

# SC-12

## 12 Relay output & 8 I/O channel

### General Description

The Relay actuator is designed for control applications. The SC-12 contains 12 electro-mechanical single-pole relay.

Each relay actuator is completed with one red LED that lights up when the relay is energized.

The logic commanding the 12 relay channels can be set by the user programming an In System Programmable logic unit.

This operation can be performed using high level CAE standard languages (CADENCE, Synario, Mentor, ORCAD). They permit the user to choose the desired configuration simply by designing the logic drawing.

Alternatively it is possible to choose one of the already existing configurations, supplied by the constructor from a wide library which can be down-loaded from the website [www.oggionisas.com](http://www.oggionisas.com).

For further information please contact directly the on-line technical service [securnt@tin.it](mailto:securnt@tin.it).

Reprogrammable capability enables fast and easy modification to the design of the systems, which leads to a substantial reduction of developing, management and systems expansion costs, assuring the user continuous process updating.

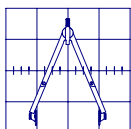
### Features

12 single pole relay rated ad 125 Vac 1A

12 LED indicators show activated relays

40 digital input channels

8 digital I/O channels



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**General specification**

Output relay max. switching	125 Vac 1A
Relay type	SPDT electromechanical
Input voltage	VIL <0.8 Vdc VIH +4Vdc +24Vdc
Input current	IH 2.5- 20 mA 1 K $\Omega$ limited resistor

**Environmental Specification**

EMC susceptibility	10V/m
Storage temperature	-40 to 85 °C
Operating temperature	-20 to 70 °C
Humidity range	90% R.H. n.c.

**Electrical Specification**

Supply Voltage	12 Vdc or Vca
Power consumption	2 watts
Supply fuse	1 mA
Logic "1"	VIH
Logic "0"	VIL
Cable Type	50 pin conductor ribbon cable

**Mechanical Specification**

Overall dimensions	180x108 mm
Weight	0.6 Kg.
Mounting	Rail Din 41612
Cabling	Screw terminals AWG 26...14

**ANCILLARY EQUIPMENT**

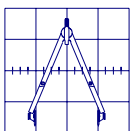
For the SC-12 modules the following accessories are available:

50 pin Ribbon cable	Cod. CB – 50
ISP Down load cable pDS4102-DL2	Cod. CB – isp
ISP Down load Software ispVM® System	Cod. SW - isp

