.
This cable used to interconnect the devices needs to comply with the following parameters:
Loop resistance R': 15...150 Ω/km
Inductance per unit length L': 0.4 ...1mH/km
Capacitance per unit length C': 80...200nF/km
C' = C' line/line + 0.5 C' line/screen, if both lines are floating or
C' = C' line/line + C' line/screen, if the screen is connected to one line (not recommended)
Length of spur Cable: max. 30m
Length of trunk cable: max. 1km
Terminators:
At each end of the trunk cable an approved line terminator with the following parameters is suitable:
R = 90...100Ω
C = 0...2.2uF
5. The FBT-6(-PA) may be connected to a circuit operating at up to 32V that is not FISCO or Entity IS certified without impacting the ability to use the FBT-6(-PA) in FISCO or Entity IS circuits.



2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com

501-353: FBT-6(-PA) Fieldbus Non-Incendive Field Wiring and FNICO Installations (FM)

2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com

502-409: FBT-6(-PA) Intrinsically Safe (IS) and FISCO Installations (IECEx)

Notes:

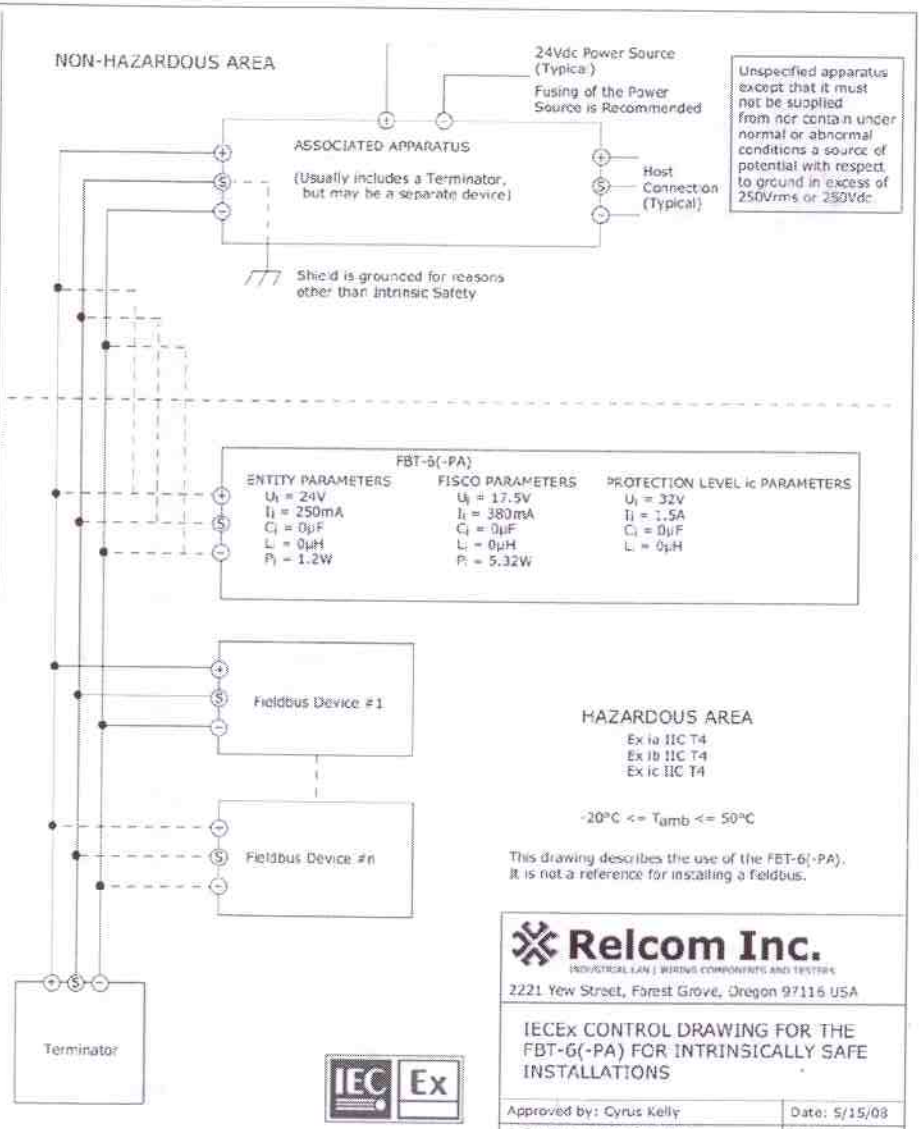
1. The FBT-6(-PA) shall not be connected to the intrinsically safe circuit at the same time as the non-hazardous area circuit.

