

E-Link Gateway Commissioning and Troubleshooting Technical Bulletin

The Johnson Controls® Equipment Link (E-Link) Gateway is an economical and versatile communications device that provides a connection between YORK® equipment, such as chillers and Remote Terminal Unit (RTUs), and open standard protocols. Specifically, the E-Link Gateway provides access to BACnet® Master-Slave/Token-Passing (MS/TP), N2, Modbus® RTU, and LONWORKS® FTT10 Building Automation System (BAS) protocols. The E-Link Gateway has been designed with the same physical dimensions and power requirements as the MicroGateway, which enables it to be used in many instances as a direct replacement part.

IMPORTANT: The E-Link Gateway does not support the ISN, American Standard Code for Information Interchange (ASCII), or YORKTalk I protocols.

The E-Link Gateway has four serial ports, one of which can host an optional LONWORKS FTT10 ProtoCessor module. Ports 1 and 4 are designated for BAS networking, and Port 2 is used to connect to the equipment. Port 3 provides access for auxiliary monitoring and control.

To simplify installation and setup, the E-Link Gateway is pre-configured with a series of chiller and rooftop profiles that you can choose by selecting the correct DIP switch settings.

Functional Overview

The E-Link Gateway is available as a stand-alone circuit board or as a circuit board mounted within a metal enclosure (Table 1).

Table 1: E-Link Gateway Product Code Numbers

Product Code Number	Description
YK-ELNK100-0	Circuit Board with Serial Communications, BACnet MS/TP, Modbus RTU, and N2
YK-ELNK101-0	Circuit Board with LONWORKS FTT10 Communications
YK-ELNKE00-0	YK-ELNK100-0 in an Enclosure
YK-ELNKE01-0	YK-ELNK101-0 in an Enclosure
YK-ELNKOLK-0	OptiView/Latitude Installation Kit
YK-ELNKSTK-0	IPU-II Installation Kit (Installation Kit not available in Europe)

The E-Link Gateway consists of two boards. The IPU-II (processor module) is mounted on the System Interface Module (SIM) (interface module). Do not separate these boards in the field.

The circuit board measures 102 x 152 mm (4 x 6 in.) and the dimensions of the enclosure are 152 x 279 x 63 mm (6 x 11 x 2-1/2 in.).

The E-Link Gateway can be powered from these voltage sources:

- 12 VDC (circuit board)
- 24 VAC (circuit board)
- 110 VAC (in an enclosure)
- 220 VAC (in an enclosure)

User Selections and Indicators

Each communication port is serviced by two Light-Emitting Diodes (LEDs):

- The **red** LED flashes to indicate that the port is **transmitting** data.
- The **green** LED flashes to indicate that the port is **receiving** data.

These LEDs are connected to the actual TX and RX signal lines and only indicate electrical activity by the specific port. The LEDs do not indicate error-free data reception or transmission.

The status and power LED provides information about current operation and the presence of electrical power.

Three DIP switches enable you to set the E-Link Gateway's MAC address, the desired equipment profile, and the output protocol. Use the momentary push button to activate the chosen selection.

Port 1, Port 2A, and Port 3 have End-of-Line (EOL) switches that allow their respective RS-485 networks to be correctly biased and terminated.

Port Configuration

From a functional perspective, the E-Link Gateway offers four communication ports. Each port is Quick Start configurable to support the protocols listed in Table 2.

Table 2: Port Configuration

Port 1	Port 2	Port 3	Port 4
BACnet MS/TP	YORK Talk III	BACnet MS/TP	LONWORKS FTT10
Modbus RTU Server	YORK Talk II	Modbus RTU Server	
N2	BACnet MS/TP	N2	
	Modbus RTU Client	VT-100	

The E-Link Gateway's ports support specific driver technologies as described in Table 3.

Table 3: Port Drivers

Port 1	Port 2A	Port 2B	Port 3	Port 4
RS-485	RS-485	RS-232	RS-485	TTL/FTT-10A

Software Revision Control

The E-Link Gateway software consists of two primary parts; the Firmware (ELF) and the Application (CNF). Both of these parts are delivered from the factory as a Johnson Combined File (JCF) shown in Figure 1. A label on the E-Link Gateway defines the version of JCF loaded in the factory.

The JCF is factory loaded and, due to its data format, cannot be reloaded in the field.

Each part of the JCF, with the exception of REDBOOT, can be reloaded individually in the field. The Firmware file uses an ELF extension, whereas the Application uses a CNF extension.

Flash Organization

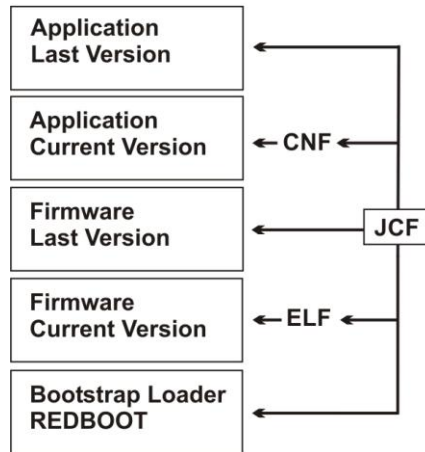


Figure 1: Flash Memory Organization

The Firmware file contains the object engine, the operating system, and all the parts required to support the various communication protocols. The Application file contains the preprogrammed Quick Start configurations of the supported field equipment.

Every time a new Firmware file is built, the file is renamed using the following convention:

FIRMWARE REV: PPPP.FFFF.MMMM.BBBB-CCC, where PPPP is the platform; FFFF is the major functionality; MMMM is the minor functionality; BBBB is the build number; and CCC is the Feature, Section, and Page (FSP) mix.

The Application file, when modified, is also renamed using a 12-character string that adheres to the following convention:

APPLICATION REVISION: TTT.MMMM.BBB, where TTT is the Application type shown in Table 4, MMMM is the major release, and BBB is the build number.

Table 4: Application Types

Type	Description
STD	A standard production Application that is released through the normal process.
CUS	A custom Application that is released and supported by the regional System Integration Services (SIS) or Custom Solutions organizations.
ENG	An engineering Application as used during the development process.

Figure 2 shows an example of the output you see after logging on to an E-Link Gateway and selecting System Diagnostics. The actual Firmware revision and Application revision relate to the current release.

Figure 2: Terminal View of System Diagnostics

Quick Starts

The Quick Start feature provides a simple method of configuring an E-Link Gateway for a specific type of equipment and output protocol. No external devices (laptops) are required because the Quick Start feature is self-contained and is invoked by setting specific addresses on a set of switches. A push button activates the functionality.

When activating a LONWORKS FTT10 Quick Start, cycle the power on the E-Link Gateway to activate the Quick Start and the LONWORKS FTT10 ProtoCessor. (The LONWORKS FTT10 ProtoCessor does not recognize the push button as a trigger to reset and load the correct conversion file.)

Field Maintenance

Implement a field edit if you need to correct an E-Link Gateway's Quick Start script. Two Quick Starts have been reserved for this purpose, allowing the E-Link Gateway's Application to be adjusted to address a profile issue, a protocol selection issue, or both.

User Access

Use a computer with a VT-100 interface to view, track, debug, make changes, or access the operation of the E-Link Gateway. To invoke this function, set Way 8 of the MAC address switch to ON and connect a computer with a VT-100 emulation program to Port 3.

User Reports

Certain parameters require adjustments on site. Users that have established a VT-100 interface on Port 3 can edit parameters. Any edits that may have been made are saved to flash memory when you exit the User Report or the User Report has timed out. Only parameters previously defined in a User Report can be edited and saved to flash memory.

Loading New Firmware and Application

If the E-Link Gateway's Firmware and Application require reloading, the preferred way is to establish a VT-100 terminal session and then use an X-modem utility to transfer the file. When using a Microsoft® Windows® Operating System (OS) based computer, X-modem capabilities already come packaged within the HyperTerminal® Application, so proprietary tools are not required.

Applications

The E-Link Gateway's Applications are designed to provide connectivity to an established base of YORK chillers that use YORK Talk II and III as their internal protocol. Native BACnet and Modbus RTU protocol speaking equipment can also use the E-Link Gateway to offer N2 and LONWORKS FTT10 communications. An example of this type of equipment is the YPAL rooftop unit.

BAS Networks

An E-Link Gateway can be connected to a BAS network after it has been Quick Started and is then ready to provide data. The E-Link Gateway acts as a server and the BAS system must initiate any requests.

The information required by the BAS is partially dependent on the protocol; but in all cases, the BAS must know the E-Link Gateway's network address (the address that uniquely identifies it on the network) and which internal data it can access.

MS/TP

The E-Link Gateway supports dynamic device binding. The BAS integrator requires the Device Object address (also known as the Device Object instance or the DE address) for device binding. This literal address allows the BAS system to connect to the E-Link Gateway using an automatic discovery process (a WHO-IS, I-AM exchange) that establishes the E-Link Gateway's Media Access Control (MAC) address. The MAC address is then used in all future requests.

The E-Link Gateway's Device Object address is generated automatically and is based on adding 5,000 to the MAC address switch setting. Sometimes the integrator may require the E-Link Gateway to have a specific Device Object address (due to site-specific policy); and in these cases, the E-Link Gateway must be site-configured. User Report 1 allows you to enter a specific Device Object address.

N2 and Modbus RTU

In case of both N2 and Modbus RTU, the E-Link Gateway is identified on the network by its MAC address, which you can set to any address between 1 and 127 using switches. Although these protocols have a wider address space, the MAC address switch limits them to 127. You can set the MAC address using software, which is discussed in a later section.

Changes to MAC address switches are updated live, so take care to align any Client Application with the E-Link Gateway's MAC address.

LONWORKS FTT10

Press the service pin on the ProtoCessor to identify the E-Link Gateway on the LONWORKS FTT10 network, which is the easiest way to determine the Neuron® ID for third-party configuration tools. For Network Automation Engine (NAE)-based systems, the XIF resource file makes it simple to discover the device.

Equipment Point Maps provide the data that a BAS system can access. These maps are available on the Johnson Controls Portal. The Point Maps are presented as spreadsheets, which define the parameters, their associated variable addresses, and a brief description of what the data actually represents for each type of equipment.

Each protocol references these variables in different ways. BACnet protocol uses the Multistate Value (MSV), Analog Value (AV), and Binary Value (BV) objects. N2 uses the Analog Data Input (ADI), Analog Data Float (ADF), and Binary Data (BD) objects. Modbus RTU protocol uses registers. LONWORKS FTT10 uses Standard Network Variable Type (SNVT). Each protocol contains different amounts of information. BACnet protocol is the most data-rich and Modbus RTU protocol is the most basic.

Figure 3, Figure 4, and Figure 5 show examples of Point Maps available on the Johnson Controls Portal.

Figure 3 shows an example of an OptiView Point Maps spreadsheet. The GPIC Object Type defines the object within the OptiView micro panel that is associated with this parameter.

Item	Ref.	Version	Date	YORK P.N	Checksum	Baud	COMMENTS
1	C.ACS.08.03	11990	03/07/98-001	07C3	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
2	C.A08.08.03		03/07/98-001	E10C	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
3	C.ACS.08.03		03/07/98-001	080E	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
4	C.A02.08.02		03/07/98-001	0A03	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
5	C.A07.08.02		03/07/98-001	0300	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
6	C.A03.08.02		03/07/98-001	080C	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
7	C.ACS.08.01	11990	03/07/98-001	F300	4800	01872	Compressor Micro Board (03/08/05-002) System 1 and 2
8	C.ACS.01.02	11990	03/07/98-002	G7ED	4800	01872	3 and 4 Compressor Micro Board (03/08/05-002) System 1 and 2
9	C.A01.01.02		03/07/98-002	E661	4800	01872	3 and 4 Compressor Micro Board (03/08/05-002) System 1 and 2

ENG	ASDII	GPIC	York Talk	ISN LINC	York Talk	N2	POINT LIST CODE	S=STANDARD	D=OPTIONAL	N=NOT AVAILABLE
17	REF	REF	Type	Type	Text	Position	POINT LIST DESCRIPTION			
18	PR3	PR3	A	Control		ADF 1	S	S	S	S
19	PR4	PR4	A	Control		ADF 2	S	S	S	S
20	PR5	PR5	A	Control		ADF 3	S	S	S	S
21	PR6	PR6	A	Control		ADF 4	S	S	S	S
22	PR7	PR7	D	Control		BD 1	S	S	S	S
23	PR8	PR8	D	Control		BD 2	S	S	S	S
24	PR9	PR9	D	Control		BD 3	S	S	S	S
25	PR0	PR0	D	Control		BD 4	S	S	S	S

Figure 3: OptiView Point Maps Spreadsheet

Figure 4 shows an example of an YCAS Point List spreadsheet. The ENG PAGE REF refers to the actual YORK Talk Feature (F54) page reference.

The N2 address is the N2 Open address that is associated with that particular parameter. Columns 1 to 10 of the Points list description indicate if a parameter is standard, optional, or not available and refer to the version of firmware/Erasable Programmable Read Only Memory (EPROM) listed as items 1 to 10 at the top of the spreadsheet.

Item	Ref.	Version	Date	YORK P.N	Checksum	Baud	COMMENTS
1	C.MLM.01.02					15.2K	If data is requested in Metric mode, must use version C.MLM.01.02.03 or later
2	C.MLM.01.02.03				425C	15.2K	Temporary fix for Metric mode requirement. Problem was with digital points.
3	C.MLM.01.02.000				889E	15.2K	adds missing data points and status codes; supports the Property Data Link feature
4	C.MLM.01.04.111						Has overlapping warning code defects. Chiller engineering is correcting.
5	C.MLM.01.04.100						Overlapping warning code defects fixed.

ENG	ASDII	GPIC	York Talk	ISN LINC	York Talk	N2	POINT LIST CODE	S=STANDARD	D=OPTIONAL	N=NOT AVAILABLE
17	REF	REF	Type	Type	Text	Position	POINT LIST DESCRIPTION			
18	PR3	PR3	A	Control	LCHL SP	ADF 1	S	S	S	S
19	PR4	PR4	A	Control	CHLFR LIMIT	ADF 2	S	S	S	S
20	PR5	PR5	A	Control		ADF 3	S	S	S	S
21	PR6	PR6	A	Control		ADF 4	S	S	S	S
22	PR7	PR7	B	Control	START STOP	BD 1	S	S	S	S
23	PR8	PR8	B	Control		BD 2	S	S	S	S
24	PR9	PR9	B	Control		BD 3	S	S	S	S
25	PR0	PR0	B	Control		BD 4	S	S	S	S
26	PR1	PR1	A	Monitor	LCHL TEMP	B-T	ADF 5	S	S	S
27	PR2	PR2	A	Monitor	RCHL TEMP	D-S	ADF 6	S	S	S

Figure 4: YCAS Point List Spreadsheet

Figure 5 shows how a chiller's Point Map is mapped to provide the required BACnet object ID references and their BACnet object names.

