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# ShortStack FX Developer's Kit

Easily Network New or Existing Smart Devices— While Preserving Your Code Investment



The ShortStack FX Developer's Kit offers device manufacturers free firmware, software, and tools for quickly adding control networking and Internet accessibility to any device with a microcontroller or microprocessor.

The kit is ideal for creating low- to mid-range controllers and multipurpose I/O devices that may require up to 254 network variables and hundreds of configuration properties.

# **FEATURES**

## Developer's Kit

The free developer's kit includes the following:

- Development tools.
- Application programming interface (API) source code.
- Firmware images for Echelon Smart Transceivers and Neuron® Chips.
- Library for creating custom firmware images.
- Example application source code.

## **Development Tool Features**

- Wizard automatically generates network-specific source code.
- Resource editor lets you view and create data types and profiles.

## ShortStack API Features

- Compact implementation for easy porting and integration.
- Porting to a new processor typically requires less than a few weeks.
- Compatible with FTXL API for easy upward migration.
- Typically requires 4KB to 6KB of program memory on the host processor and less than 1KB of RAM.
- Program memory can be ROM, PROM, or flash.
- No royalty required.

## Commonly Used ShortStack API Functions

- Broadcast a service pin message.
- Initialize the LonTalk API and Micro Server.
- Poll a network variable value.
- Get a network variable value.
- Process network events.
- Send a network variable update.
- Send an explicit message.
- Send a service pin message.
- Get the ShortStack Micro Server Neuron ID.

## Commonly Used ShortStack API Callback Functions

- Go Offline request received from network.
- Go Online request received from network.
- Micro Server reset occurred.
- Micro Server service pin pressed.
- Micro Server service pin pressed and held.
- Network variable received from network.
- Network variable update or poll completed.
- Wink request received from network.

# **Extended API Functions**

- Query/update domain configuration.
- Query/update network variable and alias configuration.
- Query/update address table configuration.
- Query/update local configuration.
- Query device status, transceiver status, and communication statistics.
- Determine if an NV or message tag is bound.
- Query ShortStack Micro Server version information.

# Firmware Features

- Runs in the FT 5000 Smart Transceiver, the Neuron 5000 Processor, and many Series 3100 chips, creating a ShortStack Micro Server.
- Communicates with any 8-, 16-, or 32-bit host microcontroller or microprocessor.
- Combined with the Neuron firmware, implements layers 2 through 6 of the ISO/IEC 14908-1 protocol stack.
- Supports up to 254 network variables and hundreds of configuration properties.
- Provides full compatibility with LNS network management tools and with any other ISO/IEC 14908-1-compliant network management tools.
- No royalty required.

## **Host Interface Options**

 Interface between the host processor and the ShortStack Micro Server can be a Serial Communications Interface (SCI) or a Serial Peripheral Interface (SPI).



#### SCI Architecture for a ShortStack Device

- Simple SCI interface using RTS/CTS plus optional host-ready signal.
- SCI bit rates up to 1.2 Mbps with an 80MHz FT 5000 or Neuron 5000 system clock.



#### SPI Architecture for a ShortStack Device

- Standard 6-wire SPI interface with optional host-ready signal.
- SPI bit rates up to 906.2 kbps uplink/ 690.5 kbps downlink with an 80MHz FT 5000 or Neuron 5000 system clock.

#### **ISI Support**

- ISI is a standard open protocol that lets devices from different manufacturers discover and interoperate with each other.
- ISI support can be used to create devices that install themselves without the use of any tools.
- ISI is ideal for devices created for the home market, where simple user installation is critical.
- ISI is supported with the FT 5000 Smart Transceiver, Neuron 5000 Processor, FT 3150 Smart Transceiver, PL 3150 Smart Transceiver, and PL 3170 Smart Transceiver.

