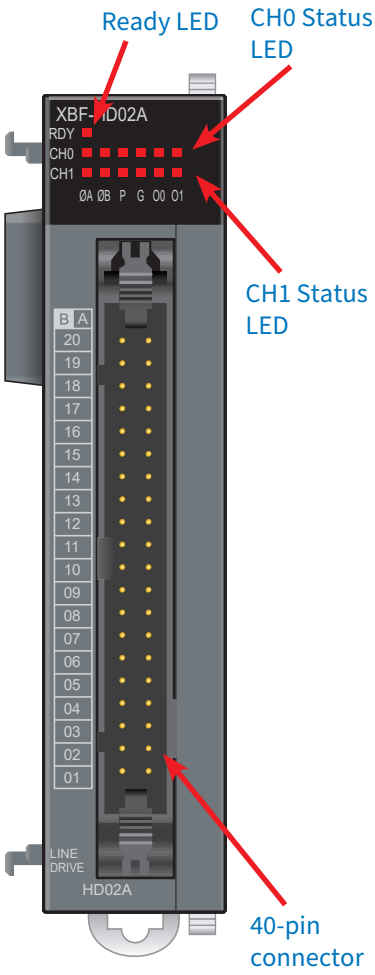
XBF-HD02A Counter Input Module

Part Number	Price	Classification	Description	# of Channels	Drawing
XBF-HD02A	$253.00	Counter Input	LS Electric XGB counter input module, 500 kHz maximum switching frequency, 2 high-speed input point(s), 5-24 VDC, sinking, 2-channel, differential encoder input(s), 2 high-speed output point(s), 5-24 VDC, sinking, external 24 VDC required.	2	PDF

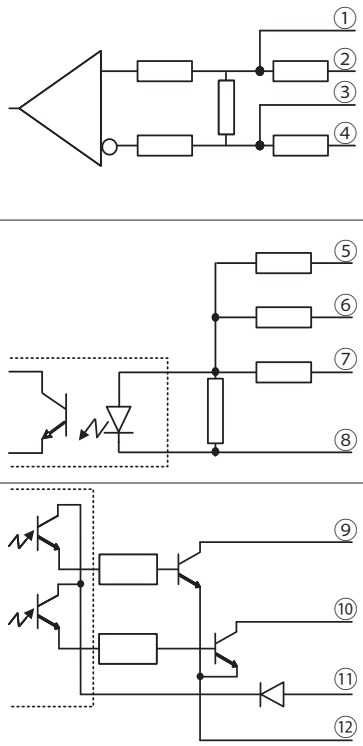
General Specifications		XBF-HD02A
Count Input Signal	Signal	A-phase, B-phase
	Input Type	Differential input (Line Drive)
	Signal Level	RS-422A Line Drive/HTL LEVEL Line Drive
Maximum Coefficient Speed		500kpps (HTL input: 250kpps)
Number of Channels		2
Coefficient Range		Signed 32-bit (-2,147,483,648 to +2,147,483,647)
Count Mode		Linear Count (when 32-bit range exceeded, carry/borrow occurs, the count value stopped)
		Ring Count (repeated count within setting range)
Input Pulse Mode		1-phase input
		2-phase input
		CW/CCW
Up/Down Setting	1-phase Input	Increasing/decreasing operation setting by B-phase input
		Increasing/decreasing operation setting by program
	2-phase Input	Automatic setting by difference in phase
	CW/CCW	A-phase input: increasing operation
		B-phase input: decreasing operation
Multiplication Function	1-phase Input	1/2 multiplication
	2-phase Input	1/2/4 multiplication
	CW/CCW	1-multiplication
Control Input	Signal	Preset instruction input, auxiliary mode instruction input
	Signal Level	5/12/24 VDC (by terminal selection) input type
	Signal Type	Voltage
External Output	Output Points	2-point/channel (for each channel): terminal output available
	Type	Select single-compared (>, ≥, =, ≤, <) or section compared output (included or excluded)
	Output Type	Open collector output (sink)
Operation Status Display	Input Signal	A-phase input, B-phase input, preset instruction input, auxiliary mode instruction input
	Output Signal	External output 0, external output 1
	Ready Status	Module Ready
Count Enable		Set through program (count available only in enable status)
Preset Function		Set through terminal or program
Auxiliary Mode Function		Count clear, count latch, section count (time setting value: 0–60,000 ms), measurement of input frquency (for respective input phase), measurement of counts per hour (time setting value: 0–60,000 ms), count prohibited function
Terminal		40-pin connector
I/O Points Occupied		Fixed point: 512
Internal Consumed Current		260mA
Weight		90g