BACnet/MS/TP YorkTalk Points Map REV C 06.12.2002

NOTE:

- This map applies to the BACnet/MS/TP Microgateway product and/or York Talk Chillers.
- Communications Mode: BACnet/MS/TP.
- This document should be submitted with the appropriate YORKTALK Points Listing.
- Contact your local York Controls Representative for appropriate Chiller YORKTALK Type Data. See Section 1, page 2 (Notes or Table).
- If an equipment with a Slave device simply adding 100 to the instance address in Section 1 enables the new Section 2 instances. For example, Page 11 in section 1 is AV1 in section 2 will be AV100.
- Contact your local York Controls Representative for appropriate YorkTalk Points Description Listings.
- BACnet M/ objects (from 101 to 199) are offset by +1. When referring, Table Codes on the YorkTalk Points tab, be sure to take this into consideration. e.g. 102 now indicates "Normal Conditions".

ENR Page Ref	Chiller Point Type	BACnet Object Type and Instance (see notes 5,7)	Priority Array Support	OBJECT NAMES Variable Assignments			YORKTALK	ENR Page Ref
				York Talk 1 Section 1 (see note 4)	York Talk 2 Section 1 (see note 4)	York Talk 3 Section 1 (see note 4)		
P03	Analog Input	AV1	YES	170-301-P03	172-301-P03	173-301-P03	See appropriate York Talk points listing	P03
P04	Analog Input	AV2	YES	171-301-P04	173-301-P04	173-301-P04	See appropriate York Talk points listing	P04
P05	Analog Input	AV3	YES	171-301-P05	173-301-P05	173-301-P05	See appropriate York Talk points listing	P05
P06	Analog Input	AV4	YES	171-301-P06	173-301-P06	173-301-P06	See appropriate York Talk points listing	P06
P07	Digital Input	DI1	YES	171-301-P07	173-301-P07	173-301-P07	See appropriate York Talk points listing	P07
P08	Digital Input	DI2	YES	171-301-P08	173-301-P08	173-301-P08	See appropriate York Talk points listing	P08
P09	Digital Input	DI3	YES	171-301-P09	173-301-P09	173-301-P09	See appropriate York Talk points listing	P09
P10	Digital Input	DI4	YES	171-301-P10	173-301-P10	173-301-P10	See appropriate York Talk points listing	P10
P11	Analog Output	AO1	NO	171-301-P11	173-301-P11	173-301-P11	See appropriate York Talk points listing	P11
P12	Analog Output	AO2	NO	171-301-P12	173-301-P12	173-301-P12	See appropriate York Talk points listing	P12
P13	Analog Output	AO3	NO	171-301-P13	173-301-P13	173-301-P13	See appropriate York Talk points listing	P13
P14	Analog Output	AO4	NO	171-301-P14	173-301-P14	173-301-P14	See appropriate York Talk points listing	P14
P15	Analog Output	AO5	NO	171-301-P15	173-301-P15	173-301-P15	See appropriate York Talk points listing	P15
P16	Analog Output	AO6	NO	171-301-P16	173-301-P16	173-301-P16	See appropriate York Talk points listing	P16
P17	Analog Output	AO7	NO	171-301-P17	173-301-P17	173-301-P17	See appropriate York Talk points listing	P17
P18	Analog Output	AO8	NO	171-301-P18	173-301-P18	173-301-P18	See appropriate York Talk points listing	P18

Figure 5: Point Maps and Object ID/References
 Figure 6 shows how a chiller's Point Map is mapped to provide the required Modbus RTU addresses, supported function codes, and associated scaling.

ENR Page Ref	Chiller Point Type	Modbus References Supported	Modbus Function Types Supported	Modbus Address	York Talk 1	York Talk 2	York Talk 3	York Talk 3	York Talk 3	York Talk 3
P03	Analog Input	4X	03, 06, 16	0001	Div 10	Div 10	Div 10	Div 10	Div 10	Div 10
P04	Analog Input	4X	03, 06, 16	0002	Div 10	Div 10	Div 10	Div 10	Div 10	Div 10
P05	Analog Input	4X	03, 06, 16	0003	Div 10	Div 10	Div 10	Div 10	Div 10	Div 10
P06	Analog Input	4X	03, 06, 16	0004	Div 10	Div 10	Div 10	Div 10	Div 10	Div 10
P07	Digital Input	0X, 4X	01, 03, 05, 16, 06, 16	0001	N/A	N/A	N/A	N/A	N/A	N/A
P08	Digital Input	0X, 4X	01, 03, 05, 16, 06, 16	0002	N/A	N/A	N/A	N/A	N/A	N/A
P09	Digital Input	0X, 4X	01, 03, 05, 16, 06, 16	0003	N/A	N/A	N/A	N/A	N/A	N/A

Figure 6: Point Maps and Modbus RTU Addresses

Theory of Operation

The E-Link Gateway is designed to express equipment data from one protocol (typically, YORK Talk, BACnet, or Modbus RTU) into a BAS protocol. To normalize the data received from or sent to the equipment, three standard BACnet object types (AV, BV, and MSV) are used. Although the E-Link Gateway contains more complex objects, these serve no function in a Gateway Application.

The E-Link Gateway is based on the ConneXsys object engine that uses FSP as its programming method.

The E-Link Gateway always serves as a master with respect to the equipment that it supports. In the case of the YORK Talk Feature (F54), the E-Link Gateway polls the chiller panel to request data from and write data to it.

When applied with BACnet enabled equipment (YPAL), the Acquisition Feature (F65) is used to read the Present Value (PV) of objects resident within the equipment and assign them to AV, MSV, or BV objects. Analog and Digital Transfers (F28 and F29) are used to write data to the equipment.

For Modbus RTU-enabled equipment, the Modbus RTU Feature (F66) polls the equipment to request data from and write data to it. As in previous cases, all the data retrieved from the equipment is assigned to AV, MSV, and BV objects.

Figure 7 shows the three major client features that are used in the E-Link Gateway. Table 5 shows the normalizing variables and the output protocols.

Equipment Communication

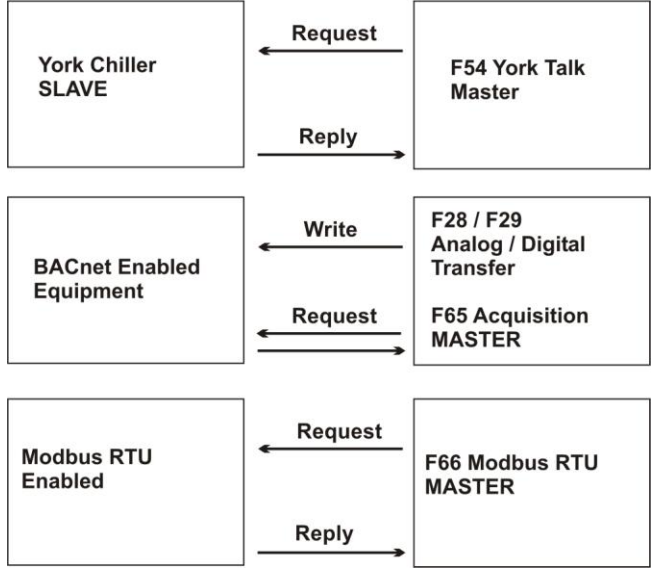


Figure 7: Client Features

Table 5: Normalizing Variables and Output Protocols

INPUT	Normalized Data	OUTPUT
YORK Talk Data	AV, MSV, BV	N2, Modbus RTU, BACnet, and LONWORKS FTT10
BACnet Data	AV, MSV, BV	
Modbus RTU Data	AV, MSV, BV	

Equipment Profiles

These are defined as collections of data points, which provide a BAS system access to certain equipment functionality when exposed on a network.

E-Link Gateway Application

To provide flexibility, the E-Link Gateway does not hardcode the equipment profiles but allows them to be easily configured by factory-designated resources. These profiles are stored as E-Link Gateway Applications that can be restored using a BACnet atomic write service or by an X-modem transfer. The assigned Application revision number reflects the state of the profile.

Principle of Operation

The E-Link Gateway Application links features together to create a predefined behavior that is executed once every system cycle. Figure 8 and Table 6 show the Firmware Features used.

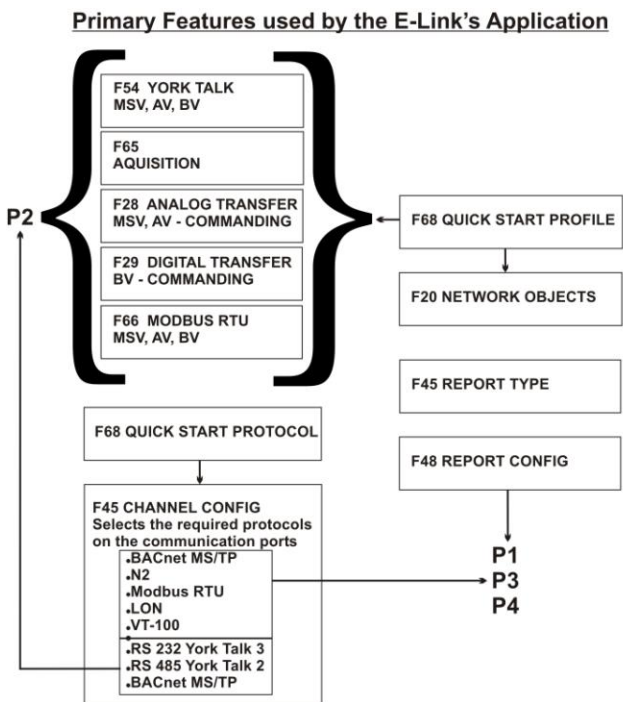


Figure 8: Features

Table 6: Features

Feature	Description
F01	MULTI STATE VALUE
F04	ANALOG VALUE
F06	BINARY VALUE
F09	BINARY OUTPUT
F20	NETWORK OBJECTS
F28	ANALOG TRANSFER
F29	DIGITAL TRANSFER
F45	CHANNEL CONFIG
F48	REPORT CONFIG
F49	USER TYPE
F50	SYSTEM DIAG
F54	YORK TALK
F60	SYSTEM STRUCTURE
F65	ACQUISITION
F66	MODBUS RTU
F67	QUICK START PROTOCOL
F68	QUICK START PROFILE
F69	MSV COMPANION
F70	QUICK START CONTINUATION

Accessing the E-Link Gateway

You must first establish communications with the E-Link Gateway to access the Application. This is done by connecting a computer to Port 3 through a converter that provides an RS-485 interface.

Next, the protocol on Port 3 must be set to Terminal mode. This is accomplished by setting the T-switch (Way 8) of the MAC switch to ON (Figure 9).

System Interface Module (SIM)

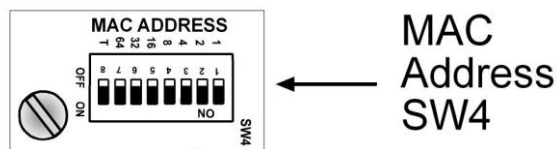


Figure 9: MAC Address Switch

Any VT-100 emulation program can be used to access the Applications, but the HyperTerminal software provides a well-proven tool for Windows OS users.

Note: All screen captures in this document were taken via the HyperTerminal software.

Set the terminal emulation software to the following settings once the computer and E-Link Gateway are connected:

- Baud rate = 57,600
- Parity = None
- Data format = 8 bits, 1 stop bit
- Set terminal for Half Duplex mode of operation
- Set for a linefeed after a carriage return

System Levels

A system of hierarchical levels offers access to the FSP of an E-Link Gateway. There are four primary system levels:

- Advisory Level
- Feature Level
- Section Level
- Page/Data Entry Level

Access all FSP data via a series of key presses from a terminal.

Advisory Level

The Advisory Level is the default of the E-Link Gateway and consists of the unit name, the current date/time, and one of the following messages:

- System Unconfigured
- System Halted
- System Monitor

Only these operations may be performed at Advisory Level:

- Password Access
- Alarm review (not applicable for standard E-Link Gateway operation)

Terminal Command Structure

The E-Link Gateway's terminal command set is based on two types of commands: base commands and extended commands.

Base commands comprise a single character and provide the basic navigation through the E-Link Gateway. They can also take the form of a string of base command characters.

Extended commands comprise complete words and provide more flexible methods of interrogating the E-Link Gateway. Extended commands cannot be strung together.

All commands consist of lowercase characters. Uppercase characters are reserved for text entry. Commands are executed by pressing the <CR> key.

Logging On

Once the terminal program has been activated, you can then establish a session with the E-Link Gateway. Send either a **logon** or **login** command to initiate the session.

The program prompts you to enter a password upon entering the logon/login command. You can use the general password (default 5555) to investigate the system for general troubleshooting activities.

Additional passwords are available for logon access. Table 7 summarizes the available passwords, access levels, and functionality.

Table 7: Password Access Levels

Password	Access Levels
5555	General access to all FSP functionality. You can make queries into the E-Link Gateway for troubleshooting activities. Any changes are not saved to flash memory.
1111	Gains access to User Report 1
2222	Gains access to User Report 2
3333	Gains access to User Report 3
4444	Gains access to User Report 4

Once a session is activated, there are two ways to terminate the session. The first way is simply to execute the **logout** or **logoff** command. Invoking either of these results in the following action by the E-Link Gateway:

Link closed
Reversing database changes...
Restarting system...

The second way to terminate the session is a period of inactivity. If there is no keyboard activity for 20 minutes, the session expires and you must log on again.

Help Command

The help command (Figure 10) accesses the E-Link Gateway's help screen and is accomplished by typing help at the prompt. Users can invoke the help command any time they are at the prompt.

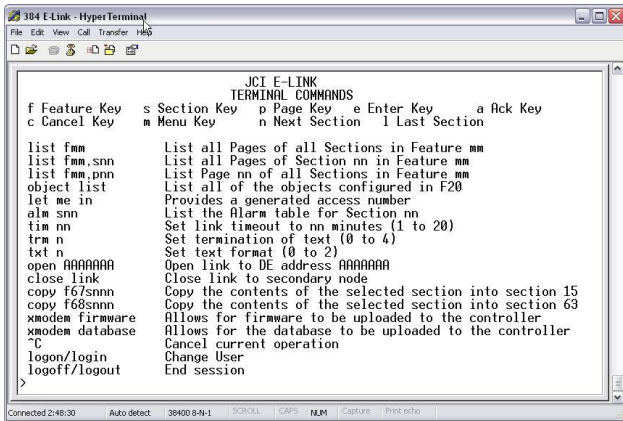


Figure 10: Terminal Commands

General Navigation Commands

The E-Link Gateway's Terminal interface supports a series of easy-to-use generic commands that allow access to the hierarchically presented data. Data in the E-Link Gateway is addressed by referencing a Feature, a Section, and a Page.

Basic FSP commands can be appended to achieve a higher degree of functionality. This guide focuses on the fundamentals, as these are sufficient to enable all functions. As you become more familiar with the navigation, more elaborate sequences can be used.

You can only access the E-Link Gateway's features after entering a valid password. Although the password can be changed in F60, the E-Link Gateway's Applications do not allow you to save the password; therefore, the default password 5555 is always valid.

Feature Command

Feature Command (f) – The feature command can be issued in two ways. The first method is to enter **fnn**, where nn is the specific two-digit feature number.