#### Requirements

- A third-party development tool for the target processor.
- The IAR Embedded Workbench was used to create the ARM7 Example Port. If you're using a different target processor or development tool, you'll have to port the driver and LonTalk Compact API to the new processor using a third-party development tool.
- To create a custom ShortStack FX Micro Server, a NodeBuilder FX Development Tool or Mini FX Evaluation Kit is required. Neither is required to use a standard ShortStack FX Micro Server firmware image.
- The NodeBuilder FX Code Wizard simplifies development, but is not required.

## **SPECIFICATIONS**

## SCI Interface Bit Rates

Interface rate selected by Micro Server clock and configuration pins, with the following settings available:

Series 3100 External Clock	Series 5000 System Clock	SBR1 (I06)	SBR0 (105)	SBR1 (IO6)	SBR0 (105)	SBR1 (I06)	SBR0 (I05)	SBR1 (I06)	SBR0 (105)
		GND	GND	GND	V <sub>dd</sub>	V <sub>dd</sub>	GND	V <sub>dd</sub>	V <sub>dd</sub>
5MHZ		38400		19200		9600		4800	
10MHZ	5MHZ	76800		38400		19200		9600	
20MHZ	10MHZ	153	600	76800		38400		19200	
40MHZ	20MHZ	302	100	153600		768	300	384	400
	40MHZ	604200		302100		153600		76800	
	80MHZ	1208400		604200		302100		153600	

#### SPI Interface Bit Rates

Interface clocked by host with the interface rate selected by the Micro Server clock and configuration pins, with the following settings available for an uplink SPI interface:

Series 3100	Series 5000	SBR1 (I06)	SBR0 (I05)	SBR1 (I06)	SBR0 (I05)	SBR1 (IO6)	SBR0 (I05)	SBR1 (IO6)	SBR0 (105)	
External Clock	System Clock	GND	GND	GND	V <sub>dd</sub>	V <sub>dd</sub>	GND	V <sub>dd</sub>	V <sub>dd</sub>	
5MHZ		292	200	166	600	102	200	51	00	
10MHZ	5MHZ	583	300	332	200	203	300	103	300	
20MHZ	10MHZ	116	700	663	300	406	600	205	500	
40MHZ	20MHZ	226	226600		129500		76700		40900	
	40MHZ	453	100	258	58900 153300		81900			
	80MHZ	906	200	517	900	306	600	163700		

# The following settings are available for a downlink SPI interface:

Series 3100 External Clock	Series 5000 System Clock	SBR1 (I06)	SBR0 (I05)	SBR1 (I06)	SBR0 (I05)	SBR1 (I06)	SBR0 (I05)	SBR1 (I06)	SBR0 (105)
		GND	GND	GND	V <sub>dd</sub>	V <sub>DD</sub>	GND	V <sub>DD</sub>	V <sub>dd</sub>
5MHZ		217	700	92	00	48	00	29	00
10MHZ	5MHZ	434	100	184	100	97	00	57	00
20MHZ	10MHZ	868	300	368	300	193	300	115	500
40MHZ	20MHZ	172	600	733	300	386	600	228	300
	40MHZ	345200		146700		77100		45600	
	80MHZ	690	500	293	400	154	300	0 91300	

### DOCUMENTATION

ShortStack FX Developer's Guide 078-0365-01B

ShortStack API Function Reference 078-0433-01D

Introduction to the LonWorks® Platform 078-0183-01B

ISI Programmer's Guide 078-0299-01F

ISI Protocol Specification 078-0300-01F

Neuron C Programmer's Guide 078-0002-02H

Neuron C Reference Guide 078-0140-02F

Neuron Tools Errors Guide 078-0402-01B

ShortStack FX ARM7 Example Port User's Guide 078-0366-01B

Series 5000 Chip Data Book 005-0199-01A

PL 3120/PL 3150/PL 3170 Power Line Transceiver Data Book 005-0193-01A

## **ORDERING INFORMATION**

The ShortStack FX Developer's Kit can be downloaded for free from www.echelon.com/shortstack. The free example port for the ARM7 is also available at this link.



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