PI DBox

Installation Guide
for

Current Loop Smart, RS485 Smart, Tokheim, Kraus, Bennett, Hybrid Mechanical, and EZ Wire Styles

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CONTENTS

PI DBox Manufacturer's Warranty

Progressive International Electronics, Inc. (SELLER) warrants to the Purchaser of fuel control equipment manufactured by Seller against defects in material or workmanship for one (1) year from date of shipment. Seller will replace or repair defective parts or replace and issue credits to the Purchaser's account in accordance with the following Conditions of Warranty.

CONDITIONS OF WARRANTY

1. Credit will be applied only when the completed warranty request form and the defective parts are received and inspected.
    Decisions to repair or replace defective equipment are solely at the discretion of PIE.
2. When parts shipments are made prior to receiving the required warranty request and defective parts, they will be billed to the Purchaser.
3. In all cases, approved warranty requests will be expedited by issuing the appropriate credit to the Purchaser's account and shipping replacement parts.
4. Credits will not be issued for parts and no cash refunds for warranty credits will be made.
5. All components and parts must be returned to the factory prepaid, and in turn, replacement components and parts will be returned prepaid by the factory.
6. Seller's warranty applies only if the equipment has been installed and used in accordance with Seller's instructions. The warranty is void if any unauthorized alteration or addition has been made to the equipment or if it has been subject to damage caused by abuse, misapplication, accident or improper operation.
7. The Seller's liability for any damages, including contribution and indemnification, arising out of or in any way connected with the supplying of the equipment or its use, shall not in any case exceed the cost of repair of the equipment as herein provided. Upon expiration of the warranty, all such liability, as well as any other liability, shall terminate.
8. Nothing contained herein shall make the Purchaser, its agents or employees, an agent or representative of Seller and Seller assumes no responsibility of any act, omission, representation or warranty by the Purchaser or anyone else except as expressly stated herein.
9. The final Decision as to the validity of any claims arising under the warranty shall be determined solely by the Seller.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID OBLIGATIONS AND ARE HEREBY DISCLAIMED AND EXCLUDED BY SELLER.

W A R N I N G

Installation must comply with the National Electrical Code, as well as Federal, State, Local and all applicable codes.

Do not install PI DBox in a volatile, combustible or explosive atmosphere. PI DBox must be protected from severe vibration, extreme temperatures, and excessive humidity.

Any peripheral equipment is to be installed in a non-hazardous location.

Any peripheral equipment connected to the PI DBox must be UL listed.

The PI DBox **must** be plugged into a dedicated 115 VAC wall socket.

History of Documentation

Version 1.0
    Initial release

Version 2.0 – April 2005
    Added Kraus and Bennett sections
    Added IP Addressing

Version 3.0 – April 2006
    Added documentation for Kraus/Bennett DBox

Version 3.1 – April 2009
    Changed IP Addressing

Version 4.0 – August 2011
    Added EZ Wire section
    Added drawings for new Tokheim and Current Loop Styles

Version 5.0 – January 2012
    Board revision changed documentation on Isolate Jumpers for Current Loop and Tokheim

Version 5.1 – June 2013
    Correction regarding unused wiring positions

Version 5.2 – December 2014
    Updated Operating Temperature under General Specifications

Version 5.3 – February 2015
    Added System Warnings in French

Version 6.0 – October 2019
    Updated drawings for Current Loop, Tokheim, RS485, and Kraus/Bennett DBoxes
    Added Hybrid Mechanical DBox section
    Added Low-Voltage Disconnect section
    Added Interface Connections section

Version 6.1 – April 2021
    Updated Hybrid Mechanical DBox Chaining details

Version 6.2 – December 2022
    Additional information for RS485 Smart Dbox installations with VeriFone Commander

Version 6.3 – September 2023
    Added information for Wayne DART dispensers
    Added jumper information for Bennett card readers and Wayne DART for FDSharp

Version 6.4 – June 2024
    Added Mechanical Relay Voltage Readings Table

Notice

Progressive International Electronics reserves the right to revise and improve this document as required. This publication details our PI DBoxes at this time, and may not accurately describe these products at all times in the future. Specifications are subject to change without notice.

Copyright

Patents

Progressive International products are manufactured or sold under one or more of the following U.S. patents.

5,790,410	5,663,887	5,361,216
5,831,861	5,557,529	5,270,943
5,694,326	5,394,336	5,108,742

Service App

The most recent release of the PI DBox Installation Guide is always available at pie-corp.com in .pdf format. For assistance in the field, be sure to download the PIE Support App from the Google Play Store, or use the QR code or link below.

https://play.google.com/store/apps/details?id=com.piecorp.pie_inc_support

System Installation

System Warnings

Safety hazards are inherent with all electrical equipment. Standard precautions must be taken at all times during installation and operation of the PI DBox systems. In addition to normal electrical precautions, the following points should be noted during installation.

- Installation must comply with the National Electrical Code, as well as Federal, State/Provincial, Local, and all applicable codes.

- High voltages are present in the PI DBox components, as well as the equipment to which it is attaching. To prevent personal injury or equipment damage, disconnect all power before proceeding with installation.

- PI DBox equipment must be installed in non hazardous areas. The main box must be protected from severe vibration, extreme temperatures and excessive humidity.

- All equipment connected to the PI DBox must be UL-approved and mounted in a nonhazardous location using standard RS232 communication.

For Use in USA

Installation of the PI DBox fuel control system must comply with the requirements of the National Electrical Code (NFPA 70), the Automotive and Marine Station Code (NFPA 30A), and all Federal, State, Local, and applicable safety codes.

For Use in Canada

Installation of the PI DBox fuel control system must comply with the requirements of the Canadian Electrical Code, the Flammable and Combustible Liquid Code, and all Federal, Provincial, Local and applicable safety codes.

The installation of the systems covered by this manual in conjunction with equipment not UL Listed has not been evaluated by the Underwriters Laboratories and is outside the intended use of this equipment. Warning: All dispensing equipment discussed in this manual is not UL Listed and the combination has not been evaluated by Underwriters Laboratories.

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Avertissements Système

Risques de sécurité sont inhérents à tous les équipements électriques. Les précautions standard doivent être prises à tous les fois pendant l'installation et le fonctionnement des systèmes PI DBox. En outre à la normale électrique précautions, les points suivants doivent être pris pendant l'installation.

- L'installation doit se conformer au Code national de l'électricité, ainsi que fédérales, d'État/provincial, Local, et tous les codes applicables.

- Hautes tensions sont présentes dans les composants PI DBox, ainsi que l'équipement auquel il est la fixation. Pour prévenir les blessures ou des dommages matériels, débrancher l'alimentation avant procéder à l'installation.

- Équipements PI DBox doit être installé dans les zones non dangereux. La boîte principale doit être protégé de fortes vibrations, aux températures extrêmes et à l'humidité excessive.