### Part number description

#### SC-12

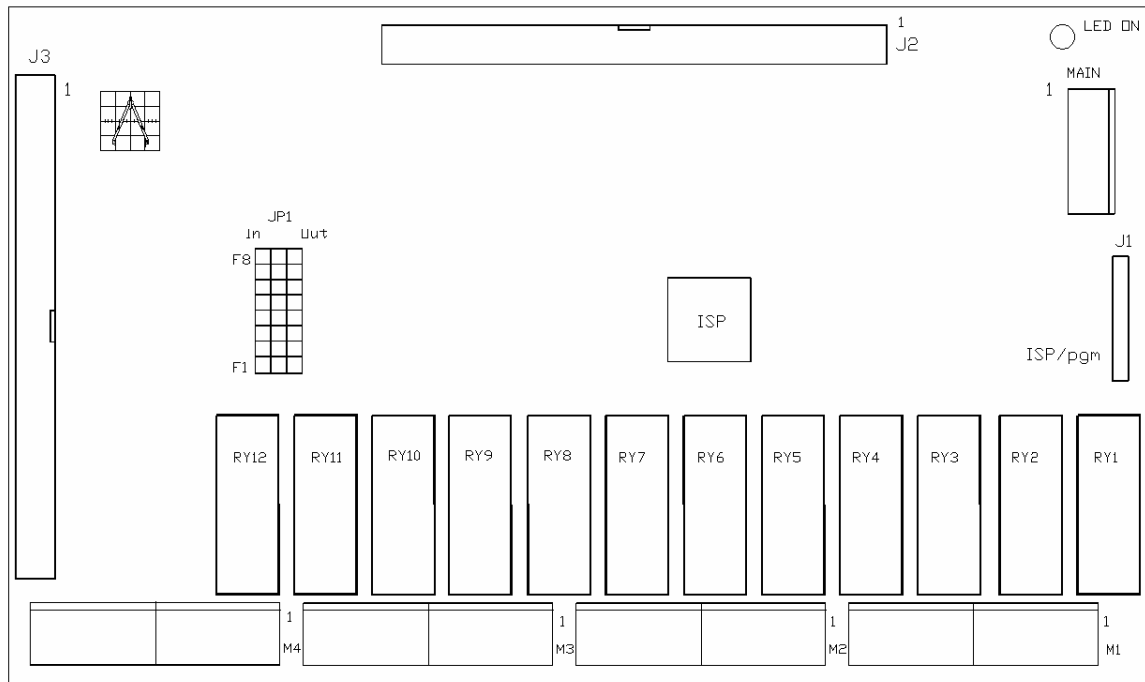
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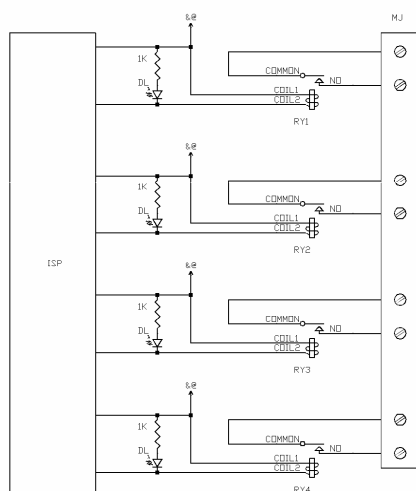


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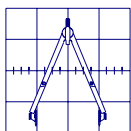


Block Diagram

Connector Pin Assignment



	<b>M1</b>	<b>M2</b>	<b>M3</b>
1	N.O. RY1	1 N.O. RY5	1 N.O. RY9
2	CM. RY1	2 CM. RY5	2 CM. RY9
3	N.O. RY2	3 N.O. RY6	3 N.O. RY10
4	CM. RY2	4 CM. RY6	4 CM. RY10
5	N.O. RY3	5 N.O. RY7	5 N.O. RY11
6	CM. RY3	6 CM. RY7	6 CM. RY11
7	N.O. RY4	7 N.O. RY8	7 N.O. RY12
8	CM. RY4	8 CM. RY8	8 CM. RY12



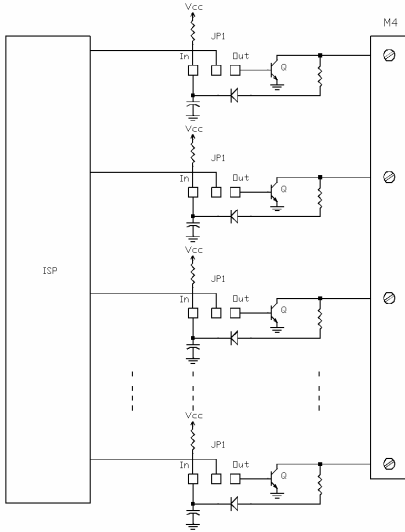
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**Block Diagram**



**J2**

**Connector Pin Assignment**

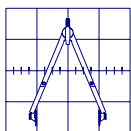
	<b>M4</b>
1	I/O 8
2	I/O 7
3	I/O 6
4	I/O 5
5	I/O 4
6	I/O 3
7	I/O 2
8	I/O 1

	<b>MAIN</b>
1	+12 Vcc
2	-12 Vcc
3	+12 Vcc
4	-12 Vcc

**J3**

In 12	1	2	In 51
In 32	3	4	In 41
In 22	5	6	In 21
In 42	7	8	In 31
In 52	9	10	In 11
In 33	11	12	In 13
In 43	13	14	In 23
GND	15	16	In 53
GND	17	18	In 14
GND	19	20	In 34
GND	21	22	In 24
GND	23	24	In 44
GND	25	26	In 54
GND	27	28	In 15
GND	29	30	In 35
GND	31	32	In 25
In 45	33	34	In 55
GND	35	36	In 16
In 18	37	38	In 36
In 26	39	40	In 46
In 38	41	42	In 56
In 28	43	44	In 17
In 48	45	46	In 37
In 27	47	48	In 58
In 47	49	50	In 57