XBF-HD02A Counter Input Module Wiring

XBF-HD02A Circuit Configuration

Circuit Configuration	Internal Circuit Number	XTB-40H Terminal	Pin Number CH0	Pin Number CH1	Signal Name	Driver Type
Input	1	AI+	B20	A20	A I phase differentiation input +	RS-422A line driver
	2	AII+	B19	A19	A II phase differentiation input +	HTL level line driver
	3	AI-	B18	A18	A I phase differentiation input -	RS-422A line driver
	4	AII-	B17	A17	A II phase differentiation input -	HTL level line driver
	1	BI+	B16	A16	B I phase differentiation input +	RS-422A line driver
	2	BII+	B15	A15	B II phase differentiation input +	HTL level line driver
	3	BI-	B14	A14	B I phase differentiation input -	RS-422A line driver
	4	BII-	B13	A13	B II phase differentiation input -	HTL level line driver
	5	P24V	B12	A12	Preset input 24V	User terminal per appropriate external power source voltage (5, 12, or 24 VDC)
	6	P12V	B11	A11	Preset input 12V	
	7	P5V	B10	A10	Preset input 5V	
	8	PCOM	B09	A09	Preset input COM	n/a
	5	G24V	B08	A08	Auxiliary function input 24V	User terminal per appropriate external power source voltage (5, 12, or 24 VDC)
	6	G12V	B07	A07	Auxiliary function input 12V	
	7	G5V	B06	A06	Auxiliary function input 5V	
	8	GCOM	B05	A05	Auxiliary function input COM	n/a
Output	9	OUT0	B04	A04	Comp. output 0	
	10	OUT1	B03	A03	Comp. output 1	
	11	24V	B02	A02	External power input 24V	
	12	24G	B01	A01	External poiwer input GND	



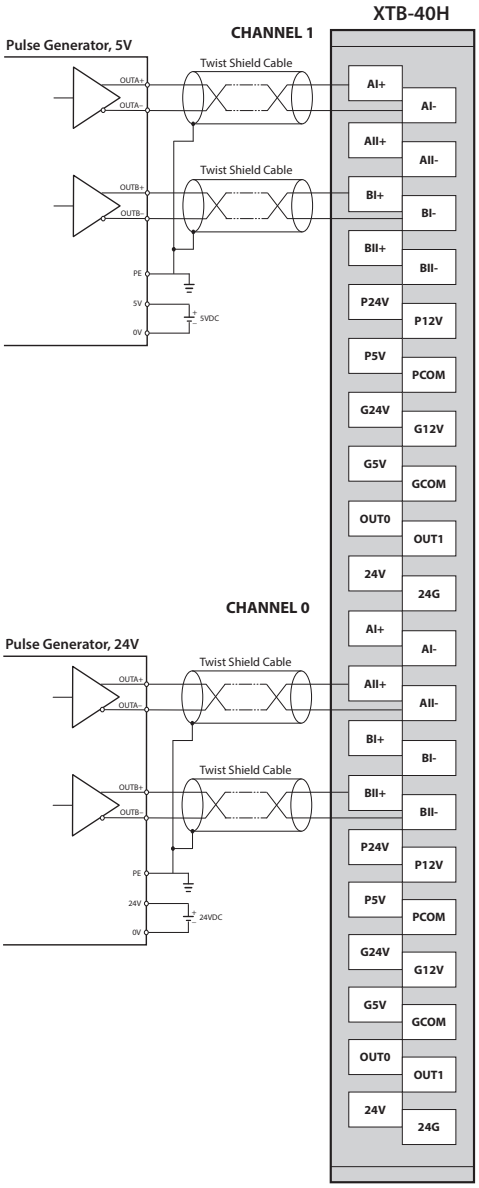
Note: AI+, AI-, BI+, BI- are 5V line driver input terminal. AII+, AII-, BII+, BII- are 24V line driver input terminal.