- Tous les équipements connectés à l' PI DBox doit être homologué UL et monté dans un non dangereux emplacement en utilisant la communication RS232 standard.

Pour utilisation aux Etats-Unis

L'installation du système de commande de carburant PI DBox doit se conformer aux exigences de la National Electrical Code (NFPA 70), l' Automobile et le Code Station Marine (NFPA 30A), et tous les fédéral, État, local, et les codes de sécurité applicables.

Pour utilisation au Canada

L'installation du système de commande de carburant PI DBox doit se conformer aux exigences de la canadienne Electrical Code, le Code liquides inflammables et combustibles, et tous les fédéral, provinciaux, étatiques, Codes de sécurité locales et applicables.

L'installation des systèmes couverts par ce manuel en conjonction avec un équipement non UL Inscrite n'a pas été évalué par les Underwriters Laboratories et est en dehors de l'utilisation prévue de cet équipement. Attention: Tous les équipements de distribution discuté dans ce manuel ne est pas UL et la combinaison n'a pas été évaluée par Underwriters Laboratories.

PI DBox

Introduction and Specifications

To ensure compatibility with major model electronic dispensers, Progressive International's PI DBox is available in several versions. Each of these versions is specifically configured for its intended dispenser type.

CL Smart DBox is used in the following applications:
>   Deer dispenser
>   Gilbarco dispenser
>   Wayne dispenser

Tokheim DBox is used with:
>   Tokheim dispenser

RS485 Smart DBox is used in the following applications:
>   Bennett card reader
>   Bennett dispenser (RS485 protocol)
>   Dong Hwa dispenser
>   PMC dispenser
>   Tatsuno dispenser
>   Tokheim DPT card reader
>   Wayne CAT card reader
>   Wayne DART Dispenser

Kraus/Bennett DBox is used in the following applications:
>   Bennett dispensers (Current Loop protocol)
>   Kraus dispensers

Hybrid Mechanical DBox is used in the following applications:
>   Mechanical dispensers (using Mechanical Relay/EMR3 PCB))
>   EMR3 (using Mechanical Relay/EMR3 PCB)
>   Electronic dispensers (using Multi-Pump PCB)

EZ Wire DBox is used in the following applications:
>   PIE ethernet (i.e., FuelDirect)
>   Non-PIE applications (i.e., other POS systems and dispenser controllers)

>   *The EZ Wire DBox can be used to control a Gilbarco dispenser <u>and</u> reader over a single pair of communication wires. This eliminates the need to run a second pair of data wires when converting a major oil dispenser/reader to the generic version.*

All of these DBoxes are designed to be used with PIE's controllers and consoles (PIE applications). The CL Smart DBox and the Tokheim DBox are also capable of being used by the dispenser brand's controlling equipment (stand-alone application). All DBoxes have LED indicators to allow simple in-field troubleshooting and diagnostics.

The following sections describe each of the PI DBox installations in detail.

General Specifications

Operating Temperature	32 to 120 degrees F (0 to 49 degrees C)
Storage Temperature	32 to 120 degrees F (0 to 49 degrees C)
Humidity	50 to 90% non-condensing
Electrical Supply	110VAC, 25 watts maximum
Size	7.5" x 7.5" x 2"
Safety Certifications	MET labs US, CA CE
	(*Hybrid Mechanical DBox is not MET certified*)

PI DBox
Interface Connections

All PI DBoxes come with a standard set of interface connections that allows each DBox to be used in many different applications. Below is a breakdown of each interface and how to connect to each.

PiPort: A proprietary port used by Progressive's PIcon II Console and Omega JR controller.

1. Connect the PIcon II or the Omega JR to the PiPort connector of the PI DBox using a serial cable supplied by PIE.

RS422: Used by Progressive's PIcon II Console and Omega JR. *(If this jumper setting is not available, the DBox model does not support this interface type.)*

1. Connect the PIcon II or the Omega JR to the RS422 connector using the supplied cables and/or adapters. See Installation manuals for each product to configure each controller for RS422.

Pins	1	2	3	4	5	6	7	8
At Controller	RxD (+)	RxD (-)	TxD (+)	TxD (-)	CTRL (+)	CTRL (-)	GND	GND
At DBox	TxD (+)	RxD (-)	RxD (+)	RxD (-)	CTRL (+)	CTRL (-)	GND	GND

RS232: Used by Progressive's FuelDirect Software Controller or any controller that has RS232 output.

1. Connect from the PC that FuelDirect is installed on to the RS232 connector using a serial cable.

XPort: Used by Progressive's FuelDirect Software Controller only.

1. Connect to the Local Area Network using an ethernet cable connected to the XPort of the PI DBox. Refer to the IP Addressing section at the end of this manual for further ethernet instructions.

2. The DBox and POS will need to be on the same Local Area Network, and it is highly recommended that they are on their own isolated network by being on the same switch.

Diagram: PI DBox Front View
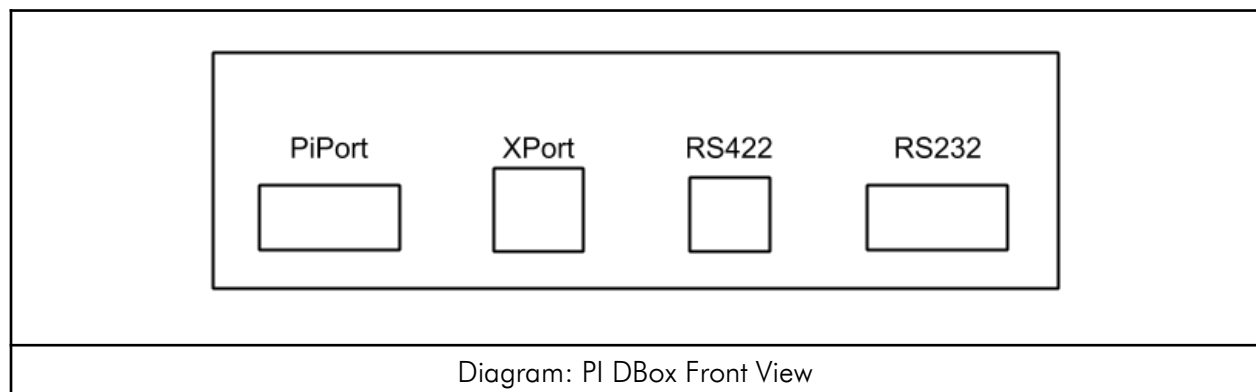
PI DBox
Low-Voltage Disconnect

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Note all warnings in System Installation Warnings section.

The CL Smart DBox, RS485 Smart DBox, and Tokheim DBox are equipped with built-in relays for signal disconnect, in compliance with current low-voltage disconnect regulations NFPA ® 30A, Section 6.7 NEC ® Sections 514.11 and 514.13. Use the following Diagram to wire the Emergency Stop switch properly. If not wired to the kill switch, the RELAY_BYPASS jumper must remain jumpered.