I/O1	1	2	GND
I/O2	3	4	GND
I/O3	5	6	GND
I/O4	7	8	GND
I/O5	9	10	GND
I/O6	11	12	GND
I/O7	13	14	GND
I/O8	15	16	GND
In 38	17	18	GND
In 18	19	20	GND
In 48	21	22	GND
In 28	23	24	GND
N.C.	25	26	GND
N.C.	27	28	GND
N.C.	29	30	GND
N.C.	31	32	GND
N.C.	33	34	GND
N.C.	35	36	GND
N.C.	37	38	GND
N.C.	39	40	GND
N.C.	41	42	GND
N.C.	43	44	GND
N.C.	45	46	GND
N.C.	47	48	GND
N.C.	49	50	GND



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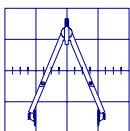
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**Signals Table**

<b>Input SC12</b>	<b>Signal Bus 8</b>	<b>Description</b>
In11	OC11	Out Open Collector 1 Card 1
In21	OC21	Out Open Collector 2 Card 1
In31	OC31	Out Open Collector 3 Card 1
In41	OC41	Out Open Collector 4 Card 1
In51	OC51	Out Open Collector 5 Card 1
In12	OC12	Out Open Collector 1 Card 2
In22	OC22	Out Open Collector 2 Card 2
In32	OC32	Out Open Collector 3 Card 2
In42	OC42	Out Open Collector 4 Card 2
In52	OC52	Out Open Collector 5 Card 2
In13	OC13	Out Open Collector 1 Card 3
In23	OC23	Out Open Collector 2 Card 3
In33	OC33	Out Open Collector 3 Card 3
In43	OC43	Out Open Collector 4 Card 3
In53	OC53	Out Open Collector 5 Card 3
In14	OC14	Out Open Collector 1 Card 4
In24	OC24	Out Open Collector 2 Card 4
In34	OC34	Out Open Collector 3 Card 4
In44	OC44	Out Open Collector 4 Card 4
In54	OC54	Out Open Collector 5 Card 4
In15	OC15	Out Open Collector 1 Card 5
In25	OC25	Out Open Collector 2 Card 5
In35	OC35	Out Open Collector 3 Card 5
In45	OC45	Out Open Collector 4 Card 5
In55	OC55	Out Open Collector 5 Card 5
In16	OC16	Out Open Collector 1 Card 6
In26	OC26	Out Open Collector 2 Card 6
In36	OC36	Out Open Collector 3 Card 6
In46	OC46	Out Open Collector 4 Card 6
In56	OC56	Out Open Collector 5 Card 6
In17	OC17	Out Open Collector 1 Card 7
In27	OC27	Out Open Collector 2 Card 7
In37	OC37	Out Open Collector 3 Card 7
In47	OC47	Out Open Collector 4 Card 7
In57	OC57	Out Open Collector 5 Card 7
In18	OC18	Out Open Collector 1 Card 8
In28	OC28	Out Open Collector 2 Card 8
In38	OC38	Out Open Collector 3 Card 8
In48	OC48	Out Open Collector 4 Card 8
In58	OC58	Out Open Collector 5 Card 8



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## Features

- **Support for All Lattice Programmable Products**
  - 1.2V to 5V programming
  - Ideal for design prototyping and debugging
- **Connect to Multiple PC Interfaces**
  - USB (v.1.0, v.2.0)
  - PC Parallel Port
- **Easy-to-Use Programming Connectors**
  - Versatile flywire, 2 x 5 (.100") or 1 x 8 (.100") connectors
  - 6 feet (2 meters) or more of programming cable length (PC to DUT)
- **Lead-Free/RoHS Compliant Construction**

## ispDOWNLOAD Cables

Lattice ispDOWNLOAD cables are designed to facilitate in-system programming for all Lattice Semiconductor ISP<sup>™</sup> devices directly from a PC. With in-system programmability, hardware functions can be programmed and modified in real-time on the system board to give additional product features, shorten system design and debug cycle time, enhance product manufacturability and simplify field upgrades.