The second method is to type **f**, which advances the Application to the next feature in sequence. The feature cycles back to F01 upon reaching F99. You can type a minus symbol at the Feature level to select the previous feature.

Section Command

Section Command (s) – The section command can be issued in two ways. The first is simply to enter the command **snnn**, where nnn is the specific three-digit section number.

The second method is to type **s**, which advances the Application to the next section.

The section cycles back to section 1 upon reaching the maximum section of a particular feature. If you enter a section number beyond the limit of a particular feature, then you are prompted with error 07 – Section number out of range.

Figure 11 and Figure 12 show two basic ways of viewing different Features and Sections.

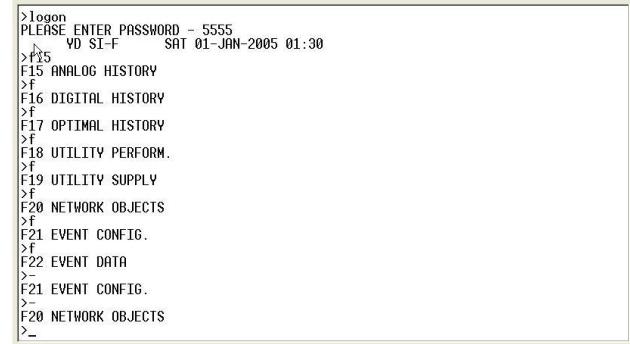


Figure 11: Features List

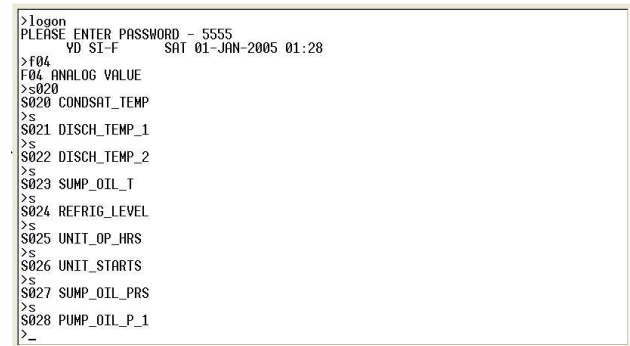


Figure 12: Sections List

You can type a minus symbol at the Section level to select the previous section.

Page Command

Page Command (p) – The page command can be issued in two ways. The first is simply entering **pnn**, where nn is the specific two-digit page number. The number of valid pages per section varies by the particular feature that has been selected.

If you select a page number beyond the limit of a particular section, then you are prompted with error 08 – Page number out of range.

The second method is to type **p**. The E-Link Gateway advances to the next page in sequence of the currently selected feature and section. Upon reaching the last page for a particular section, the page cycles back to page 1. You can type a minus symbol at the Page level to select the previous page.

Enter Command

Enter Command – The Enter command is issued to begin editing a particular field in a given Feature, Section, and Page. The editing process follows the following steps:

1. Issue the required FSP command to bring the required page into focus.
2. Type **e** and press Enter. The page is returned as before except that the contents of the user-enterable data field are replaced with an appropriate data entry prompt (see Table 8).

Table 8: Data Entry Prompts

“t.....t”	Represents an ASCII text entry.
“v.....v”	Represents either a Real or an Integer value. Real Value: 8 digits may be entered. A decimal point or minus sign reduces the effective length by 1. Integer Values: Only positive values are accepted. If a Real Value is entered, error 02 – Invalid data is returned.
“ssss”	Represents a point address (for example, 4001 or 3064).
“m...m”	Represents a menu selection (for example, ON, OFF, FIR).

Once you edit a field, type **e** and press Enter to close it. Some pages have multiple editable fields, which are sequentially opened and closed using **e**.

Figure 13 illustrates the editing sequence for all data types. It also shows how the **e** command is used to open an edit session, move through all available editable fields, and close the session.

```

VD SI-F SAT 01-JAN-2005 01:32
>F04,s001,p01
P01 LCHW_SP 6.0 C 0
>e
P01 tttttttttt 6.0 C 0
>RANDY'S ELINKe
P01 RANDY'S ELINK 6.0 C 0
>p04
P04 DIRECT INPUT: 0000
>e
P04 DIRECT INPUT: ssss
>3001e
P04 DIRECT INPUT: 3001 AV5 STEER 0.0
>p07
P07 DEFAULT VALUE: 6.0 ENG UNITS: C
>e
P07 DEFAULT VALUE: vvvvvvvv ENG UNITS: C
>67.2e
P07 DEFAULT VALUE: 67.2 ENG UNITS: mmmmm
>m
P07 DEFAULT VALUE: 67.2 ENG UNITS: W
>n
P07 DEFAULT VALUE: 67.2 ENG UNITS: KW
>_
  
```

Figure 13: Editing Sequence

Menu Command

Menu Command (**m**) – The menu command selects the next selection of the menu enumeration. Certain fields are menu-driven, depending on the feature.

If you need to adjust one of these fields, the **m** command cycles through all available enumerations.

Next Section Command

Next Section Command (**n**) – The **n** command takes you to the next section of the selected feature. The command can be used to examine the same page across multiple sections.

For example, viewing p07 (Defaults and Engineering Units) on all F04 objects could be done by first viewing p07 then typing **n** and pressing enter for the number of sections that need to be viewed.

Other Commands

Last Command (**l**) – The **l** command takes you to the last section of the current feature.

List Command – This command is used to view a list of E-Link Gateway parameters sorted by the way the command is constructed. For example:

- list f04 – This command lists all Pages of all Sections in F04 (Figure 14).

```

PLEASE ENTER PASSWORD - 5555
VD SI-F SAT 01-JAN-2005 01:23
>list f04
F04 ANALOG VALUE S001 LCHW_SP
P01 LCHW_SP 6.0 C 0
P02 DESCRIPTION:NVIC00LSETPT
P03 SOURCE: R SETPOINT CNTR: 0000 ACT: R SETPOINT CNTR 0 0
P04 DIRECT INPUT: 0000
P05 ALARM FUNCTION: 0
P06 NET 0 MAC 0.0.0.0.0.0
P07 DEFAULT VALUE: 6.0 ENG UNITS: C
P08 OUT OF SERVICE WRITABLE: YES
P09 RESET ON POWERUP: NO
P10 MIN PV: -20.0 MAX PV: 100.0
P11 SETPOINT: 6.0
P12 SENSOR INPUT SECTION: 3 DEGC TO DEGF
P13 SENSOR INPUT ENABLE: 9004 IM-SI CONVRT OFF
P14 COV INCREMENT 1.0
P15 MODBUS ADDR: 1 DATA TYPE: SIGNED SCALE: X10
P16 BACNET INSTANCE: 0
Next Section... press <enter>
  
```

Figure 14: List of All Pages of All Sections

- list f04,s001 – This command lists all Pages of Section 001 in Feature 04 (Figure 15).

```

logon
PLEASE ENTER PASSWORD - 5555
VD SI-F SAT 01-JAN-2005 00:29
>list f04,s001
F04 ANALOG VALUE S001 LCHW_SP
P01 LCHW_SP 6.0 C 0
P02 DESCRIPTION:NVIC00LSETPT
P03 SOURCE: R SETPOINT CNTR: 0000 ACT: R SETPOINT CNTR 0 0
P04 DIRECT INPUT: 0000
P05 ALARM FUNCTION: 0
P06 NET 0 MAC 0.0.0.0.0.0
P07 DEFAULT VALUE: 6.0 ENG UNITS: C
P08 OUT OF SERVICE WRITABLE: YES
P09 RESET ON POWERUP: NO
P10 MIN PV: -20.0 MAX PV: 100.0
P11 SETPOINT: 6.0
P12 SENSOR INPUT SECTION: 3 DEGC TO DEGF
P13 SENSOR INPUT ENABLE: 9004 IM-SI CONVRT OFF
P14 COV INCREMENT 1.0
P15 MODBUS ADDR: 1 DATA TYPE: SIGNED SCALE: X10
P16 BACNET INSTANCE: 0
>
  
```

Figure 15: List All Pages of Section 001 in Feature 04

- list f04,p01 – This command lists Page 01 of all Sections in Feature 04 (Figure 16).

```

Logon
PLEASE ENTER PASSWORD - 5555
VD SI-F SAT 01-JAN-2005 00:26
>list f04,p01
F04 ANALOG VALUE
P01 LCHW_SP 6.0 C 0
P01 %CURR_LIMIT 100.0 PCT 0
P01 VT_S01_P05 0.0 0
P01 VT_S01_P06 45.0 0
P01 LCHL_TEMP 0.0 C 0
P01 RCHL_TEMP 0.0 C 0
P01 EVAP_PRESS 0.0 KPA 0
P01 COND_PRESS 0.0 KPA 0
P01 OIL_DP_1 0.0 KPA 0
P01 OIL_DP_2 0.0 KPA 0
P01 RCHNL_TEMP 0.0 C 0
P01 LCHNL_TEMP 0.0 C 0
P01 %FLA_1 0.0 PCT 0
P01 %FLA_2 0.0 PCT 0
P01 EVAP_REF_T 0.0 C 0
More... press <enter>

```

Figure 16: List Page 01 of All Sections in Feature 04

Note: Enter Control+C (^C) to terminate any List Command.

Copy Commands

Two commands are used to copy the contents of a given Quick Start section of either F67 or F68 into the last available section supported by that Quick Start feature (Figure 17). (See the *Quick Starts* section for additional information.)

- copy f67snnn is used to copy the contents of section nnn (where nnn is the three-digit section number) into section 15, the last section of F67.
- copy f68snnn is used to copy the contents of section nnn (where nnn is the three-digit section number) into section 63, the last section of F68.

```

Logon
PLEASE ENTER PASSWORD - 5555
VD SI-F SAT 01-JAN-2005 00:03
>copy f67s010
Section 10 copied into section 15
>copy f68s024
Section 24 copied into section 63
>

```

Figure 17: Copy Commands

X-modem Firmware

The E-Link Gateway Firmware can be reloaded in the field using a VT-100 terminal session. The command for initiating the load is **xmodem firmware**.

A prompt indicates when the E-Link Gateway is ready to receive the Firmware file (Figure 18).

```

Logon
PLEASE ENTER PASSWORD - 5555
VD SI-F SAT 01-JAN-2005 00:10
>xmodem firmware
-- READY TO RECEIVE FILE --
>$

```

Figure 18: X-Modem Firmware

The HyperTerminal software has a Transfer selection that allows you to access a Send File window (Figure 19 and Figure 20). The filename (*.ELF) and desired protocol (Xmodem) must be entered in this window.

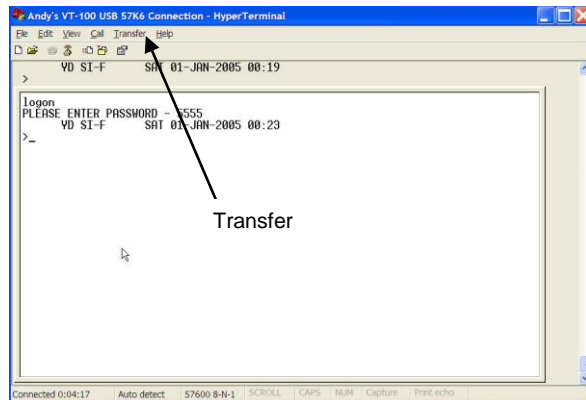


Figure 19: Transfer Option

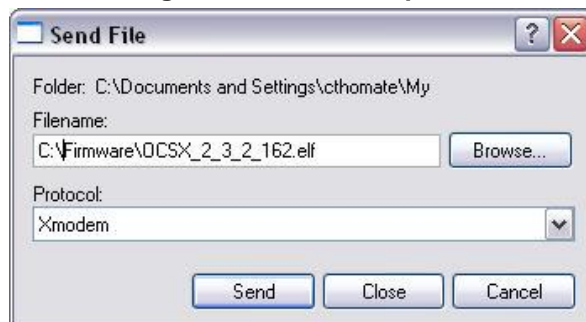


Figure 20: Send File Window

Figure 21 shows the progress of transferring data to the E-Link Gateway.

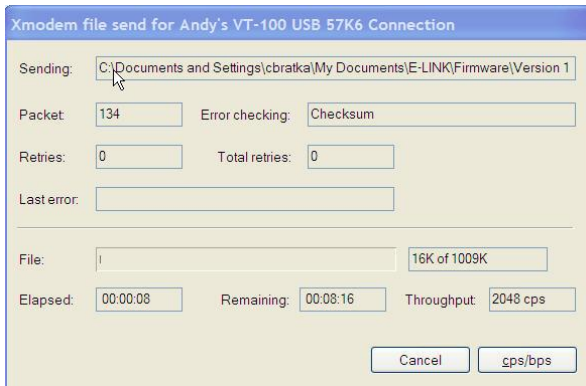


Figure 21: Data Transfer Progress

The system writes the new file to flash memory and then restarts after the E-Link Gateway receives the completed Firmware file. The current session is closed because the E-Link Gateway is going through a warm start.

Figure 21 shows the HyperTerminal software feedback during the process of updating the Firmware. You must wait until RESTARTING appears and the E-Link Gateway has reset to perform any other tasks.

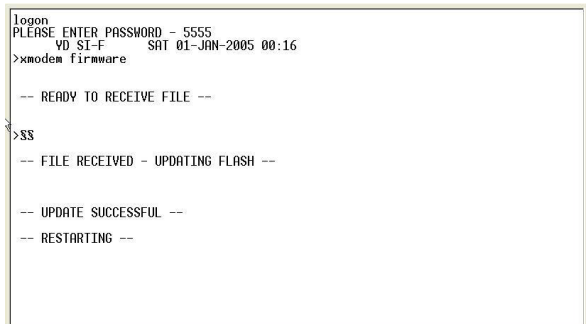


Figure 22: Messages during Firmware Update

X-modem Database

The E-Link Gateway's Application can be reloaded in the field through a VT-100 terminal interface. The command for initiating the load is **xmodem database**. You are prompted when the E-Link Gateway is ready to receive the Application file (Figure 23).

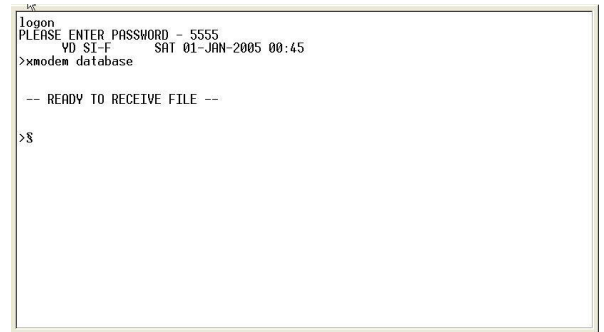


Figure 23: Ready to Receive File Message

The HyperTerminal software has a Transfer selection that allows you to access a Send File window (Figure 24), in which the filename (*.CNF) and desired protocol (Xmodem) must be entered.



Figure 24: Send File Window

Figure 25 shows the progress of transferring data to the E-Link Gateway.