Kill Switch Wiring Diagram

RELAY_SWITCH
Terminal Block
of DBox

N.O.

To Kill Switch
110 VAC

RELAY

Neutral

NOTES:
1. Use Normal Open contacts.
2. Use a relay with 110 VAC coil.
3. Remove the RELAY BYPASS jumper on the DBox.

Diagram: Low-Voltage Disconnect Wiring
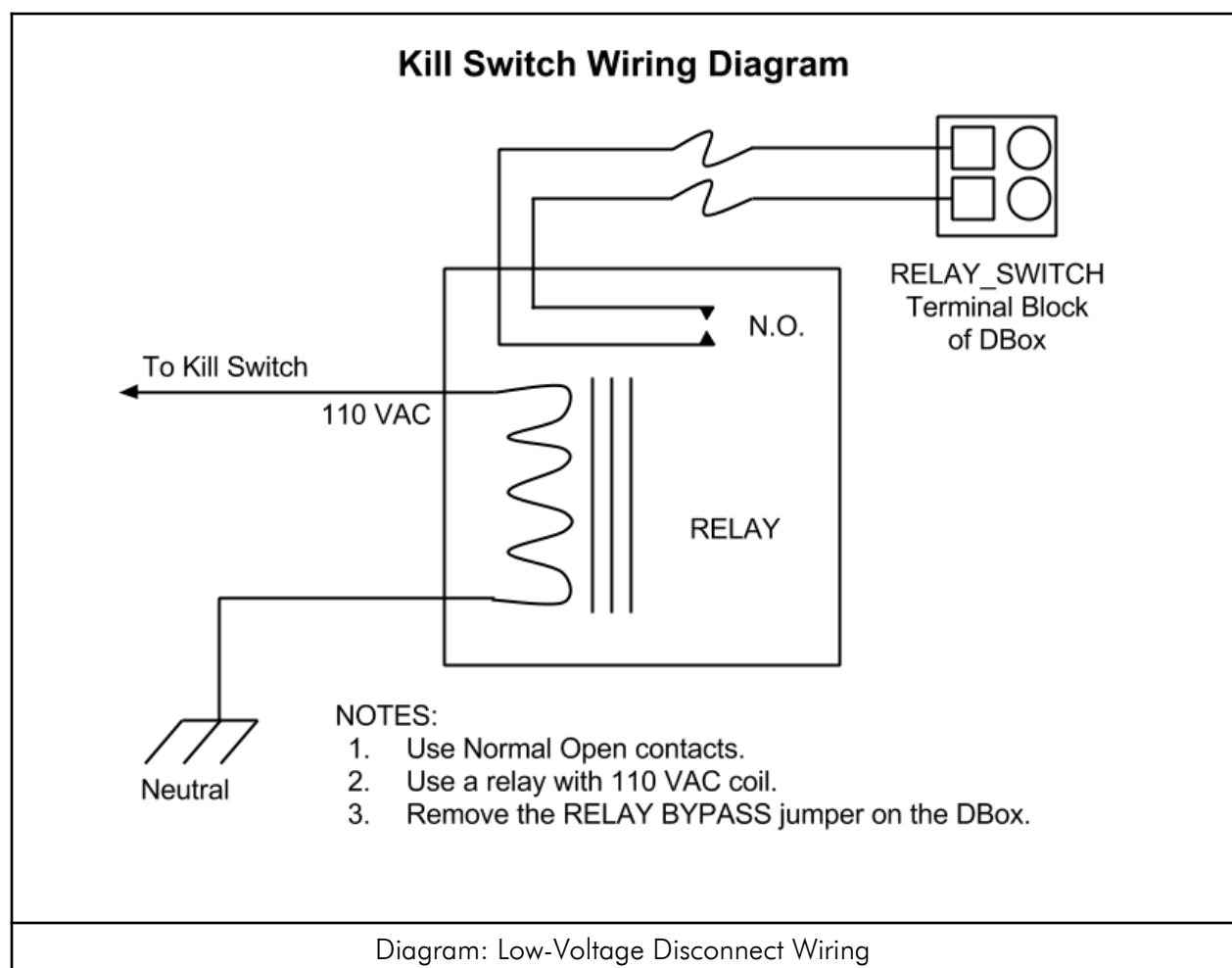
PI DBox — Model Specific Installation
CL Smart DBox
PCB Assembly Number 9000-11-6423

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Note all warnings in System Installation Warnings section.

CL Smart DBoxes are used with Deer, Gilbarco, and Wayne dispensers. Note dispenser-specific instructions for use with each dispenser. For overview, see Diagram: PI DBox — Current Loop Style on following page.

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Set jumper P12 for Gilbarco or Wayne. *(If this jumper setting is not available, the DBox model does not support this function.)*

2. Connect PI DBox to dispenser. Dispensers using current loop communication have two wires, a negative and a positive, for connectivity. Locate the pair from each dispenser to be connected and bring the pair into the PI DBox. Ignore unused position(s) in the DBox. Ensure that positive and negative wires are not crisscrossed at the PI DBox, as this will prevent communication with the controlling device.

Note: If isolation jumpers are present above wiring positions in the PI DBox, these jumpers should be left in isolate position until the controlling devices are connected to the DBox. After connecting all dispensers to be used, move jumpers to normal for each position connected.

3. Set jumper H1 (H3 for Assembly Number 9000-11-6413) to the desired interface type. Refer to the Interface Connections section for connection help or below for PI DBox specific connections.

Note: PI DBoxes are equipped with built-in relays for signal disconnect, in compliance with current low-voltage disconnect regulations. Refer to the Low-Voltage Disconnect section for more details.

Note: Steps 4-6 in the Current-Loop Style installation procedure are dependent upon the type of application — PIE application or stand-alone application. Give careful attention to which steps are needed for your particular application. Also, refer to the appropriate drawings for jumper settings, interface connections and dispenser wiring.

For applications using PIE products:

4. Set the jumper (H1 position) to the desired interface type. See Interface Connection section for interface information.

5. Referring to the DBox Front view diagram in the Interface Connection section, connect to the applicable port.

6. Proceed with programming of system.

For stand-alone applications:

4. Set the jumper (H1 position) to CL. CL is a Current Loop input. See Interface Connection section for interface information. *(If this jumper setting is not available, the DBox model does not support this interface type.)*

    a) PIPort connector when used as Current Loop:

Pin 6	Current Loop (-)
Pin 7	Current Loop (+)

5. Referring to the DBox Front View diagram in the Interface Connection section, connect to the PiPort using a DB9 Male to Male Gender Changer.

