GE

Grid Solutions

iBox/iBox Kit

Installation and Maintenance Guide

994-0047

Version 5.10 Revision 4

imagination at work

GE Information

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Contents

About This Document

Purpose

What this document provides

The *iBox/iBox Kit Installation and Maintenance Guide* contains information about two products, the iBox and the iBox Kit.

The document is split into three sections. *Section 1: Getting Started* provides an overview of the iBox. *Section 2: iBox Installation and Maintenance* provides instructions for installing, configuring, using, maintaining and troubleshooting the iBox. *Section 3: iBox Kit Installation and Maintenance* provides similar information for the iBox Kit.

Some iBox configuration procedures provide details on the SGConfig tool. For the equivalent information when using SGConfig to configure the iBox, refer to the SGConfig online help.

SGConfig Online Help

For topics related to the use of GE Digital Energy's SGConfig* configuration utility, or details of any software application used in a specific iBox, refer to the SGConfig online help.

Training Tool

In addition to the primary purpose of this Installation and Maintenance Guide, its secondary purpose is that of a Training Manual for customer training sessions provided by GE Digital Energy, or its agents.

Operating System

The procedures in this guide are based on Windows 2000. Some steps and dialog boxes may vary slightly if you are using Windows XP or Windows 2003.

Intended Audience

Job Titles

This guide is intended for use by the SCADA system installers and field engineers who are responsible for the installation, hardware configuration and maintenance of SCADA systems containing iBox units and iBox Kits.

Experience & Abilities

This guide assumes that anyone working with an iBox or iBox Kit has some prior knowledge of:

- Electrical utility industry
- Personal computer terminology and interconnection skills
- GE Digital Energy products
- Other industry products such as protective relays, meters, and voltage regulators.

Additional Documentation

For further information about the iBox and its components, refer to the following documents:

From GE Digital Energy:

- *iBox Product Overview* (PRPI-043)
- *D20, D25, iBox Automation Applications* (PRPI-048)
- SGConfig online help
- *WESMAINTII+ User's Guide* (B014-1UG)
- *68K Monitor User's Guide* (SWM0023)
- Application software configuration guides

From other manufacturers

- *Digi One User's Guide* (Digi International)
- *ADAM 4000 Data Acquisition Modules User's Manual* (Advantech)
- *DMMS300+, DMMS350, DMMS425 3-Phase Multifunction Power Monitors with Advanced Capabilities Installation, Operation and Programming Manual* (Electro Industries/GaugeTech)

Product Support

Getting Help

If you need help with any aspect of your GE Grid Solutions product, you have a few options.

Search GE Grid Solutions Web Site

The GE Grid Solutions Web site provides fast access to technical information, such as manuals, release notes and knowledge base topics.

Visit us on the Web at: http://www.gegridsolutions.com

Search GE Grid Solutions Technical Support

This site serves as a document repository for post-sales requests. To *get* access to the Technical Support Web site, go to:

http://sc.ge.com/*SASTechSupport

Contact Technical Support

GE Grid Solutions Technical Support is open 24 hours a day, seven days a week for you to talk directly to a GE representative.

In the U.S. and Canada, call toll-free: 1 800 547 8629

International customers, please call: +1 905 927 7070

Or e-mail to multilin.tech@ge.com

Product Returns

Before you return a product, please contact GE Grid Solutions Technical Support to obtain a Return Merchandise Authorization number and complete instructions for return shipments.

A Return Merchandise Authorization (RMA) number must accompany all equipment being returned for repair, servicing, or for any other reason.

Note: Product returns will **not** be accepted without a Return Merchandise Authorization number.

If you attempt to resolve problems with your GE product using methods not recommended by GE Digital Energy, this might result in damage or injury to persons and property.

Safety Precautions

Important!

Follow all safety precautions and instructions in this manual:

- Only qualified personnel should work on the iBox/iBox Kit. Maintenance personnel should be familiar with the hazards associated with electrical equipment.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, isolate or disconnect all hazardous live circuits and sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of back feed.
- Turn off all power supplying the equipment in which the iBox/iBox Kit is to be installed before installing and wiring the iBox/iBox Kit.
- Beware of potential hazards, wear personal protective equipment and carefully inspect the work area for tools and objects that may have been left inside the equipment.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- Many of the components within the iBox/iBox Kits are susceptible to damage from electrostatic discharge. Observe standard ESD (Electrostatic Discharge) precautions for handling electronic components at all times.
- Read and thoroughly understand this guide before using the iBox/iBox Kit. Save these instructions for later use and reference.

Failure to observe these instructions may result in death or serious injury.

Hazardous Voltages

Hazardous voltages can cause shock, burns or death.

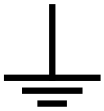
- Disconnect and lock out all power sources before servicing and removing components.
- Short all current transformer primaries before servicing.
- Do not remove the safety shields that have been installed to prevent accidental contact with hazardous voltages.
- Avoid touching iBox/iBox Kit power supplies, since these supplies contain hazardous voltages.

Safety Precautions, continued

Product Warning Symbols

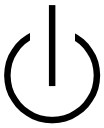
Caution (refer to accompanying documentation)

Caution (risk of electric shock)



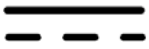
Earth/Ground Terminal

Protective Earth Terminal



Power Supply Off (Stand-by Mode)

Power Supply On



Direct Current

Alternating Current

Damaged Equipment

Do not operate an iBox or iBox Kit if it has been dropped or damaged. Return it to GE Digital Energy for inspection and repair.

Operating Environment

iBox/iBox Kits are intended for indoor use. Do not place these products in environments where unusual environmental conditions exist (such as dirt, liquids, or windblown dust) without a **secondary protective enclosure**.

For proper fire protection, iBox/iBox Kits must be installed in an enclosure equipped with a metal floor with no openings.

An IEC® 60947 compliant main disconnect switch (or other equivalent device complying with IEC 60947-1 / 60947-3) must be as electrically close as practicable to the iBox power supply.

Protection during Maintenance

Ensure iBox/iBox Kits are protected from falling debris during maintenance. Small metallic particles (such as wire clippings) could fall onto circuit boards and damage or interfere with the safe and reliable operation of the iBox/iBox Kit.

RF Interference

The iBox/iBox Kit generates radio frequency (RF) energy that can radiate if it is not installed and used in accordance with the instructions provided in this guide. This RF energy may cause harmful interference to radio communications or sensitive circuits.

Operating an inadequately shielded iBox or iBox Kit in a residential area may cause harmful interference, if this happens, you may be liable to correct the interference.

Rack Spacing

When mounting multiple iBox/iBox Kits in a rack (or when mounting an iBox/iBox Kit in a rack with other equipment), verify that there is at least one rack unit (RU) of space above and below the iBox/iBox Kit, to allow for cooling airflow, and for routing cables between field equipment and the iBox/iBox Kit (1 RU = 1.75 inches).

Power and Fusing

- For proper operation, input voltages must be within specified limits. Do not apply voltages outside this range, since this may lead to premature product failure.
- Always fuse-protect field sources.
- Always replace fuses with fuses of the same type and rating. Fuse types and ratings are stated in the product specifications.

Grounding

To ensure voltage transients are properly shunted to ground, you must connect the iBox's protective earth terminal to a low-impedance ground point using a braided cable or heavy solid copper conductor.

When making ground connections, ensure all grounding surfaces are free of dirt, residue and corrosion. You can use a coating such as Glyptal® to protect connections from oxidation and dirt deposits.

Cable shields should be grounded to either the iBox/iBox Kit ground terminal or to field equipment, but not to both. Do not ground cable shields at more than one point, since potential differences between the ground points will result in ground loops and undesirable noise sources.

Communication Cables

- Use shielded cables to prevent electromagnetic interference.
- Route all communication cables away from power-carrying cables, and make these cables as short as possible.
- Prior to start-up, verify the integrity of all communication cables and connections.

Safety Precautions, continued

Surge Protectors	When connecting the iBox/iBox Kit to communications equipment (for example, modems or radios), use appropriate surge arrestors to protect the iBox's communications ports.
iBox Cover	Never operate an iBox without having its protective cover installed, since product performance may be compromised, and equipment may be damaged if foreign objects fall into the unit.
iBox Jumpers	Configure the jumpers in your iBox before you connect field inputs and outputs.
	Use of the equipment in a manner not recommended or specified by GE Digital Energy, may impair the protection provided by the equipment.

CISPR 11-CE Mark Compliance

Important

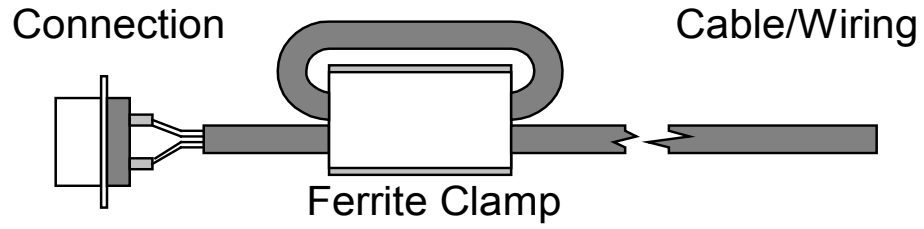
For CISPR 11, Class A-CE Mark compliance on an iBox installed outside of a protective enclosure, you must use ferrite clamps on the following:

- Serial communication cables attached to J2, J3, and J4
- Wiring connected to TB2-TB15 for digital inputs and control outputs

Note: Although the standalone iBox is CE Marked, GE does not guarantee the CE Mark of third-party components of the iBox Kits (such as the 10/100BaseT Ethernet Module or the AC and DC Analog Input Modules).

Ferrite Clamp cabling/wiring

The following diagram illustrates the cabling/wiring loop through an installed ferrite clamp.



Part Numbers

Order the following part number for each of the external ferrite clamps you require.

Part Number	Color
460-0031	White body
460-0049	Black body

Section 1: Getting Started

Overview

Introduction

Before you begin installing the iBox, review the information in this section, including the following topics:

- Description of the iBox
- Unpacking and inspection
- Storage
- Installation Tools

1.1. What is an iBox?

Product Overview

Introduction

The iBox is GE Digital Energy small point count Substation Controller. It combines advanced functionality, multiple communication ports and local I/O in a compact package.

The iBox processes both digital inputs and digital outputs. It also provides serial digital data communication ports to facilitate communications with both a master-station and local communications. The iBox is specifically designed for SCADA applications.

The iBox Kit is a rack-mounted, pre-wired, pre-configured RTU based on the iBox, but with additional (optional) power supply, Ethernet and I/O support.

Integrated Functions

The iBox can function as a:

- Programmable logic controller (PLC)
- IED gateway
- Data concentrator
- Standalone remote terminal unit (RTU).

Scalable Architecture

The iBox's flexibility makes it an excellent option for:

- Advanced substation monitoring
- Control
- Automation applications.

Features

The iBox has three software-configurable RS-232/485 serial communication ports. All three RS-232/485 serial ports interface to legacy IEDs or Master stations.

An extensive library of application software is available from GE Digital Energy to enable the iBox to interface with a wide range of IEDs.

A UTC port is available for global satellite time synchronization (however, there are three serial ports, so if you use one as a UTC port, two serial ports remain for connecting to IEDs).

Maintenance port support provides access to SGConfig, LogicLinx*, and WESMAINT* utilities.

Meets the robust requirements of the IEEE®, IEC® and CE Mark.

Patent Protection

The iBox contains a patent protection label as a formal declaration of the US patents that protect both the product and the technology developed by GE Digital Energy.

MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS:

5237511, 5303112, 5513061, 5701226

System Software

Overview

The iBox system software consists of two components:

- Base System
- Applications.

Base System Software

The Base System software provides a stable operating environment for applications, which provide specific functionality for the iBox. The Base System is made up of:

- Boot software, resident in the BootROM, and
- Base applications, required for operating the hardware.

iBox BootROM

BootROM software is stored in EPROM. The BootROM contains:

- Operating system software
- Device drivers to interface the operating system with the system hardware and software
- Diagnostic software, to verify the integrity of the iBox
- Monitor interface, for examining the system in a non-operational mode
- Startup code, to verify and initialize the application software
- Low-level maintenance and troubleshooting software

Base Applications

Standard iBox Base Applications, present in every iBox, are:

- WIN, the system database manager
- WESMAINT, which allows the operator to locally examine and control data
- 68K Monitor, which provides low-level system maintenance and diagnostic tools

WIN

WIN (for WESDAC Interface Node) is the database manager for the iBox System Point Database. The System Point Database is the heart of the iBox software system. All data flowing through the iBox is stored in the System Point Database before it is passed on to its destination.

Continued on next page

System Software, continued

WESMAINT

WESMAINT is the iBox's primary maintenance and diagnostic tool. You can access WESMAINT in three ways:

- Through the iBox WESMAINT port
- Through a modem or other serial connection to a programmed COM port
- Over a LAN or serial PPP connection, as a telnet session from a remote network station

WESMAINT is accessed using a VT100 terminal, or a PC running terminal emulation software.

Database Display

Through WESMAINT, you can access the following:

- Digital inputs and outputs
- Counters (or accumulators)
- Device status
- Sequence-of-events (SOE) and change-of-state (COS) data
- System status information
- Error log information
- User login buffer
- Other application-specific information

Other WESMAINT Functions

In addition to displaying information, a WESMAINT user can also:

- Set or clear accumulator counts
- Operate digital outputs
- Clear logged information
- Access the iBox 68K Monitor.

System Software, continued

68K Monitor

The iBox 68K Monitor, available through WESMAINT, is a diagnostic tool used to access system-level functions.

The iBox 68K Monitor is resident in both BootROM and flash memory.

When the Monitor is operated from BootROM, the following prompt appears: **D25S>**. This mode is accessed *only* while the iBox is in a maintenance state, since forcing an iBox into this mode terminates all running applications.

When the Monitor is operated from flash, the following prompt appears: **D25A>**. This is the normal mode of operation, and it can be accessed via WESMAINT at any time without disrupting unit operation.

Note

Using the 68K Monitor requires detailed knowledge of the iBox architecture and functionality. Refer to the *68K Monitor User's Guide* (SWM0023) for complete instructions about command usage and availability.

Application Software

Background

A wide range of applications can be added to the iBox to enhance its functionality. Software applications fall into three categories:

- Data Collection Applications (DCA)
- Data Processing Applications (DPA)
- Data Translation Applications (DTA)

Data Collection Applications

Data Collection Applications are used to import (collect) data from external sources, and to pass this data to WIN (the system point database manager) for storage in the system database. DCAs also forward output requests from the system database to external sources.

Data Processing Applications

Data Processing Applications are configured to select and format data from the system database, and forward this data to a SCADA host or master station

Data Translation Applications

A combination of a DPA and a DCA, Data Translation Applications use data from the system database to perform logical operations, the results of which create new data. This new data is then placed back in the system database, where it can be used as input/output data by another application.

Firmware

The set of applications installed on an iBox is referred to as its “firmware”.

Firmware is installed in the iBox flash memory prior to shipment. The iBox operational characteristics can, however, be upgraded at a later date.

Contact your GE Digital Energy representative for more information on firmware upgrades.

Plant I/O Subsystem

Plant I/O Subsystem: Overview

The iBox Plant I/O Subsystem collects, processes, and stores data related to physical inputs and outputs. Once it is stored in the system database, I/O point data can be accessed by other applications.

Plant I/O Subsystem: Functions

The Plant I/O Subsystem is responsible for scanning of iBox physical I/O points. For input type points (digital and accumulator), the data of each scan is compared to previous known data. Changes are recorded in the system database, then reported to other applications, as needed.

The Plant I/O Subsystem:

- Scans and processes up to 8 digital inputs
- Controls up to two digital outputs and two master trip/close relays.

Requests for digital outputs are accepted and processed as soon as they arrive.

Fixed Number of Points

The Plant I/O DCA maintains a fixed number of points in the System Point Database. The actual number of points is determined by the version of the P097 Plant I/O Subsystem that has been installed on your iBox.

The hardware options available in the iBox (and the user's software configuration) determine if specific system features and data points are available or disabled.

1.2. Unpacking and Inspection

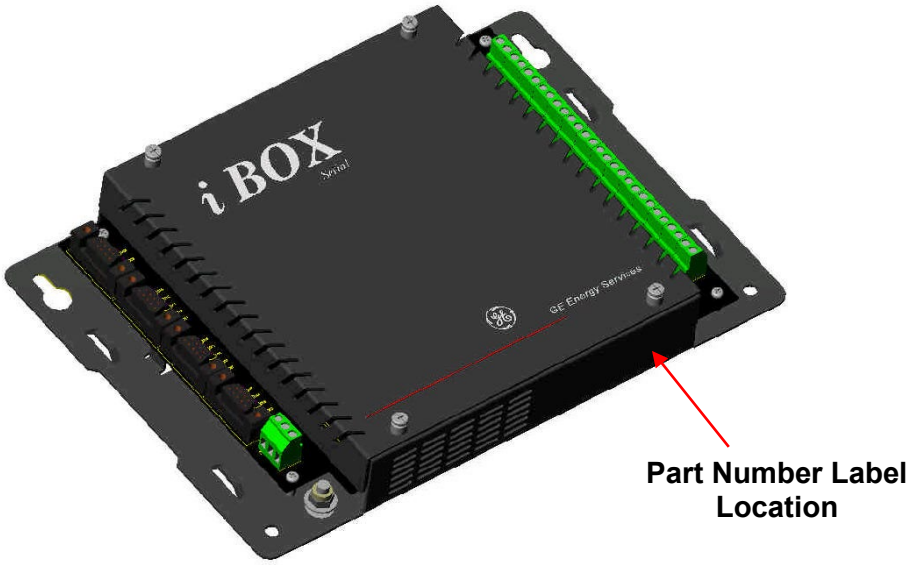
Shipping Inspection

Inspect the shipping package before opening it to see if it has sustained any damage from impact or water. If it has, *report it immediately to the carrier* without opening it. Carriers may not assume responsibility for damage after the customer accepts delivery.

Unpacking

Carefully remove the iBox from its shipping package. Visually inspect the unit to ensure it has not sustained any visible damage during transit.

The figure below shows an iBox removed from the shipping package.



Package Contents

The following items are provided as part of your iBox shipment:

- iBox or iBox Kit unit
- WESMAINT serial cable
- IBOX/iBox Kit Installation and Maintenance Guide (994-0047)
- CD including the software and copy of user documentation

Product Identification

Before installing the unit, check that the unit part number is the same as the part number on the shipping and ordering documents.

Unpacking and Inspection, Continued

Part Numbers

This table contains part numbers and descriptions for each iBox variant:

Part Number	iBox Description
505-0100	24 V Digital Input and 4 Trip/Close Control Outputs
505-0101	48 V Digital Input and 4 Trip/Close Control Outputs
505-0102	110/125 V Digital Input and 4 Trip/Close Control Outputs
505-0103	24 V Digital Input and 2 Trip/Close and 2 Form A Control Outputs
505-0104	48 V Digital Input and 2 Trip/Close and 2 Form A Control Outputs
505-0105	110/125 V Digital Input and 2 Trip/Close and 2 Form A Control Outputs

Note: Part Numbers are subject to change without notice.

1.3. Storage

Environment

Specifications for storage are:

- Temperature: -40° to +90°C
- Relative humidity: 0 to 95%, non-condensing

As a general rule, always store your iBox in an environment compatible with operating conditions. Refer to *Appendix A:* Technical Specifications for more detailed environmental specifications

Exposure to excessive temperature or other extreme environmental conditions might cause damage and/or unreliable operation.

Battery Life

The iBox battery maintains the unit's NVRAM contents for over five years, with system power applied.

If you are storing your iBox for extended periods, you should disconnect the battery by removing the iBox's top cover and pulling the battery out of the chassis.

If you are storing a new iBox which has the battery "PULL" tab in place, you do not need to remove the battery for storage; the "PULL" tab disconnects (insulates) the battery function.

Recycling of Batteries

The iBox Lithium battery is recyclable and does not contain mercury, cadmium, or lead in levels above those regulated by the European Union. Recycle the battery according to local waste management regulations.

In accordance with European Directive 2006/66/EC, batteries are marked with the crossed out wheeled bin, which indicates that they cannot be disposed of as unsorted municipal waste in the European Union. Users of batteries must use the collection points available to customers for the return, recycling, and treatment of batteries. Customer participation is important to minimize the negative effects of batteries to the environment and sustain available natural resources. For more information see www.weeerohsinfo.com.

1.4. Installation Tools

Tools for the Job

Before beginning the installation procedure, ensure you have the following tools and equipment:

- A Windows PC with **HyperTerminal** (or any Windows based terminal emulation software) loaded
- Ethernet Cable[s]
- A flat screwdriver with 0.6 x 3.5 mm blade (for terminal block wiring)
- A #2 Phillip-Server Screwdriver (for rack mounting the unit)
- A #1 Phillip-Server Screwdriver (for removing and installing the communication boards)
- Needle Nose Pliers
- Wire Cutters
- Wire Strippers
- Wire Crimping Tool (Panduit® CT-1525 or equivalent).
- 6 fork connectors
- Fork type Panduit part number PV14-6F for 14-16 AWG wire or PV18-6F for 18-22 AWG wire (or equivalent)

ESD Protective Gear

It is recommended that the following ESD gear be used during installation:

- Wrist Straps
- Foot Straps

Section 2: iBox Installation and Maintenance

Overview

Introduction

This section covers the following topics:

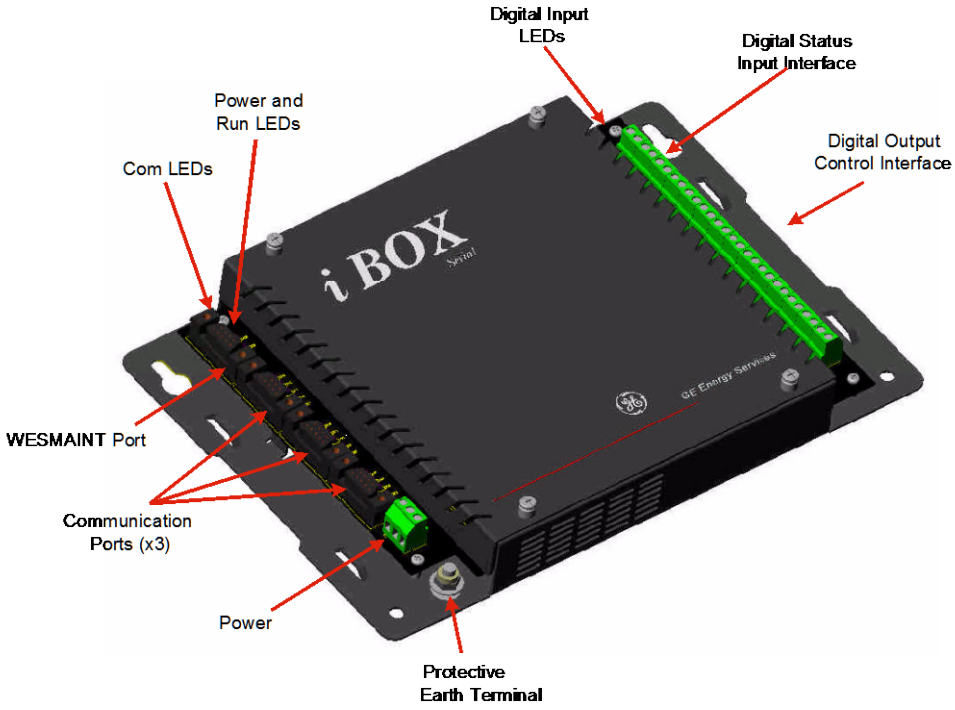
- Familiarization of the iBox
- Installing the iBox
- Configuring the iBox
- Testing the iBox
- Connecting and testing field wiring
- Servicing the iBox
- Maintaining the iBox software
- Troubleshooting the iBox
- Replacing the iBox

2.1. Familiarization

Front Panel

As you look at the iBox, the:

- Left side has four DB9 connectors (serial ports), a three-position separable terminal block (power connection), and a protective earth terminal.
- Right side has a 28-position terminal block for field I/O, separable in pairs.



Operation and Maintenance

You can operate and maintain the iBox configuration through the WESMAINT port.

Inputs/ Outputs

The iBox provides the following:

- Eight digital inputs
- Four control outputs

Digital Inputs

The iBox provides the following digital inputs:

- Eight optically isolated status inputs, 25 VDC or 125 VDC, with 20% overload
- Wetting options
- LED indications
- 4-5 mA typical current burden per input (up to 48 VDC)
- Maximum 0.5 W heat dissipation per input from current burden of inputs at 125 VDC

Continued on next page

Familiarization, continued

Control Outputs

The iBox provides the following control outputs:

- Four Trip/Close pairs, or two Trip/Close pairs and two Form A contacts.
- Separate Master Trip and Master Close relays
- Security features:
  - Protection against erroneous operation due to single point of failure
  - Select-before-operate (SBO) functionality
- 35 W breaking @ 125 VDC, 180 W breaking @ 30 VDC
- 6 A current handling capability

2.2. Installing the iBox

Overview

Safety Precautions

Before beginning to install the iBox, thoroughly review the "Safety Precautions" for guidelines and warnings regarding the safe handling and installation of the product.

Installation Steps

Installing the iBox involves the following main steps:

Step	Action
1	Physically install the iBox.
2	Connect power source and serial interfaces.
3	Power up the iBox and check for normal operation.
4	Configure the iBox using SGConfig.
5	Test the iBox.
6	Connect and test field wiring.

Installation Guidelines

Installation Environment

The iBox must be installed in an environment that provides protection against shock and fire hazard.

The iBox enclosure is intended for indoor use, primarily to provide protection against accidental contact with the enclosed modules and voltages. Do not place the product in environments where unusual conditions exist (windblown dust and dirt, for example) unless you install it in a secondary protective enclosure.

Never operate an iBox in the field with the top cover removed. Operation with the top cover removed may alter product performance specifications, and result in component damage from foreign matter entry.

Do not install and/or operate the iBox upside down.

Ensure all nuts and screws are tightened securely.

Ensure that iBox is protected from falling debris during installation.

Power Supply Source

An IEC® 60947 compliant main disconnect switch (or other equivalent device complying with IEC 60947-1 / 60947-3) must be as electrically close as practicable to the iBox power supply.

For correct iBox power supply operation, the input voltage must be within specified limits.

The iBox DC power supply draws an inrush current (less than 0.5 A) upon start-up. Ensure the field source can supply this start-up current without overloading.

Continued on next page

Installation Guidelines, continued

Power Fusing

Always replace fuses with the same type and rating used by GE Digital Energy. The fuse types and ratings are stated in "Fuse Replacement" on page 59.

Always fuse-protect field power sources.

Grounding and Shielding

To ensure safe operations, you must connect the iBox Protective Earth Terminal to a low impedance ground using braided cable or heavy solid copper conductor. When making ground connections, ensure all grounding surfaces are free of dirt, residue and corrosion.

Ensure cable shields are grounded at either the iBox functional ground terminal or at the field equipment. Do not ground the shields at more than one point because a potential difference may exist between grounds, resulting in ground loops and undesirable noise sources.

To prevent electromagnetic interference from upsetting iBox operation, use cables with an over-all cable shield. Route all communication cables away from power-carrying cables.

Communi-cations Ports and Connections

Verify the integrity of all communication cable connections prior to start-up to avoid damaging the iBox.

Serial ports are protected with surge and noise suppression components.

Always shield communication cables and make them as short as possible.

Physical Mounting

Procedure: Mounting the iBox

Step	Action
1	Align the iBox in its proper position on a flat mounting surface.
2	Install and tighten the four screws, holding the iBox firmly in place on the mounting surface.
3	Loosen the iBox top cover and remove the battery "PULL" tab. The iBox is delivered with this tab in place to insulate the battery during shipment.

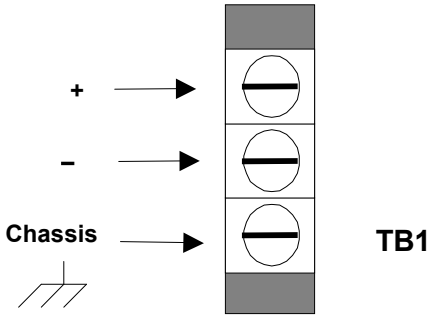
Mounting and Clearance

Leave at least one rack unit (RU) of space above and below the equipment to allow for cooling air flow and cable routing (1 RU = 1.75 inches or 44.5 mm).

Terminal Connections

Power Supply

The iBox's power supply connection is a three-position terminal block located on the bottom left side of the iBox. This removable terminal block must be disconnected to turn off the power supply input. The iBox does not have an ON/OFF switch.



Functional Ground/ Chassis

Connect the ground screw terminal to the facility's ground system before operating the iBox. Before making this connection, ensure all grounding surfaces are free of dirt, residue and corrosion. The maximum wire gauge for terminal blocks is 12 AWG.

Internal Overcurrent Protection

An internal MDL 0.5 A (slow blow) fuse protects the iBox power supply.

Power Connection Procedure

To connect the power source:

Step	Action
1	Connect ground wire to the ground terminal. A 12 AWG green and yellow wire is recommended.
2	Connect the DC power supply, observing the correct polarity, to the positive and negative connection points on TB1

The chassis ground terminal at the power supply terminal block ***must not*** be used as a protective earth connection.

Make sure the iBox is properly grounded to the protective earth terminal located at the bottom-left corner of the board. Connection must be provided with a separate green/yellow wire connected between the iBox and the facility's ground system.

System Diagnostics

System Diagnostics	Once power is applied, the iBox automatically boots and conducts a series of self-diagnostic tests. If the iBox fails to boot up properly (which indicates that a self-diagnostic failure has occurred), it might have sustained internal damage during shipping. Contact GE Digital Energy for assistance.
LEDs	The POWER and RUN LEDs will both light during the self-diagnostic sequence.
Diagnostics Completed	Self-diagnostics have completed successfully when the POWER and RUN LEDs are on solid.