XBF-HD02A Counter Input Module Wiring

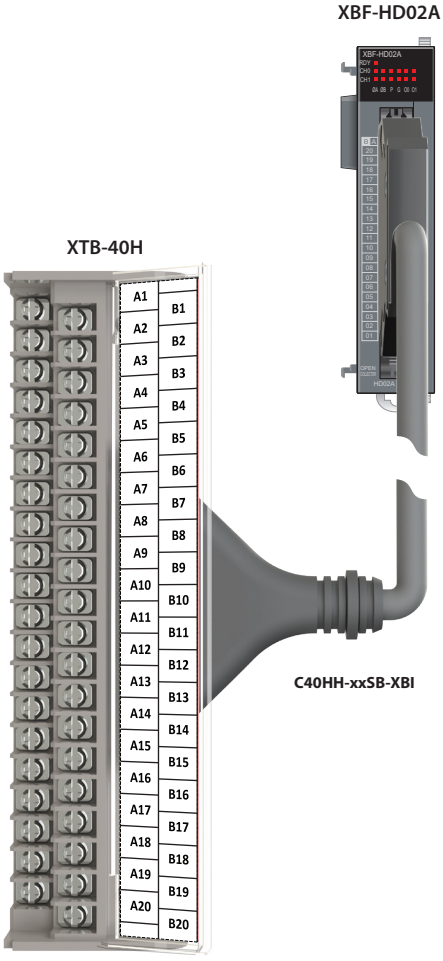
When connecting cable to your XBF-HD02A:

- Take precautions to shield high-speed input wiring from external noise sources.
- Use grounded twisted pair shielded cable (Class3)
- Keep input wiring clear of power or I/O wiring to prevent noise.
- For single-phase applications, connection only to the A-phase input points.
- Ensure wiring length does not exceed the maximum distance specified from the pulse generator.
- Download module specific XTB-40H Terminal Label Printouts here: Download Printouts

Terminal Wiring



Module Connection



XBF-HD02A Counter Input Module Configuration

Learn how to Register and Configure this counter input module by viewing the LS PLC Interactive Guide:

High Speed Counter Setup - HO02A, HD02A Based

Direct Variables

XGB series high speed counter modules are assigned 32 words in the "U" memory area based on the slot number assignment. (%UW0.z.0 - %UW0.z.31 , z= slot number). The actual memory address used within the 32 word block are specific to each module. See the table below for Direct Variable assignments.

For Direct Variable nomenclature explanation, see Direct Variable User Programming Memory.

Symbolic Variables

Symbolic variables for the analog module can be automatically created in XG5000 software by using the top MENU bar: Edit > Register Module Variable Comments.

Symbolic variables and direct variables for XBF-HD02A are as follows (z refers to module slot number (2 to 8)).