6. Proceed with programming of system.

CL Smart DBox Key Components
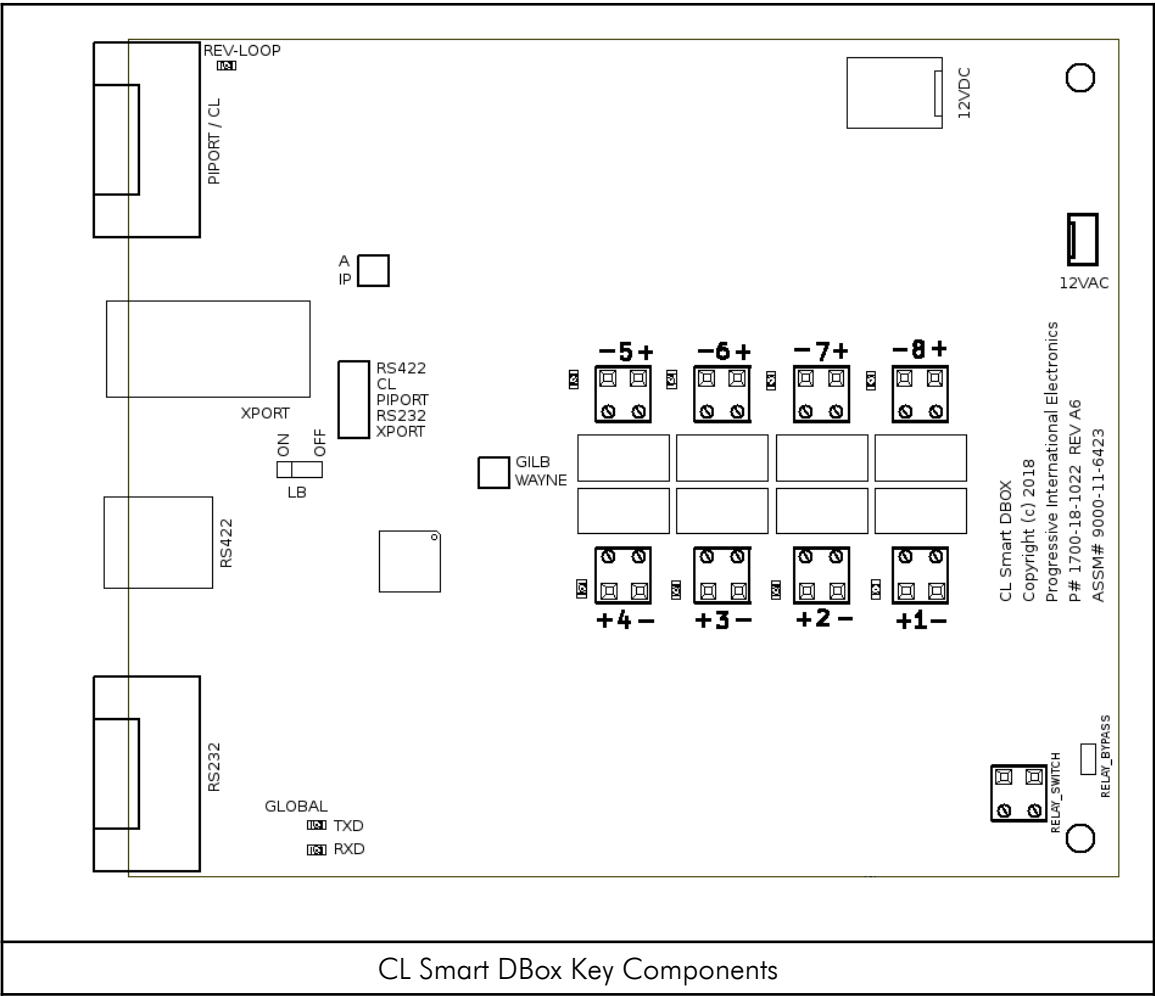
PI DBox — Model Specific Installation
Tokheim DBox
PCB Assembly Number 9000-11-6422

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Note all warnings in System Installation Warnings section.

Tokheim DBoxes are used with Tokheim dispensers. Note dispenser-specific instructions for use with each dispenser. For overview, see Diagram: Tokheim DBox Key Components later in this section.

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Connect PI DBox to dispenser. Tokheim dispensers have three wires for connectivity: TTD, TTC, and DCC. For each Tokheim dispenser being connected, bring dispenser wires into the PI DBox and connect to TTD, TTC and DCC on an unused wiring position. Ensure that wires are not crisscrossed at the DBox, as this will prevent communication with the controlling device.

Note: If isolation jumpers are present above wiring positions in the PI DBox, these jumpers should be left in isolate position until the controlling devices are connected to the DBox. After connecting all dispensers to be used, move jumpers to normal for each position connected.

2. Set jumper P3 (JP2 for Assembly Number 9000-11-6412) to the desired interface type. Refer to the Interface Connections section for connection help or below for PI DBox specific connections.

Note: PI DBoxes are equipped with built-in relays for signal disconnect, in compliance with current low-voltage disconnect regulations. Refer to the Low-Voltage Disconnect section for more details.

Note: Steps 3-5 in the Tokheim DBox installation procedure are dependent upon the type of application — PIE application or stand-alone application. Give careful attention to which steps are needed for your particular application. Also, refer to the appropriate drawings for jumper settings, interface connections and dispenser wiring.

For applications using PIE products:

3. Set the jumper on JP2 to the interface type to be used. See Interface Connection section for interface information.

4. Referring to the DBox Front View diagram in the Interface Connection section, connect to the applicable port.

5. Proceed with programming of the system.

For stand-alone applications:

3. Set the jumper on JP2 to STD. See Interface Connection section for interface information. *(If this jumper setting is not available, the DBox model does not support this interface type.)*

   a) PIPort connector when used as STD:

Pin 4	DDC (GND)
Pin 6	DCC (GND)
Pin 7	TTP (Talk to Pump)
Pin 8	TTC (Talk to Console)

4. Referring to the DBox Front Panel View diagram in the Interface Connection section, connect to the PiPort using the Tokheim Standard Input Cable (Part #9000-15-4144) supplied by PIE.