Connecting Serial Interfaces

WESMAINT Port

The iBox is equipped with a WESMAINT port. By attaching a WESMAINT cable between the WESMAINT port and your PC, the iBox can:

- Provide local maintenance and diagnostic functionality
- Download configuration data from the optional SGConfig software

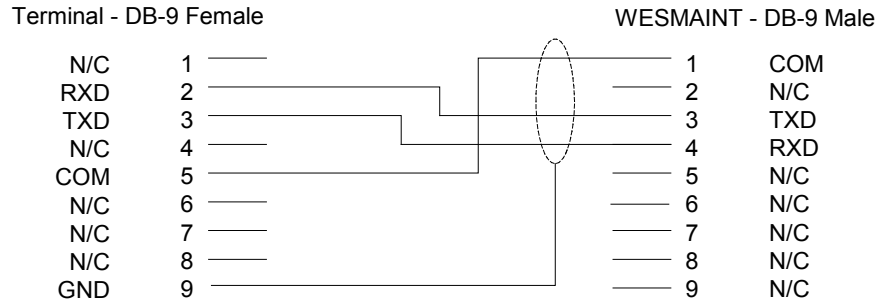
With the cable connected, you can also upload diagnostic and operational information to the PC.

The WESMAINT interface supports RS-232 signaling and normally operates at a fixed rate of 9600 bps.

WESMAINT Cable

To connect to a PC, use a WESMAINT cable (GE part number 977-0048/96), or equivalent.

The schematic for this cable is shown below:



Standard Serial Interfaces

The iBox has three serial communications ports: COM1, COM2, and COM3

All COM ports have the following standard characteristics:

- Female DB-9-F style connectors
- RS-232 and RS-485 are supported on the same physical connector.

Continued on next page

Connecting Serial Interfaces, continued

COM1 Options

In addition to the standard characteristics, COM1 has the following optional characteristics:

- Jumper-selectable (JP3) radio key, open-collector output
- Communication parameters, determined by the protocol application.

COM2 Options

COM2 can optionally be used to connect to a satellite time-code receiver, as follows:

Time code	J3 Pin	Interface	Signal
IRIG-B	8	RS-232	CTS2
Rugby Clock	2	RS-232	RX2
	5	RS-232	COM

IRIG-B Output Options

IRIG-B receivers are available with modulated and/or unmodulated output options. If the unmodulated output of the receiver is a coaxial connection, a converter will be required to interface to the iBox.

COM Ports

COM ports provide the following:

- Variable communication parameters
- Optional software flow control
- Optional hardware flow control
- Out-of-sequence transmission of one byte of data
- Support for several I/O timers
- Transmission of break characters

COM Port Options

The COM1, COM2 and COM3 serial ports are programmed using SGConfig for:

- RS-232 or RS-485
- RS-485 2-wire or 4-wire (2W/4W)

Note: The 2W/4W selection in SGConfig only affects the interface's internal software control (handshaking). It does not change the physical characteristics of the communication ports.

Connecting Serial Interfaces, continued

Serial Port Pinouts

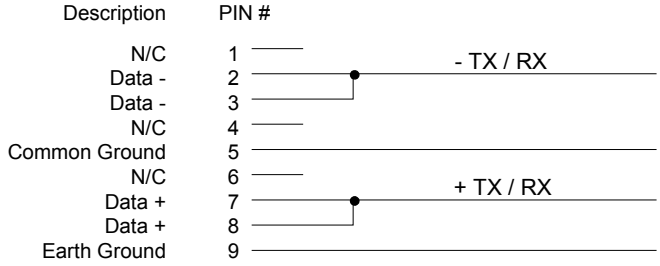
The COM port pin-outs, for both RS-232 and RS-485 configurations, are as follows:

DB-9 Pin	RS-232	RS-485
1	CD	N/C
2	RX	RX-
3	TX	TX-
4	N/C	N/C
5	Com GND	Com GND
6	N/C*	N/C
7	RTS	TX+
8	CTS	RX+
9	EARTH GND	EARTH GND
* Radio Key Open Collector Output for COM Port 1 only (jumper selected with JP3 installed).		

2-Wire RS-485 Cable

The following schematic shows the cable wiring necessary for 2-wire RS-485 operation.

iBox Connectors J2, J3 or J4



2.3. Configuring your iBox

Overview

Introduction

You can create a project for configuring your iBox device using SGConfig.

Configuration Template

A sample configuration is included on the CD with the iBox. You can create the iBox device configuration starting from the sample configuration or create a new configuration from scratch.

After you successfully create a device configuration, you can use it as a template for all subsequent iBox configurations. To do so, copy the original configuration file, and edit the copied file as necessary.

After creating the device, the remaining procedures are the same, whether you are working with a copy of an existing configuration or creating a new device configuration.

Configuration Steps

The iBox is configured using the SGConfig configuration system.

Configuring the iBox involves the following main steps:

- Create or restore a SGConfig project.
- Create and configure the iBox device in the project.
- Configure the application firmware.
- Configure the Plant I/O.
- Download the configuration to the iBox.

For the detailed procedures, refer to the SGConfig online help.

Before you Start

To configure the iBox, you will need the following items:

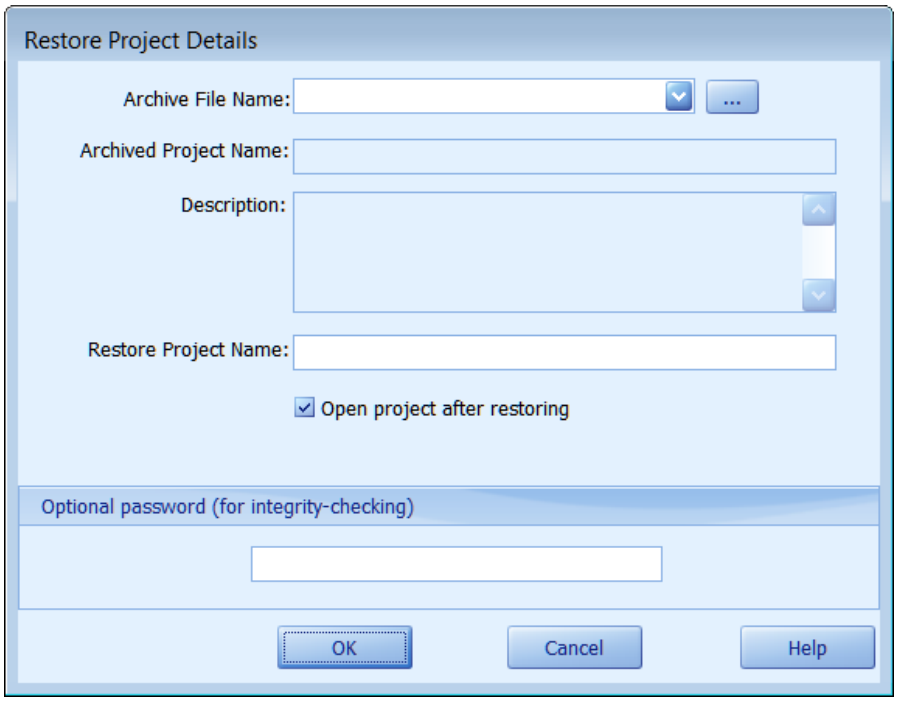
- Factory configuration for your iBox. You can find this on the configuration CD that shipped with your iBox.
- SGConfig installed on your PC.
- Serial number of your iBox, from the iBox circuit board

Restoring your SGConfig Project

Introduction

This procedure describes how to restore the SGConfig project that includes the sample configuration provided with the iBox.

Procedure: Restoring your SGConfig Project

Step	Action
1	In your Windows desktop, click **Start**, and then click **Programs**.
2	Click **SGConfig**, > **SGConfig**. **Result:** SGConfig opens.
	Importing the Factory Configuration
3	Click **GE** > **Archive** > **Project** > **Restore.**
4	Click **Restore**. **Result:** The **Restore Project Details** window appears: 
5	Insert your configuration CD in the drive.
6	Navigate to the configuration file in the **Archive File Name** field.
7	Click **OK**. **Result:** The configuration file uploads to your PC, and your project appears in an SGConfig project tab.

Creating a New iBox Device

Introduction

Creating an iBox device in SGConfig has two main steps:

- Create the new device
- Specify the device properties

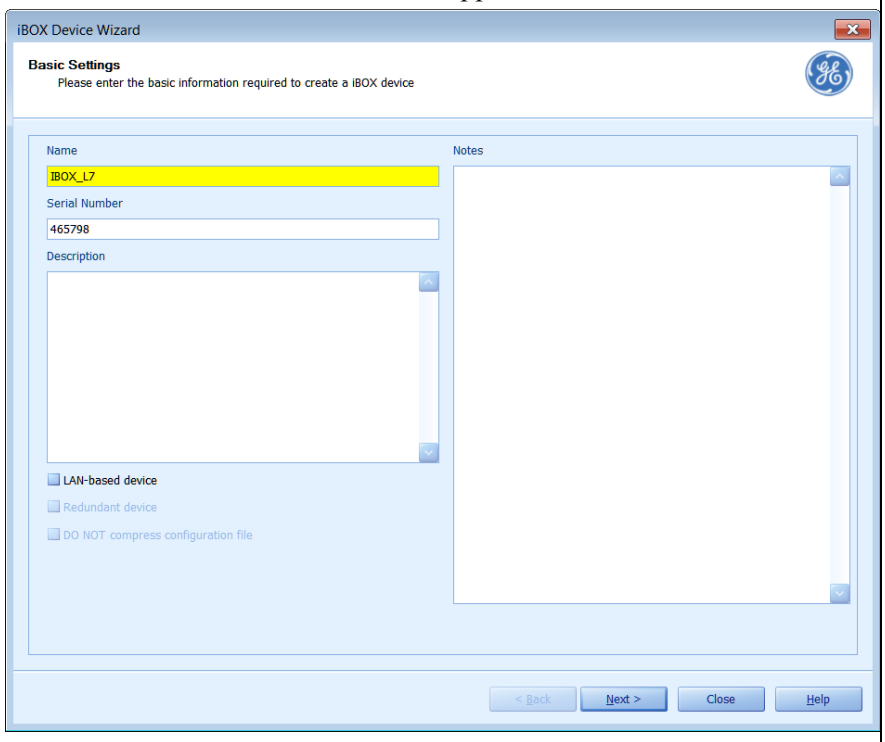
This procedure assumes that you are using the default firmware already loaded in the iBox or have created a firmware set.

iBox Device Icon

When you create a new iBox device, select the iBox device template to see the appropriate configuration screens.

Procedure: Creating a New iBox Device

To create a new iBox device:

Step	Action
1	Open the project in which you want to create the iBox device.
2	Drag and drop an iBOX device template from **Local Repository** > **Device Templates** into the project tab area.
3	Click **Edit** group > **Properties** command. **Result:** The **iBOX Device Wizard** appears. 
4	In the **Name** box, type a unique name for the device.
5	Continue to “Procedure: Setting iBox Device Properties”.

Continued on next page

Procedure: Creating a New iBox Device, continued

iBox Device Properties

Once you have created the iBox device, follow the procedures below for setting the iBox device properties.

Procedure: Setting iBox Device Properties

To set the iBox device properties:

Step	Action
	Hardware Tab
1	In the iBox Device Wizard window, click the **Hardware** tab.
2	Click the **Memory Model** tab. You should not need to change the **Base System and Global Variable Area** settings. If necessary, change the **NVRAM Area** value to suit your specific system.
3	On the **Serial I/O** tab, configure each com port for RS-232 or RS-485 communications. **Note:** The 2W/4W selection in SGConfig only affects the interface's internal software control (handshaking). It does not change the physical characteristics of the communication ports.
	Processor Tab
4	Click the **Processor** tab.
5	On the **Firmware** tab, click the **Select** button to display the available firmware definitions.
6	In the **Use Firmware Type** field, select the firmware definition that matches your iBox's applications. **Result:** The **Name** field shows the name of your firmware selection.
7	From the **Memory Model** tab, check that **Derive From iBox Hardware Setting** is selected.
8	Click **Close** to complete the creation of the new iBox device. The wizard closes.

New Device Icon

After you complete these steps, an **iBox** icon, representing your new device, appears in the main proje window. The new iBox device is now ready to be configured.

Configuring Application Firmware

Overview

The iBox uses the **D25 Plant I/O Subsystem** (P097) Data Collection Application to configure the digital inputs. Configure the iBox Plant I/O before you configure the points in the **System Point Database** application.

Procedure: Digital Input Configuration

To configure the DC digital inputs:

Step	Action
1	Configuring the iBox PPP Driver and Internet Data
2	Double-click the **D25 Plant I/O Subsystem** icon. **Result:** The **D25 Plant I/O for iBox** dialog box appears.
3	Double-click the **DC Configuration**  icon. **Result:** The **D25 DC Configuration for iBox** dialog box appears.
4	On the **General** tab, select the type of digital input board from the **First Digital Input** board list. Select one of: • C: iBox 8 channels, 24 V wetting • D: iBox 8 channels, 48 V wetting • E: iBox 8 channels, 125 V wetting The other board settings are preset. **Result:** The letter in the Device Code changes to match your selection. **Note:** Refer to the on-line help in SGConfig for details on configuring the **I/O Configuration** and **Advanced** tabs.

Other Application Configuration

Configure your other applications before continuing to install the iBox. Each application has its own configuration process. Refer to the documentation for your specific applications for configuration information.

Downloading your iBox Configuration

Procedure: Downloading your iBox Configuration

Step	Action
1	If you have not already done so, connect your PC to the iBox WESMAINT port and open SGConfig.
2	In the SGConfig **Project** window, click the iBox device icon.
3	Click **Communications** group > **Connect** > **TeraTerm** command. **Result:** The TeraTerm window appears within an SGConfig tab.
4	Press **ENTER**. **Result:** SGConfig prompts you to enter a user name.
5	Type **westronic** and press **ENTER**. **Result:** SGConfig prompts you to enter a password.
6	Type your password (the default is **rd**) and press **ENTER**. **Result:** The following screen appears: 1. SYSTEM DATA DISPLAYS 2. SYSTEM FUNCTIONS 3. APPLICATION MENUS
7	Enter "2". **Result:** The following screen appears: 1. SET TIME and DATE 2. DEVICE STATUS DISPLAY 3. 68K MONITOR 4. ERROR LOG 5. USER LOG 6. DATABASE SYNC 7. SWITCH-OVER 8. SECONDARY COMM STATUS
8	Enter "3". **Result:** The 68K Monitor command prompt appears.
9	In the command line, type **el /r** then press **ENTER**. **Result:** The iBox clears its error log.
	Tip: To speed up the configuration download, temporarily change the baud rate of the WESMAINT serial port from the default 9600 baud to 38400 baud in WESMAINT and SGConfig. To change the baud rate: • In WESMAINT, enter baud 38400 at the 68K command line. • In the **SGConfig Terminal Emulator** window, on the **Communications** menu, click **Options**. On the **Port Settings** tab, set the **Baud Rate** to **38400** and click **OK**.

Continued on next page

Downloading your iBox Configuration, continued

Procedure: Downloading your iBox Configuration (continued)

Step	Action
10	On the SGConfig click Terminal Emulator **Connectivity** group, click **Connect**. **Result:** SGConfig connects to the iBox and the 68K Monitor command line appears.
11	On the SGConfig click Terminal Emulator **Actions** menu, click **Sync To Device**. **Result:** The configuration download starts. A confirmation window appears when the download is complete.
12	Click **Reboot**. **Result:** The iBox reboots. **Note:** If you changed the baud rate to 38400, the WESMAINT communications rate automatically restores to 9600 baud after the iBox reboots. You need to manually restore the SGConfig terminal emulator communications rate to 9600.
13	From SGConfig, click the **Connectivity** group > **Disconnect** command. **Note:** If you changed the baud rate to 38400, the WESMAINT communications rate automatically restores to 9600 baud after the iBox reboots. You need to manually restore the SGConfig terminal emulator communications rate to 9600.
14	On the **File** menu, click **Exit**.
15	Physically disconnect your PC from the iBox.

Configuring the iBox to work with a DNP3 I/O Module

Introduction

Your iBox RTU Master communicates with your DNP3 I/O modules through the DNP3 Data Collection Application (DCA B023). The DNP DCA collects data from, and sends control requests to, the DNP3 I/O modules.

Refer to *Appendix F: Installing and Connecting DNP3 I/O Modules* for installation and connection instructions.

Use SGConfig to configure the DNP3 DCA in the iBox so that it communicates with your DNP3 I/O module. There are three tables to configure:

- Remote Device Table: This table contains one record for each DNP I/O module in the system. The Remote Device Table specifies the remote devices with which the DCA communicates, the polling parameters for each remote device, and the points configured on each remote device. Each record in the Remote Device Table references the appropriate Remote Device Point Mapping Table(s) and Remote Device Polling Table(s).
- Remote Device Point Mapping Table: Specifies the number and type of data points associated with each DNP I/O module.
- Remote Device Polling Table: Specifies the polling type and frequency for each DNP I/O module.

Instructions and guidelines for configuring your DNP3 DCA can be found in the following documentation:

- *DNP V3.00 DCA - Configuration Guide* (B023-0CG)
- SGConfig online help.

Note: When configuring the Time Sync option:

- Disable Time Sync for the D20A and D20K modules
- If Time Sync is enabled on a D20S module, the polling rate may be a minimum of 2 seconds (it takes about 850ms to do a Time Sync for each device).

Configuring the iBox to work with a DNP3 I/O Module, continued

Example Configuration

For example, when configuring your iBox RTU Master to work with a DNP Digital Input Module, assume that you have a DNP Digital Input Module:

- That is factory-configured with 64 digital inputs
- That has DNP address 0032
- Which is to be polled every 500 ms.
- With every poll, we want a full status update.

To meet these requirements, you would configure the DNP DCA as shown in the below table:

Table	Parameter	Value
Remote Device Table	Application Address	0032
Remote Device Point Mapping Table	DCA Object Type	Binary Input
	Number of Device Points	64
Remote Device Polling Table	Poll Data Type	Integrity
	Poll Interval	500 ms

2.4. Testing your iBox

Overview

Introduction

This section describes a number of system checks that you can perform to verify your iBox software is functioning properly.

Valid Configuration File Required

Before performing any of the tests in this section, you must have a valid configuration file loaded into the iBox's NVRAM. The iBox is typically shipped with a valid configuration file loaded during manufacturing, and this file should be still loaded when the unit is delivered to your site.

In the event that you do not have a valid configuration file loaded into your iBox's NVRAM, or the file becomes corrupted before the unit is installed, you must reload the file before performing these verification tests.

For help restoring your configuration file, refer to the online help in SGConfig.

LED Descriptions

Overview

You can verify the iBox is operating properly by inspecting the LEDs on the iBox chassis.

Description

The iBox has the following LED indicators, all of which are GREEN.

LED	Location	Description
PWR	Top left	The POWER LED remains lit when the iBox is receiving power.
RUN	Top left	The RUN LED flashes to indicate CPU bus activity. Brightness indicates more CPU bus activity.
TX1 – TX3	Left side	The TRANSMIT LED flashes when the iBox is transmitting to an outside device. There are three transmit LEDs, one for each communication port.
RX1 – RX3	Left side	The RECEIVE LED flashes when the iBox is receiving a signal from an outside device. There are three receive LEDs, one for each communication port.
RS1 – RS3	Left side	The Request to Send (RTS) LED only works on systems configured for RS-232 communications. There are three RTS LEDs, one for each communication port.
CS1 – CS3	Left side	The Clear to Send (CTS) LED only works on systems configured for RS-232 communications. There are three CTS LEDs, one for each communication port.
CD1 – CD3	Left side	The Data Carrier Detect (DCD) LED only works on systems configured for RS-232 communications. There are three DCD LEDs, one for each communication port.
I/P1 – I/P8	Right side	Each of the iBox's eight Digital Inputs (DI) has a LED that remains lit when the DI is receiving a wetting voltage.

Diagnostic Tools

General

To operate the iBox, you require the following system components:

- WESMAINT facility
- iBox monitor facility
- SGConfig configuration system.

WESMAINT

Each iBox has a WESMAINT facility that allows users to examine the iBox database, applications and communications, and to manipulate the data.

You can, for example, use WESMAINT to examine the state of digital input data, or to force a digital output ON or OFF.

WESMAINT uses a series of menus and screens that display on a VT100 terminal, or similar terminal emulator, to create a simple interface to the iBox.

With a VT100-compatible terminal emulation program or SGConfig, you can access the WESMAINT facility directly.

Note: For further information about using WESMAINT software, refer to the *WESMAINTII+ User's Guide* (Document Number B014-1UG).

68K Monitor

The iBox's 68K Monitor is a debugging and diagnostics tool that is accessible in two ways:

- As a menu selection available through WESMAINT
- Upon start-up of an iBox that has not been previously configured.

Note: For further information about using the iBox Monitor, refer to the *68K Monitor User's Guide* (Document Number SWM0023).

SGConfig

Use SGConfig to define the iBox's operating parameters. You can also use SGConfig to download configuration files to the iBox through a serial connection.

Note: For further information about SGConfig, refer to the SGConfig online help.

Boot Test Verification

System Diagnostics (POST)

The iBox software includes a Power On Self-Test (POST) process, which runs when the unit is powered ON and determines whether or not the iBox circuitry is working properly.

Terminal Emulation Software

Terminal emulation software is not part of the iBox system, but you can use terminal emulation software such as HyperTerminal® or SGConfig terminal utility for these tests.

WESMAINT Terminal for Set-up

Use the following procedure to set up a PC as a WESMAINT terminal:

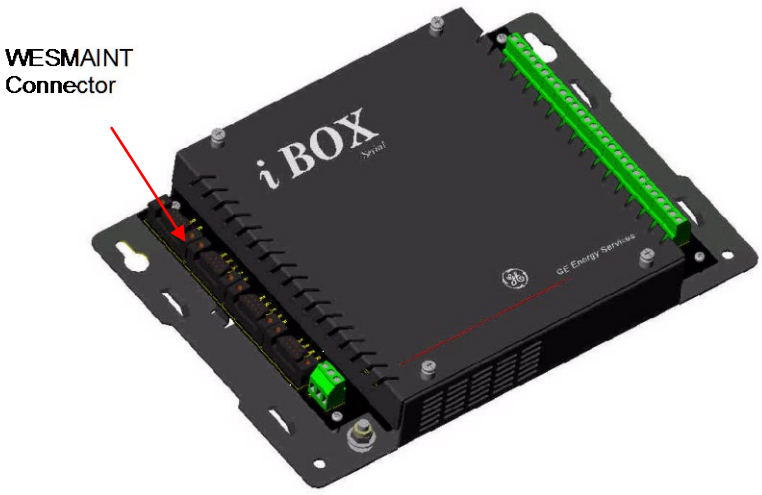
Step	Action
1	Open HyperTerminal (provided with Windows® operating system), or other VT100-compatible terminal emulation software.
2	Verify (or set) the terminal communications settings as follows:

Data Rate	9600 bps
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	XON/XOFF
Connector Settings	COM1, COM2, as required for your computer

Continued on next page

Boot Test Verification, continued

Connect to the WESMAINT port



Step	Action
1	Connect a WESMAINT cable to the female DB-9 WESMAINT port on the top left side of your iBox.
2	Attach the other end of the WESMAINT cable to the PC's selected communications port.
3	Verify the power cable is properly connected to iBox, and power is available.
4	The **POWER** and **RUN** indicators on the front upper left-hand corner illuminate when power to the iBox is turned ON.
5	Monitor the VT100 terminal's display **Result:** A series of text scripts displays as the POST routines are performed. If you do not see the text scripts, check all connections and repeat the procedure.

iBox Boot Up

The iBox automatically boots as soon as the power is turned on.

If the iBox fails to boot up, it may have sustained damage during shipping. Contact GE Digital Energy for assistance.

Log in to WESMAINT

General

When the POST is complete, you can log in to WESMAINT to continue further testing.

Procedure: Logging into Wesmaint

To log into WESMAINT from a PC:

Step	Action
1	Press ENTER **Result:** The *Welcome* screen appears, as does a login prompt. **Note:** If the *Welcome* banner does *not* appear, and only a *<iBoxS* prompt displays, a valid code or configuration file is not loaded into the iBox's memory. Stop this procedure and refer to "Downloading Code Files" on page 65 for procedures for restoring files
2	Type the User Name: ***westronic*** and press ENTER.
3	Type the Password: ***rd*** and press ENTER. **Result:** The WESMAINT **Main Menu** appears
4	If a time-out occurs, press ENTER again, to return to the **login** prompt

User Name and Password

The user name and password shown above are factory defaults. If you cannot log in, contact your system administrator to obtain the correct user name and password.

Navigating in WESMAINT

Use the UP and DOWN arrow keys, or type in the menu number, to select an option from the Main Menu. Press CTRL+L at any time to log out of WESMAINT

Further WESMAINT Information

For further information about using WESMAINT, refer to *WESMAINTII+ User's Guide* (Document Number B014-1UG).

2.5. Connecting and Testing Field Wiring

Overview

Introduction This section describes the process for making and testing field connections to the iBox.

Digital Inputs

Digital Inputs

The iBox has eight digital inputs (DIs).

Wetting Types

All DIs require an input voltage signal large enough to turn on an optical switch. If the DI is receiving a sufficient wetting voltage, the green LED associated with the DI will light.

Digital Input Thresholds

The following table shows the iBox's ON and OFF state thresholds. Verify that inputs do not exceed the maximum overload voltage; otherwise, the iBox may be damaged.

Digital Input Options	On Threshold	Off Threshold	Max Overload Voltage
Low Voltage Digital Input			
24 VDC	>14 VDC	<5 VDC	24 VDC + 20%
48 VDC	>28 VDC	<10 VDC	48 VDC + 20%
High Voltage Digital Input			
110/125 VDC	>80 VDC	<20 VDC	125 VDC + 20%

Digital Input Configuration

Digital Input Field Connections

Field wiring for all digital input variants are made through the iBox's terminal blocks, separable in pairs.

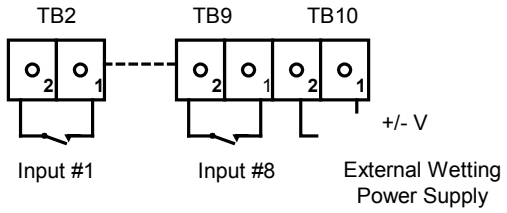
Digital Input Wetting Selection

The digital input is wetted (or turned ON) by closing a contact across the two input termination points. The voltage that is switched at the input terminals is supplied by an external source. The external power source is connected to terminal block TB-10, positions 1 and 2, as shown below.

All eight digital inputs are bipolar. Use care when connecting multiple external power sources, since the digital inputs have common returns.

Wiring Diagram: Dry Contact Operation

This diagram illustrates the DC input connections, from Input #1 (TB2) through Input #8 (TB9). TB10 accepts DC voltages of either polarity. The input voltage level to TB10 is determined by the purchased option.



Digital Outputs

Operating Modes

iBox control outputs have two modes of operation:

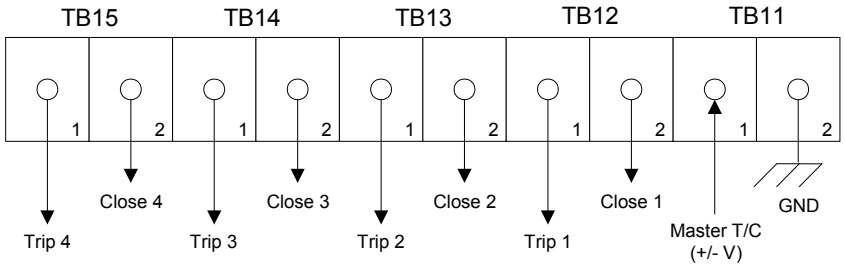
- Trip/Close (T/C) pairs
- Digital Output (DO) isolation Form A contacts.

Note: Using SGConfig, you must configure the digital outputs for four Trip/Close outputs or two Trip/Close and two digital outputs, depending on the part number.

Wiring Four Trip/Close Outputs

(Part No. 505-0100, 505-0101, 505-0102)

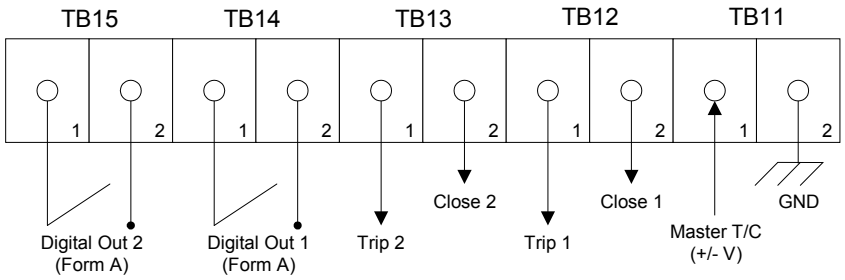
You can wire four trip/close outputs, as follows:



Wiring Two Trip/Close and Two Digital Outputs

(Part No. 505-0103, 505-0104, 505-0105)

You can wire two trip/close and two digital outputs, as follows:



Important

iBox digital outputs are not internally fuse-protected.

Remote/Local Operation

If:	Then operation is:
JP2 is installed	Remote (controls are enabled)
JP2 is removed	Local (controls are disabled)

Digital Input Verification Test

Testing Digital Inputs

To view digital input changes through WESMAINT, log in to WESMAINT as outlined in "Boot Test Verification" on page 48.

Note

The quantity and relative position of data points in the iBox's System Point Database is determined by the version of the iBox Plant I/O software application present in your iBox's firmware.

You can determine the actual point number that you want to test by viewing the point descriptions in WESMAINT, or through the SGConfig configuration tables for your iBox.

The point descriptions viewed in WESMAINT will be modified by changes you have made to the point descriptions in the iBox configuration file

Procedure: Testing Digital Inputs

The following procedure, accessible through the WESMAINT Main Menu, assumes digital inputs for the iBox are wired and wetted.