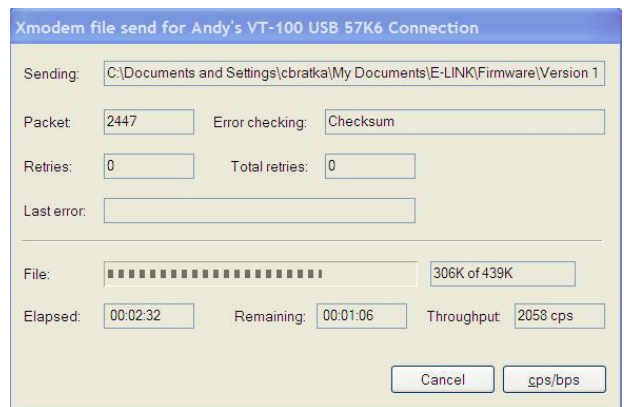


Figure 25: Data Transfer Progress

The system writes the new file to flash memory and then restarts after the E-Link Gateway receives the completed Application file. The current session is closed because the E-Link Gateway is going through a warm start.

Figure 26 shows the HyperTerminal software feedback during the process of updating the Application. You must wait until the RESTARTING message appears and the E-Link Gateway has reset to perform any other tasks.

```

YK SSS IM-G SAT 01-JAN-2005 00:05
>xmodem database
-- READY TO RECEIVE FILE --

>$
-- FILE RECEIVED - UPDATING FLASH --

-- UPDATE SUCCESSFUL --
-- RESTARTING --

```

Figure 26: Messages during Application Update

Object List Command

The object list command requires an established VT-100 session to be active. The object list command is used to display all the objects that have been activated in F20 (Figure 27).

```

>object list
OBJECT LIST
VV-001 | NEW LEAKING CON TEMP SP | NVICOLSETPT | 0 0 0 | F
VV-002 | MOTOR CURRENT REMOTE SP | NVICAPACTYLIMIT | 0 0 0 | PCT
VV-003 | HOT WATER REMOTE SP | NVIHEATSETPT | 0 0 0 | F
VV-004 | OPERATIONAL MODE | NVIOPERATIONMODE | 0 0 0 |
VV-005 | REM START STOP CMD | NVIICOLLERENABLE |
VV-006 | COMPRESSOR OIL PUMP ALARM | NVICOMPOLLALM |
VV-007 | OCSX ELINK L | SMO3 |
FTL-001 | DATABASE
FTL-002 | FIRMWARE
FTL-003 | TEMPLATE
FTL-004 | ICE PARAMETRIC DB
VV-001 | UNIT OPERATION CODE | NVIOPERCODE | 1 | SAFETY CODE VIOLATION
>### Timed Out. Link closed

```

Figure 27: Object List Command

Let Me In Command

The **let me in** command is used to generate an access code which can be used to obtain a password from an authorized support center. The system creates a password that stays active for a period of 120 minutes after the command is entered. Figure 28 shows the different codes that are generated each time the **let me in** command is entered.

```

login
PLEASE ENTER PASSWORD - 5555
VD SI-F SAT 01-JAN-2005 00:24
>let me in
Access Code = 10-66-84-81
>let me in
Access Code = 136-822-966-18225
>let me in
Access Code = 80-486-574-6241
>let me in
Access Code = 212-1278-1498-44521
>let me in
Access Code = 205-1236-1449-41616
>let me in
Access Code = 51-312-371-2500
>let me in
Access Code = 230-1386-1624-52441
>let me in
Access Code = 98-594-700-9409
>let me in
Access Code = 56-342-406-3025
>

```

Figure 28: Let Me In Command

Quick Starts

Quick Start is the method used in the field to set up and configure the operation of the E-Link Gateway. The desired modes of operation are selected on two DIP switches. Each bank of switches is used to invoke a specific behavior.

APP GROUP A switches are used to select the required equipment profile. APP GROUP B switches are used to select the desired output protocol. The binary weight of each switch (its address) is associated with a unique instance of two Application editor features.

Two features (F67 and F68) are associated with APP GROUP A and APP GROUP B and allow you to create a script that, when executed, modifies the E-Link Gateway's base configuration.

Base Configuration

The base configuration is contained within the factory-installed Application and is designed to set up objects (Features) within the E-Link Gateway that can later be modified by executing a Quick Start. The E-Link Gateway does not use Battery Random Access Memory (BRAM); so any time the power is cycled, the base configuration that is stored in flash memory is copied into Synchronous Dynamic Random Access Memory (SDRAM) ready for execution. Therefore, there is always a known starting point for the Quick Start features to work from.

Quick Start Execution

To invoke a Quick Start, set a desired address on the Application switches and press a momentary invoke push button or cycle power. When this action occurs, the base configuration is loaded from flash memory into SDRAM, and then modified according to the Application edits that are associated with the selected Quick Start settings.

In most cases, the base configuration has all the desired objects fully configured but disabled. The Quick Start feature creates the desired functionality by enabling the required functionality in the objects.

Every time a new Quick Start is invoked, the unedited base configuration is reloaded from flash memory before being modified by the Quick Start script.

Quick Start features F67 and F68 use a collection of one-line statements that can be programmed to alter the contents of the Base Configuration. There is a simple correspondence between the feature's section number and the binary weight of the Application switch.

For example, if APP Group A switches are set to 4, then the script defined in Section 4 of F68 is executed, and it determines the equipment port's behavior. If APP Group B switches are set to 10, then the script defined in Section 10 of F67 is executed, and it determines the output protocol that is used.

F67 (Quick Start Protocol) and F68 (Quick Start Profile)

P01 TT...TT ENABLE PTS SSSS SSSS SSSS SSSS

The enable points in F67/F68 are designed to allow you to programmatically control the execution of a **particular Quick Start** section. When ALL configured ENABLE Points are ON, then that particular F67/F68 Quick Start is executed. You may configure one, two, or all three of the enable points. Only the configured ENABLE points need to be ON for the section to be enabled. If any F70 continuation sections are assigned to this F67/F68, they are also activated the same way as the initial switch settings would have activated them.

A generic F67/F68 Quick Start statement is as follows:

FNN SNNN PNN FINN = TTTTTTTTTTTT S..S

The Feature, Section, Page, and field (Fi) parameters are used to uniquely identify any piece of editable RAM resident data within the E-Link Gateway. The 12-character ASCII string defines what data should be assigned to the selected property. S..S represents the status of this line of script.

If the referenced E-Link Gateway Property is a character string, such as an object's name or descriptor, then whatever has been configured in the text section on the right side of the statement overwrites the current contents.

For example, F02, S001, P01, Fi1 = OUTSIDE AIR, assigns OUTSIDE AIR to the F02 object's name.

If the referenced E-Link Gateway Property is a real number (such as an object's Relinquish Value), and if the text section of the statement is of the form X.X, the text value is converted into an Intel Real number and replaces the value of the Relinquish value property. For example, F04, S001, P07, Fi2 = 23.4, assigns 23.4 to be the F04 object's Relinquish Value property.

If the E-Link Gateway Property is an integer or enumeration, such as an object's engineering units, and if the text section of the statement is of the form X, then the text value is converted into an integer and applied to the current engineering unit selection property. For example, F04, S001, P01, Fi3 = 4, assigns ohms to the F04's object's engineering units.

Each line of the script has an associated status that informs the users whether the script has any syntax errors. If OK appears, then the script has been correctly configured and executes. The errors shown in Table 9 can be reported.

Table 9: Data Entry Prompts

Code	Meaning
“ ”	Nothing has been configured.
“OK”	The script has been configured correctly (the specified address and the entered data are compatible).
“INVALID FEATURE”	An invalid Feature number has been entered, or the specified feature does not exist or does not contain any user-editable data.
“INVALID SECTION”	An invalid Section number has been entered, or the specified section does not exist or does not contain any user-editable data.
“INVALID PAGE”	An invalid Page has been entered.
“INVALID FI”	An invalid Field has been entered.
“INVALID WRITE”	There is a data type mismatch between the referenced point and the configured value.
“INVALID DATA”	There is a data type mismatch between the point being referenced and the configured value.

The number of possible scripts contained by each of the Quick Start features is shown in Table 10.

Table 10: Data Entry Prompts

F67 ~ Protocol	F68 ~ Equipment Profile
20 Pages (scripts)	98 Pages (scripts)

If the number of scripts supported by the standard Quick Start feature is not enough to support the desired behavior, then you can use the Continuation feature to extend its capacity.

F70 Quick Start Continuation Feature

The Quick Start continuation feature is designed to provide you with the ability to increase the number of F67 or F68 Quick Start profile scripts that can be executed.

The feature is organized in the same way as F68 or F67, but in addition to the script pages, it has two steering addresses located on P01. This allows it to be associated with other F67 or F68 sections, which extend the overall script capacity that can be executed for a given Quick Start setting.

The size of the F70 script text field has been increased to 30 characters, allowing the automatic manipulation of data (such as the object names of F01, F04, and F06), which have also been increased to 30 characters in length. The state text in F01 can also be manipulated by using this extended scripting capability.

The Continuation feature is no more than a place holder for scripts that may be chained together with other F67 and/or F68 sections.

P01 allows an F67 or an F68 section number to be entered that associates that particular F70 section with another section of F67 or F68.

If several F70 sections have the same section number configured, then they collectively form an expanded script that consists of the original F67 or F68 section followed sequentially by any others that have been referenced within F70 sections.

For all F70 sections where the F67 and F68 section selections are not designated, and if ALL configured ENABLE Points are ON, then that corresponding F70 Quick Start is executed.

For the ENABLE Points, the Quick Start is only activated **once**, upon first seeing all designated ENABLE Points as ON. The operation resets only after ALL designated ENABLE PTS are OFF.

Validation has been added to F70, P01 so that the F67 and F68 sections cannot be set if any ENABLE Points are configured.

ENABLE Points can be selected with an F67/F68 section designated, but they are not acted upon while the F70 has either an F67 or an F68 section configured.

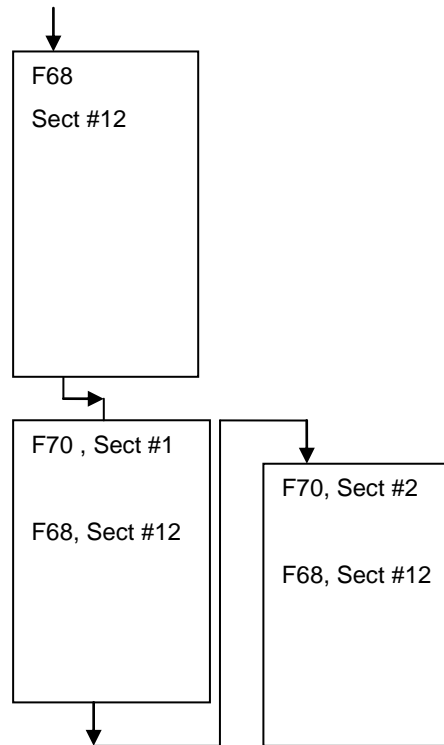


Figure 29: F70 Assigning F68 Continuations

Custom Quick Start

A user logged on with a level 5 password may edit any single section of F67 and F68. The **let me in** command is used to generate a password for saving these changes to flash memory.

Only F67 Section 15 and F68 Section 63 are able to be saved in this way. To assist with this process, two commands are available to copy an existing Quick Start script into the last section of each of these features. By using these commands, the amount of required data entry is minimized.

Two commands are used to copy the contents of a given Quick Start section of either F67 or F68 into the last available section supported by that Quick Start feature:

- copy f68snnn copies the contents of the selected section of this feature into the last custom section (that is, section 63).
- copy f67snnn copies the contents of the selected section of this feature into the last custom section (that is, section 15).

After selecting the Quick Start that requires editing, and copying it into the last section of F68 and or F67 using the previously described commands, you can then make functional changes by editing an existing line of script or adding new script lines.

To invoke a Custom Quick Start, set the APP Group A and/or APP Group B switches to 63 and 15, respectively. The E-Link Gateway resets.

Algorithmic Password

If you type **let me in** when connected to an E-Link Gateway in Terminal mode, the system generates an access string and automatically creates and stores a password that allows any custom Quick Start to be saved to flash memory. Concurrently with this process, the system starts a 120-minute down-timer which, on expiration, terminates the validity of the generated password. If you type **let me in** during the countdown period, the system automatically terminates the active password, requiring another password to be generated.

LED Operation

The E-Link Gateway uses a series of LEDs to provide a visual indication of its current operating status. The IPU-II has a Power and Status LED, and the SIM has two LEDs assigned to each port.

The green Power LED indicates that the E-Link Gateway is supplied with an input source of power. It does not indicate that this voltage source is within specification to allow the E-Link Gateway to operate correctly, just that a power source is present.

The red Status LED is used to indicate the E-Link Gateway's operating conditions (as shown in Table 11). The Status LED flashes continuously when the system is operating correctly. This flash rate is defined as 500 ms on, followed by 500 ms off. An error flash rate is defined as code sequence of 500 ms on, followed by 500 ms off to indicate the applicable code, which is then followed by a 2,000 ms delay before the sequence is repeated.

Table 11: Status LED (Red) Flash Rate Indicators

Flash Rate	Indication
LED OFF	No Application loaded. The E-Link Gateway is not configured, the system is in HALT or MONITOR mode, or the loaded Application does not match the host hardware. (The green Power LED should be used as an indication of whether power is currently applied.)
1 FLASH	Terminal mode has been invoked.
2 FLASHES	The communication between the E-Link Gateway and the equipment using F54, F65, and F66 has been lost.
3 FLASHES	A F67 or a F68 configuration error has been detected.
LED ON	Set during rebooting. No errors received with an F67/F68 patched Application or with a custom SIS developed Application.
Continuous FLASH	No errors with the standard Factory loaded Application. The E-Link Gateway is operating as expected.

The Status LED flashes quickly when the Quick Start activation push button is pressed, which indicates you have requested the E-Link Gateway to be reinitialized. The Status LED is set to on when the push button is released, which indicates a reboot.

Each Port has an associated green and red LED, which are used to indicate the port's communication status. The LEDs are connected directly to the driver's hardware lines and are therefore a reflection of the electrical activity of that port.

When the green RX LED is on, it indicates that this Port is **receiving** data electrically. It does not imply that the quality of this data is good or whether it is actually being directed to this Port. In an RS-485 Application, the green RX LED is an indicator of all network activity. When the green RX LED is off, it indicates that the Port is not receiving any data.

When the red TX LED is on, it indicates that this Port is **transmitting** data electrically. It does not imply that the quality of this data is good. It simply means that this Port is outputting data. When the red TX LED is off, it indicates that the E-Link Gateway is not transmitting any data.

User Reports

User reports allow you to edit advanced site-specific parameters that are not set within a Quick Start selection (for example, the setting of Max Masters or Device object instance).

To access the User reports, you must establish a physical connection and terminal session with the E-Link Gateway. Once the terminal connection is established, type **logon** and press Enter. The E-link Gateway responds with PLEASE ENTER PASSWORD.

Table 12 shows the valid passwords and corresponding user types:

Table 12: Valid Passwords and User Reports

Password	User Report
1111	(1) BACNET BAS PARAMETERS
2222	(2) YPAL DEST DE
3333	(3) MODBUS SCALING and EQUIPMENT INTERFACE
4444	(4) GENERAL DIAGNOSTICS and PORT CONFIGURATION

Once the password has been entered, the E-Link Gateway responds with:

```

USER  USER n (n = 1, 2, 3, or 4)
TT....TT (name of the report)
TT ... TT (name of report)
Select Option
>

```

Enter **1** or **2** and press Enter to view a list of all the pages of the selected report.