Type	Scope	Variable (Symbolic)	Address (Direct Variable Alias)	Data Type	Comment
Tag	GobalVariable	_000z_CH0_CNT	%UD0.z.1	DINT	HSC Module: CH0 Count Data
Tag	GobalVariable	_000z_CH0_LTH	%UD0.z.2	DINT	HSC Module: CH0 Latch Count Data
Tag	GobalVariable	_000z_CH0_RNG	%UD0.z.3	DINT	HSC Module: CH0 Sampling Count Data
Tag	GobalVariable	_000z_CH0_FRQ	%UD0.z.4	UDINT	HSC Module: CH0 Input Frequency Data
Tag	GobalVariable	_000z_CH0_RPU	%UD0.z.5	UDINT	HSC Module: CH0 Rev./Unit Time Data
Tag	GobalVariable	_000z_CH0_AUXEN	%UX0.z.371	BOOL	HSC Module: CH0 Auxiliary Function Request
Tag	GobalVariable	_000z_CH0_AUXING	%UX0.z.5	BOOL	HSC Module: CH0 Auxiliary Function Status
Tag	GobalVariable	_000z_CH0_BRW	%UX0.z.4	BOOL	HSC Module: CH0 Borrow Flag
Tag	GobalVariable	_000z_CH0_CMPEN	%UX0.z.372	BOOL	HSC Module: CH0 Enable Compare Function
Tag	GobalVariable	_000z_CH0_CMPOUT0	%UX0.z.6	BOOL	HSC Module: CH0 Compare 0 Output Status
Tag	GobalVariable	_000z_CH0_CMPOUT1	%UX0.z.7	BOOL	HSC Module: CH0 Compare 1 Output Status
Tag	GobalVariable	_000z_CH0_CNTEN	%UX0.z.368	BOOL	HSC Module: CH0 Enable Counter
Tag	GobalVariable	_000z_CH0_CRY	%UX0.z.3	BOOL	HSC Module: CH0 Carry Flag
Tag	GobalVariable	_000z_CH0_CRYBRW_RST	%UX0.z.378	BOOL	HSC Module: CH0 Carry/Borrow Reset Request
Tag	GobalVariable	_000z_CH0_DN	%UX0.z.0	BOOL	HSC Module: CH0 Count Direction Status
Tag	GobalVariable	_000z_CH0_DWNCNT	%UX0.z.370	BOOL	HSC Module: CH0 Count Direction Select
Tag	GobalVariable	_000z_CH0_EQ0RST	%UX0.z.374	BOOL	HSC Module: CH0 Compare 0 EQUAL Reset(Edge) Command
Tag	GobalVariable	_000z_CH0_EQ1RST	%UX0.z.375	BOOL	HSC Module: CH0 Compare 1 EQUAL Reset(Edge) Command
Tag	GobalVariable	_000z_CH0_ERR	%UX0.z.14	BOOL	HSC Module: CH0 Error Flag
Tag	GobalVariable	_000z_CH0_EXTAUX_EN	%UX0.z.380	BOOL	HSC Module: CH0 Enable Aux-Func Ext. Input
Tag	GobalVariable	_000z_CH0_EXTPRE	%UX0.z.1	BOOL	HSC Module: CH0 Preset Ext. Input Flag
Tag	GobalVariable	_000z_CH0_EXTPST_EN	%UX0.z.379	BOOL	HSC Module: CH0 Preset Ext. Input Enable
Tag	GobalVariable	_000z_CH0_EXTPST_RST	%UX0.z.381	BOOL	HSC Module: CH0 Preset Ext. Input Reset Request
Tag	GobalVariable	_000z_CH0_OUTEN	%UX0.z.373	BOOL	HSC Module: CH0 Enable Compare Output Signal
Tag	GobalVariable	_000z_CH0_PREEN	%UX0.z.369	BOOL	HSC Module: CH0 Enable Preset