Step	Action
1	Select **1 — Digital Input Display**. **Result:** The point numbers and (optionally) point descriptions appear on the WESMAINT display
2	Use arrow keys to move up or down to highlight the desired point number (or press CTRL+G if you already know the point number)
3	Short out the desired input point, and verify, through WESMAINT, that the point status has changed to ON.
4	Return to Step 2 to test other digital input points

Navigating through WESMAINT

- Press **N** to move to the Next page
- Press **P** to move to the Previous page
- Press **ESC** to move back to the previous menu level.

Digital Output Verification Test

Testing Digital Outputs

To force digital outputs through WESMAINT, first log in to WESMAINT as described in "Boot Test Verification" on page 48.

Note

The quantity and relative position of data points in the iBox's System Point Database is determined by the version of the iBox Plant I/O software application present in the iBox's firmware.

You can determine the actual point number that you want to test by viewing the point descriptions in WESMAINT or in the SGConfig configuration tables for your iBox.

The actual point descriptions in WESMAINT will be modified by any changes you have made to the point descriptions in the configuration file.

Use caution when testing digital output points that are connected to external equipment. This test may activate or damage external devices, such as relays or reclosers, and could injure personnel.

Procedure: Testing Digital Outputs

From the WESMAINT Main Menu:

Step	Action
1	Select **1 — System Data Display**
2	Select **Digital Output Display** **Result:** The point numbers and (optionally) point descriptions appear on the WESMAINT display.
3	Use arrow keys to highlight the desired point number (or press CTRL+G if you already know the point number). **Result:** The cursor flashes on the specified point number
4	Press CTRL+F when you are ready to force-change the state of the digital output point.
	Extra Security
5	At the **Password** prompt, type ***control*** and press ENTER **Result:** The Digital Output Force Display appears.
6	Press CTRL+U to change (update) the relay state.

Continued on next page

Digital Output Verification Test, continued

Procedure: Testing Digital Outputs, continued

Step	Action
7	Press the SPACE BAR to select **Pulse,** and press ENTER.
8	In the **Off time** field, type **500** and press ENTER.
9	In the **On time** field, type **500** and press ENTER.
10	In the **Repeat Command** field, type **10** and press ENTER twice. **Result:** Listen carefully for an audible click of the point relay. A test is considered successful if the relays click when forced.
11	For testing **Trip/Close** type operation, repeat steps 1- 6.
12	Press the SPACE BAR to select **Trip/Close,** and press ENTER.
13	In the **Off time** field, type **300** and press ENTER.
14	In the **On time** field, type **300** and press ENTER.
15	In the **Repeat Command** field, type the value **0** and press ENTER twice. **Result:** Listen carefully for an audible click of the point relay. A test is considered successful if the relays click when forced. **Note:** For Trip/Close operation in **Repeat Command** field, if field input value is other than zero it results in a WIN write request failed error message with status 0x0011 (operation not supported for this point).Refer to *Appendix G: Error Messages*.

Notes

Note: The password shown above is factory default. If you cannot log in, contact your system administrator to obtain the new password.

Note: The number of times that a control will operate is actually N+1, where N is the number of repeats entered in the **Repeat command** field. For a single operation, with no repeats, type *0*. For two operations, type *1*.

Test Failure

If relays do not operate:

1. Ensure that the **CONTROLS** enable jumper is in the **REMOTE** position. No error message appears in WESMAINT if the test fails
2. Reboot the iBox, and repeat the procedure
3. Call GE Digital Energy for assistance

Repeat Test

To repeat the test sequence, press CTRL+U, and then press ENTER.

Values entered for the previous test are retained until you exit the menu.

Test Next Point

To test another point, use the UP or DOWN arrows to cycle through points, then press CTRL+U to repeat the test.

2.6. Servicing your iBox

Introduction

This section provides information and procedures for maintaining the iBox.

The iBox does not require any scheduled maintenance, other than periodic inspection to ensure that the:

- Unit has sustained no accidental physical damage,
- Airflow is not obstructed, and
- Connectors and cables are intact and firmly attached.

Fuse Replacement

Fuse Location

Under normal operation, the iBox should not require disassembly. The only time you should have to open the iBox is to replace the fuse.

Fuse Location

The fuse is located in position F1 on the main board. To find the fuse, remove the iBox top cover, and look to the bottom left corner of the main board, close to the protective earth terminal.

Procedure

To replace the fuse:

Step	Action
1	Remove power to the iBox.
2	Remove the top cover.
3	Remove the fuse.
4	Replace the fuse with a GE fuse, part number 940-0215. The fuse type is MDL 0.5 A 250 V.
5	Replace the cover.
6	Reconnect the power.

Battery Replacement

Battery Location

The battery is located in position BT1 on the main board. To find the battery, remove the iBox top cover, and look to the bottom center-right of the main board, close to the column of relays.

Battery Type

The iBox uses a 3 V, BR2/3A, lithium battery, GE part number 980-0026.

Procedure

To replace the battery:

Step	Action
1	Remove power to the iBox.
2	Remove the top cover.
3	Remove the battery by removing the holder clip.
4	Replace the battery with a GE battery, part number 980-0026. Check that battery has been inserted correctly by verifying the polarity markings.
5	Snap the battery holder clip back into place.
6	Replace the cover.
7	Reconnect the power.

2.7. Maintaining your iBox Software

Overview

Introduction The iBox is factory pre-configured and tested. It contains all required operating software, and is able to upload and download configuration files.

About Code and Configuration Files

Background

iBox operation requires two different files:

- Code File: This file defines the applications that can be supported by the iBox.
- Configuration File: This file, which is generated using SGConfig, is used to enable and configure the applications' operating characteristics.

Important

The Code File and the Configuration File must be consistent.

Specifically, the configuration file created using SGConfig *must* be based on the same applications (and versions of these applications) from which the code file was created.

Any differences between the applications in the code and the configuration files may result in:

- Erratic or unpredictable behavior of the iBox
- Failure of the iBox software

Configuration and Code File Mismatch

Code and configuration file mismatch can occur for one of the following reasons.

- The wrong configuration file is downloaded to the unit. This can happen through a local SGConfig download; for example, the downloaded file could have been based on an iBox with a different code file.
- The code file that is downloaded does not match the configuration file that is resident in the iBox memory.
- The code file or the configuration file has become corrupted, either before or during download.

Preventing File Mismatch

Configuration and code file mismatch can be prevented and corrected, as follows.

- Since mismatch is usually a result of operator error, you can prevent it by exercising care.
- Erasing a configuration file that is resident in NVRAM before downloading a new code file can prevent mismatch.
- Mismatch may require the regeneration and re-downloading of one or both files.

Continued on next page

About Code and Configuration Files, continued

System Response to File Mismatch

The iBox base system performs the following procedure after each reboot:

1. Every time the iBox reboots, a counter increments
2. If the iBox runs for two minutes without a reboot, the counter clears.
3. If the counter reaches 20, the base system invalidates the configuration and forces a system reset.
4. When the iBox comes back up, the base system will sense the now-invalid configuration and will either create a default configuration or load a backed-up configuration, if one is available.

This process protects the system from file problems that might cause the system to reset before the user can access WESMAINT to rectify the problem.

While a user can always directly default the configuration by pressing <**ESC**> during the start-up sequence, this only works if the customer is physically present and connected to the WESMAINT port.

Deleting Configuration Files

Erasing a Configuration

Erase a configuration file from the iBox's NVRAM *before* downloading a new code file into FLASH memory, unless the code file is *exactly* the same as the one that was in use before the download.

There are two ways to erase a configuration file from the iBox memory:

Restoring the Default Configuration

Step	Action
1	Reboot the iBox. While it is starting, press the ESCAPE key. **Result:** The following message appears: `Are you sure you wish to generate a default configuration [y\n]?`
2	Type *Y* and press ENTER **Result:** The configuration restores to default.

Erasing the Configuration File

Step	Action
1	With a terminal connected to the iBox 68K Monitor, type *DHW* (**D**isplay **H**ard**W**are) or *SI* (**S**ystem **I**nformation) on older units. **Result:** A listing of information, including the start address and size of the NVRAM used for the configuration file, displays. The NVRAM end address can be calculated by adding the NVRAM size to the NVRAM start address.
2	Type F 00 <NVRAM Start Address> <NVRAM End Address> and press ENTER. **Result:** The specified range of NVRAM fills with 0s, erasing any configuration files.

Downloading Code Files

When to Download

There are two reasons for downloading code files:

- If the iBox has performed self-diagnostics and determined that the flash memory is either erased or corrupt, it will display the **D25S>** prompt on the system monitor when it requires code files to be downloaded
- If the iBox software program features need to be changed or upgraded, the existing flash memory can be erased, and new code downloaded.

Programming Flash Memory

There are three ways to program iBox flash memory (the one you use will depend on your system options and network type):

- Connect a PC, running terminal emulation software, to the WESMAINT port. This procedure is described below.
- Use SGConfig to access the iBox through the WESMAINT port.
- Using a parallel port adapter and software utility, connect directly to the iBox BDM (Background Debug Mode) port. This procedure, which facilitates very fast downloads, is used during the manufacture of the iBox.

Before Downloading

When a new code image is downloaded into the iBox flash memory, the amount of memory reserved for the configuration's data region, also referred to as the "Base" region, may not be large enough.

If this occurs, the following message (or a similar message) displays:

```
The configuration's data region overlaps the current
Configuration Header (NVHEADER).  Relocate the
Configuration Header / NVRAM to <address>, or set data size
to <size> and re-download.  Application will NOT be
started.
```

If this message appears, refer to the SGConfig online help on how to set the iBox **Device Properties** to increase the Base System area.

Note

Using the Windows HyperTerminal for a code download procedure can take up to two hours to complete.

Continued on next page

Downloading Code Files, continued

Serial Code Download: Requirements

You will need the following before you can download a code file into the iBox flash memory:

- Windows PC with HyperTerminal (or equivalent) communication software.
- Code file, in Motorola S-record format, on the PC's hard drive. If the file is located on a network or floppy drive, the download will be significantly slower. This file will typically be named either `down.shx`, or `sal`*`xxxx`*`.shx`.
- WESMAINT cable, for connecting the PC to the iBox WESMAINT port.

Before Starting the Download

The serial code download procedure will suspend all iBox operations. Following the download, the unit will likely require a configuration download before it becomes operational. Consult your system administrator for access and authorization to perform system download procedures

In the Application Monitor (the **D25A>** prompt displays), configuration files can be downloaded but code files cannot. To download code, the System Monitor (the **D25S>** prompt displays) must be running.

Procedure: Serial Code Download

Use the following procedure to download a code file to the iBox flash memory:

Step	Action
Access Application Monitor	
1	Connect WESMAINT serial cable from PC to the iBox's WESMAINT port
2	Start your terminal emulation software, and configure it as follows: **Data Rate**: 9600 bps **Data Bits**: 8 **Stop Bits**: 1 **Parity**: None **Flow Control**: XON/XOFF **Connector Settings**: COM1, COM2, as required for your computer

Continued on next page

Downloading Code Files, continued

Download Procedure, continued

Note If the iBox does not have a code file loaded, or if it has detected a corrupt flash file, you will have to go directly to Step 8 and log directly into the monitor.

Step	Action
	Launch System Monitor
3	Log into WESMAINT.
4	Select option 2, **System Functions**.
5	Select option 3, **68K Monitor**. **Result:** The **D25A**> prompt appears, indicating that the Application Monitor is running.
6	At the **D25A>** prompt type *rtb* ENTER. For other available commands type *help* ENTER.
7	At the **Return to the BootROM Operating System? (yes/no)** prompt, type *yes* and press ENTER **Note:** The monitor is not case-sensitive, but *Y* is *not* acceptable **Result:** The system restarts.

While the iBox is rebooting, the system is disabled.

	Log in to the System Monitor
8	After the restart is complete, press ENTER. **Result:** The **Login:** prompt appears.
9	Type the **login name** *westronic* ENTER and **password** *rd* ENTER. **Result:** The system performs self-diagnostics to ascertain whether any Flash EPROM memory is in use. The **D25S>** prompt appears, indicating the System Monitor is running.
	Clear Flash EPROM
10	Type *erase* and press ENTER (not case-sensitive). **Result:** The recommended procedure is to clear flash EPROM memory, no matter what the system check reveals.

Continued on next page

Downloading Code Files, continued

Download Procedure, continued

Step	Action
11	Type *Y* ENTER at the **Do you wish to proceed?** prompt (not case-sensitive). **Result:** The system automatically verifies that Flash EPROM memory has been cleared. The **D25S>** prompt appears. You can start the download.
Optional steps to speed up the download time:	
12	Type *Baud 38400* ENTER (speeds up to 38.4 kbps, may be chosen based on ambient EMI, cable length, PC and software limits etc.). **Result:** The monitor now communicates at 38.4 kbps.
13	Configure HyperTerminal to communicate at the same speed, and reconnect to the 68K monitor.
Optional step to provide feedback during the download:	
14	If the communication software you are using *does not* have any "progress indicator', such as HyperTerminal, you can enable echo to visually display the code file on your monitor as it is transferred. This option can usually be found in the communication settings or properties of the communication program. **Note:** Enabling echo can slow transfer slightly
Start Download	
15	Type *dl* and press ENTER.
16	Select **Send Text File** (or comparable command) from program menus. **Note:** You can only download Motorola S-Records.
17	Locate and select a file to download.
18	Press ENTER to invoke the download procedure. **Note:** Download can take from 20 to more than 45 minutes, depending on file size and speed of transfer. **Result:** The download completes, and the **D25S>** prompt appears.

Download Fails

If the transfer does not complete or it stalls, halt and restart the transfer.

Download is Successful

Reboot the iBox, watching the display on the PC monitor. Note that the iBox monitor speed returns to 9600 bps, if it was changed during the procedure.

If any error codes display, you may have to repeat the procedure.

2.8. Troubleshooting your iBox

Overview

Introduction This section provides instructions on what to do if the system malfunctions, or when error messages appear in WESMAINT.

Runtime and Startup Errors

Overview

This section provides instructions on what to do if the system malfunctions, or when error messages appear in WESMAINT.

Note: Plant I/O errors are reported as changes in the state of specific digital input points. These events are logged to the WESMAINT SOE Buffer Display.

If WESMAINT Will Not Run

In severe cases, the WESMAINT application may not run at all. If this happens:

Step	Action
1	Access the System Monitor.
2	Type *EL /P*.
3	Type *EL/R*.
4	Reboot the iBox.
5	Press ENTER **Result:** A low-level error log displays. If these tables fail to help remedy the situation, or if you need help interpreting error messages, contact GE Digital Energy for assistance.

Continued on next page

Runtime and Startup Errors, continued

iBox Trouble-shooting Tips

Symptom	Possible Causes	Suggestions
Active Operations Aborted	Controls Jumper is in the Local position (JP2 is removed).	Move the Controls Jumper to the Remote position (Install JP2).
Active Requests Aborted	The iBox Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status (a coil is not energized when it should be).	Verify coil status.
Digital Output Requests Rejected	Controls Jumper is in the Local position (JP2 is removed). The iBox Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status (a coil is not energized when it should be).	Move the Controls Jumper to the Remote position (Install JP2). Verify coil status.
Queued Requests Cleared	Controls Jumper is in the Local position. The iBox Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status (a coil is not energized when it should be).	Move the Controls Jumper to the Remote position Verify coil status
System Hangs	Watchdog failure.	Attempt Reboot, clear CCU error logs
Plant I/O Watchdog Failure	Plant I/O Subsystem integrity is faulty.	Remove and restore power to the iBox
Digital output Points are Disabled	The Local/Remote Jumper is in the Local position (JP2 is removed).	Move the Local/Remote Jumper to the Remote position (Install JP2).
Communication Watch Dog Failure	Internal system monitors detect serious errors.	Attempt Reboot, clear CCU error logs.
Coil Status Check	The iBox Plant I/O Subsystem monitoring detects a conflict between desired and actual coil status.	Verify coil status.
Digital output coils are not in the state requested by the software Plant I/O Sub failure	Hardware Watchdog.	Check Control Voltage source fuses. Check voltage. Force from WESMAINT
Digital Output Failure	Control Voltage Not Available, Coil Status Check, or Hardware Watchdog error condition.	Check Control Voltage source fuses. Check voltage. Force from WESMAINT.

Continued on next page

Runtime and Startup Errors, Continued

Symptom	Possible Causes	Suggestions
NVRAM Check Failure	System start-up fails	Use WESMAINT to view the error message, and refer to related configuration guide for suggestions.
Application Checksum Failure	System start-up fails	Use WESMAINT to view the error message, and refer to related configuration guide for suggestions.
BootROM Checksum Failure	System start-up fails	Use WESMAINT to view the error message, and refer to related configuration guide for suggestions.
Start-Up Failure	RAM check, NVRAM check, Application checksum, or BootROM checksum failed during system start-up.	Use WESMAINT to view the error message, and refer to related configuration guide for suggestions.
System Shut Down	RAM, NVRAM, FLASH, or BootROM internal system diagnostics failed.	Use WESMAINT to view the error message, and refer to related configuration guide for suggestions
Only the System Monitor is Running	No valid application code is detected.	Load application code
Code Download Failure	Download interrupted or data error encountered in downloaded file.	Clear Flash EPROM memory. Restart download procedure.
Cannot Download Code	Logged into the Application Monitor.	Exit Application Monitor, and launch System Monitor.

Initialization Errors

Overview

Several error situations, related to initialization, can occur with file transfers. The most common case will be that the configuration and code in the Boot File are those in the memory of the client causing the client to initialize immediately. Other possibilities exist.

Symptom	Possible Causes	Suggestions
BootROM Error		Press escape to reset
TFTP Error	Configuration was not completed or data corruption has occurred at the server	Use WESMAINT to view the error message
Applications Not Enabled	Configuration was not completed or data corruption has occurred at the server	Use WESMAINT to view the error message
System Restarts	Data download failure	Use WESMAINT to view the error message
Only diagnostic input can be entered	No configuration is detected in either NVRAM or in EPROM on start-up	Download a configuration remotely via the system monitor, and reboot
System error	No configuration is detected in either NVRAM or in EPROM on start-up	Download a configuration remotely via the system monitor, and reboot

Errors Indicated by LEDs

Overview The following errors are indicated by the LEDs:

Symptom	Possible Causes	Suggestions
PWR LED does not light	Unit is not receiving power	Confirm that power source is working
RUN LED does not light	Unit is not receiving power No BootROM	Confirm that power source is working Confirm BootROM installed at U4XU4
TX LED does not light	Unit is not transmitting any data RTS, CRS, DCD settings are incorrect	Check cabling to modems. If connected to a modem or converter, ensure RTS, CTS, DCD are enabled If using a Direct Serial Connection, try disabling RTS, CTS, DCD
RX LED does not light	Not receiving any data	Same as above
RS LED does not light	RTS line disabled	Enable RTS
CS LED does not light	Modem not working correctly	Check modem cabling
CD LED does not light	Not receiving data	Check modem cabling Ensure modem is receiving data
I/Px (DI LEDs) do not light	The input device is not operating properly	Confirm that the input source is working properly

2.9. Replacing your iBox

Introduction

This section outlines procedures for replacing an iBox.

Equipment Needed

- Standard electrician's tools (screwdrivers and flashlight)
- Replacement iBox.

Before Installing

Verify that the replacement iBox unit is fitted with the same options and connectors as the original unit, before proceeding.

Refer to "Product Identification" on page 20 for detailed information.

Since hazardous voltages can cause shock, burns or death:

- Disconnect and lockout all power sources before servicing and removing components
- Short all current transformer primaries before servicing.

Replacing your iBox, continued

Procedure: Replacing an iBox

Use the following procedure to replace an iBox:

Step	Action
	Removing the Existing iBox
1	Power down the iBox by unplugging power from TB1.
2	Disconnect ground from the iBox.
3	Ensure no voltage or current is applied to any of the terminals on the iBox. Use a meter if necessary.
4	Remove field wiring connections **Important:** When the new unit is installed it is important that these wires are reconnected to the same points from which they were removed. Record the position of each wire as it is removed.
5	Remove communications cables from the iBox **Important:** Note the location and orientation of each cable as it is removed
6	Remove the disconnected iBox from its mounting position
	Installing the Replacement iBox
7	Mount the new iBox.
8	Reconnect the field wiring to the same points as they were on the original unit.
9	Reconnect any communications cables that were removed to the same points as they were on the original unit.
10	Restore ground and power to the iBox.

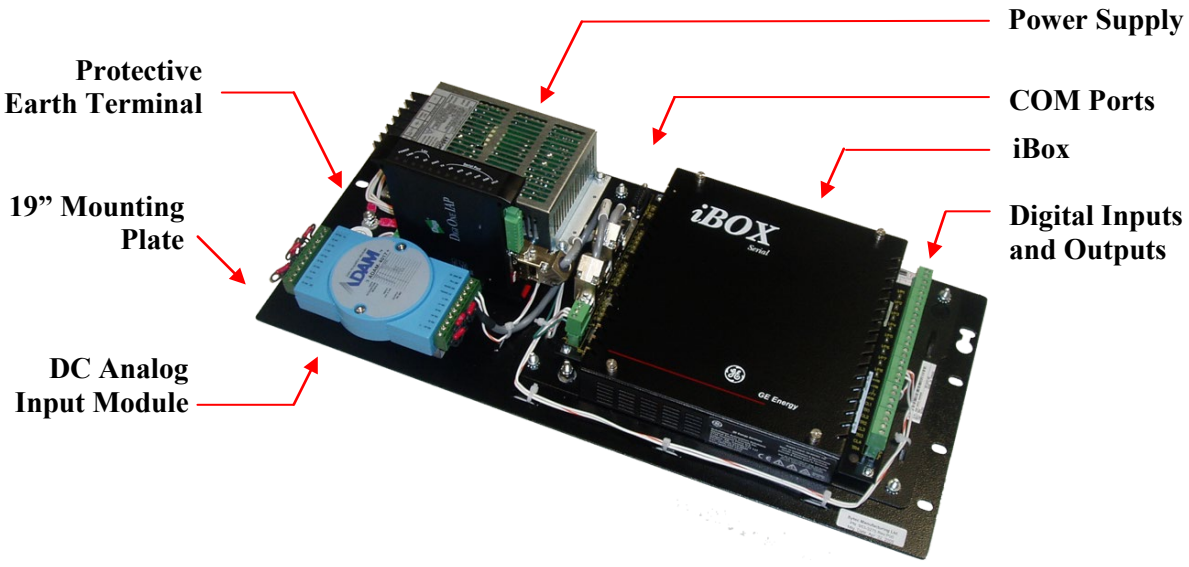
Section 3:iBox Kit Installation and Maintenance

3.1. Familiarization

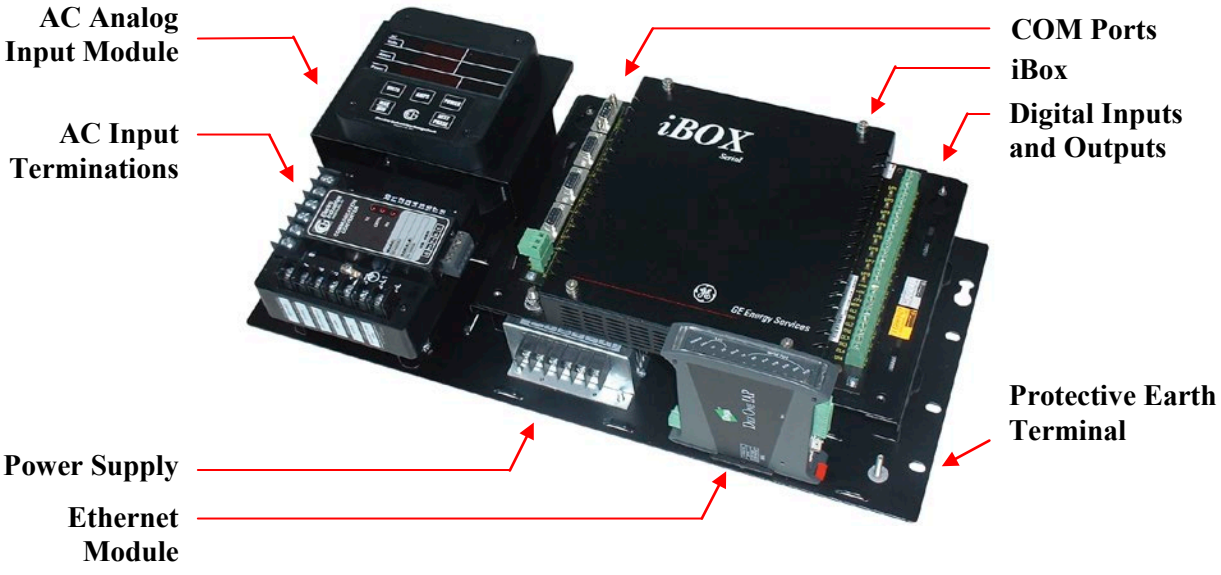
Overview

In addition to the iBox features, the 19" rack-mountable iBox Kit can be optioned to provide DC analog inputs AC analog inputs, an Ethernet connection, and support for a wide range of power supply input voltages. Examples of DC and AC iBox Kits are shown below.

DC Kit



AC Kit



What is an iBox Kit?, continued

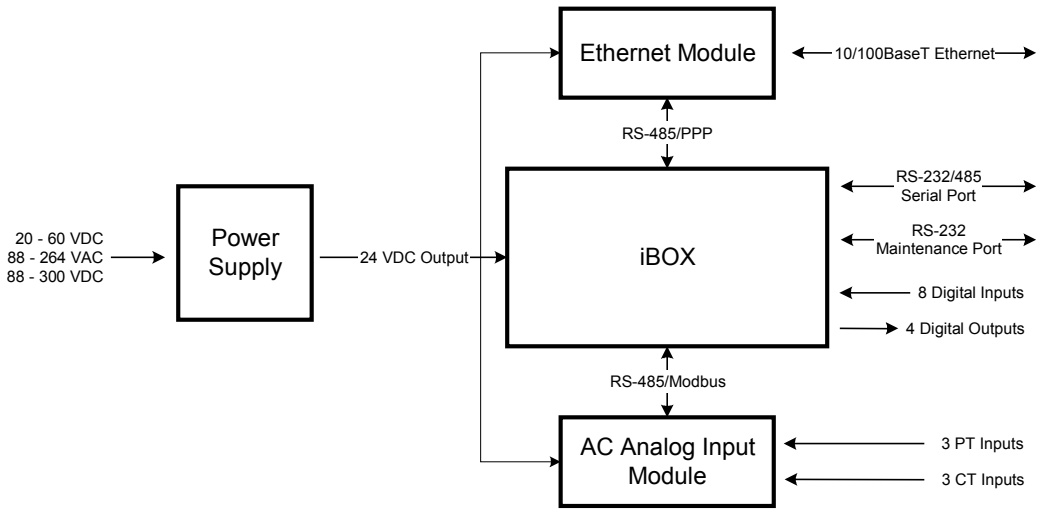
Components

The iBox Kit consists of the following components:

- iBox. See "What is an iBox?" on page 14 for more information.
- 24 VDC Power Supply (20 - 60 VDC or 88 - 300 VDC/88 - 264 VAC input)
- 10/100BaseT Ethernet Module (optional)
- DC Analog Input Module (optional, eight DC analog inputs)
- AC Analog Input Module (optional, 3 CT and 3 PT inputs)

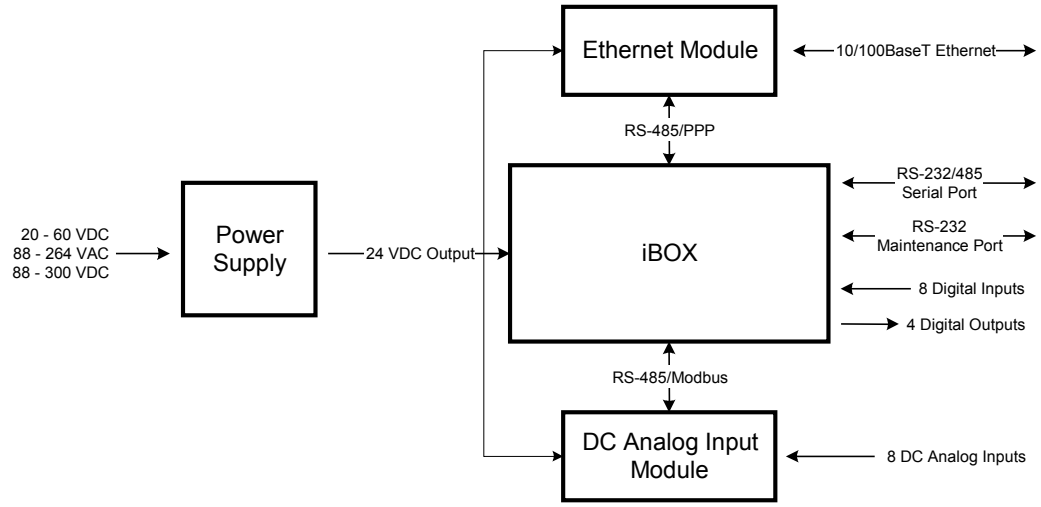
An example configuration of the iBox AC Kit is illustrated below (other options of the iBox Kit are equipped differently):

AC Kit



DC Kit

An example configuration of the iBox DC Kit is illustrated below (other options of the iBox Kit are equipped differently):



What is an iBox Kit?, continued

Operation and Maintenance

The iBox Kit can be configured to operate over a LAN or through a serial connection.

If you configure the iBox Kit to operate over a LAN, you can maintain the iBox configuration over the LAN or directly through the WESMAINT port. If you operate the iBox Kit through a serial connection, you can only maintain the iBox configuration through the WESMAINT port.