Any changes that are made in any of the reports are saved to flash memory once you have logged off from the report or the report has timed out.

User Report 1 allows certain BACnet BAS parameters to be viewed and edited. These parameters are primarily used to facilitate on-site setup, avoid protocol conflicts (the same addresses), or optimize network performance (adjust timeouts).

Figure 30 shows all the BACnet BAS parameters that may be user-adjusted in the report.

```

logon
PLEASE ENTER PASSWORD - 1111

        YSHP SSS IMK WED 05-JAN-2005 04:32
USER USER 1

01. BACNET

Select Option
>01

        YSHP SSS IMK WED 05-JAN-2005 04:32
USER USER 1

BACNET          BAS PARAMETERS
P01 DE INSTANCE: 5000 AUTO
P02 DE NAME: YSHP SSS IMK 5000 AUTO
P03 LOCATION: USER REPORT CHANGES
P04 DESCRIPTION: ALPHA / BETA ONLY
P05 APDU TIMEOUT: 3000 MSEC
P06 DESCRIPTOR PROPERTY VISIBLE: NO
P07 MG BACKWARDS COMPATIBLE: NO
P08 EDIT PORTS IN USER REPORT 4

```

Figure 30: BACnet Parameters

P01, Fi2 is used to manually set the Device Object address in circumstances when the automatically created device address is not suitable. This circumstance may occur because the address is not unique or because the site requires some particular numbering policy.

Table 13: P01 Fi Descriptions

P01	DE INSTANCE:	VVVVVVV	MMMM
	Fi1	Fi2	Fi3

P01, Fi3 normally defaults to AUTO, which creates the address automatically, but it may be changed to MAN allowing you to enter a manual address in Fi2.

If Fi3 is set to AUTO, the DE instance is created algorithmically by adding the unit's MAC address to the value of the DE Modifier multiplied by 100.

So, $Fi2 = DE\ Modifier \times 100 + nnn$ where nnn is the MAC address switch setting.

For example, if the unit's MAC address is 3, and the DE Modifier is 50, then the DE instance is $(50 \times 100) + 3 = 5003$.

If Fi3 is set to MAN, the DE instance must be entered manually in field 2. Valid entries must be in the range 0 to 4,194,303 decimal.

If the entry in Fi2 is > **4,194,303**, then the value is forced to **0**.

P02 is used to manually set the E-Link Gateway's BACnet name in situations where there may be duplication or the site policy dictates this.

Table 14: P02 Fi Descriptions

P02	DE NAME	TT....TT	MMMM
	Fi1	Fi2	Fi3

Fi3 normally defaults to AUTO, which creates the DE NAME automatically. The DE NAME can be changed to MAN allowing you to enter a user-created name, in Fi2.

If Fi3 is set to AUTO, then the Device Object's name is created algorithmically by appending the text entered in F60, P01 and the controller's DE instance. This action provides network uniqueness as required by BACnet.

P02, Fi2 = F60 P01 (text) + VVVVVVV (DE Instance)

For example, if the DE Instance is 5003 and the text entered on P01 of F60 is YPAL RTU, then the Device Object's name is YPAL RTU 5003.

If Fi3 is set to MAN, then the DE NAME must be entered manually in field 2. A valid entry is any alphanumeric string of no more than 20 characters.

P03, Fi2 is a text placeholder that allows you to define the Location of the E-Link Gateway. This BACnet property can be retrieved by requesting the Location property of the Device Object.

Table 15: P03 Fi Descriptions

P03	LOCATION	TT..TT
	Fi1	Fi2

P04, Fi2 is a text place holder used to define the E-Link Gateway's Application. This BACnet property can be retrieved by requesting the Description property of the Device Object.

Table 16: P04 Fi Descriptions

P04	DESCRIPTION	TT..TT
	Fi1	Fi2

P05, Fi2 is used to configure the time in milliseconds after which a returning acknowledgement (a simple ACK) or result (a complex ACK) is considered to have failed. The default value of this parameter is 3,000, but can be edited to any value between 500 and 60,000. To ensure optimum network performance, this parameter should be set to the same value in all intercommunicating devices.

If you enter 0, this value is automatically set to 3,000. If you enter any value less than 500, it is set to 500, and any value greater than 60,000 is reset to 60,000.

Table 17: P05 Fi Descriptions

P05	APDU TIMEOUT	VVVVV
	Fi1	Fi2

P06, Fi2 is a user-adjustable value to enable (YES) or disable (NO) the use of BACnet Descriptor Property. The default is NO. The use of the LONWORKS BAS protocol automatically sets the default state to enable (YES).

Table 18: P06 Fi Descriptions

P06	DESCRIPTOR PROPERTY VISIBLE	MMM
	Fi1	Fi2

P07, Fi2 is used to determine if the selected Quick Start profile should be backward compatible with the MicroGateway's BACnet implementation of Multi-State Value objects, and its support of the Modbus Function 17 service. In most cases, the answer is NO (disabled), which is the default selection in this report. However, for old equipment profiles, set this flag to YES (enabled).

Table 19: P07 Fi Descriptions

P07	MG BACKWARD COMPATIBLE	MMM
	Fi1	Fi2

P08 is non-adjustable; it is for information only. It tells you all port configuration changes are to be performed in User report 4, 02 Port Config Section.

USER REPORT 2 is used to set the BACnet address of the YPAL unit.

Figure 31 shows the YPAL BACnet address configuration screen.

```

logon
PLEASE ENTER PASSWORD - 2222

      YSHP SSS IMK WED 05-JAN-2005 04:43
USER USER 2

01. YPAL

Select Option
>01

      YSHP SSS IMK WED 05-JAN-2005 04:43
USER USER 2

YPAL          DEST DE
P01 F65S001 DEST DE ADDRESS:    5001
P02 F65S002 DEST DE ADDRESS:    5001
P03 GROUP DEST DE ADDRESS:     5001

```

Figure 31: YPAL BACnet Address Configuration

P01 and P02 of this report are used to configure F65's section 1 and section 2 addresses. These addresses define the BACnet address of the YPAL unit.

Table 20: P01 Fi Descriptions

P01	F65S001 DEST DE ADDRESS	VVVVVVV
	Fi1	Fi2

Table 21: P02 Fi Descriptions

P02	F65S002 DEST DE ADDRESS	VVVVVVV
	Fi1	Fi2

These pages must be set up the same way, as they are used to identify the YPAL on the BACnet network. F65 uses this address in the BACnet device auto discovery process (WHO IS --- I-AM transaction).

Both P01, Fi2 and P02, Fi2 enable you to enter a number between 0 and 4,194,303 that represents the YPAL's Device Object address. Each BACnet device must have a unique Device Object address on the network.

P03, Fi3 is used to set the destination address of the YPAL, to which write commands are sent. This address must be the same as P01 and P02.

This address is used by F57 (the Group feature) and the F28 (Analog Transfer feature) to determine where to send the data.

Table 22: P03 Fi Descriptions

P03	GROUP DEST DE ADDRESS	VVVVVVV
	Fi1	Fi2

USER REPORT 3 provides a mechanism of altering the Modbus RTU scaling of chiller parameters (run hours and number of starts), as well as editing the timeouts for F66 Modbus clients.

After an extended period of run time, certain chiller variables can exceed the maximum resolution of a Modbus RTU Register (65,353). To mitigate this, you can scale the value appropriately. For example, selecting X0.1 effectively divides the number of run hours or starts by 10, and extends the maximum value that can be represented.

Figure 32 displays the available Modbus RTU reports that can be generated using password 3333.

```

logon
PLEASE ENTER PASSWORD - 3333

      YK SSS-IM-K SAT 01-JAN-2005 00:10
USER USER 3

01. MODBUS

Select Option
>01

      YK SSS-IM-K SAT 01-JAN-2005 00:10
USER USER 3

MODBUS
01. YTS1 MOD SCALE
02. YTS2 MOD SCALE
03. EQUIP & BAS PAR

Select Option
>

```

Figure 32: Available Modbus Reports

Figure 33 - Report Option 01 - displays the Modbus RTU scaling parameters that can be field-modified to change the resolution of the equipment YORK Talk Section 1 Modbus Points.

```

Select Option
>01

      YK SSS-IM-K SAT 01-JAN-2005 00:15
USER USER 3

MODBUS          YTS1 MOD SCALE
P01 S1-P22- DATA TYPE: UNSIGNED, SCALE: X1
P02 S1-P23- DATA TYPE: UNSIGNED, SCALE: X1
P03 S1-P31- DATA TYPE: UNSIGNED, SCALE: X1
P04 S1-P32- DATA TYPE: UNSIGNED, SCALE: X1
P05 S1-P33- DATA TYPE: UNSIGNED, SCALE: X1
P06 S1-P71- DATA TYPE: UNSIGNED, SCALE: X1
P07 S1-P72- DATA TYPE: UNSIGNED, SCALE: X1
P08 S1-P73- DATA TYPE: UNSIGNED, SCALE: X1
P09 S1-P74- DATA TYPE: UNSIGNED, SCALE: X1
P10 S1-P75- DATA TYPE: UNSIGNED, SCALE: X1

```

Figure 33: YT Section 1 – Modbus RTU Scaling

Figure 34 - Report Option 02 - displays the Modbus RTU scaling parameters that can be field-modified to change the resolution of the equipment YORK Talk Section 2 Modbus Points.

```

Select Option
>02

      YK SSS-IM-K SAT 01-JAN-2005 00:18
USER USER 3

MODBUS          YTS2 MOD SCALE
P01 S2-P22- DATA TYPE: UNSIGNED, SCALE: X1
P02 S2-P23- DATA TYPE: UNSIGNED, SCALE: X1
P03 S2-P31- DATA TYPE: UNSIGNED, SCALE: X1
P04 S2-P32- DATA TYPE: UNSIGNED, SCALE: X1
P05 S2-P33- DATA TYPE: UNSIGNED, SCALE: X1
P06 S2-P71- DATA TYPE: UNSIGNED, SCALE: X1
P07 S2-P72- DATA TYPE: UNSIGNED, SCALE: X1
P08 S2-P73- DATA TYPE: UNSIGNED, SCALE: X1
P09 S2-P74- DATA TYPE: UNSIGNED, SCALE: X1
P10 S2-P75- DATA TYPE: UNSIGNED, SCALE: X1

```

Figure 34: YT Section 2 – Modbus RTU Scaling

For both 01 and 02 report selections, P01 through P09 represent the Modbus RTU scaling that is applied to the corresponding YORK Talk engineering Pages and returns the scaled value to a Modbus RTU client.

Table 23: P01 through P09 Fi Descriptions

P01 - P09	YT-S1, P022, M016, 4016- SCALE:	MMMMMM
	Fi1	Fi2

For P01 through P09, Fi2 enables you to select a scaling factor that may be selected. Table 24 shows the available multipliers for the scaling factor.

Table 24: Multipliers

Offset	Selection	Function
0	X10	Multiply the value by 10
1	X100	Multiply the value by 100
2	X1000	Multiply the value by 1000
3	X1	Multiply the value by 1
4	X0.1	Multiply the value by 0.1
5	X0.01	Multiply the value by 0.01
6	X0.001	Multiply the value by 0.001
7	X0.0001	Multiply the value by 0.0001

Figure 35 - Report Option 03 - displays the Modbus RTU scaling parameters that can be field-modified to change the equipment interface Modbus communication timeout parameter.

```

Select Option
>03

      YK SSS-IM-K SAT 01-JAN-2005 00:19
USER USER 3

MODBUS          EQUIP & BAS PAR
P01 F66 S001 250MS MODBUS TIMEOUT
P02 F66 S002 250MS MODBUS TIMEOUT
P03 F66 S003 250MS MODBUS TIMEOUT
P04 F66 S004 250MS MODBUS TIMEOUT
P05 F66 S005 250MS MODBUS TIMEOUT
P06 BAS MODBUS BEHAVIOR: MANUAL
P07 EDIT PORTS IN USER REPORT 4

```

Figure 35: Modbus Equipment Interface

P01 through P05 are user-adjustable values for the F66 Modbus RTU Timeout Property. The default is set to 250 ms.

P06 is a user-adjustable value to set the MODBUS addressing schema F02, F04, and F06 points and how the gateway responds to the BAS system for MODBUS registers that are not mapped in the equipment database. The selections are:

- **MANUAL**, the default value, sets the MODBUS addressing schema to the manual addressing that is set in the F02, F04, and F06 points; with an "error" returned to the BAS system for any MODBUS registers not mapped in the equipment database.

- **ALGORITHMIC** sets the MODBUS addressing schema to the use algorithmic MODBUS addressing for the F02, F04, and F06 points; with an "error" returned to the BAS system for any MODBUS registers not mapped.
- **MANUAL LEGACY** sets the MODBUS addressing schema to use manual MODBUS addressing that set in the F02, F04, and F06 points; with a value of "0" returned to the BAS system for any MODBUS registers not mapped in the equipment database.

P07 is non-adjustable; it is for information only. It tells you all port configuration changes are to be performed in User report 4, 02 Port Config Section.

USER REPORT 4 is the Support report and is specifically designed to assist with the debugging process. It provides a convenient location for Firmware versions, released dates, and general status information. It provides a combination of both editable and non-editable pages.

Within this user access level, there are two reports that can be selected: General Diagnostic and Port Configuration.

Figure 36 shows the available reports that can be generated using password 4444.

```

logon
PLEASE ENTER PASSWORD - 4444

      YSHP SSS IMK WED 05-JAN-2005 04:51
USER USER 4

01. GENERAL & PORTS

Select Option
>01

      YSHP SSS IMK WED 05-JAN-2005 04:51
USER USER 4

GENERAL & PORTS
01. GENERAL DIAG
02. PORT CONFIG

Select Option
>

```

Figure 36: Password 4444 Reports

General Diagnostic Report

Figure 37 – Report Option 01 - displays all the parameters contained in the General Diagnostic report.

```

Select Option
>01

      YK SSS-IM-K SAT 01-JAN-2005 00:21
USER USER 4

GENERAL & PORTS      GENERAL DIAG
P01 REF: 2.1 RELEASE WITH VIA YST WUXI
P02 CUSTOM DATABASE: NO
P03 FIRMWARE REV: 2. 3. 2. 215-
P04 FIRMWARE RELEASE DATE: 24.JAN.11
P05 APPLICATION REVISION: STD_02_01_34
P06 APP GROUP A:17
P07 APP GROUP B: 1
P08 IM-SI CONVRT OFF
P09 JCF REF =SSM4567JCF0007BL.BIN
P10 LON PROFILE: KSSSOPTI.XIF

```

Figure 37: General Diagnostic Report Parameters

P01, Fi2 is used to document an SIS custom Application or a local Technical or Field Support Center (FSC) sanctioned bug fix. Fi2 allows you to enter a 30-character text string. This text represents an FSC incident number, an SIS reference number (CMS [Contract Management System] number), or possibly a Purchase Order (PO) number.