After you complete your logic design and create a programming file with the ispLEVER<sup>®</sup> development tools, you can use ispVM<sup>®</sup> System software to program devices on your board. The ispVM System software automatically generates the appropriate ISP commands, programming addresses and programming data based on information stored in the programming file and parameters you set in ispVM. Programming signals are then generated from the USB or parallel port of a PC and directed through the ispDOWNLOAD Cable to the device, no additional components are required for programming.

ispVM System software is included with all Lattice design tool products and available for download from the Lattice web site at [www.latticesemi.com](http://www.latticesemi.com).

## ispDOWNLOAD Cable Pin Definitions

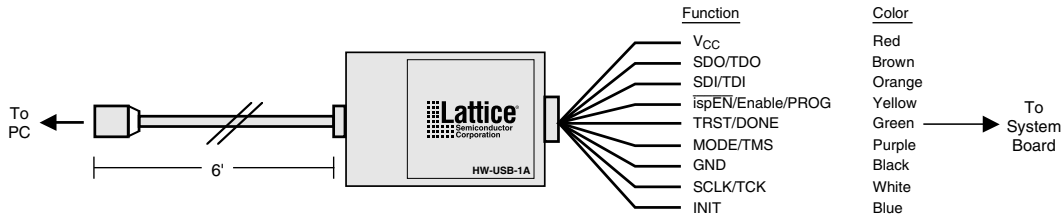
The functions provided by of the ispDOWNLOAD cables correspond with available functions on Lattice programmable devices. Since some devices contain different programming features, the specific functions provided by the ispDOWNLOAD cable may depend on the selected target device. ispVM System software will automatically generate the appropriate functions based on the selected device. See Table 1 for an overview of the ispDOWNLOAD cable functions.

**Table 1. ispDOWNLOAD Cable Pin Definitions**

ispDOWNLOAD Cable Pin	Name	ispDOWNLOAD Cable Input/Output	Description
VCC	Programming Voltage	Input	Connect to V <sub>CC</sub> or V <sub>CCJ</sub> plane of the target device. Typical I <sub>CC</sub> = 10mA. (Note: this may not be the same as a target device's V <sub>CCO</sub> plane).
SDO/TDO	Test Data Output	Input	Used to shift data out via the IEEE1149.1 (JTAG) programming standard.
SDI/TDI	Test Data Input	Output	Used to shift data in via the IEEE1149.1 programming standard.
ispEN/Enable/PROG	Enable	Output	Enable device to be programmed.
TRST	Test Reset	Output	Optional IEEE 1149.1 state machine reset.
DONE	DONE	Input	Done indicates status of configuration
MODE/TMS	Test Mode Select Input	Output	Used to control the IEEE1149.1 state machine.
GND	Ground	Input	Connect to ground plane of the target device
SCLK/TCK	Test Clock Input	Output	Used to clock the IEEE1149.1 state machine
INIT	Initialize	Input	Indicates that ORCA device is ready for configuration.

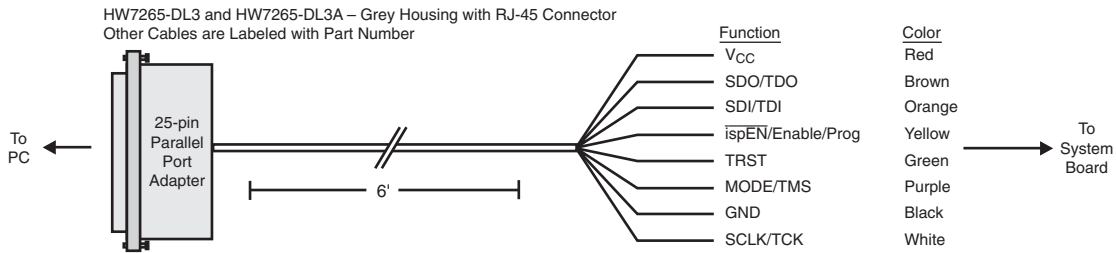
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Figure 1. ispDOWNLOAD Cable In-System Programming Interface for the PC (HW-USB-1A or HW-USB-2A)<sup>1</sup>