Inputs/ Outputs

The iBox Kit provides the following:

- Eight digital inputs
- Four control outputs
- Eight DC analog inputs (optional)
- Three PT (120/208 V) and three CT (5 A) AC analog inputs (optional)

Digital Inputs

The iBox Kit provides the following digital inputs, directly from the iBox:

- Eight optically isolated status inputs, 25 VDC or 125 VDC, with 10% overload
- Wetting options
- LED indications
- 4-5 mA typical current burden per input (up to 48 VDC)
- Maximum 0.5 W heat dissipation per input from current burden of inputs at 125 VDC

Control Outputs

The iBox Kit provides the following control outputs, directly from the iBox:

- Four Trip/Close pairs, or two Trip/Close pairs and two Form A contacts.
- Separate Master Trip and Master Close relays
- Security features:
  - Protection against erroneous operation due to single point of failure
  - Select-before-operate (SBO) functionality
- 35 W breaking @ 125 VDC, 180 W breaking @ 30 VDC
- 6 A current handling capability

DC Analog Inputs (option)

The iBox Kit provides the following DC Analog Inputs through a DC Analog Input Module:

- Eight DC analog inputs
- DC voltage options: $\pm$1 VDC, $\pm$5 VDC, $\pm$10 VDC
- DC current options: $\pm$20 mA, 4–20 mA
- 14-bit resolution plus sign

Continued on next page

AC Analog Inputs (option)

The iBox Kit provides the following AC Analog Inputs through an AC Analog Input Module:

- Single circuit monitoring (wye connected)
- V_{RMS}, I_{RMS}, Phase Angle, Frequency, Power Factor
- Real Power (W), Reactive Power (VAR), Apparent Power (VA)
- Watt-Hour
- Nominal PT input range: 0 to 150 VLN or 250 VLL
- Nominal CT input: 5 A
- Frequency: 50/60 Hz
- Measurement range: 0 to 125% of nominal
- Accuracy: 0.3%
- Continuous overload withstand: 200% of nominal
- Short duration overload withstand: 100 A for 3 s
- Surge withstand as per IEEE C37.90.1, ANSI C62.41
- True RMS sampling at 64 samples per cycle
- Isolation: 2500 VAC/60 Hz
- Burden:
  - Voltage & Current: 0.1 VA max
  - Power Supply: 6 VA max

Power Supply

The power supply provides 24 VDC power to all iBox Kit components. It can also deliver limited 24 VDC power to customer-provided equipment. The power supply comes in two input voltage-range options:

- 20 - 60 VDC (7 A max)
- 88 - 300 VDC (1.4 A max) / 88 - 264 VAC (2.1 A max)

Maximum output is 24 VDC / 4 A or 24 VDC @ Vin min. For further clarification regarding the power supply, consult the manufacturer's power supply guide as listed in the *Additional Documentation* section.

Remote Maintenance

If your iBox Kit is equipped with an Ethernet interface, you can access and configure the iBox from a remote PC running SGConfig.

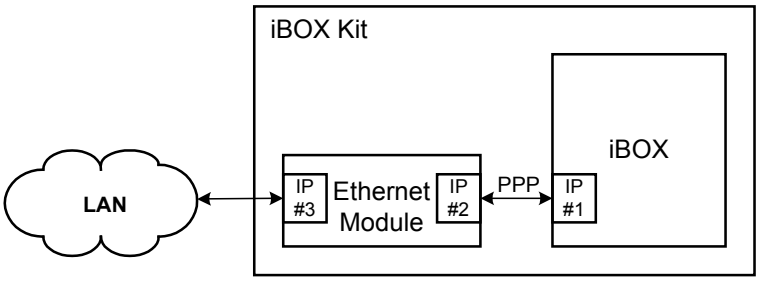
What is an iBox Kit?, continued

PPP (Point-to-Point Protocol)

The iBox uses PPP to communicate through the iBox Kit Ethernet Module to a LAN, or externally to communications equipment such as a radio.

IP Addressing

When it is equipped with an Ethernet Module, the iBox Kit requires three IP addresses, two external and one internal, as shown below:



IP #1 and IP #3 are both accessible from the LAN. IP #2 is internal to the iBox Kit and is not accessible from the LAN. You set IP #2 and IP #3 when you configure the Ethernet Module. The Ethernet Module calculates IP #1 (equal to IP #2 + 1), and assigns this address to the iBox through PPP.

Configuration

The iBox Kit ships pre-configured, based on your order; however, you need to configure the PPP Driver, Ethernet Module IP addresses, and SCADA protocol (e.g., DNP or IEC) addresses. You configure the iBox Kit components as follows:

Component	Configuration Method
iBox	Locally through the iBox maintenance (WESMAINT) port, from a PC running SGConfig. If it is equipped with an Ethernet Module, the iBox can also be configured through the LAN, from a remote PC running SGConfig. Refer to "Configuring the iBox Kit Components" on page 87.
Ethernet Module	Locally through the module's Ethernet port/Web server, from a computer running a Web browser. Refer to "Configuring the Ethernet Module" on page 109.
DC Analog Input Module	Locally through the device's RS-485 port, from a computer running the vendor's configuration utility. Refer to "Configuring the DC Analog Module" on page 123.
AC Analog Input Module	No configuration typically required.

Default Configuration Options

When shipped as part of an iBox Kit, the iBox comes preconfigured for that particular option, as shown in *Appendix B: iBox Kit Default Configurations*.

3.2. Installing the iBox Kit

Overview

Safety Precautions

Before beginning to install the iBox Kit, thoroughly review the "Safety Precautions" for guidelines and warnings regarding the safe handling and installation of the product.

Installation Steps

Installing the iBox Kit involves the following main steps:

Step	Action
1	Physically install the iBox Kit.
2	Connect power source, ground and serial interfaces.
3	Power up the iBox Kit and check for normal operation.
4	Configure the iBox Kit components.
5	Test the iBox Kit.
6	Connect and test field wiring.

Physical Mounting

Rack Spacing

When mounting the iBox Kit in a rack with other equipment, leave at least one rack unit (RU) of space above and below the equipment to allow for cooling air flow and cable routing (1 RU = 1.75 inches or 44.5 mm).

Required Clearances

The exterior dimensions of the iBox Kit are:

- 8.75” high x 19" wide x 2" deep (22.2 cm high x 48.3 cm wide x 5.1 cm deep)

Procedure – Mounting the iBox Kit

To mount the iBox Kit on a rack:

Step	Action
1	Determine the location of the iBox Kit in the 19-inch mounting rack.
2	Insert, but don’t tighten the top two mounting screws.
3	Slide the iBox Kit over the top mounting screws and drop down into position.
4	Insert the bottom mounting screws.
5	Tighten all four mounting screws.

Note: iBox Kits should be installed with the equipment modules and LEDs visible from the front of the rack.

Note: Equipment cabling will typically route along the rack channel, come through a space above or below the iBox Kit then connect to the mounting panel, iBox, power supply, Ethernet Module and I/O module.

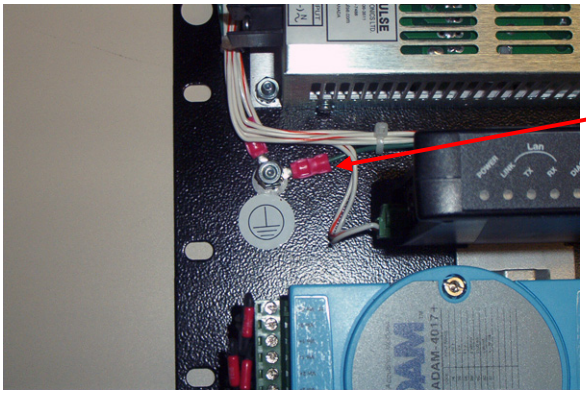
Note: An IEC® 60947 compliant main disconnect switch (or other equivalent device complying with IEC 60947-1 / 60947-3) must be as electrically close as practicable to the iBox Kit power supply.

You are now ready to connect ground, power, and communications cabling to the iBox Kit.

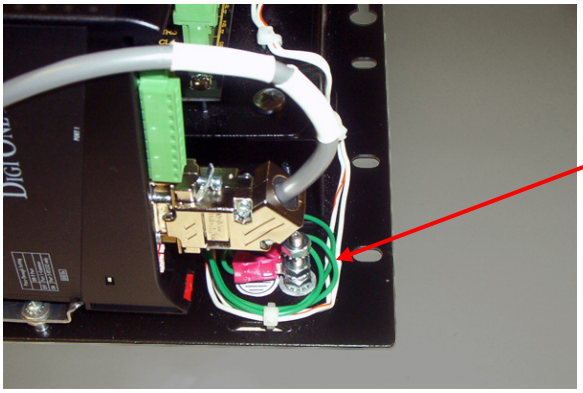
Connections

Ground Connection

Connect site ground to the iBox Kit protective earth terminal. We recommend 12 AWG wire, a ring connector and a toothlock washer.



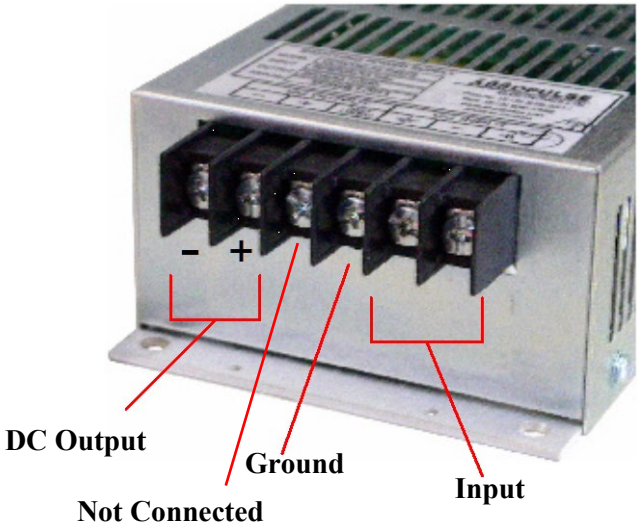
iBox Kit (DC) Protective Earth Terminal



iBox Kit (AC) Protective Earth Terminal

Power Connection

Connect power to the iBox Kit power supply. External fuse installation is required. Consult the power supply rating section for power ratings.



Communications Cabling

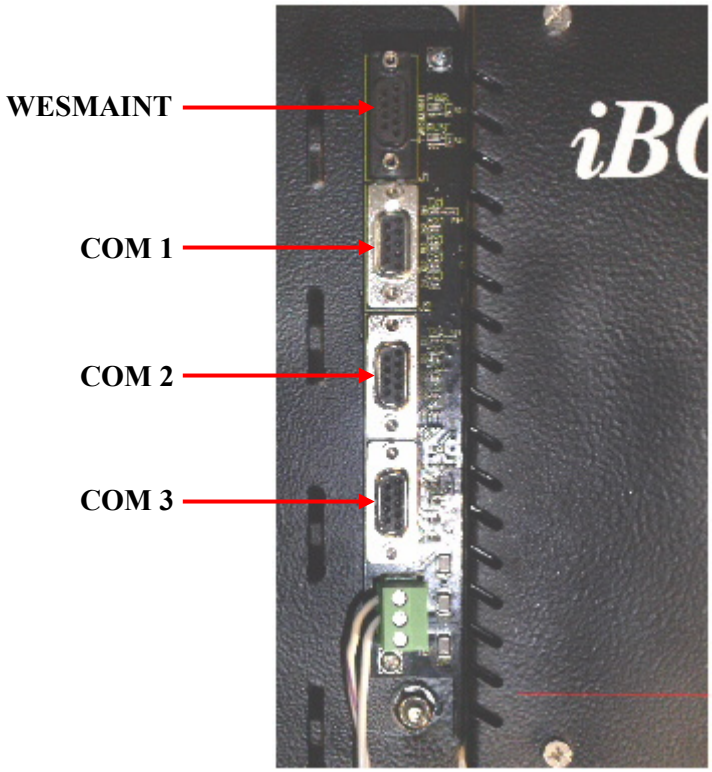
Communi-cations Cabling - Ethernet

If your iBox is equipped with an Ethernet module, connect the LAN to the iBox by plugging a CAT5 cable equipped with an RJ45 connector into the Ethernet module:

Communications Cabling, continued

Communications Cabling - Serial

As necessary, connect the appropriate iBox COM port to your equipment using serial cables with male DB-9 connectors:



Note: COM port assignments for different iBox Kit options are summarized in *Appendix B: iBox Kit Default Configurations*.

Note: The Ethernet module is connected to the COM3 port by a special GE-supplied cable (GE part number 977-0526.)

3.3. Configuring the iBox Kit Components

Introduction

Your iBox Kit modules have been pre-configured based on your order. However, you need to configure, or confirm the configuration of, the following items:

iBox Kit Module	Configurable Settings
iBox	• Project properties • Device properties • Communications properties • SCADA protocol addresses • PPP Driver (if applicable) • User ID and password
Ethernet Module (if equipped)	• IP addresses • Admin password • Pass-through switch • Configuration ports setting
DC Analog Input Module (if equipped)	In most cases, you will not have to reconfigure the DC Analog Input Module. You may, however, want to change the following: • Input type (voltage or current) • Input range • Point descriptors
AC Analog Input Module (if equipped)	In most cases, you will not have to reconfigure the AC Analog Input Module. You may, however, want to change the following: • Point descriptors

Note: Configuration procedures vary for the iBox operating over a serial connection versus a LAN connection. Be sure to follow the appropriate set of procedures for your type of connection.

Continued on Next Page

Configuring and Testing your iBox Kit Components, continued

Before you Start

To configure an iBox Kit with a serial connection, you will need:

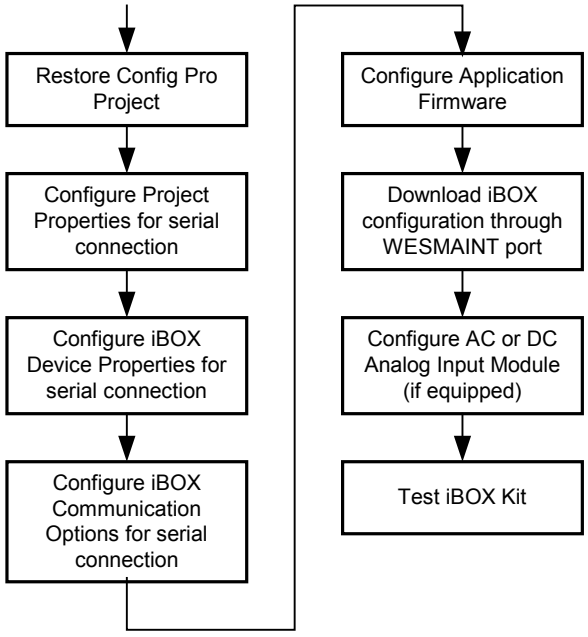
- Factory configuration for your iBox. You can find this on the configuration CD that shipped with your iBox Kit.
- SGConfig installed on your PC.
- Serial number of your iBox, from the iBox circuit board

To configure an iBox Kit with a LAN connection, you will need, in addition to the above:

- IP address/subnet mask of the LAN, iBox and Ethernet Module
- Gateway address, if your iBox is connected to the LAN through a router.
- Factory configuration for your Ethernet Module. You can find this on the configuration CD.

Configuration Sequence – Serial Connection

If you are operating the iBox Kit through a serial port, the process for configuring and testing the iBox Kit components is as follows:



Continued on Next Page

Configuring and Testing your iBox Kit Components, continued

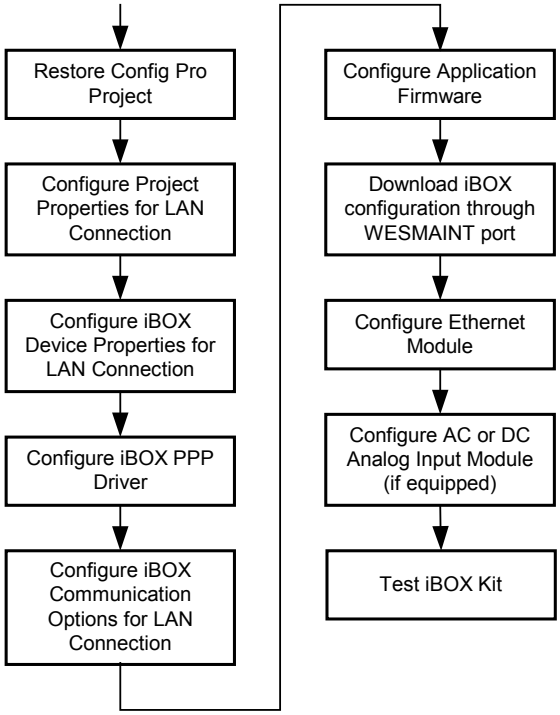
Configuration Procedures – Serial Connection

The procedures for configuring an iBox Kit with a serial connection are as follows:

Configuring and Testing your iBox Kit Components, continued

Configuration Sequence – LAN connection

If you are operating the iBox Kit through a LAN, the process for configuring and testing the iBox Kit components is as follows:



Note: The first time you configure the iBox in an iBox Kit, you will do it through the WESMAINT serial port. Once you have configured the iBox, you will be able to download subsequent configurations over the LAN.

Configuration Procedures – LAN connection

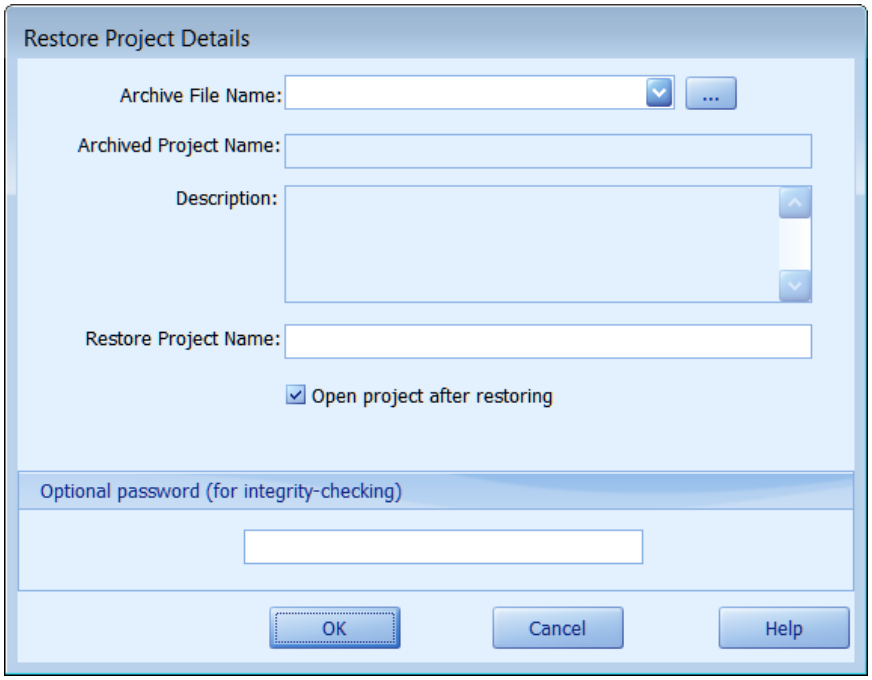
The procedures for configuring an iBox Kit with a LAN connection are as follows:

Restoring your SGConfig Project

Introduction

This procedure describes how to restore the SGConfig project that includes the sample configuration provided with the iBox.

Procedure: Restoring your SGConfig Project

Step	Action
1	In your Windows desktop, click **Start**, and then click **Programs**.
2	Click **SGConfig**, > **SGConfig**. **Result:** SGConfig opens.
	Importing the Factory Configuration
3	Click **GE** > **Archive** > **Project** > **Restore.**
4	Click **Restore**. **Result:** The **Restore Project Details** window appears: 
5	Insert your configuration CD in the drive.
6	Navigate to the configuration file in the **Archive File Name** field.
7	Click **OK**. **Result:** The configuration file uploads to your PC, and your project appears in an SGConfig project tab.

Next Step

If you are operating the iBox Kit through a serial connection, the next step is:

- Configuring Project Properties - Serial on page 92

If you are operating the iBox Kit through a LAN connection, the next step is:

- Configuring Project Properties on page 98

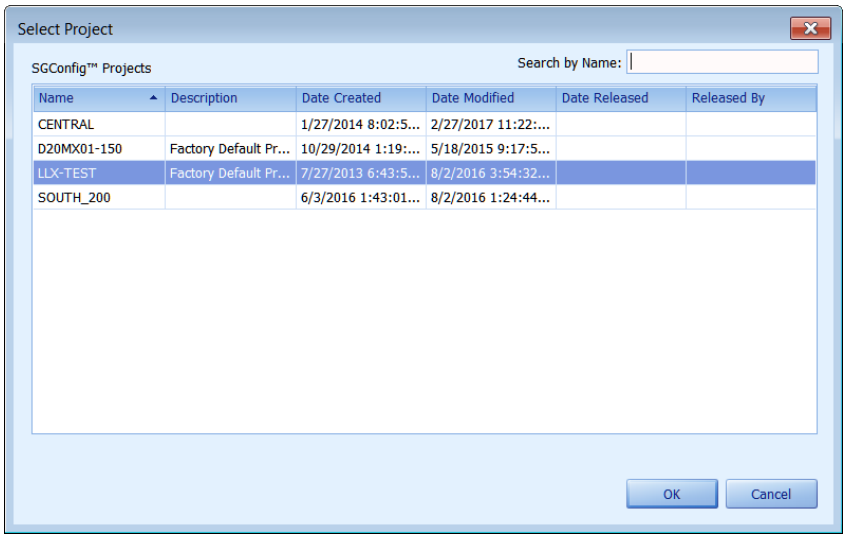
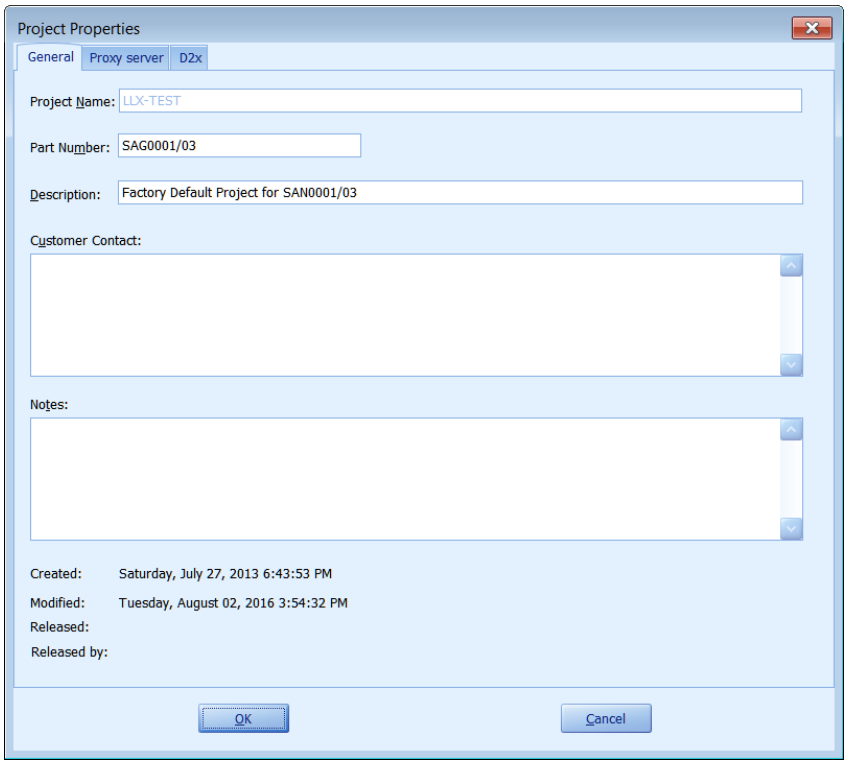
Continued on next page

Configuring Project Properties - Serial

Introduction

Use the following procedure to configure Project Properties if you are operating the iBox Kit through a serial connection.

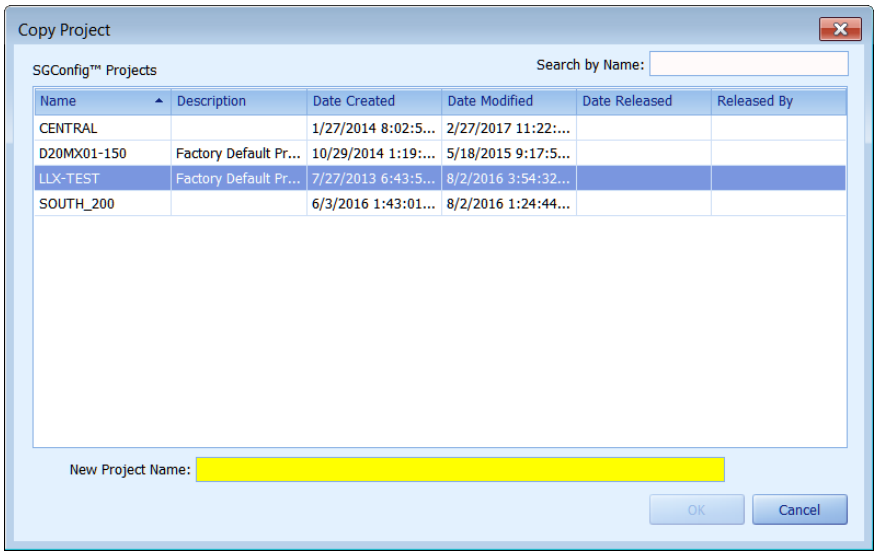
Procedure: Configuring Project Properties - Serial

Step	Action
1	In SGConfig, click **GE** > **Project** > **Properties**. **Result:** The **Select Project** window appears: 
2	Select your project under **SGConfig Projects** and click **OK**. **Result:** The **Project Properties** window appears: 

Continued on next page

Configuring Project Properties - Serial, continued

Procedure: Configuring Project Properties - Serial [continued]

Step	Action
3	Select the **D2x** tab > **General** tab. Verify that **LAN Based Project** is not checked and click **OK**.
4	Click **GE** > **Copy Project**. **Result:** The **Copy Project** window appears: 
5	Type in a **New Project Name** for your project.
6	Click **OK** to save.

Next Step

The next step is:

- Configuring iBox Device Properties - Serial on page 94

Configuring iBox Device Properties - Serial

Procedure: Configuring iBox Device Properties - Serial

Refer to "iBox Device Properties" on page 36 for instructions on configuring iBox Device Properties, when you are connecting to the iBox Kit through a serial port.

Next Step

The next step is:

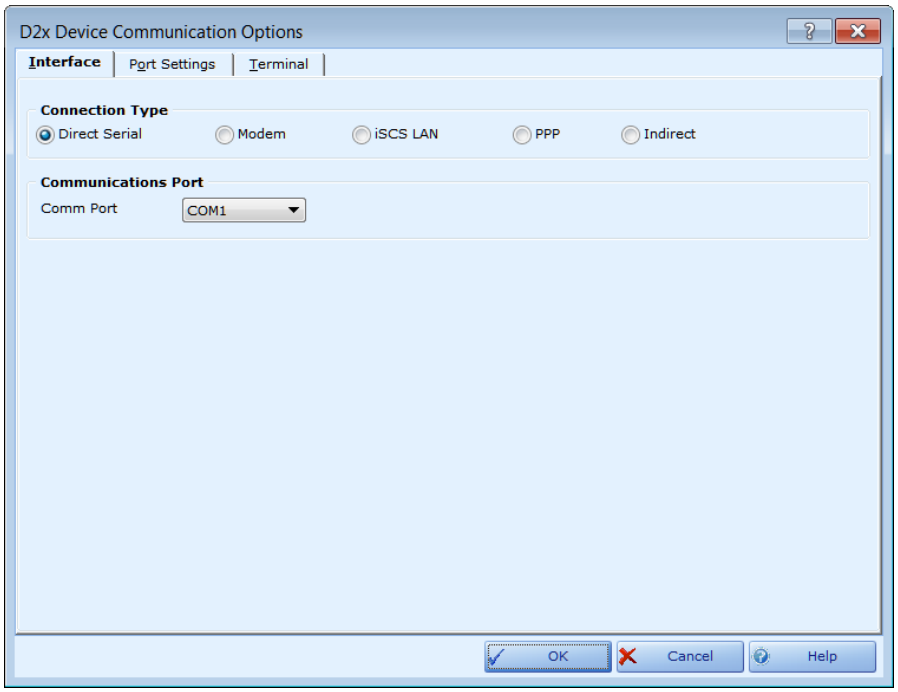
- Configuring iBox Communications Options - Serial on page 95

Configuring iBox Communications Options - Serial

Introduction

Use the following procedure to configure iBox Communications Options if you are operating the iBox Kit through a serial connection.

Procedure: Configuring Communi-cations Options - Serial

Step	Action
1	In the **Project** tab area, right-click the iBox device icon.
2	Click **Communications** group > **Options** command.
3	On the **Interface** tab, select **Direct Serial** under **Connection Type** and **COM1** from the **Comm Port** list. 
4	Click **OK** to save.

Next Step

The next step is:

- Configuring the Application Firmware on page 96

Configuring the Application Firmware

Procedure: Configuring Application Firmware

Refer to "Configuring Application Firmware" on page 40 for directions on how to configure iBox application firmware.

Next Step

If you are operating the iBox Kit through a serial connection, the next step is:

- Downloading your iBox Configuration - Serial on page 97

If you are operating the iBox Kit through a LAN connection, the next step is:

- Downloading your iBox Configuration - LAN on page 108

Downloading your iBox Configuration - Serial

Overview

To download your iBox configuration file, connect your PC to the iBox WESMAINT port.

Procedure: Downloading your iBox configuration through the WESMAINT port

Refer to "Downloading your iBox Configuration" on page 41 for instructions on how to download a configuration file to the iBox through the WESMAINT port.