5. Proceed with programming of system.

Tokheim DBox Key Components
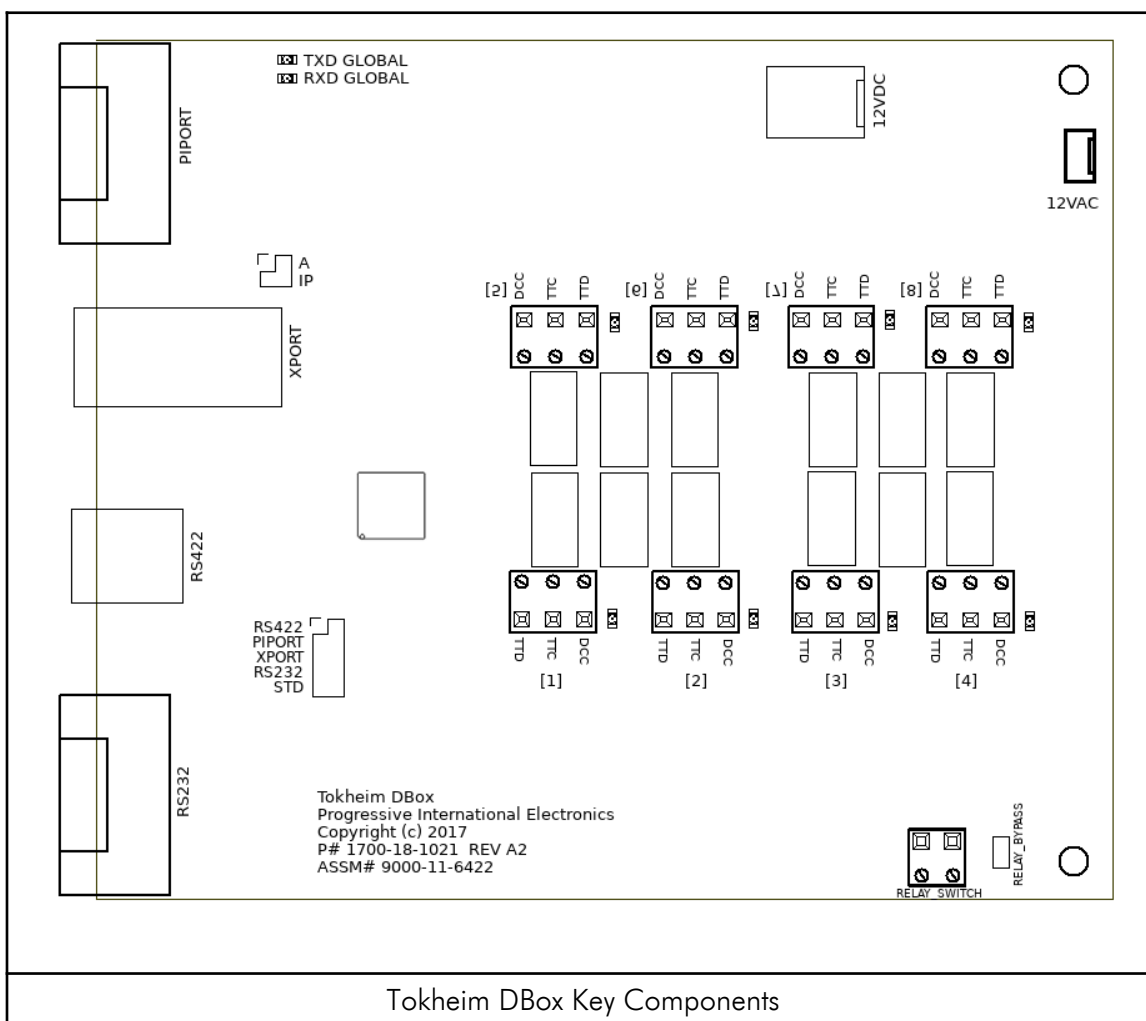
PI DBox — Model Specific Installation
RS485 Smart DBox
PCB Assembly Number 9000-11-6324

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Note all warnings in System Installation Warnings section.

RS485 Smart PI DBoxes are used with Bennett dispenser (RS485 protocol), Bennett card reader, Dong Hwa dispenser, ORPAK card reader, Pump Measure Control (PMC) dispenser, Tatsuno dispenser, Tokheim DPT, Wayne CAT card reader, and Wayne DART dispensers. Note dispenser-specific instructions for use with each dispenser or card reader. For overview, see diagrams on the following pages.

The RS485 Smart DBox can be used in three different modes: Standard RS485 DBox, Gilbarco Emulation, and Wayne CAT Optimization. Standard RS485 is how all previous versions of the RS485 PI DBox have worked, and Gilbarco Emulation allows controllers that communicate to Gilbarco dispensers to control non-Gilbarco dispensers. Wayne CAT Optimization is a feature that optimizes the polling loop when connected to Wayne CAT card readers.

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Connect PI DBox to dispenser or card reader. Devices using RS485 communication have three wires for connectivity: +, -, and ground. For each RS485 device being connected, bring communication wires into the PI DBox and connect to +, -, and ground on an unused wiring position. Ensure that wires are not crisscrossed at the DBox, as this will prevent communication with the controlling device.

Note: For DBox Assembly Number 9000-11-6314, connect no more than four physical devices in each of the four groups of connections (1-4, 5-8, 9-12, and 13-16). Two device addresses are equivalent to two connections. J2 should be jumpered for Gnd.

2. Referring to the Interface Jumper Settings tables that follow, set jumper P2 to the desired interface type and jumper P9 to the desired control. Refer to the Interface Connections section for connection help.

Interface Jumper Settings - Assembly #9000-11-6324			
Interface Type	**LB ON**	**P9**	**P2**
PiPort	ON	PIPORT	PIPORT
RS422	ON	RS422	RS422
RS232	OFF	RS232	RS232
XPort E 140220 or XPort C 090612	OFF	Not Jumpered	XPORT
XPort 5.0 (or higher)	ON	XPORT	XPORT

Interface Jumper Settings - Assembly #9000-11-6314			
Interface Type	**J6**	**J8**	**J10**
PiPort	LB	PIPort	PIPort
RS232	Norm	/txd	RSTxd
XPort E 140220 or XPort C 090612	Norm	/txd	XPort
XPort 5.0 (or higher)	LB	XPort	XPort

Note: PI DBoxes are equipped with built-in relays for signal disconnect, in compliance with current low-voltage disconnect regulations. Refer to the Low-Voltage Disconnect section for more details.

Note: The following steps in the RS485 Smart DBox installation procedure are dependent upon the type of application — Standard RS485, Gilbarco Emulation, or Wayne CAT Optimization. Give careful attention to which steps are needed for your particular application. Also, refer to the appropriate drawings for jumper settings, interface connections and dispenser wiring.

Standard RS485 DBox

Standard mode is a connection to dispensers or card readers using RS485 protocol (PMC) where the controller is set to the same dispenser type (PMC). This is how all previous versions of the RS485 PI DBox have worked in the past. Refer to the table below for the proper jumper settings.

Standard RS485 DBox Jumper Settings							
Controller	STD/ALT	LB ON	ALT0	ALT1	ALT2	CTRL/ALT3	-CTRL/ALT4
FuelDirect (new)*	OFF	ON	OFF	OFF	OFF	ON	OFF
FuelDirect (old)+	OFF	OFF	OFF	OFF	OFF	OFF	OFF
FuelDirect (RS232)	OFF	OFF	OFF	OFF	OFF	OFF	OFF
PIcon II or Omega JR	OFF	ON	OFF	OFF	OFF	ON	OFF
FDSharp (Bennett Reader)	OFF	OFF	OFF	OFF	OFF	OFF	OFF
FDSharp (Wayne DART)	OFF	ON	OFF	OFF	OFF	OFF	OFF

* FuelDirect 057.007.050-rc10 (or newer) AND XPort 5.00 (or newer). P2 & P9 set to XPORT

+ FuelDirect 057.007.050-rc9 (or older) AND/OR XPort 4.01 (or older). P2 set to XPORT. P9 not jumpered.