Table 25: P01 Fi Descriptions

P01	REF	TT..TT
	Fi1	Fi2

P02, Fi2 indicates whether a custom SIS created Application is currently active. This flag can only be set in F50, P45 by a developer using the E-Link Gateway's Master password. This flag cannot be set in the Field as a result of a FSC bug fix.

Table 26: P02 Fi Descriptions

P02	CUSTOM DATABASE	MMM
	Fi1	Fi2

P03 and P04 display the revision and the date when the Firmware was compiled and released.

Table 27: P03 Fi Descriptions

P03	FIRMWARE REV	2.3.2.163-A
	Fi1	Fi2

Table 28: P04 Fi Descriptions

P04	FIRMWARE RELEASE DATE	16-SEP-07
	Fi1	Fi2

P05 displays the Application Revision; this is the revision of the Application and may be configured in F45, P04, by a developer that has access to the E-Link Gateway's Master password.

Table 29: P05 Fi Descriptions

P05	APPLICATION REVISION	ENG.001.023
	Fi1	Fi2

P06 and P07 display the decimal value of APP Group switch A and APP Group switch B, respectively. These pages effectively announce what Quick Starts are active.

Table 30: P06 Fi Descriptions

P06	APP GROUP A:	MMM
	Fi1	Fi2

Table 31: P07 Fi Descriptions

P07	APP GROUP B:	MMM
	Fi1	Fi2

P08 displays a flag that indicates whether the routine that converts imperial units to metric is currently active. If Fi2 is set to OFF, then the routine is currently inactive. This is important for LONWORKS implementations.

Table 32: P08 Fi Descriptions

P08	IM-SI CONVRT	MMM
	Fi1	Fi2

P09 displays the version of the JCF image at the time the Application was created.

Table 33: P09 Fi Descriptions

P09	JCF REF	SSM3456JCF0005BL.BIN
	Fi1	Fi2

P10 displays the LON PROFILE that is presently active. This is a read-only field that is generated by the type of equipment that has been Quick Started.

Table 34: P10 Fi Descriptions

P10	LON PROFILE	*.XIF
	Fi1	Fi2

Port Configuration Report

The Port Configuration report provides a status of all the communication ports and a means of software setting the configuration for each port. The switches of the Protocol switch bank, switch bank **B**, must be set to OFF for any changes in the ports to be persistent. All port settings **must** be configured from the User report due to the disabling of the automatic setup by the protocol QS (all the switches set to OFF).

Figure 38 – Report Option 02 - displays all the parameters contained in the Port Configuration report.

```

Select Option
>02

          YSHP SSS IMK WED 05-JAN-2005 04:53
USER USER 4

GENERAL & PORTS      PORT CONFIG
P01 P1 BACNET MS/TP   - BPS ACT: 76800
P02 P1 BPS:AUTO PARITY:NONE SBITS:1
P03 P1 MAC ADDR=AUTO MANUAL MAC= 0
P04 P1 MAX MASTERS= 127
P05 P2 YorkTalk 3
P06 P2 BPS:19200 PARITY:ODD SBITS:1
P07 P2 MAC ADDR=AUTO MANUAL MAC= 0
P08 P3 YorkTalk 3 SRVR
P09 P3 BPS:19200 PARITY:ODD SBITS:1
P10 P3 MAC ADDR=AUTO MANUAL MAC= 0
P11 P3 MAX MASTERS= 127
P12 P4 Terminal
P13 P4 BPS:57600 PARITY:NONE SBITS:1
P14 P4 MAC ADDR=MAN  MANUAL MAC= 1
P15 BAS PORTS P1 AND P3 EDITS ARE
P16 PERSISTANT WHEN SW B IS ALL OFF
P17 MAX MASTERS ALWAYS PERSISTANT
P18 REGARDLESS OF SW B SETTING
  
```

Figure 38: Port Configuration Report

Where PNN = P01, P05, P08, and P12, the parameters are used to display the currently selected protocol on Ports 1, 2, 3, and 4, respectively.

Table 35: P01 Fi Descriptions

P01,05, P08,P12	Ports, 1, 2, 3 and 4	MM	BPS (P01)	ACT: (P01)	MMMM (P01)
	Fi1	Fi2	Fi3	Fi4	Fi5

Table 36: Port Protocol Selections

Offset	Baud Rate
0	Terminal
1	Modbus I/O
2	LON
3	Modbus Server
4	API
5	Modbus Client
6	BACNET MS/TP
7	YORKTalk 3
8	YORKTalk 2 V6
9	YORKTalk 2 V4
10	YORKTalk 3 SRVR
11	YORKTalk 2 SRVR
12	N2
13	Disabled
14 ¹	Monitor Port 1
15 ¹	Monitor Port 2
16 ¹	Monitor Port 4

1. These selections are for Port 3 Only.

Selections 14, 15, and 16 allow you to capture a communication's log of the specified port using a terminal connected to Port 3.

When any of the Monitor Port selections are chosen, Port 3 is set automatically to 57,600 baud, no parity, and 1 stop bit. From this point forward, when Port 3 is **not** in the override terminal mode (for example, SW8 of the MAC address switch is **not on**), then every byte received or transmitted from the monitored communication port is echoed out of Port 3. Setting SW8 to **on** allows you to edit F45 Port 3 settings and, if required, to terminate the monitoring mode.

HyperTerminal Software Settings:

To capture the log file with hyperterm, certain configuration properties must be set.

Settings Tab > Emulation:

From the drop-down menu, select Viewdata.

Settings Tab > Select ASCII Setup:

Append line feeds to incoming line ends must be unchecked.

Under the **Transfer** menu select **Capture Text**. Browse Select the folder to create the capture file folder. Select All Files (*.*) for the **save as type**. Name the file with a .BIN extension. Select **Save**. Select **Start**. To stop the capture, from the **Transfer** menu, select **capture text**. Select **Stop**.

The captured file should then be sent to the Support Group for processing.

Any selections of the monitor modes made with a 5555 password is automatically reversed after 60 minutes.

P01 - Fi3 through Fi5 are only used by Port 1. When Fi2 is set to AUTO on P02, Fi5 is system generated and displays the negotiated baud rate for Port 1. When Port 1 is set to a baud rate other than AUTO on P02, the selected baud rate is displayed.

The valid displayed baud rates for Port 1 are 1200, 4800, 9600, 19,200, 38,400, 57,600, and 76,800.

P02, P06, P09, and P13 display the baud rate, parity, and stop bits that are assigned to the communication ports.

Table 37: P02 – Fields Descriptions

P02,P06,P09,P13	Ports,1,2,3 and 4	BPS:	MMMM
	Fi1	Fi2	Fi3

Table 38: Fi3 Baud Rate Selections

Offset	Baud Rate
0	1200
1	4800
2	9600
3	19,200
4	38,400
5	57,600
6	76,800
7	AUTO (Port 1 Only)

Table 39: P02 Fields Description Continued

P02,P05,P08,P11	PARITY:	MMM	SBITS:	M
	Fi4	Fi5	Fi6	Fi7

Table 40: Fi5 Parity Selection (Ports 1, 2, 3, 4)

Offset	Parity
0	NONE
1	EVEN
2	ODD
3	IGNR

Table 41: Fi7 Stop Bit Selection (Ports 1, 2, 3, 4)

Offset	Stop Bit
0	1
1	2

P03, P07, P10, and P14 provide a means for software setting the MAC addresses for Ports 1, 2, 3, and 4, respectively.

Table 42: P03 MAC Address Configuration

P03,P07,P10, P14	MAC ADDR =	MMMM	MANUAL MAC =	VVV
	Fi1	Fi2	Fi3	Fi4

Fi2 defaults to AUTO, which means the MAC address is obtained from the setting on the MAC address switch (SW4).

If the MAC address is changed during normal system operation and P03 is set to AUTO, then the DE INSTANCE and DE NAME are automatically updated.

To set a manual MAC address, set Fi2 to MAN and enter the desired MAC address in Fi4.

P04 and P11, Fi2 allows you to set the Max Masters parameter on Port 1 and Port 3, respectively. The Max Masters parameter defines the highest MAC address of any Master node on the MS/TP network. The default value is 127, but you can set it to any value between 1 and 127. If you enter a value of 0, it is automatically changed to 127. If you enter a number greater than 127, it is reset to 127.

Table 43: P04 Fi Descriptions

P04,P11	MAX MASTERS:	VVV
	Fi1	Fi2

To ensure most efficient communications, set the Max Masters value no larger than the highest MAC address of any node on the MS/TP network.

P15 through P18 are non-adjustable, and for information only. They tell you all BAS port configuration changes are only persistent when Switch Group B is set with all switches off and that the adjustment of the Max Masters parameter is persistent regardless of Switch Group B setting.

Writing Values to the E-Link Gateway

The E-Link Gateway is a multi-port device that enables different communication protocols to concurrently read and write values. To facilitate a predictable outcome from any write sequence, priority arbitration has to be used. Figure 39 shows the port organization and data flow within the E-Link Gateway.

Only AV and BV objects that have their SOURCE set to R-Setpoint, R-Setup Flag, or Network can accept a value from a network write command. As the data within the E-Link Gateway is represented as BACnet objects, the BACnet priority array provides a very convenient way in which to manage all the write requests.

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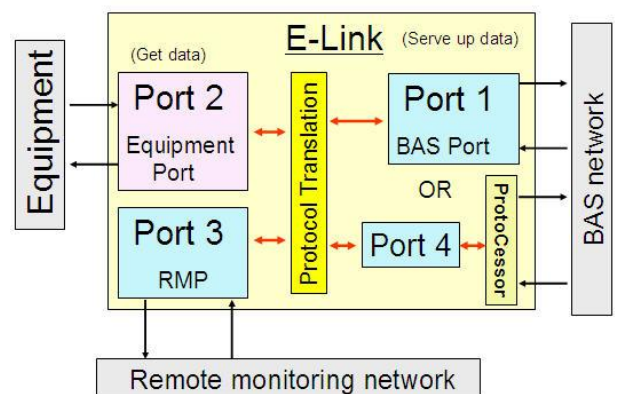


Figure 39: Port Organization and Data Flow

All BACnet **commands**, sent to objects with their SOURCE set to R-Setpoint or R-Setup Flag, are placed in the Priority array at the commanded priority level, and then saved to flash memory after a timeout expires.

BACnet **write commands**, sent to objects with their SOURCE set to NETWORK, are placed in the Priority array at level 16. The last command received takes precedence. In this configuration, the value received from the network is not maintained after a power cycle.

LONWORKS communication is provided by interfacing the ProtoCessor to the E-Link Gateway using BACnet services. From a writing perspective, it can be considered as a BACnet write command at priority 16.

Any N2 or Modbus RTU writes are placed in the Priority array at level 16, and the last command received takes precedence.

Figure 40 shows the behavior of a Modbus RTU device writing on Port 1 and Modbus RTU or N2 on Port 3.

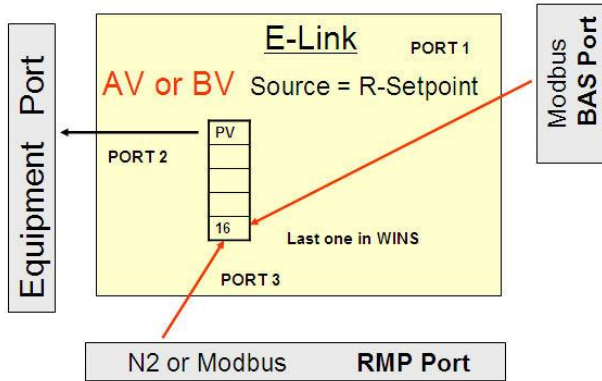


Figure 40: Modbus RTU Device Data Flow

Figure 41 shows the behavior of a BACnet device writing on Port 1 and N2 or Modbus RTU on Port 3.

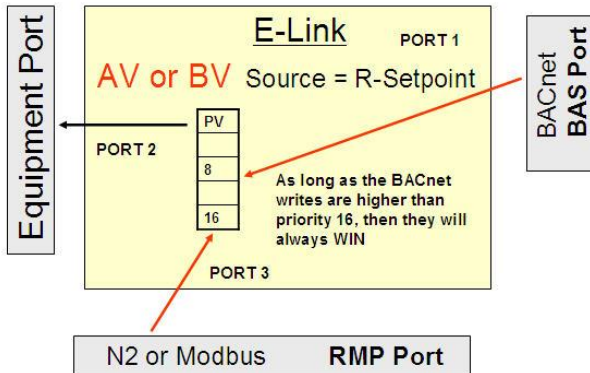


Figure 41: BACnet Device Data Flow

Figure 42 shows the behavior of a BACnet device writing on Port 1 and N2 or Modbus RTU on Port 3 when the SOURCE of the object is set to NETWORK.

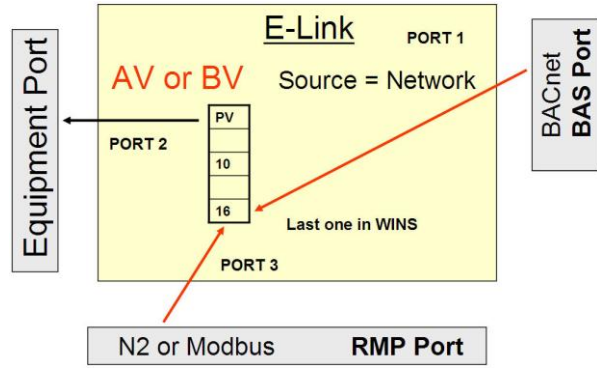


Figure 42: BACnet Device Data Flow with Network Object Source

Protocols

Each E-Link Gateway's port is configured by using a Quick Start selection. The script that is executed edits the appropriate pages within F45 selecting the protocol to be assigned to each port.

Table 44: Source Selections

Offset	PROTOCOL	FUNCTION
0	Terminal	Allows a VT-100 session
1	Modbus I/O	Supports YORK Modbus RTU I/O cards
2	LON	Allows BACnet communications over TTL
3	Modbus Server	Serves up data to a Modbus RTU Client
4	API	Passes control to another Application (Café interface)
5	Modbus Client	Acts as a general purpose Modbus RTU Client (F66)
6	BACNET MS/TP	Allows BACnet communications over RS-485
7	YORKTalk 3	Acts as a YORK Talk 3 Client to an OptiView chiller
8	YORKTalk 2 V6	Acts as a YORK Talk 2 Client to Small Tonnage chillers
9	YORKTalk 2 V4	Acts as a YORK Talk 2 Client to Small Tonnage chillers
10	YORKTalk 3 SRVR	Acts as a Server to a YORK Talk 3 Client
11	YORKTalk 2 SRVR	Acts as a Server to a YORK Talk 2 Client
12	N2	Serves up data to a N2 Client
13	Disabled	

Port Policy

Any port may be set to any selection in Table 46 as long as no two ports are the same.

The exceptions to this policy are BACnet MS/TP and Modbus RTU Server, which allow four concurrent instances. If you try to configure more than one instance of N2, the system automatically resets the new selection to its previous setting.

The numerically lowest port is active when you configure more than one instance of the other protocol selections.