Next Step

If your iBox Kit is equipped with a DC Analog Input Module, the next step is:

- Configuring the DC Analog Module on page 123

If your iBox Kit is equipped with an AC Analog Input Module, the next step is:

- Configuring the AC Analog Module on page 130

If your iBox Kit is not equipped with a DC or AC Analog Input Module, the next step is:

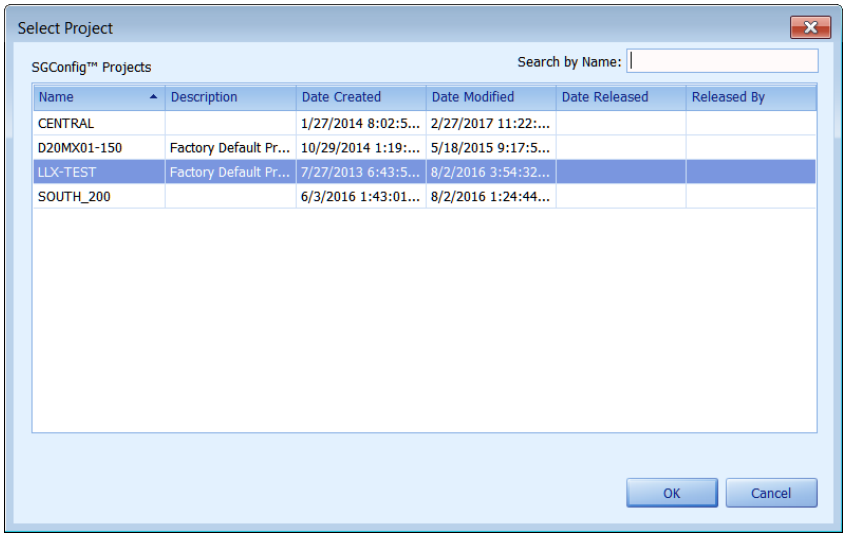
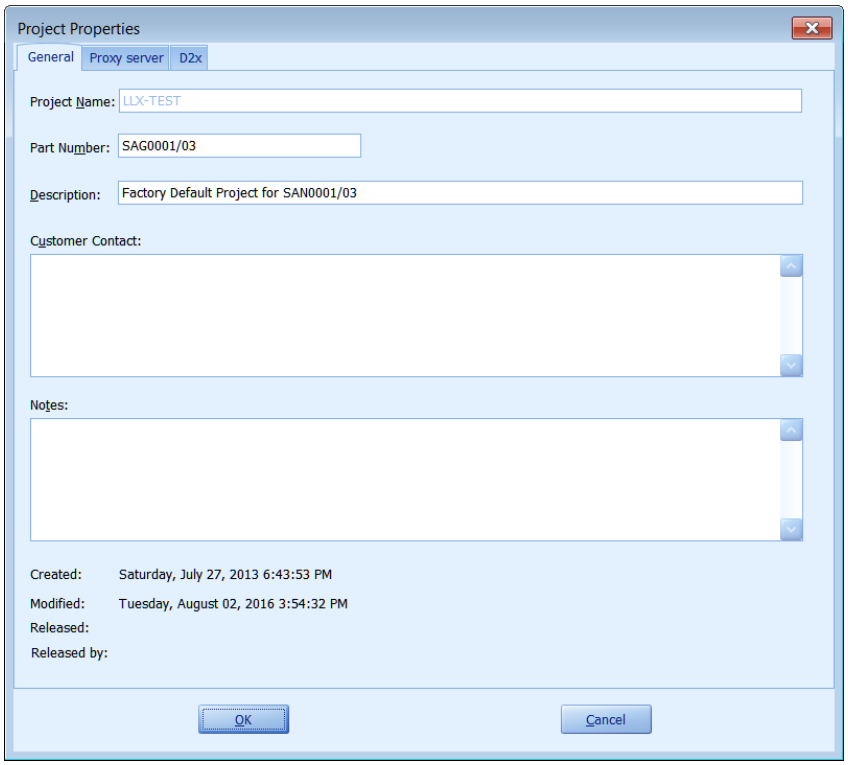
- Testing the iBox Kit on page 131

Configuring Project Properties - LAN

Introduction

Use the following procedure to configure Project Properties if you are operating the iBox Kit through a LAN connection.

Procedure: Configuring Project Properties - LAN

Step	Action
1	In SGConfig, click **GE** > **Project** > **Properties**. **Result:** The **Select Project** window appears: 
2	Select your project under **SGConfig Projects** and click **OK**. **Result:** The **Project Properties** window appears: 

Continued on next page

Configuring Project Properties - LAN, continued

Procedure: Configuring Project Properties - LAN [continued]

Step	Action
3	Click the **D2x** > **General** tab.
4	On the **General** tab, select **LAN Based Project**.
5	Click the **Segments** tab. On the **LAN A** tab, select **LAN A Enabled**, and enter the **IP Address** and **Subnet Mask**. **Note:** Even if your LAN has a default gateway, you do not need to enter it here.
6	Click **OK** to save.

Next Step

The next step is:

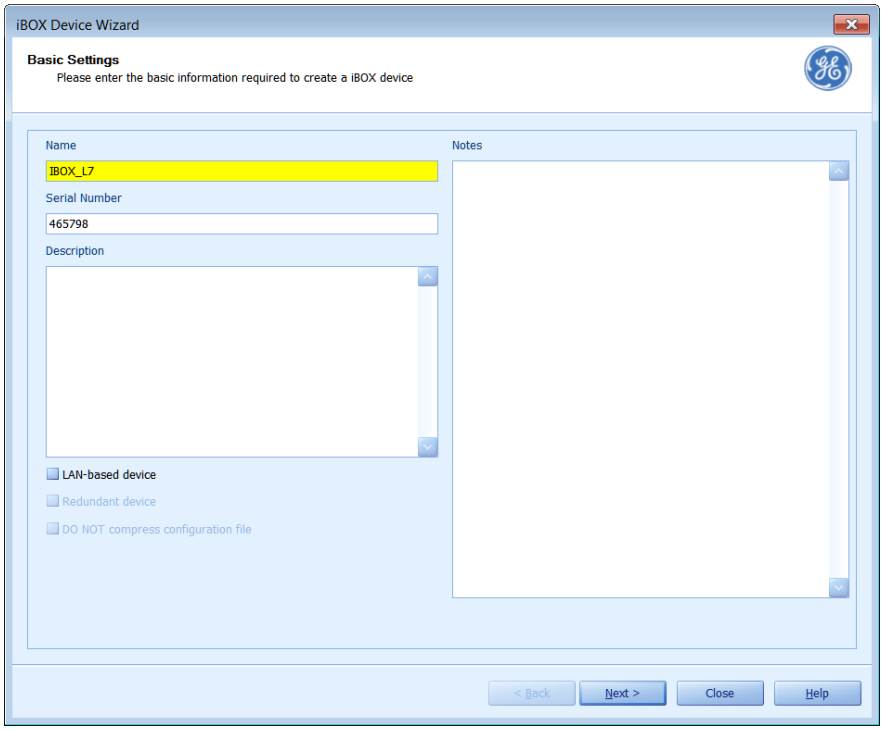
- Configuring iBox Device Properties - LAN on page 101

Configuring iBox Device Properties - LAN

Introduction

Use the following procedure to configure iBox Device Properties if you are operating the iBox Kit through a LAN connection.

Procedure: Configuring Device Properties - LAN

Step	Action
1	Select the iBox device.
2	Click **Edit** group > **Properties** command. **Result:** The **iBOX Device Wizard** appears. 
3	Verify **LAN based device** is selected.
4	In the **Description** box, type in a name for the iBox.
5	In the **Serial Number** box, type i the serial number of the iBox.

Continued on next page

Configuring iBox Device Properties - LAN, continued

Procedure: Configuring Device Properties - LAN [continued]

Step	Action
6	Click the **Processor** tab.
7	On the **Memory Model** tab, ensure that **Derive From iBox Hardware Setting** is selected.
8	Confirm the settings are as shown above, and modify them if they are not.
9	Click the **LAN Settings** tab, and then click the **General** tab.
10	Confirm the settings are as shown above, and modify them if they are not.
11	Click the **LAN Specific** tab:
12	Enter the **Host Address**. **Note:** The **Host Address** is set to [(PPP IP Address of the Ethernet Module) + 1]. The iBox and Ethernet Module PPP IP addresses are related, as outlined in "IP Addressing" on page 81. **Note:** Do not change the **Ethernet Address** settings.
13	Click **OK** to save.

Next Step

The next step is:

- Configuring the iBox PPP Driver on page 103

Configuring the iBox PPP Driver and Internet Data Links

Procedure: Configuring the PPP Driver

Step	Action
1	Select the iBox device.
2	Click **Communications** > **Options**. Result: The D2x Device Communication Options window > Interface tab appears.
3	Select the **PPP** Connection Type. Result: The tabs applicable to the connection type appear.
4	Click the **Tables** tab.
5	On the **PPP main config** tab, verify the following settings and modify them if necessary:

Field	Value
Port	COM3
Baud	19.2K
Bits per char	8
Parity Type	Even
Parity Mode	None
Stop Bits	1
RTS	Disable
CTS	Disable
DCD	Enable
RTS on delay	0
DCD on delay	0
RTS off delay	0
Max PPP receive unit	1500
Restart timer	3
ACCM	Disable
CHAP	Disable
Challenge_retries	2
Challenge_period	5

Note: You should not need to change any of the above settings from their default values. If you do, you also need to make corresponding changes to the Digi One® Ethernet Module, if equipped, or to the equipment to which the iBox Ethernet port is connected. See "Configuring the Ethernet Module" on page 109.

6	Close the **PPP Driver** window.
7	Click **Yes** to save your changes.

Continued on next page

Configuring the iBox PPP Driver and Internet Data Links, continued

Procedure: Configuring the PPP Driver `(continued)

Step	Action
8	On the **Data Translation Applications** tab, double-click the **DNP Internet Data Link** icon. **Note:** If your system uses the IEC 60870-5-104 data link, select the appropriate application icon.
9	Click the **Tables** tab.
10	In **Local Host Name**, enter *****.
11	Close the **DNP Internet Data Link** window.
12	Click **Yes** to save your changes.
13	Close the **Applications** window.

Next Step

The next step is:

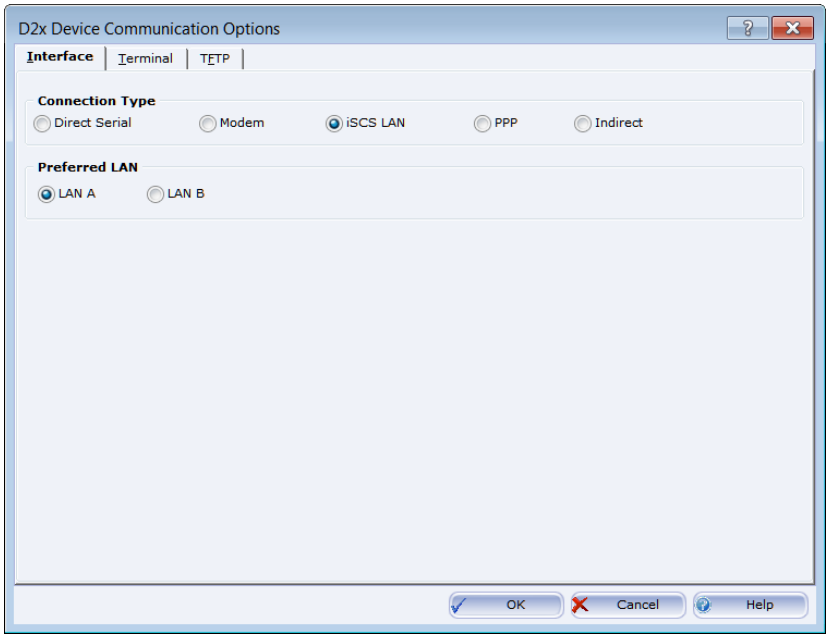
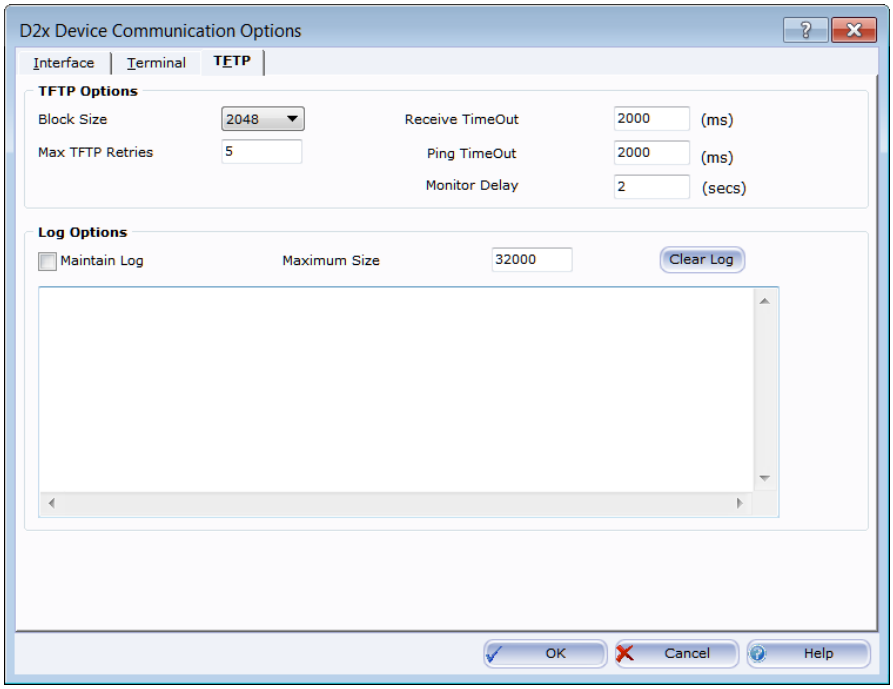
- Configuring iBox Communications Options - LAN on page 105

Configuring iBox Communications Options - LAN

Introduction

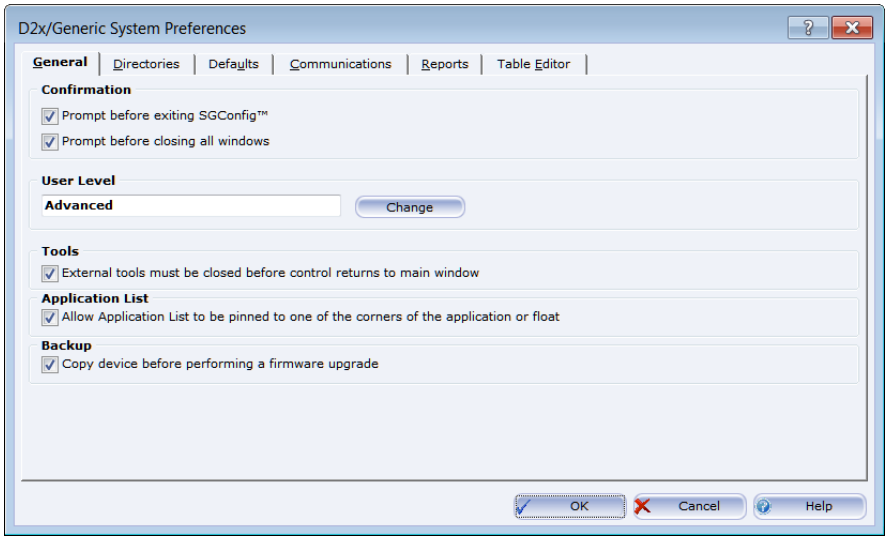
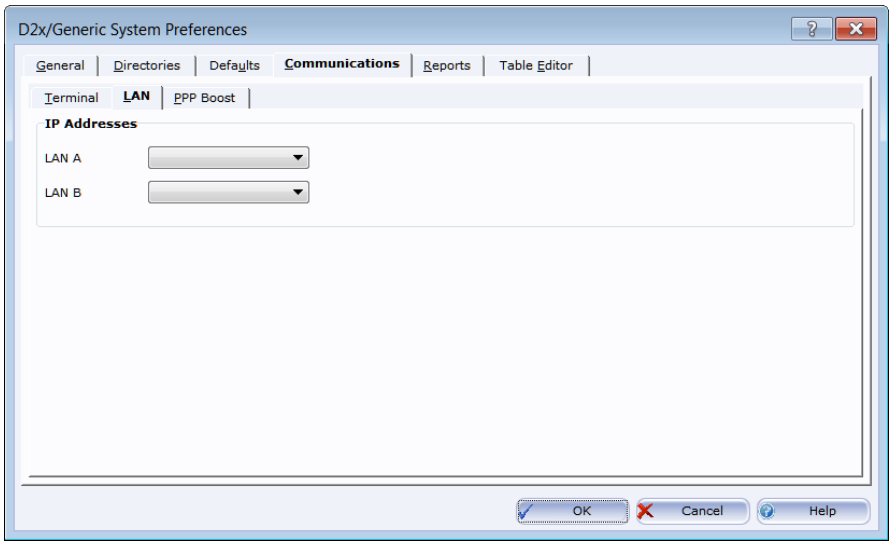
Use the following procedure to configure iBox Communications Options if you are operating the iBox Kit through a LAN connection.

Procedure: Configuring Communi-cations Options - LAN

Step	Action
1	In the **Project** window, right-click the iBox device icon, click **Communications**, and then click **Options**.
2	On the **Interface** tab, click **iSCS LAN** and **LAN A**. 
3	Click the **TFTP** tab. 
4	Verify the settings are as shown above, and modify them if they are not.
5	Click **OK** to save.

Configuring iBox Communications Options - LAN, continued

Procedure: Configuring Communi-cations Options - LAN

Step	Action
6	Click **Preferences** > **D2x/Generic System Preferences**. **Result:** The SGConfig D2x/Generic System Preferences window appears: 
7	Click the **Communications** tab, then click the **LAN** tab. 
8	In **LAN A**, select from the list the source IP address that you will use to communicate with the iBox Kit over the LAN.
9	Click **OK**.

Next Step

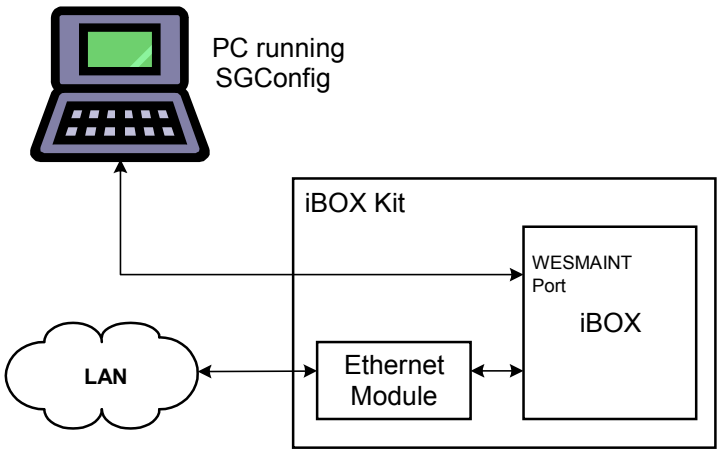
The next step is:

- Configuring the Application Firmware on page 96

Downloading your iBox Configuration - LAN

Introduction

The first time you configure your iBox, you will need to connect your PC to the iBox WESMAINT port, as shown below:



Procedure: Downloading your iBox configuration through the WESMAINT port

Refer to "Downloading your iBox Configuration" on page 41 for instructions on how to download a configuration file to the iBox through the WESMAINT port.

Note: Once you have configured the iBox PPP driver and the Ethernet Module, you will be able to download your iBox configuration over the LAN, as outlined in "Downloading your iBox Configuration over the LAN" on page 136.

Next Step

The next step is:

- Configuring the Ethernet Module on page 109

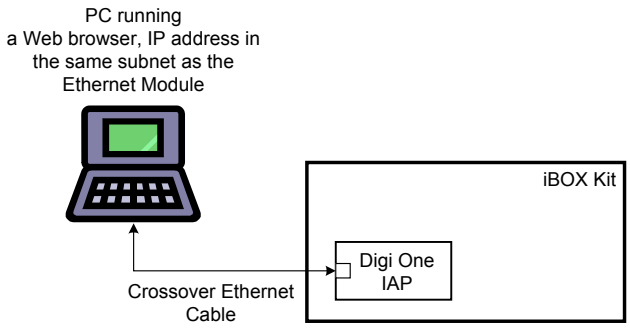
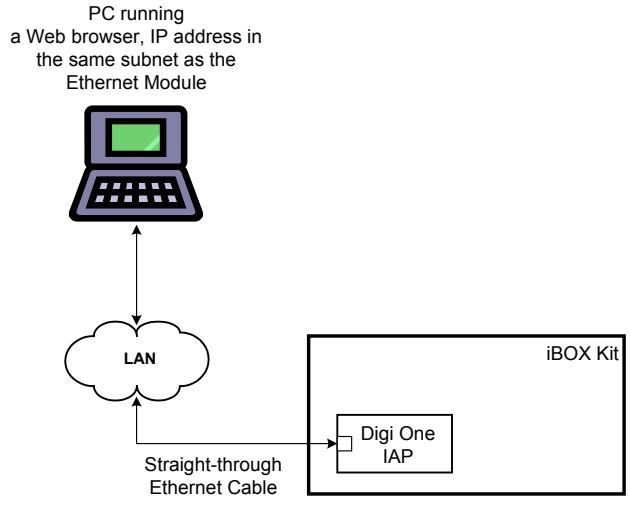
Configuring the Ethernet Module

Introduction

The following procedure describes the configuration of the Digi One IAP Ethernet Module.

Procedure: Configuring the Digi One IAP

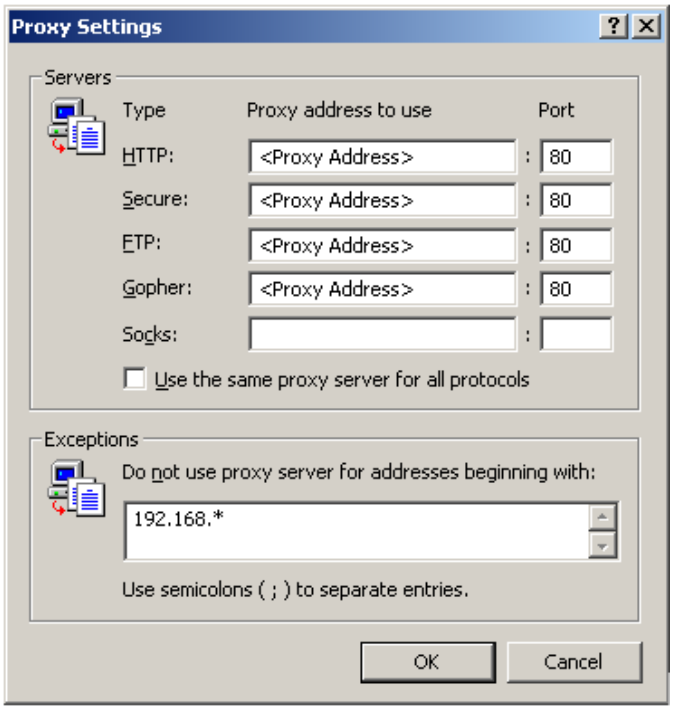
You need to set the Digi One Ethernet and PPP IP addresses. Refer to "IP Addressing" on page 81 for an explanation. You also need to change the Digi One root password.

Step	Action
	Connecting to the Digi One
1	Connect a PC to the Digi One IAP's RJ45 connector either directly, as shown below:  or through the network: 

Continued on next page

Configuring the Ethernet Module, continued

Procedure: Configuring the Digi One (continued)

Step	Action
Configuring your PC's Proxy Settings (Windows 2000)	
If your PC is configured to use a proxy server, follow the procedure below to add the Digi One IP address to **Exceptions** so you can browse directly into the Digi One Web server. **Note:** The procedure may vary for Windows XP.	
2	Click **Start**, point to **Settings**, and then click **Control Panel**.
3	Double-click the **Internet Options** icon.
4	Select the **Connections** tab.
5	Click **LAN Settings**.
6	Do one of the following: • If **Use a proxy server for your LAN** is not selected, you do not have to make any further changes to your Proxy Settings. Close all Windows dialog boxes and proceed to "**Modifying IP Addresses in the Digi One Configuration File**". • If **Use a proxy server for your LAN** is selected, proceed to the next step.
7	In **Proxy Server**, click **Advanced**. **Result:** The **Proxy Settings** dialog box appears: 

Continued on next page

Configuring the Ethernet Module, continued

Procedure: Configuring the Digi One (continued)

Step	Action
8	In **Exceptions**, add the default Digi One Ethernet IP address, 192.168.1.100. **Note:** You can use the wildcard character (*) to specify a range of IP addresses; for example, if you enter 192.168.*, all messages sent to IP addresses starting with 192.168 will be sent directly, not through the proxy server. **Note:** Once you change the Digi One Ethernet IP address, you will have to modify **Proxy Settings** accordingly.
9	Click **OK** and close all windows.
	Changing Pass Through Switch Settings
10	Locate the pass-through switch on the bottom of the Digi One IAP  Change the switch setting from the default state OFF to ON
11	Reboot the Digi One IAP. Refer to steps 1 to 4 in *Appendix C: Resetting the Digi One Configuration.*

Continued on next page

Configuring the Ethernet Module, continued

Procedure: Configuring the Digi One (continued)

Step	Action
Modifying the Ports Setting in the Digi One Configuration File	
12	Copy the Digi One default configuration file from the configuration CD to a folder on your PC's hard drive. This file can be found as follows `\ Digi Default Config \ Digi Default Config.txt`
13	Open the Digi One default configuration file in a text editor such as Notepad
14	Search for all instances of **ports=1** and replace with **ports=2**. There should be 4 changes.
Modifying IP Addresses in the Digi One Configuration File	

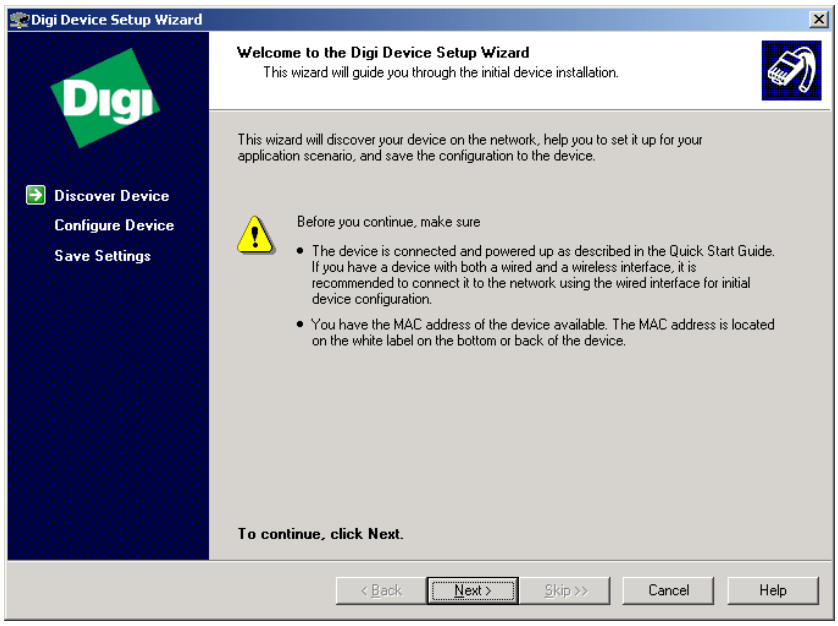
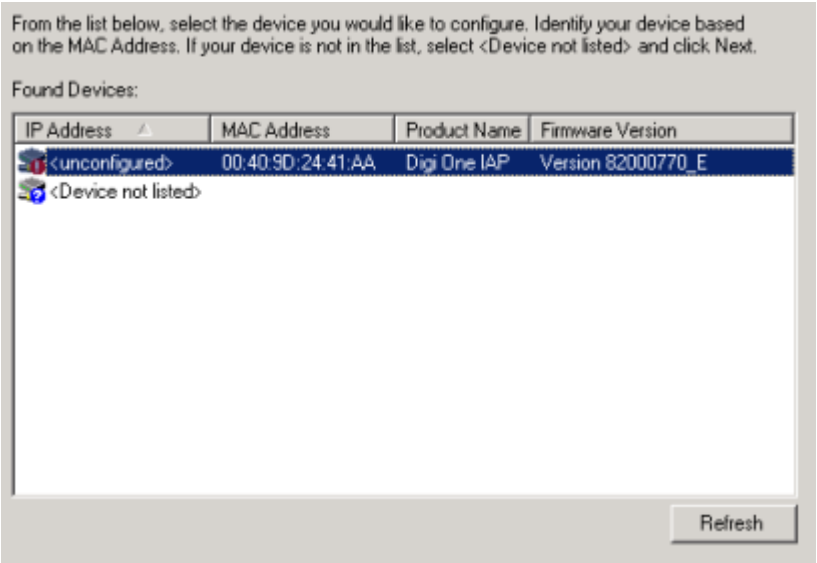
15	Near the top of the configuration file, change the Ethernet IP address, subnet mask, and gateway address.
	Note: If a gateway is not used, set the gateway address to the Digi One Ethernet IP address. Refer to "IP Addressing" on page 81 for an explanation of iBox Kit IP addressing.
	Example: If the Digi One Ethernet IP address is 192.168.1.100 and a gateway is not used change the following lines in the configuration file:
	`set config ip=192.168.1.100 submask=255.255.255.0`
	`set config gateway=192.168.1.100`

16	Modify the Digi One's PPP IP address. Refer to "IP Addressing" on page 81 for an explanation of the Digi One's PPP IP address setting. **Example:** In the following example, the PPP IP address is set to 192.168.1.19: `set user name="link1" localipaddr=192.168.1.19 netrouting=off` In this example, the iBox IP address will automatically be set to 192.168.1.20 (192.168.1.19 + 1) over PPP.
17	Save the modified configuration file as *DigiDefaultConfig_Modified.txt*.