XBF-HD02A Counter Input Module Configuration, *continued*

Type	Scope	Variable (Symbolic)	Address (Direct Variable Alias)	Data Type	Comment
Tag	GobalVariable	_000z_CH1_CNT	%UD0.z.6	DINT	HSC Module: CH1 Count Data
Tag	GobalVariable	_000z_CH1_LTH	%UD0.z.7	DINT	HSC Module: CH1 Latch Count Data
Tag	GobalVariable	_000z_CH1_RNG	%UD0.z.8	DINT	HSC Module: CH1 Sampling Count Data
Tag	GobalVariable	_000z_CH1_FRQ	%UD0.z.9	UDINT	HSC Module: CH1 Input Frequency Data
Tag	GobalVariable	_000z_CH1_RPU	%UD0.z.10	UDINT	HSC Module: CH1 Rev./Unit Time Data
Tag	GobalVariable	_000z_CH1_DN	%UX0.z.16	BOOL	HSC Module: CH1 Count Direction Status
Tag	GobalVariable	_000z_CH1_EXTPRE	%UX0.z.17	BOOL	HSC Module: CH1 Preset Ext. Input Flag
Tag	GobalVariable	_000z_CH1_CRY	%UX0.z.19	BOOL	HSC Module: CH1 Carry Flag
Tag	GobalVariable	_000z_CH1_BRW	%UX0.z.20	BOOL	HSC Module: CH1 Borrow Flag
Tag	GobalVariable	_000z_CH1_AUXING	%UX0.z.21	BOOL	HSC Module: CH1 Auxiliary Function Status
Tag	GobalVariable	_000z_CH1_CMPOUT0	%UX0.z.22	BOOL	HSC Module: CH1 Compare 0 Output Status
Tag	GobalVariable	_000z_CH1_CMPOUT1	%UX0.z.23	BOOL	HSC Module: CH1 Compare 1 Output Status
Tag	GobalVariable	_000z_CH1_ERR	%UX0.z.30	BOOL	HSC Module: CH1 Error Flag
Tag	GobalVariable	_000z_CH1_CNTEN	%UX0.z.384	BOOL	HSC Module: CH1 Enable Counter
Tag	GobalVariable	_000z_CH1_PREEN	%UX0.z.385	BOOL	HSC Module: CH1 Enable Preset
Tag	GobalVariable	_000z_CH1_DWNCNT	%UX0.z.386	BOOL	HSC Module: CH1 Count Direction Select
Tag	GobalVariable	_000z_CH1_AUXEN	%UX0.z.387	BOOL	HSC Module: CH1 Auxiliary Function Request
Tag	GobalVariable	_000z_CH1_CMPEN	%UX0.z.388	BOOL	HSC Module: CH1 Enable Compare Function
Tag	GobalVariable	_000z_CH1_OUTEN	%UX0.z.389	BOOL	HSC Module: CH1 Enable Compare Output Signal
Tag	GobalVariable	_000z_CH1_EQ0RST	%UX0.z.390	BOOL	HSC Module: CH1 Compare 0 EQUAL Reset(Edge) Command
Tag	GobalVariable	_000z_CH1_EQ1RST	%UX0.z.391	BOOL	HSC Module: CH1 Compare 1 EQUAL Reset(Edge) Command
Tag	GobalVariable	_000z_CH1_CRYBRW_RST	%UX0.z.394	BOOL	HSC Module: CH1 Carry/Borrow Reset Request
Tag	GobalVariable	_000z_CH1_EXTPST_EN	%UX0.z.395	BOOL	HSC Module: CH1 Preset Ext. Input Enable
Tag	GobalVariable	_000z_CH1_EXTAUX_EN	%UX0.z.396	BOOL	HSC Module: CH1 Enable Aux-Func Ext. Input
Tag	GobalVariable	_000z_CH1_EXTPST_RST	%UX0.z.397	BOOL	HSC Module: CH1 Preset Ext. Input Reset Request
Tag	GobalVariable	_000z_RDY	%UX0.z.15	BOOL	HSC Module: Ready Flag

Environmental Specifications, all XGB Series Modules

Item				Specification	Reference
Ambient Operating Temperature				0–55°C (32–131°F)	–
Storage Temperature				-25–70°C (-13–158°F)	
Ambient Operating Humidity				5–95% relative humidity (non-condensing)	
Storage Humidity				5–95% relative humidity (non-condensing)	
Vibration[1]	Occasional Vibration	Frequency	$5 \le f < 8.4$ Hz	3.5 mm pulse width	IEC61131-3-2
			$8.4 \le f < 150$Hz	9.8 m/s^2 (1G)	
	Continuous Vibration		$5 \le f < 8.4$ Hz	1.75 mm pulse width	
			$8.4 \le f < 150$Hz	4.9 m/s^2 (0.5G)	
Shocks			Peak Acceleration	147 m/s^2 (15G)	
			Duration	11ms	
			Pulse Wave Type	Half-sine (3 times each direction per each axis)	
Noise Resistance	Square Wave Impulse Noise			1,500VAC 900VDC	LS Electric standard
	Electrostatic Discharge			Voltage: 4kV (contact discharge)	IEC61131-3-2 IEC61000-4-2
	Radiated Electromagnetic Field Noise			80–1,000 MHz, 10 V/m	IEC61131-3-2 IEC61000-4-3
	Fast Transient / Burst Noise		Classification	Voltage	IEC61131-3-2 IEC61000-4-4
			Power Supply	2kV	
			Digital/Analog Input/Output Communication Interface	1kV	
Environment				Free from corrosive gases and excessive dust	–
Attitude				Less than 2,000m	
Pollution Degree				Less than 2 (see note 2)	
Cooling Method				Air-cooling	

1 - Vibration of 10 times each direction (X, Y, and Z)
2 - Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected.