2. The FBT-6(-PA) may be connected to a circuit operating at up to 32V that is not FISCO or Entity IS certified without impacting the ability to use the FBT-6(-PA) in FISCO or Entity IS circuits at some later time (cannot connect to IS and non-IS circuits at the same time).

3. The "Entity" concept allows interconnections of intrinsically safe apparatus to associated apparatus, not specifically examined in such combination. The criteria for interconnection is that maximum voltage (Ui) and current (Ii) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal to or greater than the maximum voltage (Uo) and current (Io) levels which can be delivered by the associated apparatus, considering faults and applicable factors. In addition, the maximum unprotected capacitance (Ci) and inductance (Li) of the intrinsically safe apparatus, including interconnecting wiring, must be equal to or less than the maximum capacitance (Co) and inductance (Lo) which can be safely connected to associated apparatus. If these criteria are met, then the combination may be connected.

4. The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Ui), the current (Ii) and the power (Pi) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo), the current (Io) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than terminators) connected to the Fieldbus must be less than or equal to 5nF and 10µH respectively.
In each IS Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo) of the associated apparatus used to supply the bus must be limited to the range of 14Vdc to 17.5V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except a leakage current of 50µA for each connected device.
Separately powered equipment needs galvanic isolation to ensure that the intrinsically safe Fieldbus circuit remains passive.
The cable used to interconnect the devices needs to comply with the following parameters:
Loop resistance R': 15...150 Ω/km
Inductance per unit length L': 0.4...1mH/km
Capacitance per unit length C': 80...200nF/km
C' = C' line/line + 0.5 C' line/screen, if both lines are floating or
C' = C' line/line + C' line/screen, if the screen is connected to one line **(not recommended)**
Length of spur Cable: max. 30m
Length of trunk cable: max. 1km
Length of splice: max. 1m
Terminators:
At each end of the trunk cable an approved line terminator with the following parameters is suitable:
R = 90...100Ω
C = 0...2.2µF.

All connections must be supplied from a galvanically isolated intrinsically safe supply.



2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com
501-315 Rev. D

Relcom Inc.
INDUSTRIAL LAN | WIRING COMPONENTS AND TESTERS

ATEX CATEGORY 3 INSTRUCTIONS

Safety instructions for installation and operating personnel

This product insert and the user manual contain basic safety instructions for installation, operation and maintenance and servicing. Failure to comply with these instructions can endanger personnel, the plant and the environment.

Before use:

- Read the product insert and user manual.
- Give adequate training to the operating personnel.
- Ensure that the contents of the product insert and user manual are fully understood by responsible personnel.
- The national installation and mounting regulations (e.g. IEC 60079-14, National Electrical Code) apply.

When operating the apparatus:

- Make the product insert and user manual available at all times.
- Observe safety instructions.
- Observe national safety and accident prevention regulations.
- Operate the equipment within its published specification.

Servicing/maintenance work or repairs which are not described in the operating instructions must not be performed without prior agreement with the manufacturer.

Any damage may render explosion protection null and void.

No changes to the devices or components impairing their explosion protection are permitted.

The device may only be used if it is in an undamaged, dry and clean state.

Electrical Ratings

Vmax	Imax	Ci	Li	Voc	Isc
32V	1.5A	0uF	0uH	0V	0A

2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com

ATEX Safety Instructions

FBT-6
FBT-6-PA

Fieldbus Monitors

The following information is in accordance with the Essential Health and Safety Requirements (Annex II) of the EU Directive 94/9/EC [the ATEX Directive - safety of apparatus] and is provided for those locations where the ATEX Directive is applicable.

General

a) In common with all other electrical apparatus installed in hazardous areas, this apparatus must only be installed, operated and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis. [See clause 4.2 of EN 60079-17].

b) This apparatus meets the requirements of electrical apparatus in accordance with EN 60079-0, EN 60079-11, and EN 60079-27.

c) This apparatus provides protection against all the relevant additional hazards referred to in Annex II of the directive, such as those in clause 1.2.7.

Installation

a) Product use must comply with the appropriate European, national and local regulations, which may include reference to the IEC code of practice IEC 60079-14. In addition, particular industries or end users may have specific requirements relating to the safety of their installations and these requirements should also be met. For the majority of installations the Directive 1999/92/EC [the ATEX Directive - safety of installations] is also applicable.

b) This apparatus is a portable electrical apparatus and may be used in a hazardous area (Zone 0, 1 or 2). No mounting or additional enclosure is required.

c) This apparatus must not be subjected to mechanical and thermal stresses in excess of those permitted in the certification documentation, this safety information and the product specification.

d) The apparatus must not be used where it may be attacked by aggressive substances and must be protected from excessive dust, moisture and other contaminants.

e) The apparatus enclosure is made of 8% carbon fiber reinforced ABS plastic and the front panel is covered by a polyester film. The user must determine if the apparatus is safe for use in particular surrounding conditions.