Continued on next page

Configuring the Ethernet Module, continued

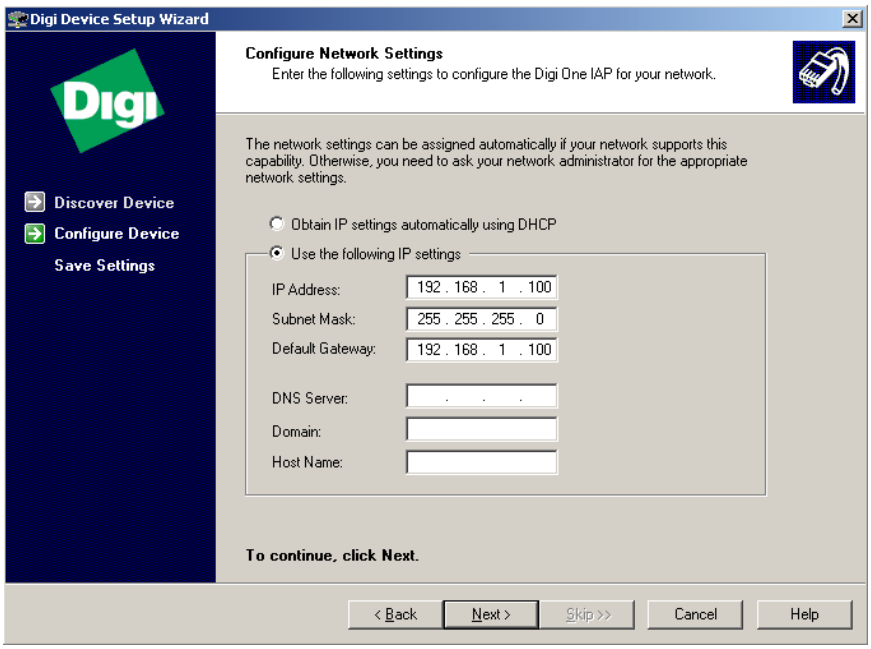
Procedure: Configuring the Digi One (continued)

Step	Action
	Starting the Digi Device Setup Wizard
18	Insert the Digi Software and Documentation CD in your CD ROM drive. **Result:** The Digi Device Setup Wizard starts automatically: 
19	Click **Next**. **Result:** The Setup Wizard discovers Digi devices on the LAN, and presents a list of the discovered devices: 

Continued on next page

Configuring the Ethernet Module, continued

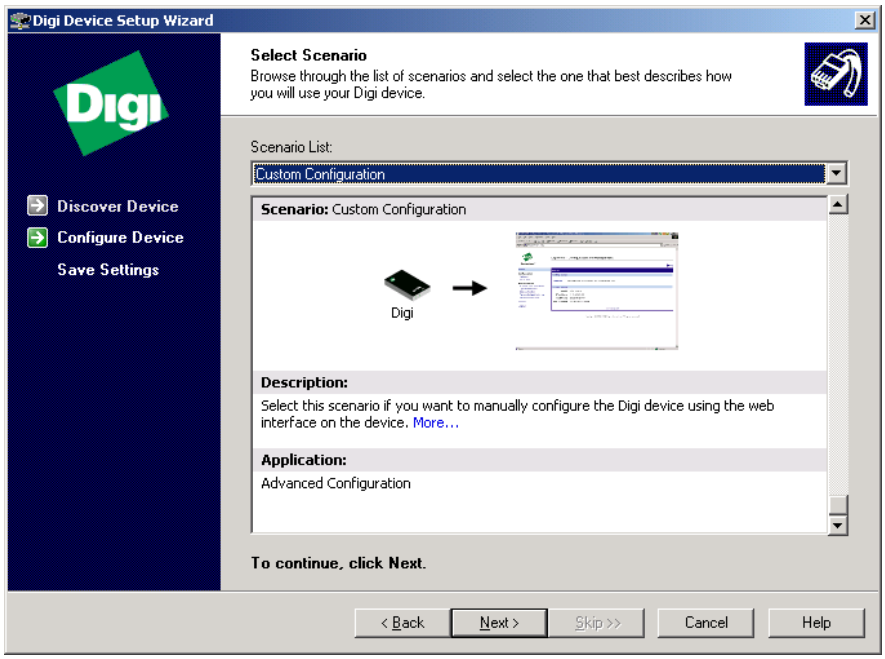
Procedure: Configuring the Digi One (continued)

Step	Action
20	Select your device. **Note:** The MAC address of your Digi One IAP is located on the white label on the bottom or back of the device.
21	Click **Next**. **Result:** The **Configure Network Settings** page appears: 
Configure the Digi One IP Settings	
22	Select **Use the following IP settings**.
23	Enter the Digi One Ethernet IP address and subnet mask, as shown in the above example. Enter a gateway address if one is required. Check with your network administrator if you are not sure.

Continued on next page

Configuring the Ethernet Module, continued

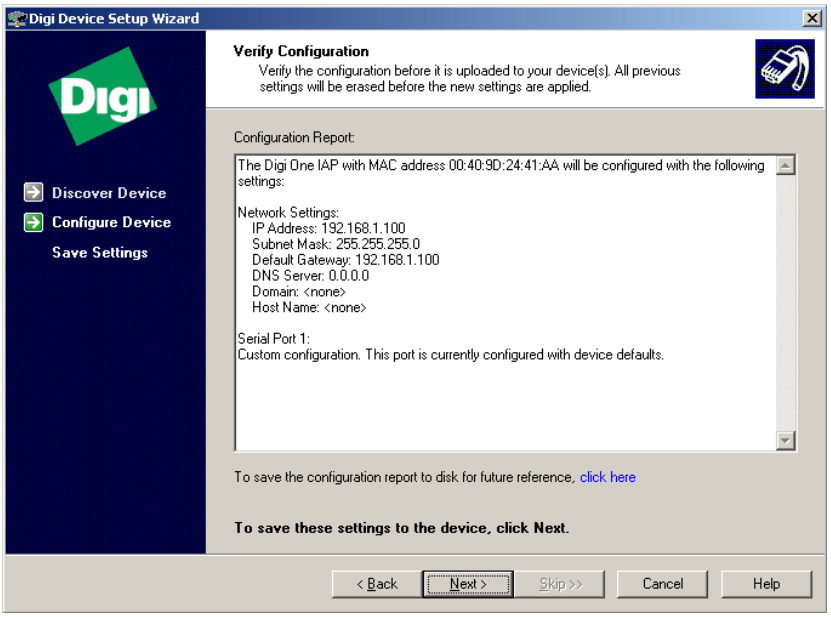
Procedure: Configuring the Digi One (continued)

Step	Action
24	Click **Next**. **Result:** The **Select Scenario** page appears: 
Downloading the Configuration to the Digi One	
25	In the drop-down list under **Scenario List**, select **Custom Configuration**.

Continued on next page

Configuring the Ethernet Module, continued

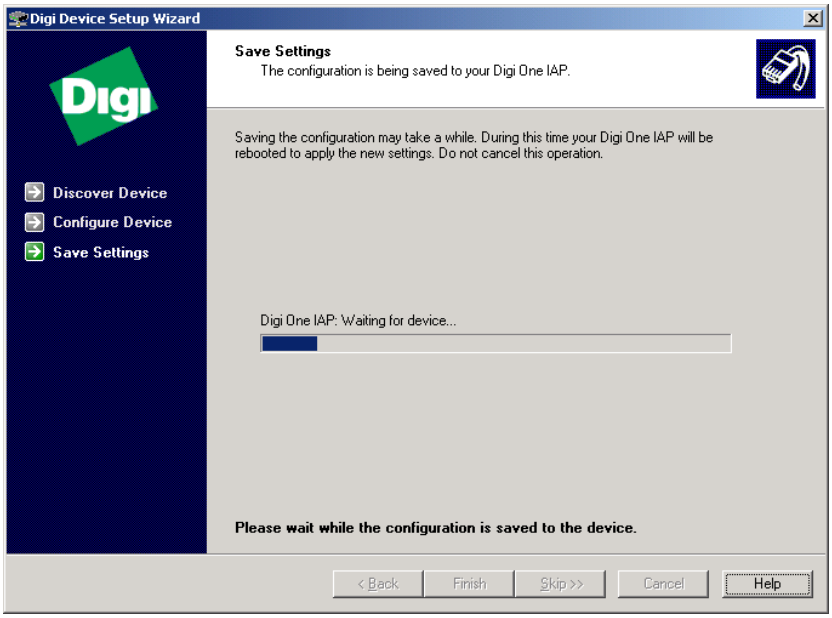
Procedure: Configuring the Digi One (continued)

Step	Action
26	Click **Next**. **Result:** The **Verify Configuration** page appears: 

Continued on next page

Configuring the Ethernet Module, continued

Procedure: Configuring the Digi One (continued)

Step	Action
27	Do one of the following: • If the configuration parameters are not correct, click **Back** and make the necessary corrections. • If the configuration parameters are correct, click **Next**. **Result:** The Setup Wizard saves the network settings to the Digi One, and then reboots the device: 

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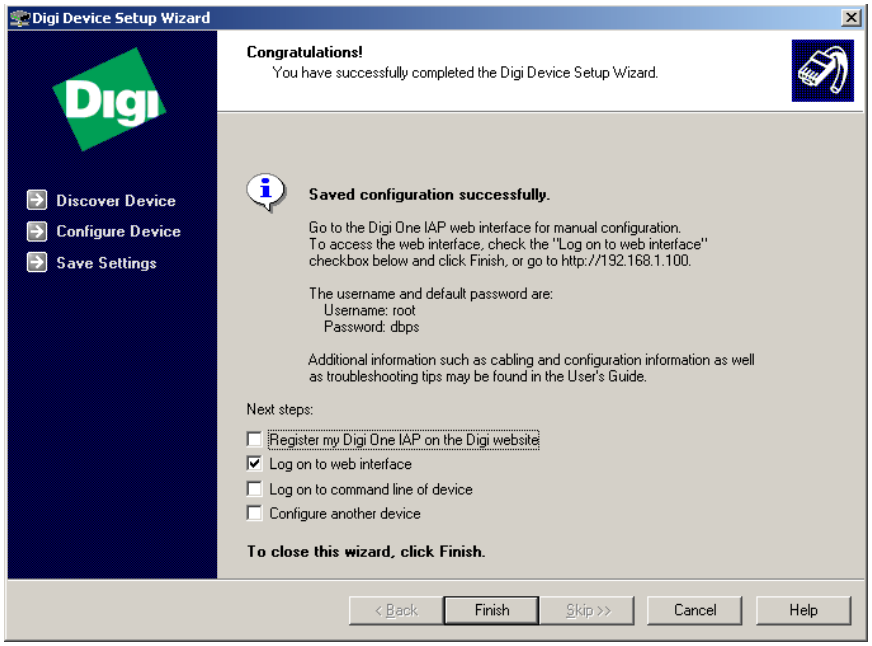
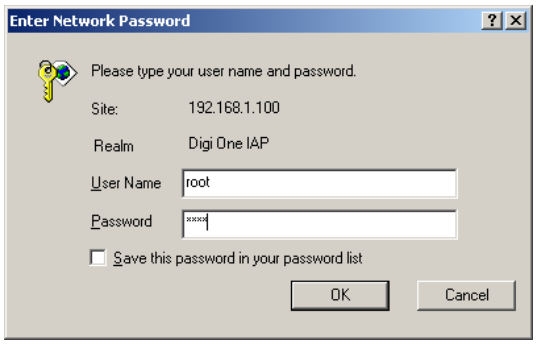
Configuring the Ethernet Module, continued

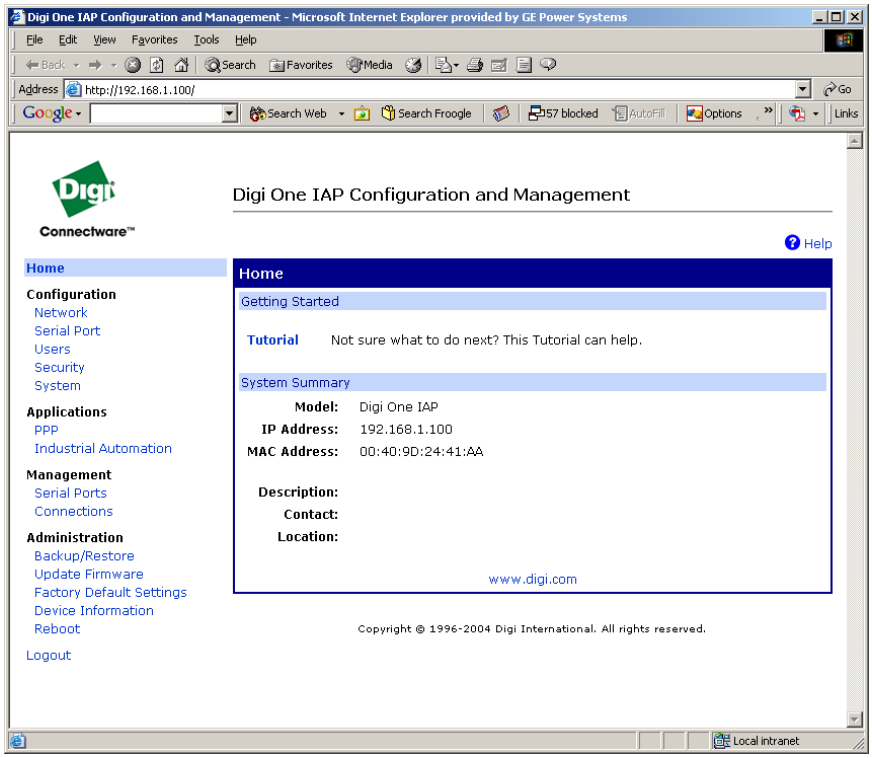
Procedure: Configuring the Digi One (continued)

Step	Action
	Connecting to the Digi One Web Server
28	When the reboot completes, the **Saved configuration successfully** screen appears: 
29	Make sure **Register my Digi One IAP on the Digi website** is not selected, and click **Finish**. **Result:** The **Enter Network Password** dialog box appears: 

Continued on next page

Configuring the Ethernet Module, continued

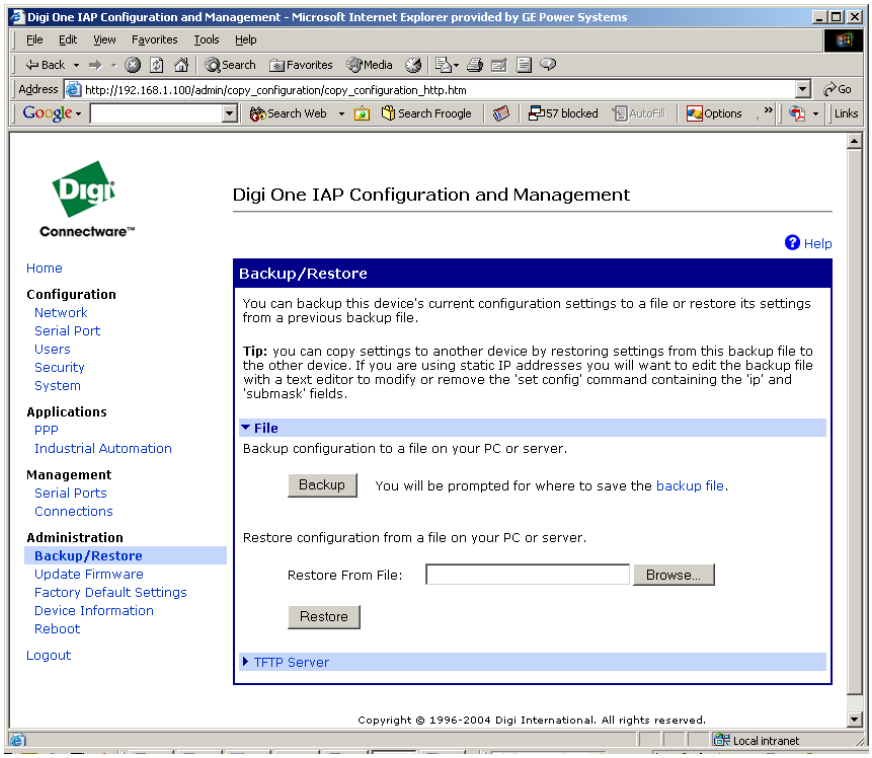
Procedure: Configuring the Digi One (continued)

Step	Action
30	Enter User Name **root** and Password **dbps** and click **OK**. **Result:** The **Digi One IAP Configuration and Management** home page appears: 

Continued on next page

Configuring the Ethernet Module, continued

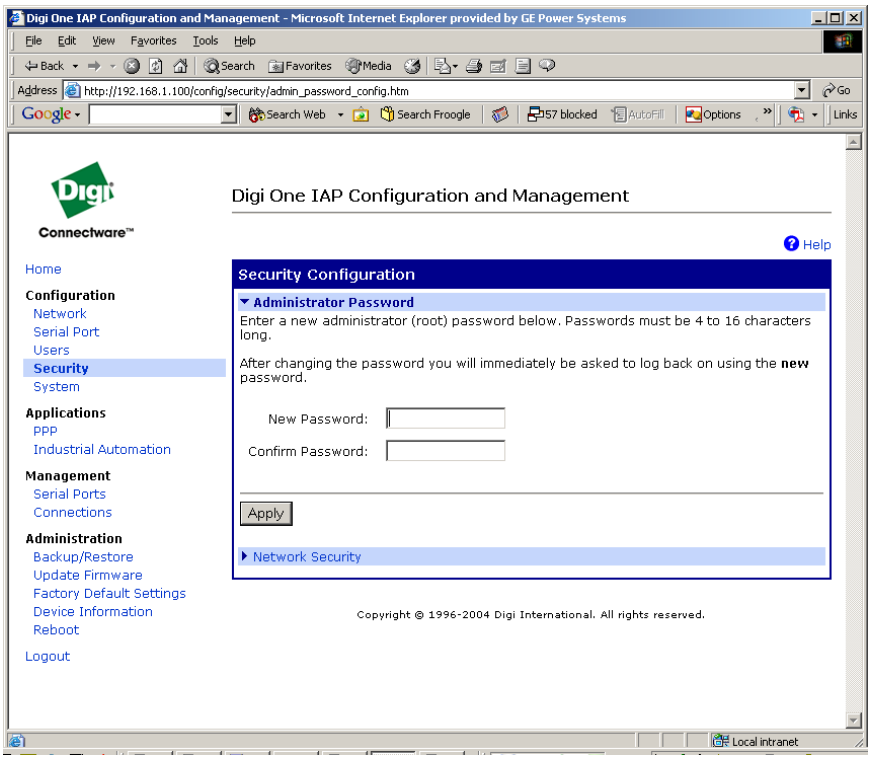
Procedure: Configuring the Digi One (continued)

Step	Action
	Downloading the Configuration File to the Digi One
31	Under **Administration**, click **Backup/Restore**. **Result:** The **Backup/Restore** page appears: 
32	Click **Browse** and enter the location of the Digi One configuration file on your PC.
33	Click **Restore**. **Result:** The Digi One receives the configuration file from your PC.
34	Click **Done**. **Result:** The **Reboot** page appears. **Note:** The Digi One IAP needs to be rebooted for the new configuration settings to be applied.
35	Click **Reboot**. **Result:** The Digi One reboots.

Continued on next page

Configuring the Ethernet Module, continued

Procedure: Configuring the Digi One (continued)

Step	Action
36	To confirm that it is correctly configured, ping the Digi One through the DOS command line.
37	Under **Configuration**, click **Security.** **Result:** The **Security Configuration** dialog appears: 
38	Enter and confirm your new administrator password and click **Apply**. **Note:** The next time you browse to the Digi One Web server, you will need to enter user name **root** and this new password. If you forget this password, you can reset the Digi One to its default configuration and password (user name **root**, password **dbps**), by following the procedure outlined in "Resetting the Digi One Configuration" on page 153. If you reset the Digi One, you will need to reconfigure it using the procedure outlined in this section. **Note:** You will now be able to configure the Digi One through its Web server. Refer to the Digi One User's Guide, which you can obtain from the Digi Software & Documentation CD.

Configuring the Ethernet Module, continued

Next Step

If your iBox Kit is equipped with a DC Analog Input Module, the next step is:

- Configuring the DC Analog Module on page 123

If your iBox Kit is not equipped with a DC Analog Input Module, the next step is:

- Testing the iBox Kit on page 131

Configuring the DC Analog Module

Overview

The ADAM®-4017+ DC Analog Input Module has been pre-configured based on your order. Typically, all of the analog inputs will be configured the same way; for example, they may all be configured to have a voltage range of ±1 V.

In most cases, you will not have to reconfigure the DC Analog Input Module. You may, however, want to change the following:

- Input type (voltage or current)
- Input range
- Point descriptors

The following procedure is intended as a high-level overview. For detailed instructions and settings, refer to the following documents:

- *ADAM 4000 Data Acquisition Modules User's Manual* – Available from the Advantech CD that shipped with your iBox Kit (accessible through **Manual** > **ADAM 4000** > **ADAM-4000.pdf**)
- *Modbus®DCA Configuration Guide (A059-0CG)* – Available from the GE Digital Energy CD that shipped with your iBox Kit
- *Calculator DTA Configuration Guide (A083-0CG)* – Available from the GE Digital Energy CD that shipped with your iBox Kit

Before you Start

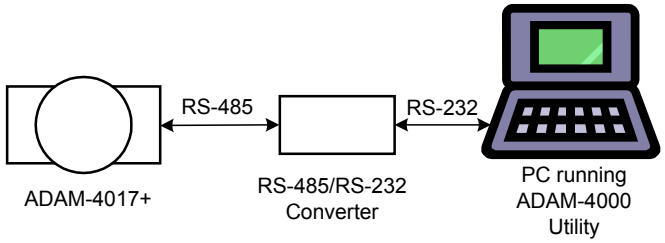
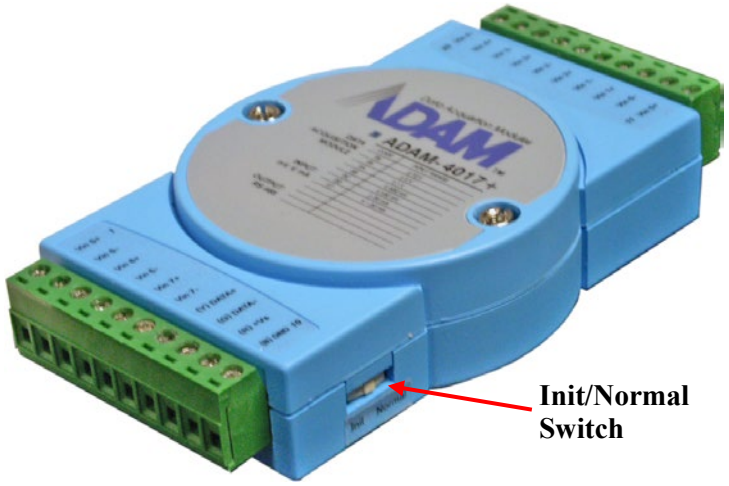
You need the following to configure the ADAM-4017+:

- RS-485/RS-232 converter
- Cables to connect the RS-232 side of the converter to your PC COM port, and the RS-485 side of the converter to your ADAM-4017+ DATA+ and DATA- terminals.
- Phillips screwdriver, to disconnect field and communications wires to the ADAM-4017+.
- Needle-nose pliers to make jumpering changes, in the event that you want to change the input types from voltage to current, or vice versa.
- PC equipped with:
  - ADAM-4000 Utility, available from the Advantech CD that shipped with your iBox Kit
  - SGConfig, available from the GE Digital Energy CD that shipped with your iBox Kit.

Configuring the DC Analog Module, continued

Procedure: Configuring the ADAM-4017+

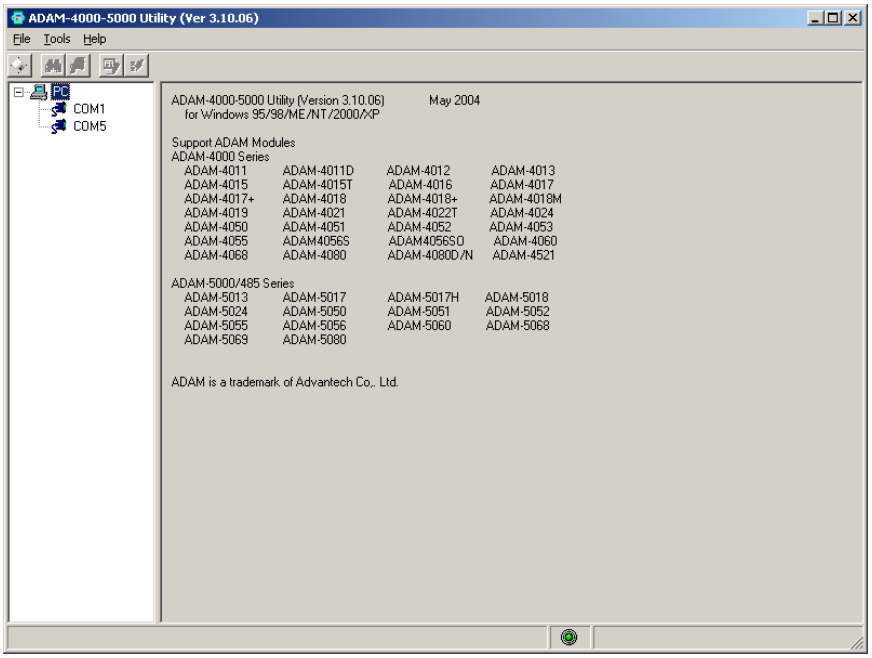
If you want to change the configuration of some or all of the analog inputs, follow the procedure below. If necessary, refer to the procedures in the vendor's manual.

Step	Action
1	Power down the iBox Kit.
2	Disconnect the cable between the ADAM-4017+ and iBox COM2, at the ADAM-4017+ end.
3	Connect the RS-485 side of the RS-485/RS-232 converter to the DATA+ and DATA- terminals on the ADAM-4017+. Connect the RS-232 side of the converter to one of your PC's COM ports. 
4	Switch the operating mode of the ADAM-4017+ from **Normal** to **Init**, then restore power to the unit: 

Continued on next page

Configuring the DC Analog Module, continued

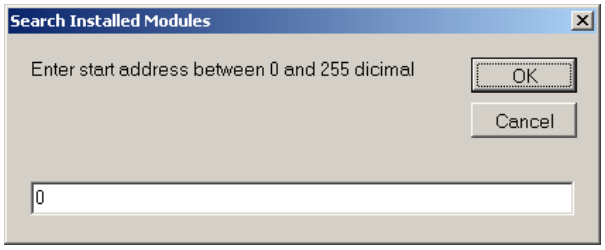
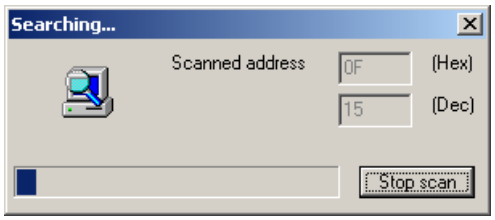
Procedure: Configuring the ADAM-4017+ (continued)

Step	Action
5	Install the ADAM-4000 utility from the Advantech CD (accessible through **Install Products** > **ADAM-4000 Utility)**.
6	Open the **ADAM-4000 Utility:**  **Result:** The ADAM Utility Main Screen appears: 

Continued on next page

Configuring the DC Analog Module, continued

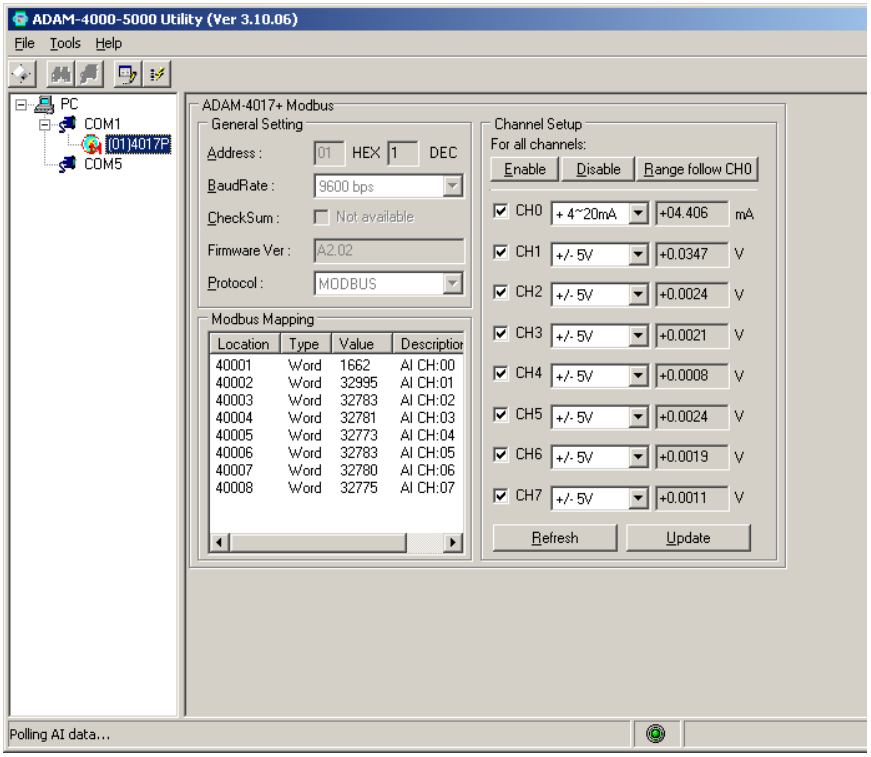
Procedure: Configuring the ADAM-4017+ (continued)

Step	Action
7	In the left-hand pane, select the COM port to which the ADAM-4017+ is connected, and click **Search** ( ) in the toolbar. **Result:** The **Search Installed Modules** dialog box appears: 
8	Click **OK**. **Result:** The ADAM-4000 Utility searches for and displays devices on the COM port.
9	As soon as your ADAM 4017+ is displayed in the left-hand pane, click **Stop scan** to halt the device search: 

Continued on next page

Configuring the DC Analog Module, continued

Procedure: Configuring the ADAM-4017+ (continued)

Step	Action
10	Select the ADAM-4017+ device in the left-hand pane. **Result:** The ADAM-4017+ configuration displays in the right-hand pane: 
11	Make the desired changes. **Note:** You can change the characteristics of individual analog points, or make the same change to all analog points. Refer to the ADAM-4000 Utility Online Help for further information. To access this online help, your PC must be connected to the Internet. **Note:** If you are changing the ADAM-4017+ input range from voltage to current, or vice versa, you will need to power down the device, remove its cover, and change the jumper setting for the analog input(s). For detailed instructions and settings, refer to the *ADAM 4000 Data Acquisition Modules User's Manual* – Available from the Advantech CD that shipped with your iBox (accessible through **Manual** > **ADAM 4000** > **ADAM-4000.pdf**)

Continued on next page

Configuring the DC Analog Module, continued

Procedure: Configuring the ADAM-4017+ (continued)

Step	Action
12	Click **Update**, then **OK** when you receive the message that the setup was successful:
13	Remove power to the ADAM-4017+.
14	Change the ADAM-4017+ operating mode switch from **Init** back to **Normal**.
15	Restore power to the ADAM-4017+.
16	In the ADAM-4000 Utility, click  . **Result:** The device configuration is now consistent with the change or changes you made.
17	Remove power to the ADAM-4017+.
18	Disconnect the ADAM-4017+ from the RS-485/RS-232 converter, and reconnect it to the iBox.