In many cases, when you select a protocol on a particular port, a default baud rate, parity, and the number of stop bits are automatically assigned.

Normal Operation Port 3 Override: T Switch On

If SW8 of the MAC address switch is on, then the protocol on Port 3 is automatically forced to Terminal at 57K6 baud; with no parity.

If SW8 of the MAC address switch is off, then the protocol on Port 3 is set to the configuration in F45 on Port 3, and uses the baud rate and parity that are assigned to this port.

Port 2 Override: All MAC Switches On

Note: The Port 2 Override is not designed for normal system operation. It is reserved for hardware debugging.

If SW1 through SW8 of the MAC address switch are all set to on, then the protocol on Port 2 is forced to Terminal at 57K6 baud; with no parity.

If SW8 the MAC address switch is off, then the protocol on Port 2 is set to the configuration in F45 on Port 2. SW1 through SW7 = DON'T CARE.

IMPORTANT: Invoking this function breaks the communication link with the Equipment.

A star (*) displayed at the end of F45, P07, and P08 indicates that the current port's protocol selection has been overridden to Terminal.

If a port override is invoked, a Port 2 override always takes priority over a Port 3 override, and a Port 3 override always takes priority over a Terminal setting on Port 4. Likewise, a terminal setting on Port 1 usurps control from any other ports.

Figure 43 shows the default protocols selected on the ports when all the Quick Starts are set to off.

```

NO QS SET   SAT 01-JAN-2005 00:37
>F45
F45 CHANNEL CONFIG.
>list
F45 CHANNEL CONFIG. S001 CONFIGURATION
P01 KEYBOARD TIMEOUT 30 MINUTES
P02 STATUS P0: FREE
P03 STATUS P1: FREE P2: FREE
P04 STATUS P3: ACTIVE P4: FREE
P05 PROTOCOL P0: UNAVAILABLE
P06 PROTOCOL P1: BACNET MS/TP
P07 PROTOCOL P2: YorkTalk 3
P08 PROTOCOL P3: YorkTalk 3 SRVR *
P09 PROTOCOL P4: Terminal
P10 UNAVAILABLE
P11 MAC ADDR P1: 3 AUTO MANUAL MAC= 0
P12 MAC ADDR P2: 3 AUTO MANUAL MAC= 0
P13 MAC ADDR P3: 3 AUTO MANUAL MAC= 0
P14 MAC ADDR P4: 1 MAN MANUAL MAC= 1
P15 P1 BPS:AUTO ACT:76800 PARITY:NONE STOP BITS:1
More... press <enter>

```

Figure 43: Default Protocols

N2

The E-Link Gateway's N2 Server uses the N2 Open protocol to access the Present Value (P01) of the following features: F01, F04, and F06. The N2 interface can be configured to operate at any of the available baud rates in F45; however, in practice, only 9600 baud is used by the Quick Starts. The N2 protocol uses no parity, 8 data bits, and 1 Start and 1 Stop bit, which are automatically set by the Quick Starts.

In an N2-centric world, all data is referenced using objects. The E-Link Gateway supports three of the N2 object types: ADF, ADI, and BD. These are virtual points which align well with the gateway functionality offered by the E-Link Gateway (Table 45).

Table 45: N2 Objects

N2	E-Link Gateway Objects	Function
ADI	F01	Integer
ADF	F04	Float Internal value
BD	F06	Byte

Network Visibility

Any E-Link Gateway data that is required to be visible on an N2 network must be represented by a valid section address and be exposed in F20. If an object is not exposed in F20 but accessed by an N2 Master, an N10 error occurs.

N2 Addressing

The E-Link Gateway uses the corresponding BACnet object instance as the N2 object address. For example, AV102 is mapped to ADF102 and BV50 is mapped to BD50.

Reading N2 Values

All of the supported objects return Reliability, Overridden status, and Present Value when polled.

N2 Reliability is derived in the same way as it is for the corresponding BACnet object, whereas the Overridden state is set by the N2 Master performing the override command.

Table 46: N2 Attributes and Errors

	Attribute 1	Attribute 2	Error
ADI	Reliability Overridden	Present Value (PV)	N10, if section out of range or not in F20
ADF	Reliability Overridden	Present Value	N10, if section out of range or not in F20
BD	Reliability Overridden	Present Value	N10, if section out of range or not in F20
AI	Not Supported		N10
BI	Not Supported		N10
AO	Not Supported		N10
BO	Not Supported		N10

Writing to N2 Objects

An N2 Master may perform an Adjust, or an Override, on any of the objects shown in Table 47.

Table 47: N2 Attributes and Errors

	Out of Service = F	Out of Service = T	Source
	ADJUST	OVERRIDE	
ADI	PV not changed, An ACK is returned	PV Writable	Any
ADF	PV Writable	PV Writable	R-Setpoint
ADF	PV Writable	PV Writable	Network
ADF	PV not changed ACK returned	PV Writable	Any other
BD	PV Writable	PV Writable	R-Setup Flg
BD	PV Writable	PV Writable	Network
BD	PV not changed ACK returned	PV Writable	Any other
AI	PV not changed, ACK returned		Any
BI	PV not changed, ACK returned		Any
AO	PV not changed, ACK returned		Any
BO	PV not changed, ACK returned		Any

An overridden object must be taken out of service before writing to its PV.

Note: If an object cannot be taken out of service, an N11 error occurs in the N2 Server.

Limit Checking

When Adjusting or Overriding an ADI or ADF object, any new value is first checked to ensure that it is within allowable limits.

In the case of the ADI object, the network value is first checked to determine if it exceeds the maximum number of states as configured on P10. If it does, an N10 error occurs. If it does not, the new value replaces the PV.

In the case of the ADF object, the network value is checked to determine if it is outside the limits configured on P10. If so, an N10 error occurs. Otherwise, the new value replaces the PV.

In the case of the BD object, the network value is checked to determine whether it is anything other than a 0 or 1. If it is, an N10 error occurs. Otherwise, the new value replaces the PV.

Modbus RTU

The E-Link Gateway's Modbus RTU Server provides a means for a third-party Modbus RTU Client to access the PV of the following features: F01, F02, F03, F04, F05, F06, F07, F08, and F09. However, only F01, F04, and F06 are used within the E-Link Gateway's Application.

The Modbus RTU interface can be configured to operate at any of the available baud rates, parities, and stop bits that are selectable in F45. However, in practice, only certain selections that were used by the Modbus MicroGateway are supported by the Quick Starts.

Note: Unlike BACnet and N2, Modbus RTU data does not need the referenced objects to be exposed in F20 to make them network visible.

Modbus RTU Addressing

The E-Link Gateway references all its Modbus RTU data using 16-bit registers. These registers are expressed as decimal values within the E-Link Gateway's interface. Hexadecimal values are used within the Modbus RTU messages. All data addresses in a Modbus RTU message are zero-based. The first occurrence of a data item has an address value of 0 in the message, but is defined as Register 1 from a user perspective.

Algorithmic Addressing

In case of F02, F03, F05, F07, and F09 (and optionally selectable in F45 Page 46 for F01, F04, and F06), the address that references the PV of these features is obtained by combining the feature number and the section number using the following rule:

The feature number expressed as a HEX value is appended with the section number also expressed as a HEX value to form a single 16-bit HEX address. The Feature and Section numbers are both converted into Hex and then appended to form a single address.

Some Applications require expressing the Modbus RTU address as a decimal number. In this case, the FSP address is calculated as follows:

1. The Feature number (**ff**) is converted into a HEX number so as to create FF. As this applies to Features 1 through 9, the decimal representation is also the HEX representation.
2. Next, the Section number (**nnn**) is converted into a HEX number, to create NNN.
3. The two parts are then appended together to form a single HEX number **FFNNN**.

4. This HEX number FFNNN is then converted into a decimal to create **XXNNN**.

Note: 1 is added to the converted value to take into account the inherent offset.

Examples

To reference the PV of F02, S001, use Modbus RTU register 0201H. If you are using a typical Modbus RTU Client (for example, F66), convert this HEX address into a decimal number ($513 + 1 = 514$).

To reference the Present Value of F07, S110, use Modbus RTU register 076EH. If you are using a typical Modbus RTU Client (for example, F66), convert this HEX address into a decimal number ($1902 + 1 = 1903$).

Manual Addressing

The E-Link Gateway also uses a mechanism within F01, F04, and F06 objects that allows you to override the default algorithmic addressing method and to specify a specific Modbus RTU register address to be used by a given section. A separate page has been provided in these objects to specify this address. This value is represented as a decimal number and is defaulted to 0 to indicate that no Modbus RTU address is available.

Services

Table 48 shows the supported Modbus RTU Function codes listed by Feature used by the E-Link Gateway's Application.

Table 48: N2 Attributes and Errors

Function Codes	F01	F04	F06
01- Read Coil Status			X
02- Read Input Status			X
03- Read Holding Register	X	X	X
04- Read Input Registers	X	X	X
05- Force Single Coil			X
06- Preset Single Register		X	X
15- Force Multiple Coils			X
16- Preset Multiple Registers		X	X

Data Presentation

When the E-Link Gateway receives a request for the PV of F02, F04, F07, F08, and F09, it responds by returning a signed integer that is its P01 value multiplied by 10. For example, if an F04, P01 value is 32.7, then the Server returns 327.

An F04 may also be configured individually to scale its data using different data types and scale multipliers.

If the P01 value of any of the previously mentioned features is less than -32,768 (or greater than 32,767), then the E-Link Gateway Modbus RTU Server responds with an Illegal Data Value exception code.

If the Server receives a request for the PV of an F01 or an F03, it responds by returning an unsigned integer (for example, its P01 value) unmodified in any way. If the P01 value is less than 0 or greater than 65,535, the Server responds with an Illegal Data Value exception code.

BACnet/ LONWORKS FTT10

The E-Link Gateway is essentially a BACnet device that uses BACnet objects to represent its data. It supports both Client and Server functionality and uses MS/TP for its data link. Whereas the E-Link Gateway supports many other standard and nonstandard BACnet objects, (AI, BI, AO, SCHED, CAL, NTF, YSV F03, and so on), its Application only uses the AV, BV, and MSV for both internal manipulation and for exposing data onto a BACnet network. LONWORKS is provided by the addition of an optional ProtoCessor module that translates between BACnet and LONWORKS.

Network Visibility

Any E-Link Gateway data that is required to be visible on BACnet or LONWORKS FTT10 networks must be represented by a valid section address and be exposed in F20. If an object is not exposed in F20 but accessed by a BACnet system, an Object not Supported error occurs.

BACnet Addressing

In most cases, the E-Link Gateway uses the section number of the associated Feature as the BACnet instance. For example, 4102 maps to AV102 and 6050 to BV 50. A mechanism is included within F01, F04, and F06 that enables a specific BACnet instance to be configured, and so replaces the Feature's section number.

The functionality of the E-Link Gateway from a BACnet perspective is fully defined within its Protocol Implementation Conformance Statement (PICS)/BACnet Interoperability Building Blocks (BIBBS) statement.

LONWORKS ProtoCessor

The E-Link Gateway provides LONWORKS access by the addition of a LONWORKS ProtoCessor module. This is a two port device that has one of its ports dedicated to interfacing with the host (the E-Link Gateway), whereas the other port is used to connect to the LONWORKS network.

The E-Link Gateway uses electrical TTL signals on Port 4 to connect to the LONWORKS ProtoCessor module. BACnet MS/TP is used to transfer data between the two components.

The first E-Link Gateway Application supports the 12 LONMARK® profiles stored on the ProtoCessor module.

- OPTIVIEW.XIF
- YDOPTI.XIF
- YORK2.XIF
- YPAL.XIF
- KSSSOPTI.XIF
- KVSDOPTI.XIF
- KYDOPTI.XIF
- KYIAOPTI.XIF
- KYSTOPTI.XIF
- R2YORK2.XIF
- R2PAL.XIF
- STCWUXI.XIF

The ProtoCessor BACnet network is limited to one other device, that of the E-Link Gateway. When the LONWORKS Quick Start is invoked, all the BACnet network communication parameters on Port 4 are prefixed to the following values:

- Baud Rate = 38.4 K Baud
- Max Masters = 3
- E-Link Gateway's Port 4 Device Object's Instance (DE) = 100
- E-Link Gateway's MAC address = 1 (The ProtoCessor uses a MAC address of 2)
- Max info frames = 1

The BACnet Description property is made non BACnet writable, but can still be changed by the Quick Starts.

LONWORKS Profile Selection

The selection of an equipment profile is performed automatically by the ProtoCessor reading a proprietary BACnet text property within the E-Link Gateway. This property is configured by selecting a GROUP A Quick Start, which writes the desired profile name into F45, S001, P45. Once the profile is selected, it represents the data that a LONWORKS user may access from this piece of equipment.

Note: Whereas a Network Variable (NV) may be defined in a profile, it may not always be supported by the equipment. You must reference the specific Point Maps for the equipment to determine if the point is actually available.

LONWORKS Point Mapping

The E-Link Gateway has been organized so that only objects that are required to be made network visible are added to the **Device object_list_property**. The ProtoCessor reads this standard BACnet property to determine what objects need to be translated into LONWORKS SNVTs.

Each standard AV, BV, and MSV object used by the E-Link Gateway contains all the information needed to enable these objects to be represented on the LONWORKS network. On determining what objects need to be exposed, the object's

BACnet_Description_Property provides a string descriptor that is used to map this object to the appropriate location within the profile.

Objects

Certain objects added into the **DE object_list_property** are writable. These objects are known as Network Variable Inputs (NVI) and are explicitly defined by the profile. The ProtoCessor can also verify that the objects are writable within the E-Link Gateway by the first three characters of the Description property.

The LONWORKS protocol requires that all data is expressed in SI units. Equipment can represent its data in both Imperial and SI units and, therefore, the E-Link Gateway must be capable of converting from Imperial to SI units and vice versa.

Switching from Imperial to SI can often be easily accomplished through a software switch. However, in older chiller models, this process may require the replacing of Erasable Programmable Read-Only Memory (EPROM).

Quick Start 9 and 11 – APP GROUP B

These two Quick Starts are used to convert Imperial to SI units when the data is sourced from the equipment and then from SI to Imperial when the data is coming from the LONWORKS network.

These Quick Starts are used if the equipment is deployed in markets that require Imperial data to be displayed locally on the micro panel. The E-Link Gateway's Application converts these values into SI units before transferring them to the ProtoCessor module.

Quick Start 10 and 12 – APP GROUP B

These two Quick Starts are used to pass through the equipment values without any conversion.

These Quick Starts are used if the equipment is deployed in markets that require SI data to be displayed locally on the micro panel. The E-Link Gateway transfers raw values from the equipment without any modification.

SNVT Data

Most of the SNVTs used within the E-Link Gateway profiles are simple data types (for example, unsigned long). However, **Snvt_switch** is a two-element structure that combines a binary and an unsigned short to support a more complex behavior.

When exposing a data value as a Network Variable Output (NVO) of type **SNVT_switch**, the ProtoCessor reads the value from the associated BACnet BV object which offers a Boolean value of 0 or 1. If a **SNVT_switch** NVO is specified in the profile but a BV object is not exposed in the E-Link Gateway's **object_list_property**, then the NVO is set to a NULL (0xFF).