⚠ Special Conditions For Safe Use

The USB connector shall only be connected to other apparatus when the FBT-6(-PA) is located in an unclassified (a.k.a. safe or non-hazardous) location.

The Fieldbus and USB connections shall not be connected to electrical circuits at the same time.

While used in IS applications, the FBT-6(-PA) must be connected only to equipment certified for intrinsic safety and compatible with the parameters listed in Table 1.

	Entity IS parameters	FISCO parameters
Ui (V)	24	17,5
Ii (mA)	250	380
Pi (W)	1,2	5,32
Li	0	0
Ci	0	0

Table 1 – Parameters for use in IS applications

2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com

Inspection and maintenance

a) Inspection and maintenance should be carried out in accordance with European, national and local regulations which may refer to the IEC standard IEC 60079-17. In addition, specific industries or end users may have specific requirements which should also be met.
b) Access to the internal circuitry must not be made during operation or at any other time.
c) If the outer enclosure of the apparatus needs to be cleaned, this should be done with a cloth lightly moistened by a dilute mixture of detergent in water.

Repair

This product must not be repaired. It must be replaced by an equivalent certified product.

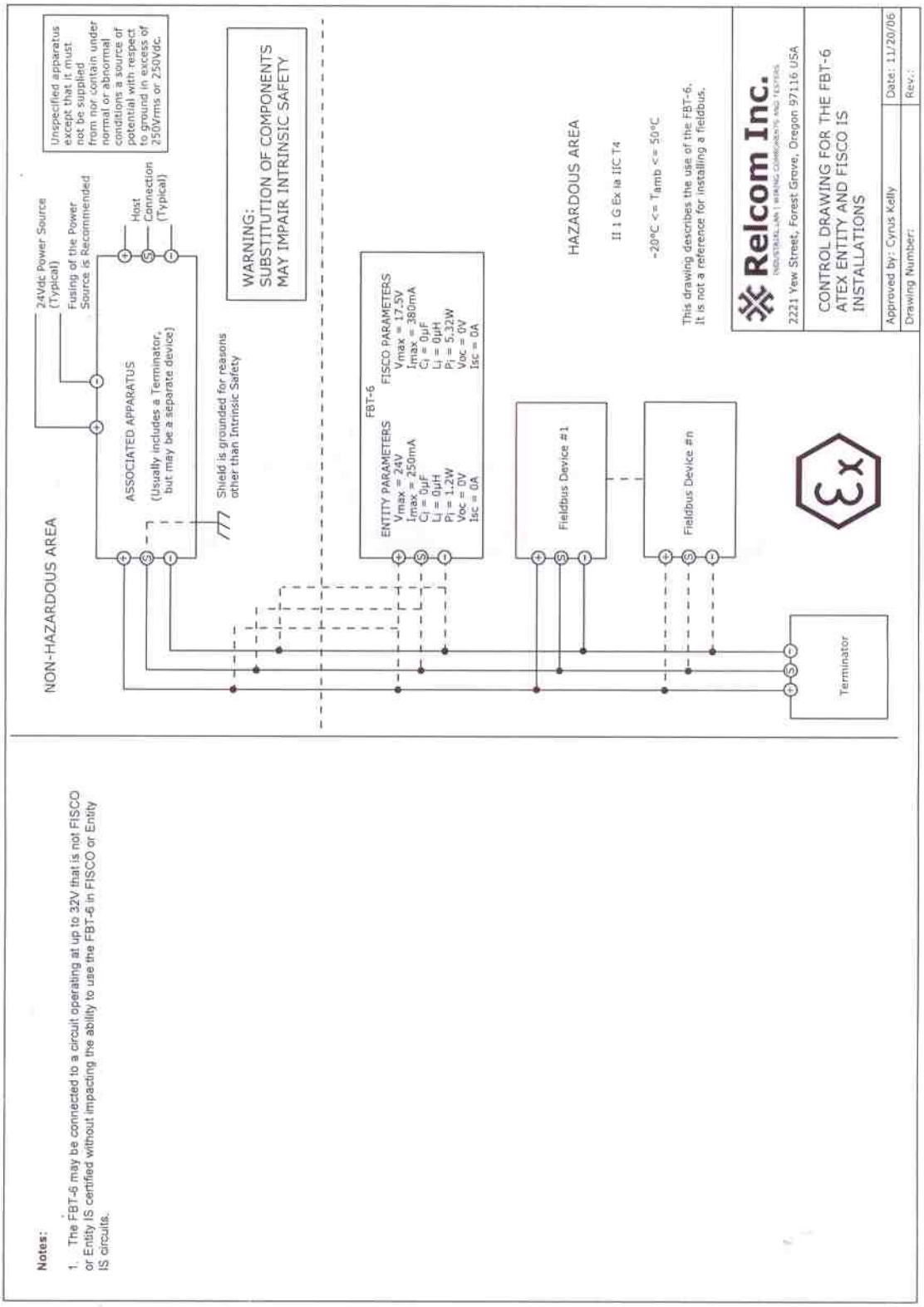
Marking

Each fieldbus monitor is marked with the following information:

a) Company Name, and Address (shown below)
b) Product Number
c) Certificate number – **LCIE 06 ATEX 6111 X**
d) Ex classification – **II 1 G Ex ia IIC T4**
e) CE mark and Notified Body Number (LCIE) – **0081**
f) Ambient Temperature range - **-20C ≤ Tamb ≤ 50C**

2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com

FBT-6 ATEX Intrinsic Safety Control Drawing (Entity and FISCO)



2221 Yew Street
Forest Grove, Oregon 97116 USA
(503) 357-5607 or (800) 382-3765
Fax (503) 357-0491
www.relcominc.com

EC Declaration of Conformity

502-154 Rev: D.0

We declare under our sole responsibility that the FBT series products listed in Annex 1 overleaf, to which this declaration relates, conform with the requirements of the Directives below by compliance to the standards listed:

1. Council Directive 2004/108/EC (EMC Directive) relating to Electro-Magnetic Compatibility.