Available I/O Modules

XGB Series I/O Modules									
Part Number	Price	Description	Digital Input	Digital Output	Analog Input	Analog Output	Motion	Bus Coupler Compatible	Smart Link Required
Digital									
XBE-DC08A	$59.00	LS Electric XGB discrete input module, 8-point, 24 VDC, sinking/sourcing, 1 common(s), 8 point(s) per common. Removable terminal block included.	✓					✓	
XBE-DC16A	$70.00	LS Electric XGB discrete input module, 16-point, 24 VDC, sinking/sourcing, 1 common(s), 16 point(s) per common. Removable terminal blocks included.	✓					✓	
XBE-DC16B	$78.00	LS Electric XGB discrete input module, 16-point, 12-24 VDC, sinking/sourcing, 1 common(s), 16 point(s) per common. Removable terminal blocks included.	✓					✓	
XBE-DC32A	$97.00	LS Electric XGB discrete input module, 32-point, 24 VDC, sinking/sourcing, 1 common(s), 32 point(s) per common. Requires XTB-40H terminal block and C40HH-xxSB-XBI cable.	✓					✓	✓
XBE-AC08A	$88.00	LS Electric XGB discrete input module, 8-point, 120 VAC, 2 common(s), 4 point(s) per common. Removable terminal blocks included.	✓					✓	
XBE-RY08A	$80.00	LS Electric XGB relay output module, 8-point, 125 VDC/250 VAC, (8) Form A, 1 common(s), 8 point(s) per common, 2A/point, 5A/common. Removable terminal block included.		✓				✓	
XBE-RY08B	$95.00	LS Electric XGB relay output module, 8-point, 125 VDC/250 VAC, (8) Form A, 8 isolated common(s), 1 point(s) per common, 2A/point. Removable terminal blocks included.		✓				✓	
XBE-RY16A	$110.00	LS Electric XGB relay output module, 16-point, 125 VDC/250 VAC, (16) Form A, 2 isolated common(s), 8 point(s) per common, 2A/point, 5A/common. Removable terminal blocks included.		✓				✓	
XBE-TN08A	$60.00	LS Electric XGB discrete output module, 8-point, 12-24 VDC, sinking, 1 common(s), 8 point(s) per common, 0.5A/point, 2A/common. Removable terminal blocks included.		✓				✓	
XBE-TN16A	$78.00	LS Electric XGB discrete output module, 16-point, 12-24 VDC, sinking, 1 common(s), 16 point(s) per common, 0.5A/point, 2A/common. Removable terminal blocks included.		✓				✓	
XBE-TN32A	$109.00	LS Electric XGB discrete output module, 32-point, 12-24 VDC, sinking, 1 common(s), 32 point(s) per common, 0.2A/point, 2A/common. Requires XTB-40H terminal block and C40HH-xxSB-XBI cable.		✓				✓	✓
XBE-TP08A	$62.00	LS Electric XGB discrete output module, 8-point, 12-24 VDC, sourcing, 1 common(s), 8 point(s) per common, 0.5A/point, 2A/common. Removable terminal blocks included.		✓				✓	
XBE-TP16A	$88.00	LS Electric XGB discrete output module, 16-point, 12-24 VDC, sourcing, 1 common(s), 16 point(s) per common, 0.5A/point, 2A/common. Removable terminal blocks included.		✓				✓	
XBE-TP32A	$93.00	LS Electric XGB discrete output module, 32-point, 12-24 VDC, sourcing, 1 common(s), 32 point(s) per common, 0.2A/point, 2A/common. Requires XTB-40H terminal block and C40HH-xxSB-XBI cable.		✓				✓	✓
XBE-DN32A	$172.00	LS Electric XGB discrete combo module, Input: 16-point, 24 VDC, sinking/sourcing, Output: 16-point, 12-24 VDC, sinking, 0.2A/point, 2A/common. Requires XTB-40H terminal block and C40HH-xxSB-XBI cable.	✓	✓				✓	✓
XBE-DR16A	$97.00	LS Electric XGB discrete combo module, Input: 8-point, 24 VDC, sinking/sourcing, Output: 8-point, 125 VDC/250 VAC, relay, (8) Form A (SPST) relays, 2A/point, 5A/common. Removable terminal blocks included.	✓	✓				✓	
Motion									
XBF-PN04B	$350.00	LS Electric XGB 4-axis positioning module, EtherCAT protocol, 1 high-speed input point(s), sinking/line driver (differential), 1-channel, differential and single-ended encoder input(s), (1) Ethernet 100Base-TX (RJ45) port(s). For use with LS Electric XEM-Dx32Hx PLCs.					✓		
XBF-PN08B	$395.00	LS Electric XGB 8-axis positioning module, EtherCAT protocol, 1 high-speed input point(s), sinking/line driver (differential), 1-channel, differential and single-ended encoder input(s), (1) Ethernet 100Base-TX (RJ45) port(s). For use with LS Electric XEM-Dx32Hx PLCs.					✓		
XBF-HO02A	$176.00	LS Electric XGB counter input module, 200 kHz maximum switching frequency, 2 high-speed input point(s), 5-24 VDC, sinking, 2-channel, single-ended encoder input(s), 2 high-speed output point(s), 5-24 VDC, sinking, external 24 VDC required.					✓	✓	✓
XBF-HD02A	$253.00	LS Electric XGB counter input module, 500 kHz maximum switching frequency, 2 high-speed input point(s), 5-24 VDC, sinking, 2-channel, differential encoder input(s), 2 high-speed output point(s), 5-24 VDC, sinking, external 24 VDC required.					✓	✓	✓