Procedure: Modifying the Point Descriptors

You may wish to modify the default point descriptions for the DC Analog Inputs to more meaningful descriptions for your system. Follow these steps to change the point descriptors of the DC analog inputs.

Step	Action
1	Open the iBox Kit device in SGConfig, open the **Applications List**, and click the **System Point Database Applications** tab.
2	Double-click the **System Point Database** icon. **Result:** The **System Point Database Properties** window displays.
3	On the **DCA/DTA List** tab, select **MODBUS DCA** and click the **Descriptors** button. **Result:** The **Point Descriptors** window appears.
4	Click the **Analog Inputs** tab on the bottom of the window. Enter new **Point Descriptions** as desired. Click **OK**.
5	On the **DCA/DTA List** tab, select **Calculator DTA** and click the **Descriptors** button. **Result:** The **Point Descriptors** window appears.
6	Click the **Analog Inputs** tab on the bottom of the window. Enter new **Point Descriptions** as desired. Click **OK** twice. **Result:** SGConfig updates the configuration tables.

Configuring the DC Analog Module, continued

Next Step

If your iBox Kit is equipped with a AC Analog Input Module, the next step is:

- Configuring the AC Analog Module on page 130

If your iBox Kit is not equipped with a AC Analog Input Module, the next step is:

- Testing the iBox Kit on page 131

Configuring the AC Analog Module

Overview

In most cases, you will not have to reconfigure the AC Analog Input Module. You may, however, want to change the Point descriptors

The following procedure is intended as a high-level overview. For detailed instructions and settings, refer to the following documents:

- *DMMS300+, DMMS350, DMMS425 3-Phase Multifunction Power Monitors with Advanced Capabilities Installation, Operation and Programming Manual* (Electro Industries/GaugeTech) that shipped with your iBox Kit
- *Modbus DCA Configuration Guide (A059-0CG)* – Available from the GE Digital Energy CD that shipped with your iBox Kit

Before you Start

You need the following to configure the DMMS module:

- PC equipped with SGConfig, available from the GE Digital Energy CD that shipped with your iBox Kit.

Procedure: Modifying the Point Descriptors

You may wish to modify the default point descriptions for the AC Analog Inputs to more meaningful descriptions for your system. Follow these steps to change the point descriptors of the AC analog inputs.

Step	Action
1	Open the iBox Kit device in SGConfig, open the Applications List, and click the **System Point Database Applications** tab.
2	Double-click the **System Point Database** icon. **Result:** The **System Point Database Properties** window displays.
3	On the **DCA/DTA List** tab, select **MODBUS DCA** and click the **Descriptors** button. **Result:** The **Point Descriptors** window appears.
4	Click the **Analog Inputs** tab on the bottom of the window. Enter new **Point Descriptions** as desired.
5	Click the **Counters** tab. Enter new **Point Descriptions** as desired. Click **OK** twice. **Result:** SGConfig updates the configuration tables.

Next Step

The next step is:

- Testing the iBox Kit on page 131

Testing the iBox Kit

Overview

You can verify the iBox Kit is operating properly by:

- Inspecting the LEDs on each of the iBox Kit components, and
- Pinging the Ethernet Module and the iBox from your PC

Digi One IAP LEDs

When operating normally, the Digi One LEDs appear as follows:

LED	Normal Operation
POWER	Solid GREEN
LINK	Solid GREEN
DCD	Solid GREEN
DSR	Solid GREEN
DTR	Solid GREEN
RTS	Solid GREEN
TX	Flashing GREEN
RX	Flashing GREEN

ADAM-4017+ LEDs

The ADAM-4017+ has a single GREEN LED, which operates as follows:

LED Operation	Description
OFF	Power OFF
GREEN Solid	Power ON, unit is not being polled over the Modbus interface.
GREEN Flashing	Power ON, unit is being polled over the Modbus interface at the same rate as the LED is flashing.

DMMS LEDs

Refer to the manufacturer's manual.

iBox LEDs

For information on iBox LED operation, refer to:

- "LEDs" on page 32 (for LED operation during self diagnostics)
- "LED Descriptions" on page 46 (for normal LED operation)
- "Errors Indicated by LEDs" on page 74 (for information on using LED indications to troubleshoot iBox problems)

Pinging the Ethernet and iBox

If the iBox Kit modules are operating correctly, and it is configured for LAN connection, you will be able to ping the Ethernet Module and iBox IP addresses from your PC.

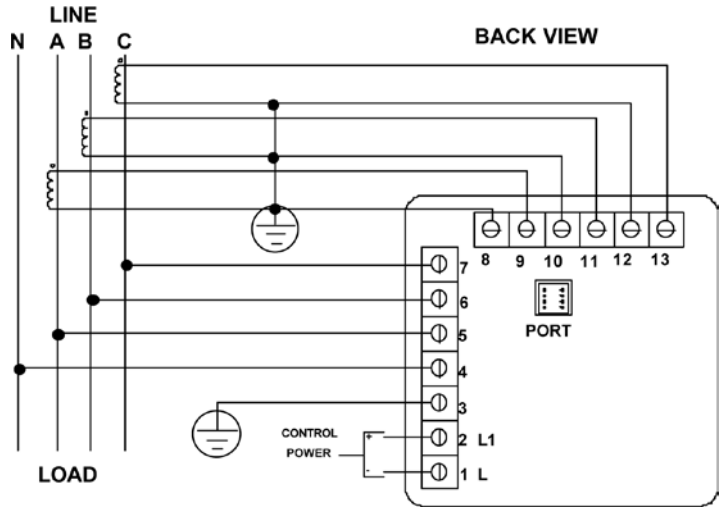
3.4. Connecting Field Wiring

Digital Inputs and Outputs

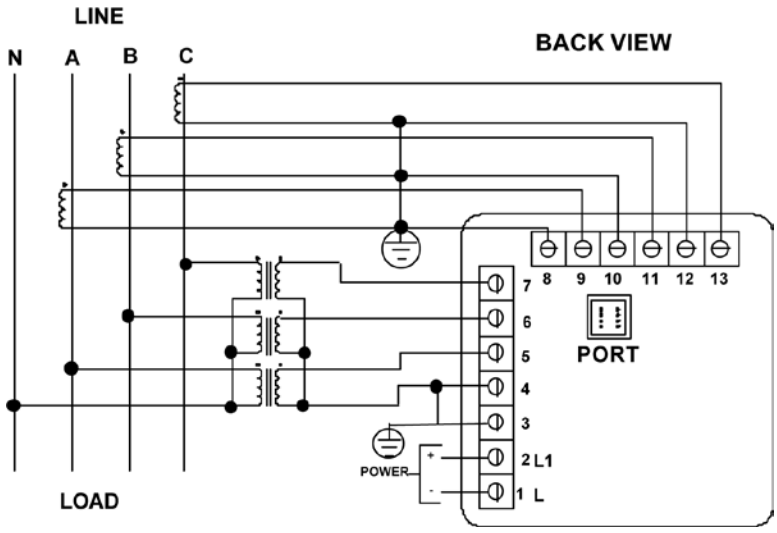
Digital inputs and outputs are connected directly to the iBox. Refer to "Connecting and Testing Field Wiring" on page 51 for information on how to connect field wiring to the iBox, and how to map and test these connections.

AC Analog Inputs

AC analog inputs are connected to the iBox Kit through the AC Analog Input module, as shown below:



Three-Phase Four-Wire Wye with Direct Voltage and CTs



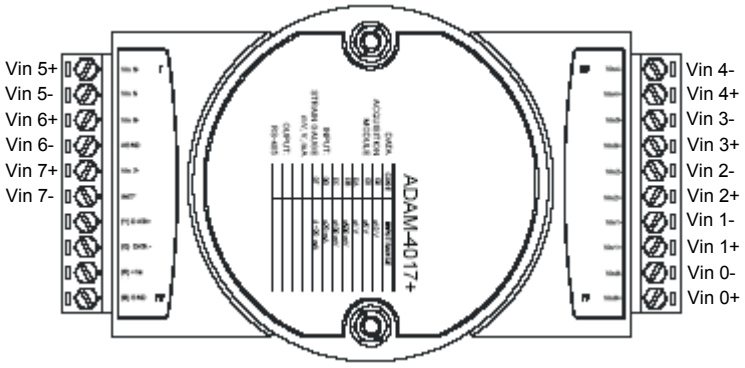
Three-Phase Four-Wire Wye with CT and PTs

Continued on Next Page

Connecting Field Wiring, continued

DC Analog Inputs

DC analog inputs are connected to the iBox Kit through the DC Analog Input module, as shown below:



3.5. Servicing your iBox Kit

Overview

This section provides information about servicing your iBox Kit, in particular:

- Servicing the iBox
- LED operation
- Location of fuses
- Updating your iBox configuration

Procedure: Servicing the iBox

For instructions on how to service the iBox, refer to "Servicing your iBox" on page 58.

Connections

The other modules in the iBox Kit require very little servicing. Verify that connections are tight, and LEDs are operating correctly.

LED Operation

For information on the operation of LEDs on iBox components, refer to the following sections of this document:

- iBox LEDs (refer to "LED Descriptions" on page 46)
- Digi One IAP LEDs (refer to "Digi One IAP LEDs" on page 131)
- ADAM-4017+ LEDs (refer to "ADAM-4017+ LEDs" on page 131)
- DMMS LEDs (refer to the manufacturer's manual)

Procedure: Replacing Fuses

For information on the location and replacement of iBox fuses, refer to "Fuse Replacement" on page 59.

3.6. Maintaining your iBox Kit Software

Overview

The iBox software may need occasional maintenance. Although other modules may also contain firmware, this firmware will typically not need to be upgraded.

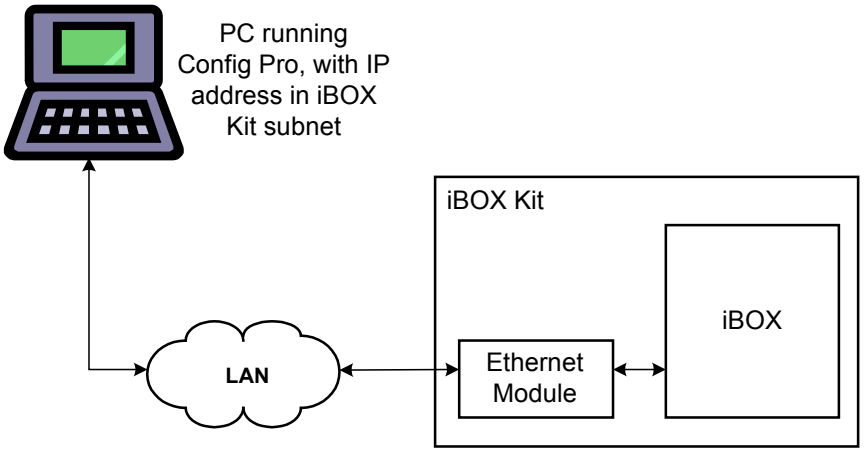
Maintaining your iBox Software

For information about your iBox software and instructions on how to maintain it, refer to “Maintaining your iBox Software” on page 61.

Downloading your iBox Configuration over the LAN

Introduction

Once you have configured the iBox PPP Driver and Ethernet Module, you can download subsequent changes to the iBox configuration over the LAN. To do this, configure your PC with an IP address in the LAN's subnet. This is illustrated below:



Note: Refer to *Appendix D: Setting your PC IP Address* for instructions on how to set your PC's IP address (for Windows 2000).

Downloading your iBox Configuration over the LAN, continued

Procedure: Downloading your iBox Configuration over the LAN

To download an iBox configuration file over the LAN:

Step	Action
1	In the **Project** window, click the iBox device icon.
2	Open the Terminal Emulator; see the SGConfig online help topic: Open Terminal Emulator. **Result:** SGConfig opens a Terminal Emulator tab.
3	Log into WESMAINT. **Result:** The **WESMAINT** main menu appears.
4	Select option **2, System Functions**. **Result:** The **System Functions** menu appears.
5	Select option **3**, **68K Monitor**. **Result:** The system prompt appears, indicating that the Applications Monitor is running.
6	At the system prompt, type **rtb** and press ENTER. For other available commands, type **help** and press ENTER.
7	At the **Return to the BootROM Operating System? (yes/no)** prompt, type **yes** and press ENTER. **Note:** The monitor is not case sensitive, but **Y** is not acceptable. **Result:** The iBox restarts.
8	In SGConfig, open the project containing the iBox device.
9	In the project window, right-click the iBox device icon, click **Communications**, and then click **Configuration Download**. **Result:** SGConfig downloads the new configuration to the iBox. SGConfig displays progress messages until the new configuration has been successfully downloaded. **Note:** The iBox does not need to be rebooted for the new configuration to be effective.
10	Exit SGConfig.

3.7. Troubleshooting your iBox Kit

Overview

The LED indicators on each iBox Kit device can be used to troubleshoot most iBox Kit problems. If device configuration files are those supplied with the iBox Kit, most problems are the result of failed cabling or connection.

iBox

If you are experiencing general problems or are unable to isolate a problem to a particular iBox Kit module, the problem may lie with the iBox unit. For iBox troubleshooting guidelines, refer to "Troubleshooting your iBox" on page 69.

Network Connection

If you are having problems connecting to the network, check the operation of the Ethernet Module. The following table shows normal LED operation for the Digi One and provides suggestions for corrective action if LED operation is not normal.

LED	Normal Operation	Suggestions
POWER	Solid GREEN	Check power supply/connections
LINK	OFF	RED LED indicates no network/cabling
DCD	Solid GREEN	Check cabling connections/serial port
DSR	Solid GREEN	Check cabling connections/serial port
DTR	Solid GREEN	Check cabling connections/serial port
RTS	Solid GREEN	Check cabling connections/serial port
TX	Flashing GREEN	Check cabling connections/serial port
RX	Flashing GREEN	Check cabling connections/serial port

ADAM 4017+

If you are having a problem with DC analog inputs, check the operation of the ADAM-4017+. The following table shows normal LED operation for the ADAM 4017+ and provides suggestions for corrective action if LED operation is not normal.

LED	Description	Suggestions
OFF	Power OFF	Check power supply/connections
Solid GREEN	Power ON, no polling	Check cabling if it should be polled
Flashing Green	Power ON, MODBUS polling	Check cabling if it should not be polled

Configuration

Changes to the iBox configuration file may result in incorrect operation. If you are unable to isolate the problem by inspecting the LEDs and by checking unit cabling, verify the iBox configuration file against Appendix B: iBox Kit Default Configurations and modify if appropriate.

3.8. Replacing your iBox Kit

Procedure: Replacing an iBox Kit

To replace an iBox Kit:

Step	Action
1	Disconnect the communication cables from the iBox Kit.
2	Disconnect all field wiring from the iBox Kit. Tip: Make sure you label these connections carefully, so you can restore them once the replacement unit is installed.
3	Remove power cabling.
4	Disconnect the ground wire from the iBox Kit.
5	Fully unscrew the lower mounting screws. Loosen the upper mounting screws, then raise and remove the iBox Kit from the rack.
6	Check the jumpers and settings on the replacement iBox Kit and make sure they are the same as those on the failed unit.
7	Mount the replacement iBox Kit in the rack. Insert the lower mounting screws, and tighten all mounting screws.
8	Reconnect the ground wire to the iBox Kit.
9	Reconnect power cabling.
10	Reconnect all field wiring, exactly as it was connected previously.
11	Reconnect the communication cables.
12	Verify that the replacement iBox Kit indicators are functioning properly. Refer to “LED Operation” on page 134
13	Test your iBox Kit inputs and outputs, using the procedures outlined in “Connecting Field Wiring” on page 132.
14	Return the failed iBox Kit to GE Digital Energy, following the product return procedures.

Section 4: Removing Configuration Data and Sensitive Information

Overview In the event that it is necessary to remove the configuration data and sensitive information from the iBox (for example, the iBox is being disposed of or being returned for maintenance [i.e., RMA]), this section provides the data removal procedure.

It may also be necessary to remove data from a PC that has run SGConfig for the purpose of configuring a iBox. Again, this section provides the data removal procedure.

4.1. From the iBox Device

Method The configuration data can be removed from these devices by either:

- Removing the battery from the device for at least 5 minutes.

  Result: The configuration data which was backed up in NVRAM is removed, since the NVRAM is powered by a battery.

  Note: This does not remove the firmware running in the flash memory.

OR

- Restarting the device:

  1. Restart the device by either:
     - Turning the power off and on, or
     - Typing the **boot** command at the 68K monitor prompt.
  2. When messages appear on the 68k monitor prompt, press the **Esc** key a few times within 5 seconds.

     Result: The message: "Are you sure you wish to generate a default configuration? (y/n)" appears.
  3. Type **y** (or **Y**).

     Result: The current configuration file is overwritten with the default configuration. The 68k monitor is initiated. The configuration has been defaulted to a factory-based configuration and the user's configuration has been deleted.
  4. Remove the firmware from the flash memory:
     a. Login to the device through the 68K monitor (if not already logged in).
     b. Type **sp** to suspend all processes running on the device.
     c. Type **erase** to clear the flash.

        Result: This takes several seconds to complete.

        Result: The Flash Erased message appears when the erase operation is completed.
  5. Confirm the flash has been erased by typing img at the prompt to view the image file.

     Result: No firmware information should appear.

4.2. From the PC Running Configuration Software

Method

If SGConfig have been used to configure the iBox processor, configuration data resides on the data storage media (e.g., hard drives, memory cards, etc.) of the PC running SGConfig.

The iBox configuration data can be removed from the PC by either:

- Recommended: Physically removing and destroying the data storage media, or
- Using a program to securely wipe (i.e., completely erase) the data storage media; that is, not just reformat or remove the names of the files from the file allocation table.

Appendix A: Technical Specifications

iBox

Power Requirements

Power Supply Input Options	⎓ 20-60 Vdc
Power Consumption	7 Watts (maximum)
Inrush Current	Less than 0.5A peak
Power Supply Protection	Input fuse Reverse polarity protection provided

Communi-cation Ports

Maintenance Port	WESMAINT DB-9-F, EIA 232 @ 9600 bps
Standard Serial Communication Ports (3)	DB-9-F, EIA 232/485 up to 38400 bps (concurrently) Software configurable Jumper selectable (JP3) Radio Key output on Port 1 36 Vdc max., 3 A peak max., 0.1 sec ON, 10% duty cycle
UTC Time Port (in place of one serial port)	DB-9-F, EIA 232 Port 2

Digital Inputs

General	Up to eight bipolar optically isolated (2000 V_{rms})
Burden	From 1.9 mA to 5.5 mA max. power dissipation is 0.5 W per input
Wetting Options	External wetting - for all input options Modes of operation: Dry contact and voltage sense 24 Vdc, 48 Vdc, and 110/125 Vdc

Continued on next page

Technical Specifications – iBox, continued

Digital Outputs

General	Up to four relay outputs: 4 Trip/Close pairs or 2 Trip/Close pairs and 2 Form A contacts
Security features	Separate Master Trip and Master Close relays Single point of failure integrity, select-before-operate (SBO) functionality. Remote/Local jumper JP2.
Control Voltage	External
Switching Characteristics	35 W breaking @ 150 Vdc 180 W breaking @ 30 Vdc
Maximum Carrying Current	6 A

Size and Environment

Dimensions	Width (of Mounting Panel)	28 cm (11 inch)
	Height	19 cm (7.5 inch)
	Depth	4.5 cm (1.75 inch)
Weight	1 kg (2.2 lb) maximum	
Operating Temperature	-40° to +80°C, may exceed EN61010-1 metal enclosure temperature of +70° C at ambient temperature of +60°C.	
Storage Temperature	-40° to +90°C	
Humidity Rating	0 to 95% relative humidity, non-condensing	
Operating Altitude	0 to 2000 meters	
Environmental Rating	IP20	
Installation (Overvoltage) Category	CAT II EN61010-1 **Note:** Must be installed in an overall protective enclosure and/or a protective environment unless the power supply terminals have a protective cover installed	
Pollution Degree	2	
IEC 68-2-1	Cold	
IEC 68-2-2	Dry heat	
IEC 68-2-6	Vibration	
IEC 68-2-30	Damp heat, cyclic (12+12-hour cycle)	
MTBF	> 74000 hours @ 40°C **Note**: Increased operating temperature decreases MTBF of the device	

Continued on next page

Technical Specifications – iBox, continued

EMI/EMC Compliance

CISPR11	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.
EN61000-4-2	Immunity Test
EN61000-4-3	Radiated, radio-frequency, electromagnetic field immunity Test
EN61000-4-4	Electrical Fast Transient/Burst Immunity Test
EN61000-4-5	Surge Immunity Test
EN61000-4-6	Immunity to conducted disturbances induced by radio-frequency fields
EN 61000-4-12	Damped Oscillatory Wave Immunity Test (100 kHz/1 MHz)
EN 61010-1	Safety Requirements For Electrical Equipment For Measurement, Control and Laboratory Use - Part 1: General Requirements.
EN60255-5	Dielectric Test Impulse Voltage Test Insulation Resistance
EN61000-4-16	Test for Immunity to Conducted, Common Mode Disturbances in the Frequency Range 0 Hz to 150 kHz (steady state frequency)
IEEE C37.90.1-1989	SWC capability

Field Terminations & Wiring

Digital Outputs	250 V rated compression termination consisting of a header and removable plugs suitable for 12 – 24 AWG wire rated for 6A/150V
Power Supply Inputs	250 V rated compression termination consisting of a header and removable plugs suitable for 12 – 24 AWG wire 0.5A/60V
Digital Inputs	250 V rated compression termination consisting of a header and removable plugs suitable for 12 – 24 AWG wire 0.01A/150V
Protective Earth Terminal	#10 fastener **Note:** Ground wire must be the largest gauge of all wires used for field termination. A green and yellow 12 AWG wire is recommended.

iBox Kit

Physical

Dimensions	8.75" high x 19" wide x 2" deep (22.23 cm high x 48.26 cm wide x 5.08 cm deep)
Mounting	19" rack mounting
Operational Temperature	iBox: -40° to +80°C DC Analog Module: -10° to +70°C AC Analog Module: -20° to +70°C Ethernet Module: 0° to +60°C Power Supply: -40° to +80°C
Storage Temperature	-40° to +90°C
Humidity Rating	95% non-condensing at 55°C
Operating Altitude	0 – 2000 meters
Protective Earth Terminal	Protective earth terminal is provided on the mounting plate

Power Supply

Input Voltage Options	20-60 VDC or 88-264 VAC/88-300 VDC
Output Voltage	24 VDC
Overload Protection	Current limiting with short circuit protection
Connections	Screw-type terminal block

iBox Communi-cation Ports

Maintenance Port	DB-9-F, EIA 232 @ 9600 bps
Standard Serial Comm-unication Ports (3)	• DB-9-F, EIA 232/485 up to 38400 bps (concurrently) • Software configurable • Jumper selectable (JP3) Radio Key output on Port 1 • 36 VDC max, 3 A peak max, 0.1 sec ON, 10% duty cycle

Ethernet Interface (optional)

Port Type	100BaseTX
Speed	10/100 Mbps
Connector	RJ-45

Technical Specifications – iBox Kit, continued

Digital Inputs

General	Up to eight bipolar optically isolated (2000 V_{rms})
Physical	250 V rated compression termination consisting of a header and removable plugs suitable for 12 – 24 AWG wire 0.01A/150V
Burden	• From 1.9 mA to 5.5 mA • Max. power dissipation is 0.5 W per input
Wetting Options	• External wetting - for all input options • Modes of operation: – Dry contact and voltage sense – 24 VDC, 48 VDC, and 110/125 VDC

Digital Outputs

General	Up to four relay outputs, configured as either: • 4 trip/close pairs or • 2 trip/close pairs and 2 Form A contacts
Physical Connection	250 V rated compression termination consisting of a header and removable plugs suitable for 12 – 24 AWG wire rated for 6A/150V
Security features	• Separate Master Trip and Master Close relays • Single point of failure integrity, select-before-operate (SBO) functionality. • Remote/Local jumper JP2
Control Voltage	External
Switching Characteristics	• 35 W breaking @ 150 VDC • 180 W breaking @ 30 VDC
Maximum Carrying Current	6 A

Continued on next page

Technical Specifications – iBox Kit, continued

AC Analog Inputs (optional)

Analog Input Options	V_{RMS}, I_{RMS}, Phase Angle, Frequency, Power Factor, Real Power (W), Reactive Power (VAR), Apparent Power (VA), Watt-Hour
Nominal PT Input Range	0 to 150VLN or 250VLL
Frequency	50/60 Hz
Measurement Range	0 to 125% of nominal
Accuracy	0.3%
Continuous Overload Withstand	200% of nominal
Short Duration Overload Withstand	100 A for 3 seconds
Surge Withstand	As per IEEE C37.90.1, ANSI C62.41
True RMS Sampling	64 samples per cycle
Isolation	2500 VAC/60 Hz
Burden	• Voltage and Current: 0.1 VA max • Power Supply: 6 VA max

DC Analog Inputs (optional)

Analog Input Options	Two DC analog inputs, or eight DC analog inputs
A/D Resolution	14 bits plus sign
Nominal DC Voltage Input Range Options	±1 VDC, ±5 VDC or ±10 VDC
Nominal DC Current Input Range Options	±20 mA or 4-20 mA
Accuracy	±0.2% of full scale @ 25°C

Appendix B: iBox Kit Default Configurations

When shipped as part of an iBox Kit, the iBox COM port default configurations are set to one of the following:

iBox (IBOX-BSC[1])

	Configuration Details	Comments
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: COM1 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
Modbus DPA	Modbus Address: 1 Communication Port: COM2 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
DNP DCA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: COM3 Baud Rate: 9600 Communication Type: RS-232	The DNP DCA is configured to poll an iBox. If you connect COM3 to COM1, you can see the DNP DCA polling the DNP DPA.
WESMAINT	User Name: westronic Password: rd Control Password: control	

[1] Name of the device within the SGConfig sample project

iBox Kit with AC Analogs (IBOX-ACA)

	Configuration Details	Comments
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Baud Rate: 9600 Communication Port: COM1 Communication Type: RS-232	Refer to point map tables for more detail.
Modbus DPA	Modbus Address: 1 Communication Port: COM2 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
WESMAINT	User Name: westronic Password: rd Control Password: control	

Note: COM3 is used to connect the AC analog input module to the iBox.

IBOX Kit with DC Analogs (IBOX-DCA)

	Configuration Details	Comments
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Baud Rate: 9600 Communication Port: COM1 Communication Type: RS-232	Refer to point map tables for more detail.
Modbus DPA	Modbus Address: 1 Communication Port: COM2 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
WESMAINT	User Name: westronic Password: rd Control Password: control	

Note: COM3 is used to connect the DC analog input module to the iBox

IBOX Kit Ethernet (IBOX-LAN)

	Configuration Details	Comments
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: COM1 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: Ethernet Master IP Address: 192.168.1.200 Slave IP Address: 192.168.1.20 Subnet Mask: 255.255.255.0	Refer to point map tables for more detail.
DNP DCA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: COM3 Baud Rate: 9600 Communication Type: RS-232	The DNP DCA is configured to poll an iBox. If you connect COM3 to COM1, you can see the DNP DCA polling the DNP DPA.
WESMAINT	User Name: westronic Password: rd Control Password: control	

Note: COM2 is used to connect to the Ethernet Module via PPP/TCP/IP.

IBOX Kit with AC Analogs and Ethernet (IBOX-ACL)

	Configuration Details	Comments
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: COM1 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: Ethernet Master IP Address: 192.168.1.200 Slave IP Address: 192.168.1.20 Subnet Mask: 255.255.255.0	Refer to point map tables for more detail.
WESMAINT	User Name: westronic Password: rd Control Password: control	

Note: COM2 is used to connect to the Ethernet Module via PPP/TCP/IP.
Note: COM3 is used to connect the AC Module to the iBox.

IBOX Kit with DC Analogs and Ethernet (IBOX-DCL)

	Configuration Details	Comments
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: COM1 Baud Rate: 9600 Communication Type: RS-232	Refer to point map tables for more detail.
DNP DPA	iBox DNP 3.0 Master Address: 10 iBox DNP 3.0 Slave Address: 1 Communication Port: Ethernet Master IP Address: 192.168.1.200 Slave IP Address: 192.168.1.20 Subnet Mask: 255.255.255.0	Refer to point map tables for more detail.
WESMAINT	User Name: westronic Password: rd Control Password: control	

Note: COM2 is used to connect to the Ethernet Module via PPP/TCP/IP.
Note: COM3 is used to connect the DC analog input module to the iBox.