The ProtoCessor reads the BV object's PV, assigning it to the **SNVT_switch** according to Table 49.

Table 49: BV Values

BV Value	SNVT_switch Components	
	State	Value
0	0	0
1	1	100

Likewise, the ProtoCessor writes the **SNVT_switch** data to the BV object according to Table 50.

Table 50: SNVT Switch Data

SNVT_switch Components		BV Value
State	Value	
0	0	0
1	X-Don't Care	1

LONWORKS Status

The ProtoCessor does not activate its LONWORKS FTT10 output until it has completely processed the configuration data obtained from the E-Link Gateway. From a LONWORKS perspective, the ProtoCessor should appear offline. If the ProtoCessor were to make the FTT10 side active too soon, then the LONWORKS network has the option of asking for data that could not be answered.

Handling 8040 LONMARK® Profile

As well as providing the data that is defined within the profile, subscribing to the LONMARK 8040 profile requires some mandatory Configuration Properties to be supported are:

- nciChillerEnable
- nciMAXSendTime
- nciMinSendTime
- nciCapacityLim
- nciCoolsetPt

The E-Link Gateway's implementation handles the functionality of **nciChillerEnable**, **nciCapacityLim**, and **nciCoolSetPt** internally and, therefore, any LONWORKS FTT10 commands applied to these parameters are overwritten immediately.

- **nciMaxSendTime** is the maximum time period before certain NVO values are transmitted. In the case of the E-Link Gateway's OPTIVIEW configuration, the applicable NV should be:
- **nvoActiveSetpt – nvolvgCndWTemp**
- **nvoActualCapacity – nvoEntCndWTemp**
- **nvoEntCndWTemp – nvoEntCHWTemp**
- **nciMinSendTime** is the minimum time period before the objects can be retransmitted.

E-Link Gateway Application Summary Highlights

Table 51: Equipment Profile Application Highlights

Switch Settings	Client Features Used	Sections Used	Poll Interval	Port 2 Protocol	Port 2 Baud Rate	Port Hardware	Port 2 Parity	Functionality
1	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YK with SSS Imperial (Version J)
2	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YK with VSD Imperial (Version J)
3	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YT with SSS Imperial (Version J)
4	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YT with VSD Imperial (Version J)
5	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YS / YR with SSS Imperial (Version J)
6	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YK with SSS Metric (Version J)
7	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YK with VSD Metric (Version J)
8	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YT with SSS Metric (Version J)
9	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YT with VSD Metric (Version J)
10	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YS / YR with SSS Metric (Version J)
11	F54	1	15 s	YORK Talk 2 V6	1200	RS-485	ODD	YORK Talk II, 1200, 1 Sect (Version 2)
12	F54	1	15 s	YORK Talk 2 V6	4800	RS-485	ODD	YORK Talk II, 4800, 1 Sect (Version 2)
13	F54	1 & 2	15 s	YORK Talk 2 V6	4800	RS-485	ODD	YORK Talk II, 4800, 2 Sects (Version 2)
14	F54	5	5s	YORK Talk 3	19K2	RS-232	ODD	YD Imperial (Version J)
15	F54	5	5s	YORK Talk 3	19K2	RS-232	ODD	YD Metric (Version J)
16	F65, F28	1 & 2, 1 to 45	N/A	BACnet MS/TP	38K4	RS-485	NONE	YPAL IPU-I (Version 2)
17	F54	3 & 4	5s	YORK Talk 3	19K2	RS-232	ODD	YK with SSS Imperial (Version K)
18	F54	3 & 4	5s	YORK Talk 3	19K2	RS-232	ODD	YK with VSD Imperial (Version K)
19	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YT with SSS Imperial (Version K)
20	F54	3 & 4	5s	YORK Talk 3	19K2	RS-232	ODD	YT with VSD Imperial (Version K)
21	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YR /YS/YN with SSS Imperial (Version K)
22	F54	3 & 4	5s	YORK Talk 3	19K2	RS-232	ODD	YK with SSS Metric (Version K)
Continued on next page. . .								

Switch Settings (Cont.)	Client Features Used	Sections Used	Poll Interval	Port 2 Protocol	Port 2 Baud Rate	Port Hardware	Port 2 Parity	Functionality
23	F54	3 & 4	5s	YORK Talk 3	19K2	RS-232	ODD	YK with VSD Metric (Version K)
24	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YT with SSS Metric (Version K)
25	F54	3 & 4	5s	YORK Talk 3	19K2	RS-232	ODD	YT with VSD Metric (Version K)
26	F54	3	5s	YORK Talk 3	19K2	RS-232	ODD	YR/YS/YN with SSS Metric (Version K)
27	F54	6	5s	YORK Talk 3	19K2	RS-232	ODD	YST with Imperial (Version K)
28	F54	7	5s	YORK Talk 3	19K2	RS-232	ODD	YIA with Imperial (Version K)
29	F54	6	5s	YORK Talk 3	19K2	RS-232	ODD	YST with Metric (Version K)
30	F54	7	5s	YORK Talk 3	19K2	RS-232	ODD	YIA with Metric (Version K)
31	F66	1 to 5	N/A	Modbus RTU	9600	RS-485		Wuxi STC Models: YEWS-D1, YEAS, YGAS
32	F54	5	5s	YORK Talk 3	19K2	RS-232	ODD	YD Imperial (Version K)
33	F54	5	5s	YORK Talk 3	19K2	RS-232	ODD	YD Metric (Version K)
34 to 62								Reserved for the future

Table 52: Conversion Routines

Conversion Routines	
F13, Section #1	DEG F TO DEG C
F13, Section #2	PSI TO KPA
F13, Section #3	DEG C TO DEG F
F13, Section #4	LBH TO KGH
F13, Section #5	KGH TO LBH
F13, Section #6	GPM TO LPM
F13, Section #7	LPM TO GPM
F13, Section #8	BTUL TO KJKG
F13, Section #9	KJKG TO BTUL
F13, Section #10	WC TO PA
F13, Section #11	PA TO WC
F13, Section #12	CFM TO M3HR
F13, Section #13	M3HR TO CFM
F13, Section #14	IN TO MM
F13, Section #15	KPA TO PSI
F13, Section #16	SPARE

Table 53: BO References and Functions¹

BO Reference	Function	Where Used
BO1	YT COMS FAIL	F54
BO2	BACNET FAIL	F65
BO3	MODBUSFAIL	F66 (future)
BO4	IM-SI CONVRT	F04
BO5	TRANS.TIMER	F28
BO6	ACQUIS_FAIL	F65
BO7	USER RPT ENA	F48

1. BO-004 (9004) when ACTIVE enables the conversion from Imperial to Metric units. This flag is set to TRUE in the Output Protocol Quick Starts, 9 and 12.

Troubleshooting an E-Link Gateway

LEDs

Whenever possible, the E-Link Gateway's LEDs should be used for visual troubleshooting. In many instances, the LEDs are sufficient in diagnosing problems. (See the LED Operation section for additional information on the behavior of the various LEDs.)

The Status LED provides a simple indication of the E-Link Gateway's operation, indicating conditions such as whether communications between the E-Link Gateway and the equipment have failed, if a custom Application is being used, and if Port 3 has been overridden.

The red and green communication LEDs located on the SIM visually display the electrical activity on each of the port lines. There is no intelligence behind how these LEDs are driven. They provide an analog representation of the port's signals and sometimes offer indication of a malfunction. For example, if the green LED is always dimly illuminated, it could indicate an incorrectly biased network or electrical noise coupled onto the network.

Software Troubleshooting

In many cases, the E-Link Gateway must be debugged by actually interrogating the Applications. In this circumstance, Port 3 is temporarily used to provide a VT-100 access to the system. (See the Accessing the E-Link Gateway for the actual mechanics of invoking this functionality.)

Using Port 3 to access the E-Link Gateway's Applications means that any connectivity normally used by Port 3 is temporarily disabled. Proper authorization to disable Port 3 should be obtained before proceeding.

Access and the syntax used to navigate through the E-Link Gateway's Applications are described in the *Accessing the E-Link Gateway* section. This section focuses only on the actual troubleshooting steps and not the mechanics.

In some instances, the data being presented by the network is questioned, and it becomes necessary to follow it from input to output.

Expected Network-Visible Data

For a selected Quick Start, there is an expected list of points that should be available to the network. Accessing the object list command displays the list of points and this list can be compared against the lists shown in an earlier section of this document. If the standard Application is used, the two lists should be the same.

The object list command provides a snapshot of the points' Present values at a given point in time, so this can be used to correlate the data that the E-Link Gateway is delivering versus the data that the network device is retrieving.

Interpreting the Object List Data

The object list command returns the Object ID, Object Name, PV, and Engineering Units of any point that is in the **BACnet Object_List_Property**. So if the network protocol is BACnet, there is a one-to-one correspondence with this list and what the BACnet device should be seeing.

N2

The E-Link Gateway's N2 protocol implementation only supports the retrieval of the PV and the point's status, so the Name and Engineering units are superfluous. Each point's analog and binary values (ADF and BD objects) correlate directly with what is being displayed by the object list command.

In the case of the ADI objects, the N2 values are always one less than that what is being displayed by the Object list command.

Modbus RTU

As with N2 Applications, the Name and Engineering units are superfluous in a Modbus RTU Application. Only the PV has any relevance. When correlating values being retrieved by a Modbus RTU Master and those displayed by the object list command, the following should be considered.

Registers displaying equipment CODES always have a value that is one less than that what is being displayed by the Object list command.

Any analog value displayed by a Modbus RTU Master must be processed according to the applied scaling. For example, the object list value is returned to a Modbus RTU network multiplied by the scale factor configured within the referenced object.

LONWORKS

When correlating the values retrieved by a LONWORKS system with the values displayed by the object list command, the following information should be considered.

SNVTs displaying equipment codes always have a value that is one less than that what is being displayed by the Object list command. Both analog and binary values follow the PVs that are shown in the object list.

Reviewing the E-Link Gateway's Input Data

Sometimes it is helpful to view the raw data that is actually being retrieved by the E-Link Gateway. In the case of Applications that use the YORK Talk protocols, F54 should be interrogated.

Viewing F54, P02 provides an easy way of observing the integrity of the E-Link Gateway to chiller communications. Continuously refreshing P02 is a good way of ensuring that the link is reliable.

If the long-term stability of the communication's link is suspect, then BO-001 (9001) will trend using F16 (Digital History). As the E-Link Gateway does not use any Battery Backed up RAM, all histories are **lost** after a power cycle.

To view the value of a specific point, the Point Maps must first be used to determine which F54 page contains the point address. This page also displays the point's value. Continually refreshing the page provides real time update.

The value of one or more points may be trended over time using F15 (Analog History). This trend could be useful if erroneous behavior of a point is suspected. As the E-Link Gateway does not use any Battery Backed up RAM all histories are **lost** after a power cycle.

Table 54: Troubleshooting Guide

Symptom	Probable Cause	Solution
The Power LED is OFF.	No power to the unit. Malfunctioning power supply.	Ensure input voltage is on. Check input voltage (24 VAC, 12 VDC, 110 VAC or 220 VAC). Replace the E-Link Gateway.
STATUS LED is OFF.	No Application configuration is loaded, the E-Link Gateway is UNCONFIGURED, or the system is in HALT or MONITOR mode or the loaded Application does not match the host hardware. (The Green Power LED should be used as an indication of whether power is currently applied to the unit).	XMODEM in Application CNF file. Replace the E-Link Gateway.
1 FLASH	Terminal mode has been invoked.	Set SW8 on the MAC address switch to OFF.
2 FLASHES	The communications between the E-Link Gateway and the equipment using (F54, F65, and F66) have been lost.	Check to see if the equipment is powered on and operational. Check that the correct Quick Start has been invoked. Check that the wiring between the E-Link Gateway and the equipment is in place.
3 FLASHES	A F67 or a F68 configuration error has been detected.	Power cycle the E-Link Gateway. XMODEM in Application CNF file. Replace the E-Link Gateway.
LED ON	Set during rebooting. NO ERRORS with a F67/F68 patched. Application or with a custom SIS developed Application.	Wait until the E-Link Gateway has initialized. CUSTOM Application.
Port 1 Red and Green LEDs never flash (observe for 30 seconds).	The BAS device is not making any requests. The Port is not setup correctly. Incorrect wiring (RX and TX swapped). Defective Port 1 circuit.	Ensure BAS device is online and communicating. Check that the correct Quick Start has been invoked on APP Group B. Ensure wiring is correctly installed. Replace the E-Link Gateway.
Continued on next page . . .		

Symptom (Cont.)	Probable Cause	Solution
Port 2 Red and Green LEDs never flash (observe for 30 seconds).	The Port is not set up correctly. Equipment micro panel is not communicating. Incorrect wiring (RX and TX swapped). Defective Port 2 driver.	Check that the correct Quick Start has been invoked on APP Group A. Ensure the equipment is configured correctly. Ensure wiring is correctly installed. If Port 2A is being used replace the RS-485 driver. If Port 2 B is being used replace the E-Link Gateway.
Port 3 Red and Green LEDs never flash (observe for 30 seconds).	The BAS device is not making any requests. The Port is not set up correctly. Incorrect wiring (RX and TX swapped). Defective Port 1 driver.	Ensure BAS device is online and communicating. Check that the correct Quick Start has been invoked on APP Group B. Ensure wiring is correctly installed. Replace the RS-485 driver.
Port 4 Red and Green LEDs never flash (observe for 5 seconds).	The Port is not set up correctly. Just the Red LED is flashing: Defective ProtoCessor. Defective Port 4 circuitry.	Check that the correct Quick Start has been invoked on APP Group A. Check that the ProtoCessor is either not present or is badly seated. Replace the ProtoCessor. Replace the E-Link Gateway.
BAS system is unable to communicate, but the E-Link Gateway appears to be working.	Communication wiring is incorrect. The port is not setup correctly (incorrect protocol, baud rate, stop bits, and others). The E-Link Gateway's MAC address is not unique, or does not match that which is configured in the BAS system. For BACnet systems, the E-Link Gateway's Device Object address does not match that which is configured in the BAS system.	Correct the wiring. Check that the correct Quick Start has been invoked on APP Group A. Change the E-Link Gateway's MAC address or the BAS system's configuration. Change the E-Link Gateway's Device Object address in User Report 1 or change the BAS system's configuration.
The communications between the BAS system and the E-Link Gateway are slow or unreliable.	The network wiring has been installed incorrectly (wrong cable, too close to high noise sources, and others). The network cable's shields have not been grounded. The network is terminated in more places than at its ends. The Port's drivers are defective.	Reinstall the cable per the recommended wiring instructions. Ground the shields. Terminate only at the two network extremes. For Port 2A and Port 3, change out the RS-485 drivers. For Port 1 change out the E-Link Gateway.
BAS system is communicating, but values appear to be suspect.	BAS system is referencing the incorrect data. Modbus RTU Scaling is not configured correctly.	Align the BAS system addressing scheme with the Point Maps. Adjust the scaling in the User Report.



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