Note: See "Smart Link I/O System" on page tLSE-120 for the XTB-40H terminal block and cables. See "XGB PLC Replacement Terminals" on page tLSE-119 for replacement removable terminal blocks.

Continued on next page

Smart Link I/O System

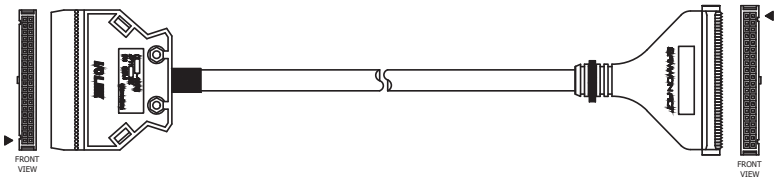
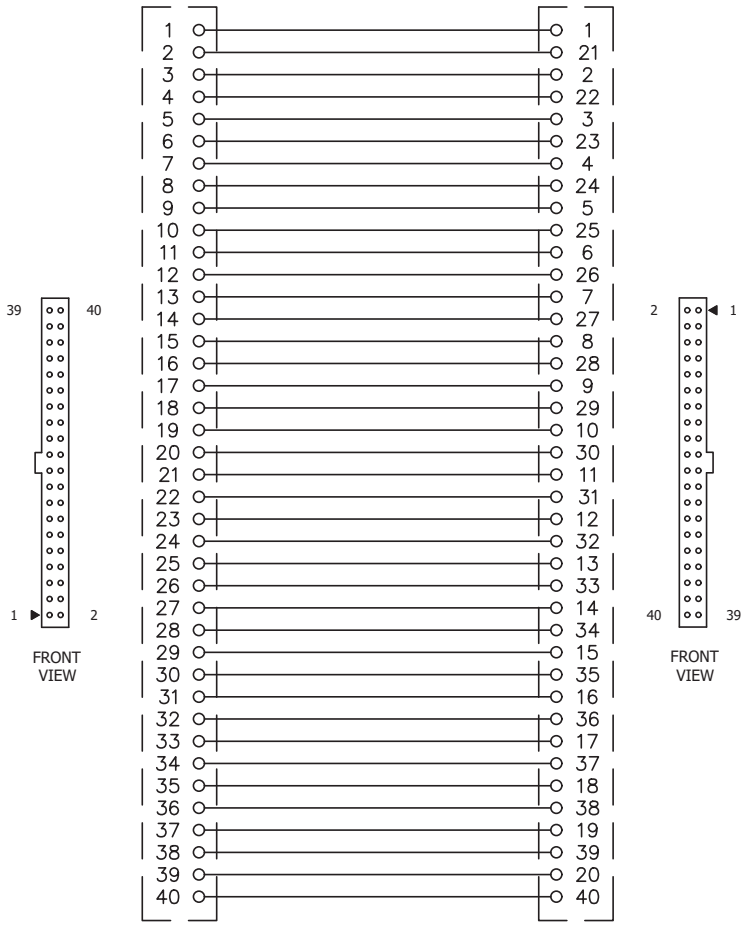
The Smart Link I/O system is a breakout wiring system used for high density I/O modules in the LS Electric XGB PLC series. The system is required for all modules with a 40-pin connection, and consists of a Smart Link cable with an XTB-40H terminal block.