1. Lattice PAC-Designer<sup>®</sup> software does not support programming with USB cables. To program ispPAC devices with these cables, use the ispVM System software.

Figure 2. ispDOWNLOAD Cable In-System Programming Interface for the PC<sup>1</sup>



1. HW7265-DL3, HW7265-DL3A, HW-DL-3B, HW-DL-3C and HW-DLN-3C are functionally equivalent products.

Figure 3. ispDOWNLOAD Cable In-System Programming Interface for the PC (pDS4102-DL2 or pDS4102-DL2A)

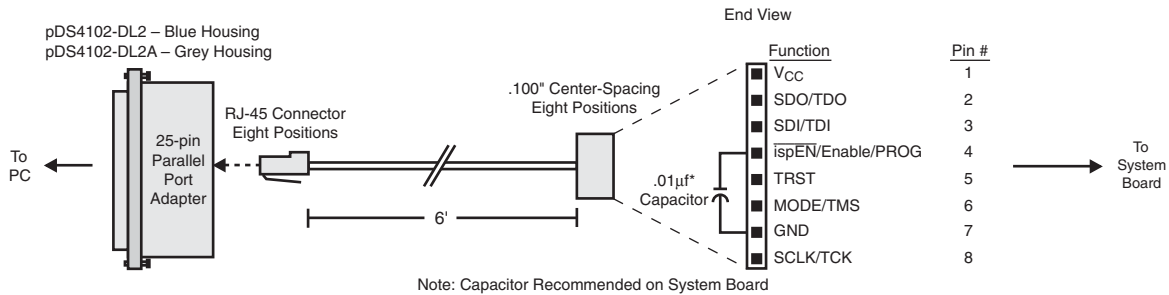
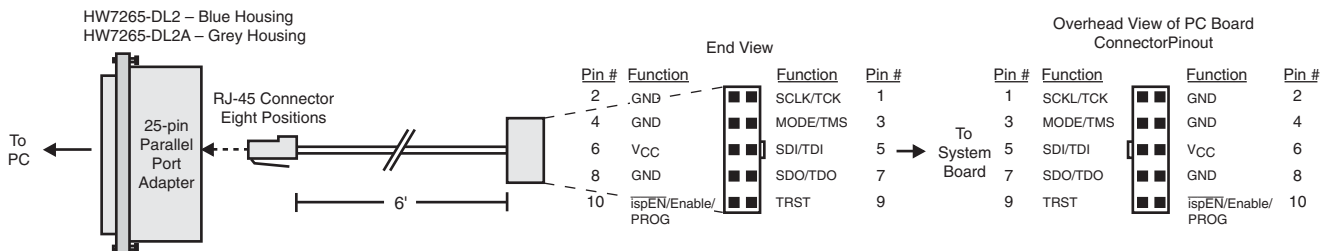


Figure 4. ispDOWNLOAD Cable In-System Programming Interface for the PC (HW7265-DL2 or HW7265-DL2A)



## Programming Software

ispVM System is the preferred programming management software tool for all Lattice devices and download cables. The latest version of ispVM System is always available for download from the Lattice web site at [www.latticesemi.com/software](http://www.latticesemi.com/software).

PAC-Designer is the design tool for Lattice ispPAC and ispCLOCK devices. PAC-Designer can also be used to program these devices. If using PAC-Designer for programming, pay special attention to the notes in this document, and the PAC-Designer system help.