3. Proceed with programming of system.

Gilbarco Emulation

RS485 Smart PI DBox has the ability to emulate a Gilbarco dispenser. Gilbarco Emulation allows controllers that communicate with Gilbarco dispensers to control dispensers that use RS485 protocol. The DBox emulates a Gilbarco dispenser, and allows a controller to be set to Gilbarco, but communicate to other dispenser brands that use RS485 protocol (PMC, for example). Refer to the table below for the proper jumper settings.

3. Jumper the pins for STD/ALT at P6.

4. Referring the the RS485 Smart DBox Gilbarco Emulation Jumper Settings table that follows, set the jumpers at P6 for the dispenser type that will be connected to the DBox.

RS485 Smart DBox Gilbarco Emulation Jumper Settings							
Pump Brand	STD/ALT	LB ON	ALT0	ALT1	ALT2	CTRL/ALT3	-CTRL/ALT4
Wayne CAT	ON	*See Below*	OFF	OFF	OFF	OFF	OFF
PMC	ON	*See Below*	ON	OFF	OFF	OFF	OFF
Bennett 485*	ON	*See Below*	OFF	ON	OFF	OFF	OFF
Tatsuno	ON	*See Below*	ON	ON	OFF	OFF	OFF
Dong Hwa	ON	*See Below*	OFF	OFF	ON	OFF	OFF
Mechanical	ON	*See Below*	ON	OFF	ON	OFF	OFF

* Bennett 485: The Model Type of each dispenser must be set in Diagnostics for proper functionality. See Diagnostics section below.

> For applications using the PIcon II, Omega JR, and FuelDirect (XPORT & RS232)
> *   LB ON should be jumpered.
>
> For applications using the VeriFone Commander (serial connection):
> *   LB ON should not be jumpered
> *   P2 and P9 should be jumpered for RS232
> *   K22 should be jumpered for RTS
> *   Installations to RS232 port of the Smart Dbox requires the VF Commander to Smart Dbox Adapter (Part #9000-16-0009)
> *   Note: The Commander will only handle 5-digit mode, so the 5/6 Digit Mode setting needs to be set to 5 in the Gilbarco Emulation settings in Diagnostics

5. Proceed with programming of the system.

Wayne CAT Optimization

For applications using Wayne CAT Optimization:

RS485 Smart PI DBox has a feature to optimize the polling loop when connected to Wayne CAT card readers.

3. Jumper the pins for STD/ALT at P6.

4. Referring the the RS485 Smart DBox Wayne CAT Jumper Settings table that follows, set the jumpers at P6 accordingly.

RS485 Smart DBox Wayne CAT Jumper Settings							
Pump Brand	STD/ALT	LB ON	ALT0	ALT1	ALT2	CTRL/ALT3	-CTRL/ALT4
Wayne CAT	ON	*See Below*	OFF	OFF	OFF	OFF	OFF

5. Proceed with programming of the system.

RS485 Smart DBox Key Components
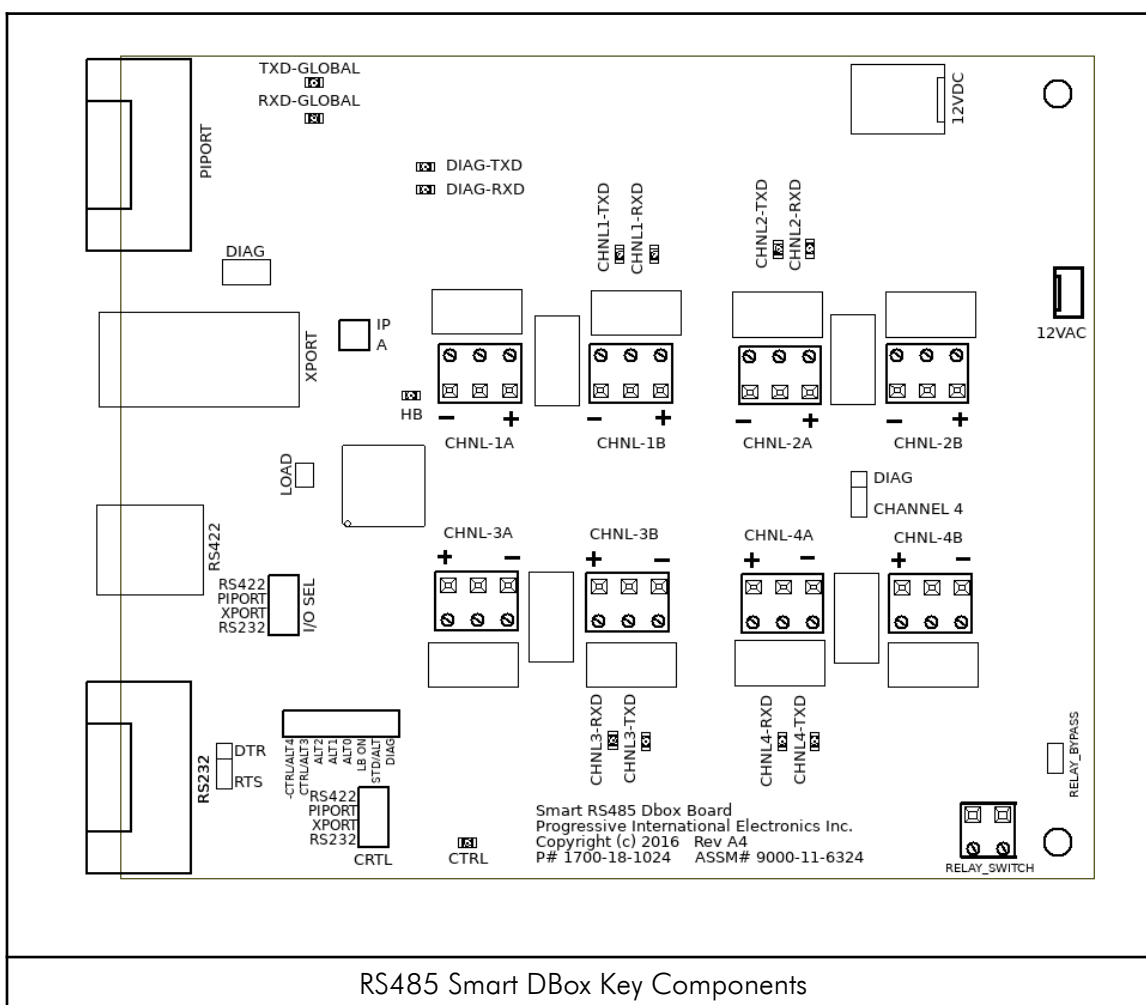
RS485 Smart DBox Diagnostics

RS485 Smart PI DBox has built-in Diagnostics that may need to be accessed for configuration or troubleshooting purposes. For example, when set for Bennett 485, the Model Type of each dispenser must be set in Diagnostics for proper functionality. When accessing Diagnostics, Channel 4 functionality is disabled.