Download module specific XTB-40H Terminal Label Printouts here: Terminal Printouts

Part Number	Price	Description	Length	Compatible With
XTB-40H	$20.00	LS Electric XGB terminal block, 40-pin screw type. For use with LS Electric XGB series high-density modules.	n/a	All LS XGB series PLCs and modules with 40-pin connectors
XTB-40H-LABEL	$3.00	AutomationDirect terminal label sheet, printed with terminal names for LS Electric XGB series modules. Package of 8. For use with XTB-40H terminal block.	n/a	
C40HH-05SB-XBI	$22.00	LS Electric XGB PLC I/O cable, 1.6ft/0.5m cable length, 40-pin connector to 40-pin connector. For use with LS Electric XGB series high-density modules.	0.5 m	
C40HH-10SB-XBI	$25.00	LS Electric XGB PLC I/O cable, 3.2ft/1m cable length, 40-pin connector to 40-pin connector. For use with LS Electric XGB series high-density modules.	1m	
C40HH-15SB-XBI	$29.00	LS Electric XGB PLC I/O cable, 4.9ft/1.5m cable length, 40-pin connector to 40-pin connector. For use with LS Electric XGB series high-density modules.	1.5 m	
C40HH-20SB-XBI	$36.00	LS Electric XGB PLC I/O cable, 6.5ft/2m cable length, 40-pin connector to 40-pin connector. For use with LS Electric XGB series high-density modules.	2m	
C40HH-30SB-XBI	$42.00	LS Electric XGB PLC I/O cable, 9.8ft/3m cable length, 40-pin connector to 40-pin connector. For use with LS Electric XGB series high-density modules.	3m	

XTB-40H Specifications		
Number of Pins		40 pin
Terminal Pitch		7.0 mm
Connector Type		MIL-C-83503 (50P polarity guide: 2EA)
Applicable Wires		AWG22–16 (1.5mm^2/MAX)
Insulation Resistance		100MΩ (500VDC)
Dielectric Strength		500VAC 1 minute
Screw		M3 x 8L
Screw Torque		1.2N•m (12kgf•cm)
Ambient Temperature		-10ºC to +50ºC (no freezing)
Material	Case	Modified PPO
	Protective Cover	Polycarbonate
	PCB	Epoxy 1.6t

Smart Link I/O System, Terminals and Cable Connections

Module to Cable to Terminal Pinouts		
Module Pins	***C40HH-xxSB-XBI***	***XTB-40H Terminal***
B20		A1
B19		B1
B18		A2
B17		B2
B16		A3
B15		B3
B14	HIROSE HIF3BA-40D-2.54R HIROSE HIF3BA-40D-2.54R	A4
B13		B4
B12		A5
B11		B5
B10		A6
B09		B6
B08		A7
B07		B7
B06		A8
B05		B8
B04		A9
B03		B9
B02		A10
B01		B10
A20		A11
A19		B11
A18		A12
A17		B12
A16		A13
A15		B13
A14		A14
A13		B14
A12		A15
A11		B15
A10		A16
A09		B16
A08		A17
A07		B17
A06		A18
A05		B18
A04		A19
A03		B19
A02		A20
A01		B20