Refer to the following table when connecting a fly-wire download cable to systems that use the 1x8-position or 2x5-position connectors. For newer Lattice FPGA families, a 1x10 connector used in conjunction with the ispDOWNLOAD USB cable adds support for the DONE and INITN signals. Both of these signals are inputs to the cable, and can be used to help verify device configuration.

**Table 2. Fly-wire Conversion Reference**

Function	Fly-wire Cable	1x10 Connector	1x8 Connector	2x5 Connector
$V_{CC}^1$	Red	1	1	6
TDO/SDO	Brown	2	2	7
TDI/SDI	Orange	3	3	5
ispEN <sup>2</sup> /Enable/PROGRAMN	Yellow	4	4	10
TRST <sup>3</sup>	Green	5	5	9
TMS/MODE	Purple	6	6	3
GND	Black	7	7	4 (2 and 8)
TCK <sup>4</sup> /SCLK	White	8	8	1
DONE <sup>3</sup>	Green	9		
INITN	Blue	10		

1. For devices that have a  $V_{CCJ}$  pin, the  $V_{CCJ}$  must be connected to the cable's  $V_{CC}$ , and a 0.1 $\mu$ F decoupling capacitor is required on  $V_{CCJ}$  close to the device. Please refer to the device data sheet to determine if the device has a  $V_{CCJ}$  pin.
2. For older Lattice ISP devices, a 0.01 $\mu$ F decoupling capacitor is required on ispEN/ENABLE of the target board.
3. The TRST and DONE pin is multiplexed on the ispDOWNLOAD USB cable. If the device TRST signal is available on the board, connect the USB fly-wire TRST/DONE wire to TRST. If the device DONE signal is available on the board (or if both TRST and DONE are available), connect the USB fly-wire TRST/DONE wire to DONE. Please make sure the correct setting is selected in ispVM (Options, Cable and I/O Port Setup). This will tell ispVM whether the TRST/DONE cable is used as a TRST or a DONE signal.
4. For newer FPGA devices (i.e. LatticeECP/EC), a 4.7K pull-down resistor is recommended on TCK of the target board.

Table 3 lists the recommend pin connections. Please contact Lattice technical support for information on unlisted device families. (e-mail: [techsupport@latticesemi.com](mailto:techsupport@latticesemi.com), phone: 1-800-LATTICE).

**Table 3. Recommend Cable Connections**

Device Family	TCK, TMS, TDI and TDO	ispEN/ ENABLE <sup>1</sup>	PROGRAMN <sup>6</sup> / PRGM	TRST <sup>2, 6</sup>	DONE <sup>3, 6</sup>	INITN <sup>3, 6</sup>
LatticeSC/M	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
LatticeECP2/M	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
LatticeXP™, LatticeXP2™	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
LatticeECP/EC	Mandatory	N/A	Do Not Connect	N/A	Optional	Optional
MachXO™	Mandatory	N/A	N/A	N/A	N/A	N/A
ORCA/FPSC	Mandatory	N/A	Mandatory	N/A	Optional	Optional
ispXPGA®	Mandatory	N/A	Optional	N/A	Optional	Optional
ispXPLD™	Mandatory	N/A	Optional	N/A	Optional	Optional
ispMACH™ 4000	Mandatory	N/A	N/A	N/A	N/A	N/A
ispMACH/ispLSI® 5000	Mandatory	N/A	N/A	N/A	N/A	N/A
MACH®4A <sup>4</sup>	Mandatory	Optional	N/A	Optional	N/A	N/A
ispGDX2™	Mandatory	N/A	N/A	N/A	N/A	N/A
ispClock™	Mandatory	N/A	N/A	N/A <sup>5</sup>	N/A	N/A
ispPAC Power Manager/ Power Manager II	Mandatory	N/A	N/A	Optional <sup>5</sup>	N/A	N/A
ispPAC	Mandatory	N/A	N/A	N/A <sup>5</sup>	N/A	N/A

1. Please refer to the ispDOWNLOAD Cable ispEN Pin section below for detailed information on connecting the ispEN/ENABLE pin.