To access Diagnostics:

1. Power down the PI DBox.

2. Jumper the pins for DIAG at K23.

3. Connect a Micro USB cable to DIAG1 on the PC Board.

4. Power up the PI DBox.

5. To access diagnostics, a computer running a terminal emulation software such as Hyperterm for Windows is required. The diagnostic port is a serial port with the following connection parameters.

Baud Rate	57600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

PI DBox — Model Specific Installation
Kraus/Bennett DBox – Kraus Application
PCB Assembly Number 9000-11-6426

<div align="center">⚠️</div>

Note all warnings in System Installation Warnings section.

Kraus/Bennett DBoxes are used with either Kraus or Bennett Electronic Dispensers using Current Loop protocol. Brand selection is made by simply configuring jumper P7 (JP8 for Assembly Number 9000-11-6416) to either Kraus or Bennett. Although the same DBox is used in both applications, in this document we refer to either "Kraus Application" or "Bennett Application" for instruction purposes. Note dispenser-specific instructions for use with each dispenser. For overview of Kraus application see Key Components of PI Kraus/Bennett DBox following this section.

The following Kraus models must have the minimum version of software noted to work properly with Progressive equipment:

Micon 100

	152 printed circuit board	versions 3.1 & 3.2
	252 printed circuit board	version 6.30
	463 PLCC processor	version 7.03
Micon 200		version 1.09
Micon 300		version 2.04
Micon 500		all versions

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Set jumper P7 (JP8 for Assembly Number 9000-11-6416) to Kraus.

2. Connect the data communication wires from the Kraus dispenser into the dispenser connectors on the Kraus Electronic Style PI DBox. See Diagram: PIE Product to PI DBox to Kraus Electronic Dispensers and Diagram: Key Components of PI DBox — Kraus/Bennett Style for Kraus Application. Also note the layout of the Kraus dispenser head, referring to Diagram: Kraus Dispenser Head Layout. There are three data communication wires connecting to a Kraus dispenser. They are labeled as follows:

   TTC — Talk to Console/Kraus dispenser transmit data
   TTP — Talk to Dispenser/Kraus dispenser receive data
   DDC — Data Common / Kraus dispenser ground

3. Set jumper P5 and P6 to the desired interface type. (For Assembly Number 9000-11-6416, see Step 4 for jumper settings.) Refer to the Interface Connections section for connection help.

Note: For Assembly Number 9000-11-6416, set jumpers JP4, JP5, and JP20 to the desired interface type:

>RS232 — jumper only position JP20
>Ethernet (XPort) — jumper only position JP5
>PiPort — jumper only position JP4

4. Proceed with programming of the system.

Note: For MTI (D&H) computer heads, the TTC and TTP signals must be jumpered to the second address (i.e., 1 to 2, 3 to 4, 5 to 6, ... 15 to 16). Refer to the board orientation for the dispenser position.

The MTI (D&H) heads <u>must</u> be upgraded to the latest hardware version for the communication to operate properly. Please contact MTI (Measurement Technology, Inc.) for upgrades.

Key Components of PI Kraus/Bennett DBox

Kraus Micon 100 Dispenser Head

9 ——— TTP
10 ——— TTC
16 ——— DCC

H ⟋ 14
Manual
Override
Switch

1 7 20 2 3 6 8

115 VAC
Input from
Dedicated
Circuit

H
N
Gnd

Large   Small
Valve   Valve

Kraus Dispenser Head Layout   *04/05*

PI DBox — Model Specific Installation
Kraus/Bennett DBox – Bennett (Current Loop) Application
PCB Assembly Number 9000-11-6426

Note all warnings in System Installation Warnings section.

Kraus/Bennett DBoxes are used with either Kraus or Bennett Electronic Dispensers using Current Loop protocol. Brand selection is made by simply configuring jumper P7 (JP8 for Assembly Number 9000-11-6416) to either Kraus or Bennett. Although the same DBox is used in both applications, in this document we refer to either "Kraus Application" or "Bennett Application" for instruction purposes. Note dispenser-specific instructions for use with each dispenser. For overview of Kraus application see Key Components of PI Kraus/Bennett DBox following this section.

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Set jumper P7 (JP8 for Assembly Number 9000-11-6416) to Bennett.

2. Connect the data communication wires from the Bennett dispenser(s) (Orange [+] and Yellow [-]) into the dispenser connectors on the Bennett PI DBox provided by PIE. See Key Components of PI Kraus/Bennett DBox at end of this section for wiring.

3. Set jumper P5 and P6 to the desired interface type. (For Assembly Number 9000-11-6416, see Step 4 for jumper settings.) Refer to the Interface Connections section for connection help.