DC Analog Input Ranges

For all bipolar inputs, regardless of whether the input is bipolar current or voltage, the following is always true:

Input Value	Value Returned to Master
Maximum negative input	-32768
Zero input	0
Maximum positive input	32767

However, for the 4-20 mA input, the following values are returned by the iBox to the master:

Input Value	Value Returned to Master
Any input in the range of 0 to 4 mA	-32768
Half of Full Scale (12 mA)	0
Maximum input (20 mA)	32767

Appendix C: Resetting the Digi One Configuration

You can restore your Digi One configuration to the factory default configuration, as follows:

Procedure: Resetting the Digi One Configuration

Step	Action
1	Turn off power to the Digi One.
2	With a pointed object, such as small screwdriver or the point of a paperclip, press and hold the recessed RESET switch, located on the same side of the Digi One as the Ethernet connector: 
3	While holding down the RESET button, restore power to the Digi One. **Result:** The Digi One DIAG LED displays a 1–5–1 pattern after about 20 seconds.
4	When the 1–5–1 LED pattern is complete, release the RESET button. **Result:** The Digi One boots up and its configuration resets to default. The user name resets to **root** and the password to **dbps**.
5	Reconfigure the unit by following the procedure outlined in "Configuring the Ethernet Module" on page 109.

Appendix D: Setting your PC IP Address

Procedure: Setting an IP Address in Windows 2000

Step	Action
1	In the Windows 2000 **Start** menu, click **Settings**.
2	Click **Network and Dial-up Connections**.
3	Double-click **Local Area Connections**.
4	Click **Properties**.
5	Select **Internet Protocol (TCP/IP)**.
6	Click **Properties**.
7	Select **Use the following IP address**,
8	Enter an IP address that is in the same subnet as the iBox, but not used by any other devices. Enter the same subnet mask as the iBox.
9	Click **OK**.
10	Click **OK** in the **Local Area Connections** window.
11	Close **Local Area Connection Status**.
12	Close **Network and Dial-up Connections**.

Appendix E: DPA Default Point Mapping

For point mapping of individual standard iBox kits, please look in the **Source** column of the table below. Point mapping corresponding to Plant I/O applies to all types of standard iBox kits.

DCA				DPA		
Source	Data Type	MODBUS DCA Register Address	Point Description	COM1	COM2	
				DNP DPA Point	MODBUS DPA Point Address	DNP TCP/IP DPA Point
Plant I/O	DI	N/A	iBox Digital Input #1	0	1	0
		N/A	iBox Digital Input #2	1	2	1
		N/A	iBox Digital Input #3	2	3	2
		N/A	iBox Digital Input #4	3	4	3
		N/A	iBox Digital Input #5	4	5	4
		N/A	iBox Digital Input #6	5	6	5
		N/A	iBox Digital Input #7	6	7	6
		N/A	iBox Digital Input #8	7	8	7
	DO	N/A	iBox Digital Output #1	0	9	0
		N/A	iBox Digital Output #2	1	10	1
		N/A	iBox Digital Output #3	2	11	2
		N/A	iBox Digital Output #4	3	12	3
DNP DCA (IBOX-BSC and IBOX-LAN)	DI	N/A	Digital Input #1 on DNP DCA	8	13	8
		N/A	Digital Input #2 on DNP DCA	9	14	9
		N/A	Digital Input #3 on DNP DCA	10	15	10
		N/A	Digital Input #4 on DNP DCA	11	16	11
		N/A	Digital Input #5 on DNP DCA	12	17	12
		N/A	Digital Input #6 on DNP DCA	13	18	13
		N/A	Digital Input #7 on DNP DCA	14	19	14
		N/A	Digital Input #8 on DNP DCA	15	20	15
	DO	N/A	Digital Output #1 on DNP DCA	4	21	4
		N/A	Digital Output #2 on DNP DCA	5	22	5
		N/A	Digital Output #3 on DNP DCA	6	23	6
		N/A	Digital Output #4 on DNP DCA	7	24	7

DCA				DPA		
Source	Data Type	MODBUS DCA Register Address	Point Description	COM1	COM2	
				DNP DPA Point	MODBUS DPA Point Address	DNP TCP/IP DPA Point
MODBUS DCA (IBOX-DCA and IBOX-DCL)	AI	0	ADAM-4017 AI CH: 00	N/A	N/A	N/A
		1	ADAM-4017 AI CH: 01	N/A	N/A	N/A
		2	ADAM-4017 AI CH: 02	N/A	N/A	N/A
		3	ADAM-4017 AI CH: 03	N/A	N/A	N/A
		4	ADAM-4017 AI CH: 04	N/A	N/A	N/A
		5	ADAM-4017 AI CH: 05	N/A	N/A	N/A
		6	ADAM-4017 AI CH: 06	N/A	N/A	N/A
		7	ADAM-4017 AI CH: 07	N/A	N/A	N/A
Calculator DTA	AI	N/A	Scaled Analog Input #1	0	1	0
		N/A	Scaled Analog Input #2	1	2	1
		N/A	Scaled Analog Input #3	2	3	2
		N/A	Scaled Analog Input #4	3	4	3
		N/A	Scaled Analog Input #5	4	5	4
		N/A	Scaled Analog Input #6	5	6	5
		N/A	Scaled Analog Input #7	6	7	6
		N/A	Scaled Analog Input #8	7	8	7
MODBUS DCA (IBOX-ACA and IBOX-ACL)	AI	278	VOLT PHASE A-N INST	0	1	0
		279	VOLT PHASE B-N INST	1	2	1
		280	VOLT PHASE C-N INST	2	3	2
		281	VOLT PHASE A-B INST	3	4	3
		282	VOLT PHASE B-C INST	4	5	4
		283	VOLT PHASE C-A INST	5	6	5
		284	AMP PHASE A INST	6	7	6
		285	AMP PHASE B INST	7	8	7
		286	AMP PHASE C INST	8	9	8
		287	AMP NEUTRAL INST	9	10	9
		288	WATT INST	10	11	10
		289	VAR INST	11	12	11
		290	VA INST	12	13	12
		291	PF INST	13	14	13
		292	FREQ INST	14	15	14
		293	WATT PHASE A INST	15	16	15

DCA				DPA		
Source	Data Type	MODBUS DCA Register Address	Point Description	COM1	COM2	
				DNP DPA Point	MODBUS DPA Point Address	DNP TCP/IP DPA Point
MODBUS DCA (IBOX-ACA and IBOX-ACL) continued	AI	294	WATT PHASE B INST	16	17	16
		295	WATT PHASE C INST	17	18	17
		296	VAR PHASE A INST	18	19	18
		297	VAR PHASE B INST	19	20	19
		298	VAR PHASE C INST	20	21	20
		299	VA PHASE A INST	21	22	21
		300	VA PHASE B INST	22	23	22
		301	VA PHASE C INST	23	24	23
		302	PF PHASE A INST	24	25	24
		303	PF PHASE B INST	25	26	25
		304	PF PHASE C INST	26	27	26
		317	VOLT PHASE A-N AVG	27	28	27
		318	VOLT PHASE B-N AVG	28	29	28
		319	VOLT PHASE C-N AVG	29	30	29
		320	VOLT PHASE A-B AVG	30	31	30
		321	VOLT PHASE B-C AVG	31	32	31
		322	VOLT PHASE C-A AVG	32	33	32
		323	AMP PHASE A AVG	33	34	33
		324	AMP PHASE B AVG	34	35	34
		325	AMP PHASE C AVG	35	36	35
		326	AMP NEUTRAL AVG	36	37	36
		327	WATT AVG	37	38	37
		328	VAR AVG	38	39	38
		329	VA AVG	39	40	39
		330	PF AVG	40	41	40
		331	FREQ AVG	41	42	41
		332	WATT PHASE A AVG	42	43	42
		333	WATT PHASE B AVG	43	44	43
		334	WATT PHASE C AVG	44	45	44
		335	VAR PHASE A AVG	45	46	45
		336	VAR PHASE B AVG	46	47	46
		337	VAR PHASE C AVG	47	48	47

DCA				DPA		
				COM1	COM2	
Source	**Data Type**	**MODBUS DCA Register Address**	**Point Description**	**DNP DPA Point**	**MODBUS DPA Point Address**	**DNP TCP/IP DPA Point**
MODBUS DCA (IBOX-ACA and IBOX-ACL) continued	AI	338	VA PHASE A AVG	48	49	48
		339	VA PHASE B AVG	49	50	49
		340	VA PHASE C AVG	50	51	50
		341	PF PHASE A AVG	51	52	51
		342	PF PHASE B AVG	52	53	52
		343	PF PHASE C AVG	53	54	53
		356	VOLT PHASE A-N MAX	54	55	54
		357	VOLT PHASE B-N MAX	55	56	55
		358	VOLT PHASE C-N MAX	56	57	56
		359	VOLT PHASE A-B MAX	57	58	57
		360	VOLT PHASE B-C MAX	58	59	58
		361	VOLT PHASE C-A MAX	59	60	59
		362	AMP PHASE A MAX	60	61	60
		363	AMP PHASE B MAX	61	62	61
		364	AMP PHASE C MAX	62	63	62
		365	AMP NEUTRAL MAX	63	64	63
		366	WATT MAX	64	65	64
		367	VAR MAX	65	66	65
		368	VA MAX	66	67	66
		369	PF MAX	67	68	67
		370	FREQ MAX	68	69	68
		395	VOLT PHASE A-N MIN	69	70	69
		396	VOLT PHASE B-N MIN	70	71	70
		397	VOLT PHASE C-N MIN	71	72	71
		398	VOLT PHASE A-B MIN	72	73	72
		399	VOLT PHASE B-C MIN	73	74	73
		400	VOLT PHASE C-A MIN	74	75	74
		401	AMP PHASE A MIN	75	76	75
		402	AMP PHASE B MIN	76	77	76
		403	AMP PHASE C MIN	77	78	77
		404	AMP NEUTRAL MIN	78	79	78
		405	WATT MIN	79	80	79

DCA				DPA		
Source	Data Type	MODBUS DCA Register Address	Point Description	COM1	COM2	
				DNP DPA Point	MODBUS DPA Point Address	DNP TCP/IP DPA Point
MODBUS DCA (IBOX-ACA and IBOX-ACL) continued	AI	406	VAR MIN	80	81	80
		407	VA MIN	81	82	81
		408	PF MIN	82	83	82
		409	FREQ MIN	83	84	83
		1282	RESET VOLT/AMP/POWER	84	85	84
		1284	RESET MAX/MIN/WH	85	86	85
	AO	1282	RESET VOLT/AMP/POWER	0	89	0
		1284	RESET MAX/MIN/WH	1	90	1
	CT	434	WATT HOUR BCD COUNTER 8	N/A	N/A	N/A
		435	WATT HOUR BCD COUNTER 7	N/A	N/A	N/A
		436	WATT HOUR BCD COUNTER 6	N/A	N/A	N/A
		437	WATT HOUR BCD COUNTER 5	N/A	N/A	N/A
		438	WATT HOUR BCD COUNTER 4	N/A	N/A	N/A
		439	WATT HOUR BCD COUNTER 3	N/A	N/A	N/A
		440	WATT HOUR BCD COUNTER 2	N/A	N/A	N/A
		441	WATT HOUR BCD COUNTER 1	N/A	N/A	N/A
LogicLinx	CT	N/A	KWH counter 32bit	0	N/A	0
		N/A	KWH counter 16bit MSB	N/A	87	N/A
		N/A	KWH counter 16bit LSB	N/A	88	N/A

Notes:

- ADAM-4017 AI CH: 00 to 07 are converted by the Calculator DTA into two's compliment numbers which are stored in the system point database (Scaled Analog Input #1 to 8).
- WATT HOUR BCD COUNTER 1 to 8 of the AC meter are ASCII BCD numbers. These numbers are converted into KW HOUR (KWH counter 32bit) by LogicLinx to be passed to the DNP master. Then "KWH counter 32bit" is converted into two 16-bit counters (KWH counter 16bit MSB and KWH counter 16bit LSB) to be passed to the MODBUS master.

Appendix F: Installing and Connecting DNP3 I/O Modules

This Appendix describes how to install and connect DNP3 I/O modules, and connect to the iBox.

For more details on the DNP3 I/O module, refer to the 994-0085 Installation and Maintenance Guide.

Overall Procedure to Install and Connect DNP3 I/O Modules

To install and connect DNP3 I/O modules:

1. Configure the DNP3 DCA in the iBox so that it communicates with your DNP3 I/O module.
   Refer to section: Configuring the iBox to work with a DNP3 I/O Module on page 43.
2. Physically locate and mount DNP3 I/O module in a 19 inch rack or cabinet.
   Refer to section: Installing DNP3 I/O Modules in a Rack on page 164.
3. Connect the DNP3 I/O module to site ground.
   Refer to section: Connecting to Protective Ground on page 165.
4. Interconnect the DNP3 I/O modules and connect power:
   - For low voltage DNP3 I/O, refer to section: Connecting DNP3 I/O Modules (Low Voltage) on page 166.
   - For high voltage DNP3 I/O where connection is made to an external power supply, refer to section: Connecting DNP3 I/O modules (High Voltage) on page 167.
5. Turn power on to the module, and test it to make sure it is functioning properly.

It is recommended that you complete the above procedure before connecting and testing your field wiring.

Installing DNP3 I/O Modules in a Rack

Rack Spacing

When mounting multiple DNP3 I/O modules in a rack, or when mounting DNP3 I/O modules in a rack with other equipment , verify that there is at least one rack unit (RU) of space above and below the DNP03 I/O module to allow for cooling air flow and cable routing (1 RU = 1.75 inches or 44.5 mm).

Required Clearances

The exterior dimensions of the DNP3 I/O module are:

Dimension	Measurement
Width	19 inches (483 mm)
Height	5.25 inches (133.4 mm)
Depth	2.5 inches (63.5 mm)

Allow about 14 inches (356 mm) of total cabinet depth, to provide clearance for cables and maintenance access.

Rack Mounting Procedure

To mount the DNP3 I/O module in a rack:

1. Determine the location of the DNP3 I/O module in a 19-inch mounting rack.
2. Install, but do not tighten the top two mounting screws.

   Note Install the DNP3 I/O module with the LEDs visible from the front of the rack.
3. Slide the DNP3 I/O module over the top mounting screws and drop down into position.
4. Insert the bottom mounting screws.
5. Tighten all four mounting screws.

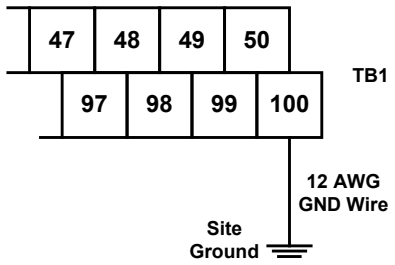
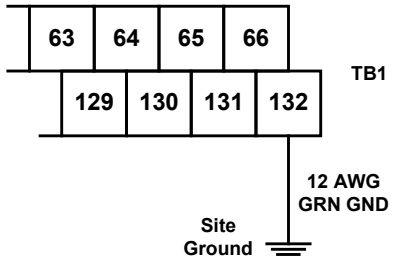
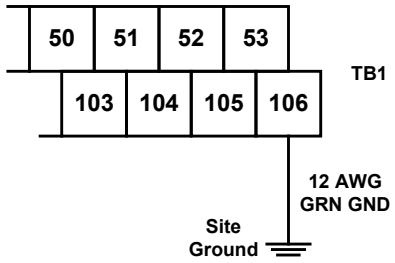
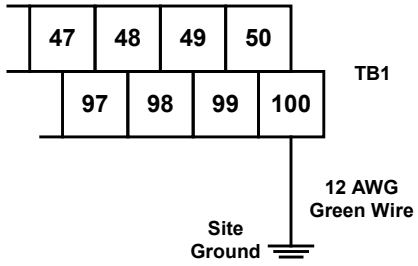
You are now ready to connect ground to the DNP I/O module. See “Connecting to protective ground” on page 165.

Connecting to Protective Ground

Connect your DNP3 I/O module to site ground, using a separate 2.05 mm (12 AWG) Yellow/ Green wire.

NOTICE Each type of DNP I/O Module has a different ground point, as shown in the examples below.

The location of the protective ground terminal varies between WESTERM I/O module types. Refer to Module Layout drawing of your module for detailed information. For example, see below.

DC Analog Input Module	
Digital Input Module	
Control Output Module	
Combination Input Output Module	

After site ground has been connected, you are now ready to connect power, and DNP3 link cabling to the DNP3 I/O module. See section: Connecting DNP3 I/O Modules (Low Voltage) on page 166 or section: Connecting DNP3 I/O modules (High Voltage) on page 167.

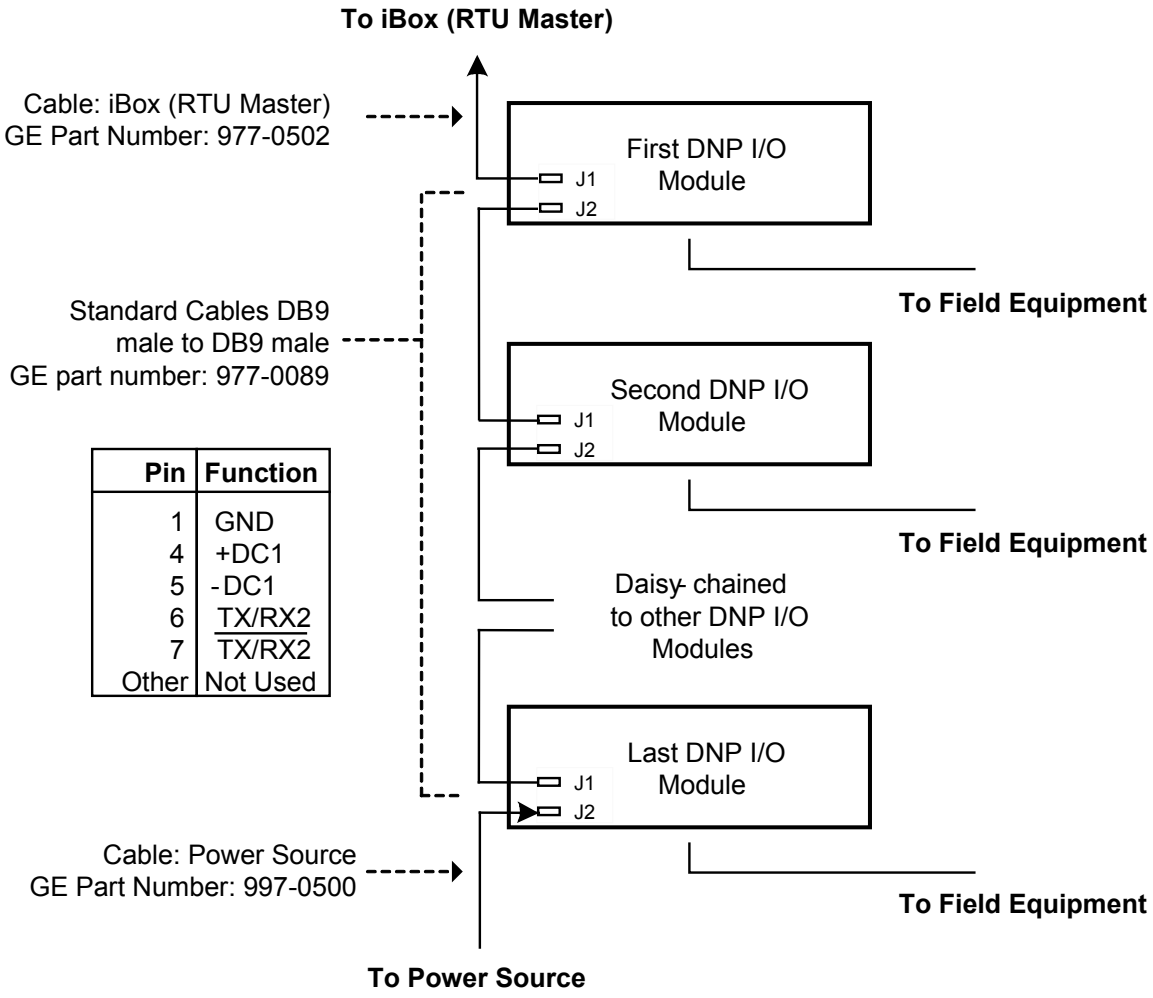
Connecting DNP3 I/O Modules (Low Voltage)

For a Low Voltage (LV) DNP3 I/O module, connect the:

- Interconnect cabling between each DNP3 I/O module, and
- Power to the last DNP3 I/O module of the chain.

DNP3 I/O Module (LV) Interconnect Cabling

The DNP3 I/O module interconnect cabling is shown below:



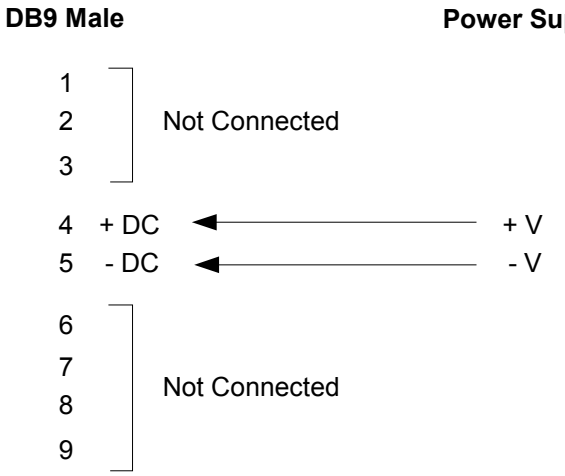
Pin	Function
1	GND
4	+DC1
5	-DC1
6	TX/RX2
7	TX/RX2
Other	Not Used

After DNP3 I/O modules have been interconnected, you are now ready to connect power to the DNP3 I/O modules. See the following subsection: DNP3 I/O module (LV) connection to the Power Source.

DNP3 I/O Module (LV) Connection to the Power Source

Connect the power supply to the last DNP3 I/O module in the chain.

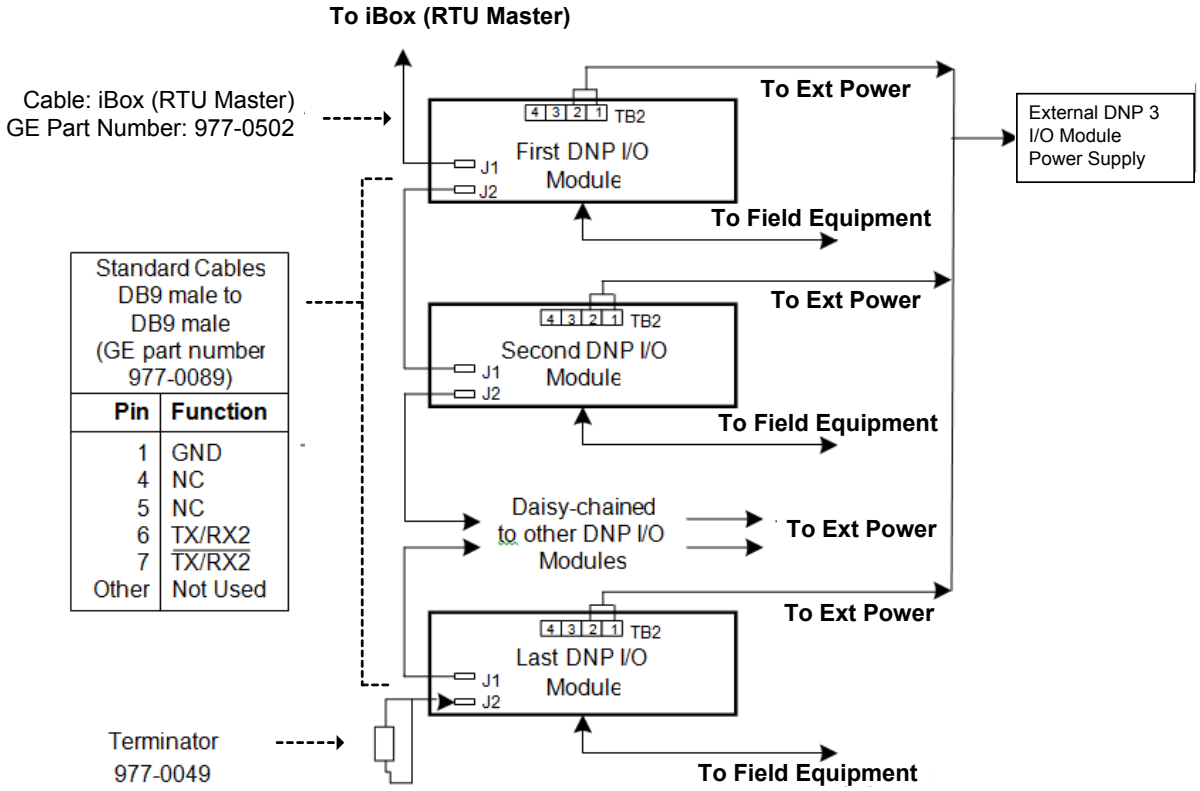
The cable from J2 on the last DNP3 I/O module to the power source (GE part number 977-0500) provides the connections shown in the following wiring diagram.



Connecting DNP3 I/O modules (High Voltage)

For a High-Voltage (HV) DNP3 I/O Module, for example: WESTERM D20SZ (517-0249-ML):

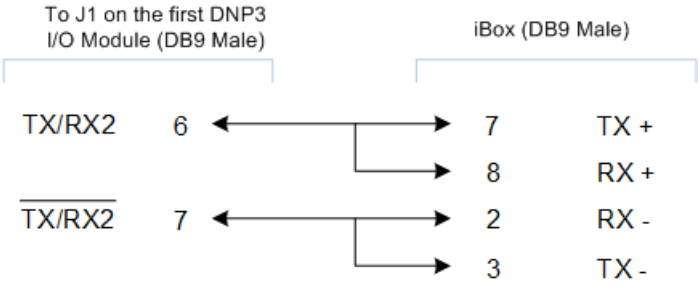
1. Interconnect the DNP3 link cabling between each DNP3 I/O module.
2. Connect pins 1 and 2 (and also pins 3 and 4 if a redundant power supply is used) on TB2 to an External Power Supply (40 to 150 VDC) as shown below:



Note: The location of the External (Ext) Power Supply terminal varies between WESTERM I/O module types.

Connecting to a iBox

The cable from an iBox RTU Master to the first DNP I/O Module (GE Part Number 977-0502) has the following connections and jumpers:



Note: Make sure the iBox RTU Master is configured for RS-485, 2W mode.

Appendix G: Error Messages

When processing an output request, the Plant I/O Subsystem (P097) DCA may not be able to execute the request. If this occurs, the Plant I/O Subsystem DCA will set the status code returned with the request to the appropriate error code, and negatively acknowledge (NACK) the control request. This section describes the possible status codes returned.

Control Requests Error Codes

Error Message	Description
Unsupported Point (0x0010)	Requested control point is not supported.
Unsupported Operation (0x0011)	Requested control operation is not supported for this point.
Output Not Available (0x0012)	The control output is not available for this point.
Queue Not Available (0x0013)	The control output queue is not available.
Invalid Request Parameters (0x0014)	The control output request parameters are not valid for this control point.
Too Much Lead Time (0x0015)	The control output request lead time is too much.
Not Enough Lag Time (0x0016)	The control output request lag time is not enough.
Window Too Small (0x0017)	Control output request time window is too small.
No Room on Queue (0x0018)	The control output request queue is full.
Not Armed (0x0019)	The control request point is not armed.

Analog Requests Error Codes

Error Message	Description
Analog Output Unsupported Point (0x0010)	The analog output point is not supported.
Analog Output Not Available (0x0011)	The analog output is not available.
Online Configuration in Progress (0x0012)	Another online configuration change is in progress.
Online Configuration Invalid Type (0x0013)	Configured alarm settings do not match the alarm type.
Online Configuration Invalid Settings (0x0014)	Configured alarm settings are out of range.
Online Configuration Alarm Not Available (0x0015)	Specified alarm number is unavailable.
Online Configuration Invalid Alarm Number (0x0016)	Specified alarm number is out of range.
Online Configuration No Alarm Number (0x0017)	No alarm number has been submitted.
Online Configuration Cancelled (0x0018)	Configuration change is cancelled.
Online Configuration Time Out (0x0019)	Configuration change cancelled due to timeout.
Online Configuration Disabled (0x001A)	Online configuration services are disabled.
Online Configuration Change Disabled (0x001B)	Online configuration change service is disabled
Online Configuration Out of Events (0x001C)	Request rejected. Lacked WIN event buffers.

Online Configuration Wev List Not Available (0x001D)	The WEV (WIN event) list request is not available.
Online Configuration Out of Timers (0x001E)	Lacked timed event buffers
Online Configuration Sendx Fail (0x001F)	Message send failed

MODIFICATION RECORD

Version	Revision	Date	Change Description
4.00	1	March 23, 2005	Document updated for iBox Kit.
	2	August 18, 2005	Updated to reflect new calculator procedures
5.00	1	October 21, 2005	Updated for ConfigPro 6 and AC Analog Input Module
	2	February 8, 2006	Added info regarding CE Mark, protective earth terminal, and power supplies.
	3	April 10, 2006	Updated info about power supply & protective enclosure.
	4	October 5, 2006	Created Appendix G: Error Messages (Control and Analog requests error codes). Added info regarding Trip/Close operation in Digital Output Verification Test. Refer to Clarify Case# 20060727-0259
		October 11, 2006	Clarify Case: 20060605-0257-1: Updated document to clarify on DO wiring (Digital Output section in 2.5 Connecting and Testing Field Wiring).
	5	January 21, 2009	Minor updates throughout to reflect product enhancements.
	6	March 25, 2009	Documented Ethernet module pass-through switch and configuration file modifications.
5.10	0	February 10, 2010	Updated appendices B and E.
	1	June 6, 2014	Corrected ground connections in the drawings of the Digital Outputs section. Corrected the ground reference (chassis ground) in the first Caution in the Terminal Connections section. Add section: Removing Configuration Data and Sensitive Information from the iBox.
	2	July 30, 2014	Added Appendix F: Installing and Connecting DNP3 I/O Modules
	3	Sep 11, 2014	Fixed links.
	4	May 15, 2017	Replaced references to ConfigPro with SGConfig. Updated GE branding and contact information. Added information on battery “PULL” tab removal during iBox installation.

AUTHENTICATION RECORD

VERSION	REV.	DATE	AUTHOR	CHANGE DESCRIPTION
5.00	6	March 25, 2009	E. Stuhr	*Configuring the Ethernet Module* section.
5.10	0	February 10, 2010	E. Stuhr	Appendices B and E.