2. Please refer to the ispDOWNLOAD Cable TRST Pin section below for detailed information on connecting the TRST pin.

3. The DONE and INITN signals are only available on the ispDOWNLOAD USB cable. These signals are inputs to the cable and can be used to help verify device configuration.

4. Please refer to the device data sheet. Not all packages have the ENABLE or TRST pin.

5. When using PAC-Designer software to program ispPAC devices, do not connect this pin.

6. When using these connections, be sure to select the correct settings in the Cable and I/O Port Setup dialog in the ispVM System software.

## Connecting the ispDOWNLOAD Cable

The target board must be un-powered when connecting, disconnecting, or reconnecting the ispDOWNLOAD Cable. Always connect the ispDOWNLOAD Cable's GND pin (black wire), before connecting any other JTAG pins. Failure to follow these procedures can result in damage to the target programmable device.

### ispDOWNLOAD Cable TRST Pin

Connecting the board TRST pin to the cable TRST pin is not recommended. Instead, connect the board TRST pin to Vcc. If the board TRST pin is connected to the cable TRST pin, instruct ispVM to drive the TRST pin high as follows:

1. Select the **Options** menu item
2. Select **Cable and I/O Port Setup**
3. Check the **TRST/Reset Pin Connected** check box
4. Select the **Set High** radio button

If the proper option is not selected, the TRST pin will be driven low by ispVM. Consequently, the BSCAN chain will not work because the chain will be locked into RESET state.

### ispDOWNLOAD Cable ispEN Pin

The following pins should be grounded:

- BSCAN pin of the 2000VE devices
- ENABLE pin of MACH4A3/5-128/64, MACH4A3/5-64/64 and MACH4A3/5-256/128 devices.

However, the user has the option of having the BSCAN and ENABLE pins driven by the ispEN pin from the cable. In this case, ispVM must be configured to drive the ispEN pin low as follows:

1. Select the Options menu item
2. Select Cable and I/O Port Setup
3. Check the ispEN/BSCAN Pin Connected check box
4. Select the Set Low radio button


**Table 4. ispDOWNLOAD Cable Feature Summary**

Feature	HW-USBN-2A	HW-USB-2A	HW-USB-1A	HW-DLN-3C	HW7265-DL3, HW7265-DL3A, HW-DL-3B, HW-DL-3C	HW7265-DL2	HW7265-DL2A	PDS4102-DL2	PDS4102-DL2A
USB	X	X	X						
PC-Parallel				X	X	X	X	X	X
1.2V Support	X	X							
1.8V Support	X	X	X	X	X		X		X
2.5-5.0V Support	X	X	X	X	X	X	X	X	X
2x5 Connector	X	X	X	X	X	X	X		
1x8 Connector	X	X	X	X	X			X	X
Flywire	X	X	X	X	X				
Lead-free Construction	X			X					
Available for order	X			X					

Each ispDOWNLOAD Cable ships with two small connectors that help you keep the flywires organized. The following manufacturer and part number is one possible source for equivalent connectors:

- 1x8 Connector (e.g. Samtec SSQ-108-02-T-S)
- 2x5 Connector (e.g. Samtec SSQ-105-02-T-D)

### Ordering Information

Description	Ordering Part Number	China RoHS Environment-Friendly Use Period (EFUP)
ispDOWNLOAD cable (USB). Contains 6' USB cable, flywire connectors, 8-position (1x8) adapter and 10-position (2x5) adapter, lead-free, RoHS compliant construction.	HW-USBN-2A	
ispDOWNLOAD cable (PC only). Contains parallel port adapter, 6' cable, flywire connectors, 8-position (1x8) adapter and 10-position (2x5) adapter, lead-free, RoHS compliant construction.	HW-DLN-3C	

Note: Additional cables are described in this document for legacy purposes only, these cables are no longer produced. The cables currently available for order are fully equivalent replacement items.

### Technical Support Assistance

Hotline: 1-800-LATTICE (North America)  
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