   EN 61326-1:2006 (Table 2 – industrial locations) Class A equipment.

2. Council Directive 2006/95/EC (Low Voltage Directive) relating to Product Safety.

   Product complies with the LVD because it does not provide voltage isolation and the maximum specified input voltage is below 75VDC.

3. Council Directive 94/9/EC (ATEX Directive) relating to equipment and protective systems intended for use in potentially explosive atmospheres.

   See Annex 1 for Standards used to show compliance with the ATEX directive.

09/25/09

M. Strauser
Senior Fieldbus Engineer

M. Graube
President

Relcom Inc.
INDUSTRIAL LAN | WIRING COMPONENTS AND TESTERS

+1 503 357-5607

2221 Yew Street, Forest Grove, OR 97116, USA

www.relcominc.com

Annex 1 - Conforming Products

Product	Description	EMC[1]	LVD[2]	ATEX[3]	Cat1/Cat2 ATEX Cert. No.	Cat3 ATEX Cert. No.
FBT-3	Fieldbus Monitor	Yes	Yes	N/R	None	None
FBT-4	Fieldbus Power and Signal Probe	Yes	Yes	N/R	None	None
FBT-5	Wiring Validator	Yes	Yes	N/R	None	None
FBT-6	Fieldbus Monitor – FF	Yes	Yes	Yes	LCIE06ATEX6111X	RELC07ATEX1003X
FBT-6-PA	Fieldbus Monitor – Profibus PA	Yes	Yes	Yes	LCIE06ATEX6111X	RELC07ATEX1003X

Notes relating to CE Marking:

1. Entries in this column may be: 'Yes' – Product conforms to the EMC Directive; 'N/R' – Product is not required to conform to the EMC Directive
2. Entries in this column may be: 'Yes' – Product conforms to the LVD Directive; 'N/R' – Product is not required to conform to the LVD Directive
3. Entries in this column may be: 'Yes' – Product conforms to the ATEX Directive; 'N/R' – Product is not required to conform to the ATEX Directive

Certificate Number	Standards	Notified Body		
		Number	Name	Address
LCIE06ATEX6111X	EN 60079-0: 2006 (note 1) EN 60079-11: 2007 (note 1) EN 60079-27: 2008 (note 1)	0081	LCIE	33 Avenue du General Leclerc 92262 Fontenay-aux-Roses France
RELC07ATEX1003X	EN 60079-0: 2006 EN 60079-11: 2007 EN 60079-15: 2005	Not Required – Relcom ATEX Category 3 Self Certification		

Notes relating to the EN Standards:

1. The original LCIE Certificate used EN 60079-0:2004, prEN60079-11:2005, and EN60079-27:2004. We have determined that there are no technological differences (affecting the products) between these standards and the currently harmonized EN standards listed above.