Note: For Assembly Number 9000-11-6416, set jumpers JP4, JP5, and JP20 to the desired interface type:
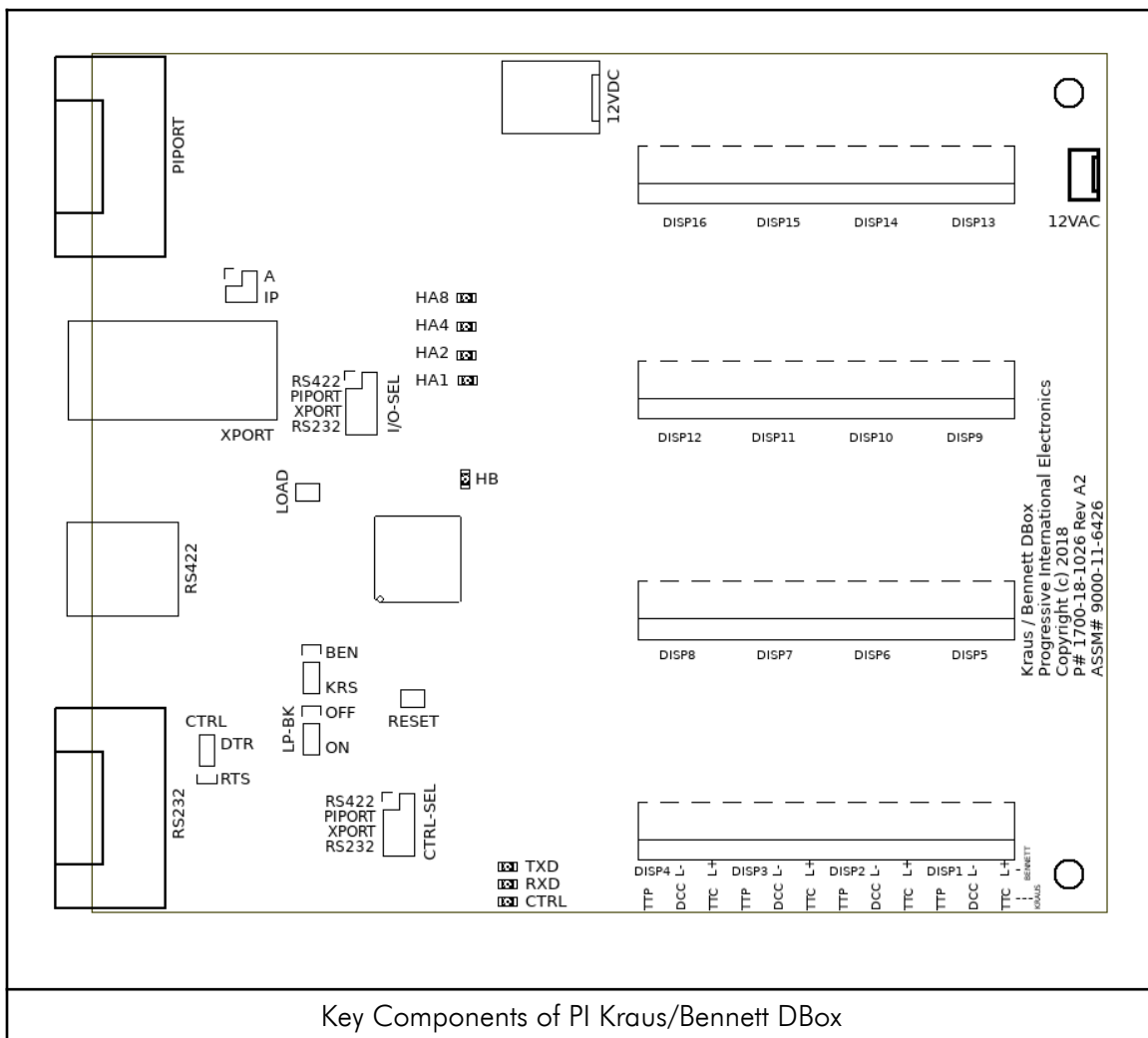
> RS232 — jumper only position JP20
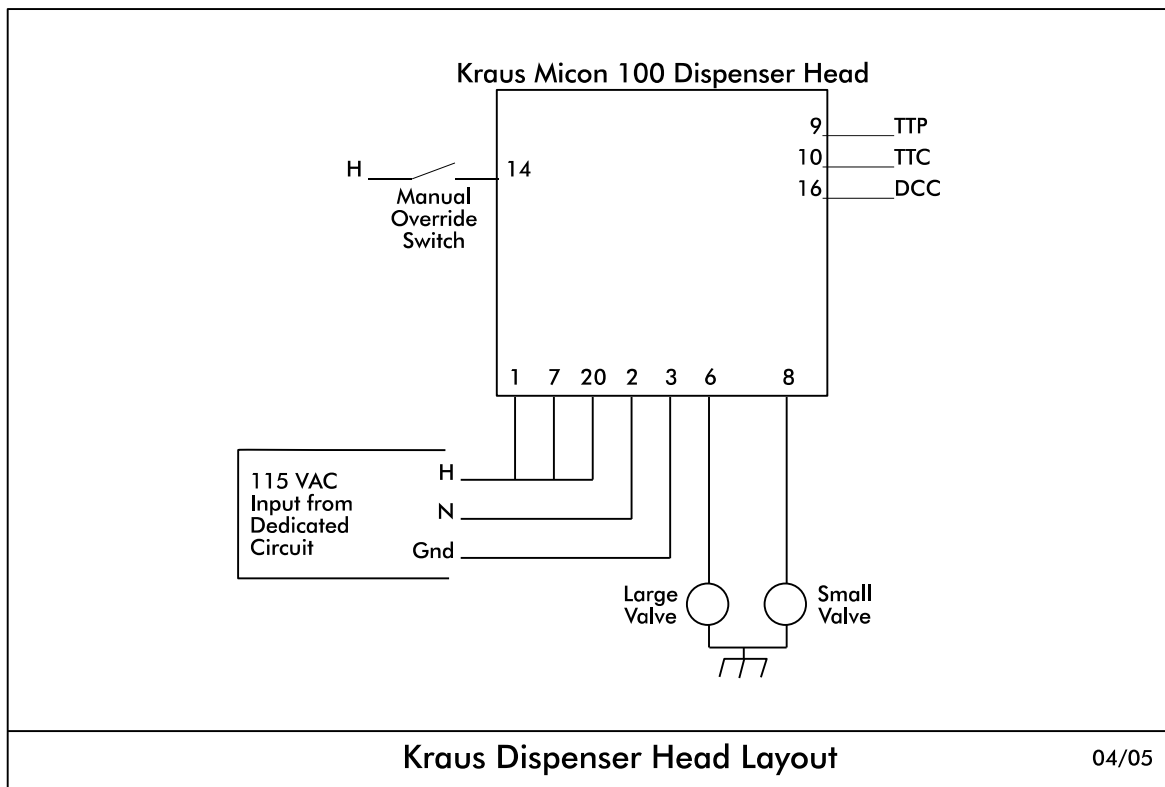> Ethernet (XPort) — jumper only position JP5
> PiPort — jumper only position JP4

4. Proceed with programming of the system.

Key Components of PI Kraus/Bennett DBox

PI DBox — Model Specific Installation

Hybrid Mechanical DBox

Hybrid Interface PCB Assembly Number 9000-11-6701
Mechanical Relay/EMR3 PCB Assembly Number 9000-11-6605
Hybrid Multi-Pump PCB Assembly Number 9000-11-6604

⚠

Note all warnings in System Installation Warnings section.

Hybrid Mechanical PI DBoxes can be used with Mechanical and Electronic dispensers of most brands. Note dispenser-specific instructions for use with each dispenser.

The Hybrid Mechanical PI DBox can use the following internal boards to accomplish most any combination of site configurations:

- Hybrid I/O board: Common interface board for all site configurations.

- Mechanical Relay board: Used for Mechanical dispensers only.

- EMR3 board: Used for Veeder Root EMR3 only.

- Hybrid Multi-Pump board: Used for Wayne, Gilbarco, Tokheim, Kraus, Bennett (using RS485 protocol), PMC, and Tatsuno Electronic dispensers.

Daisy Chaining Mechanical DBoxes

The maximum number of Mechanical Relay boards that can be mounted in one cabinet is eight. Two Hybrid Mechanical DBoxes can be chained together to get up to 16 Fueling Positions on the same controller, and can be accomplished with this setup:

1. Configure both DBoxes as described below and connect the communication cable to the Hybrid I/O board of DBox A.

2. For Hybrid I/O board 9000-11-6701:

    a) Move the interface type jumper (P12) to RS422 for DBox B.

    b) Move the control type jumper (P11) to RS422 for DBox B.

    c) Connect a CAT5 cable from LINK (J4) of DBox A to RS422 (J3) of DBox B.

3. For Hybrid I/O board 9000-11-6601:

    a) Remove the interface type jumper (J17) for DBox B.

    b) Remove the control type jumper (J13) for DBox B.

    c) Connect a Hybrid DBox Daisy Chain Cable (9000-15-9020) from CHAIN (J19) of DBox A to CHAIN of DBox B.
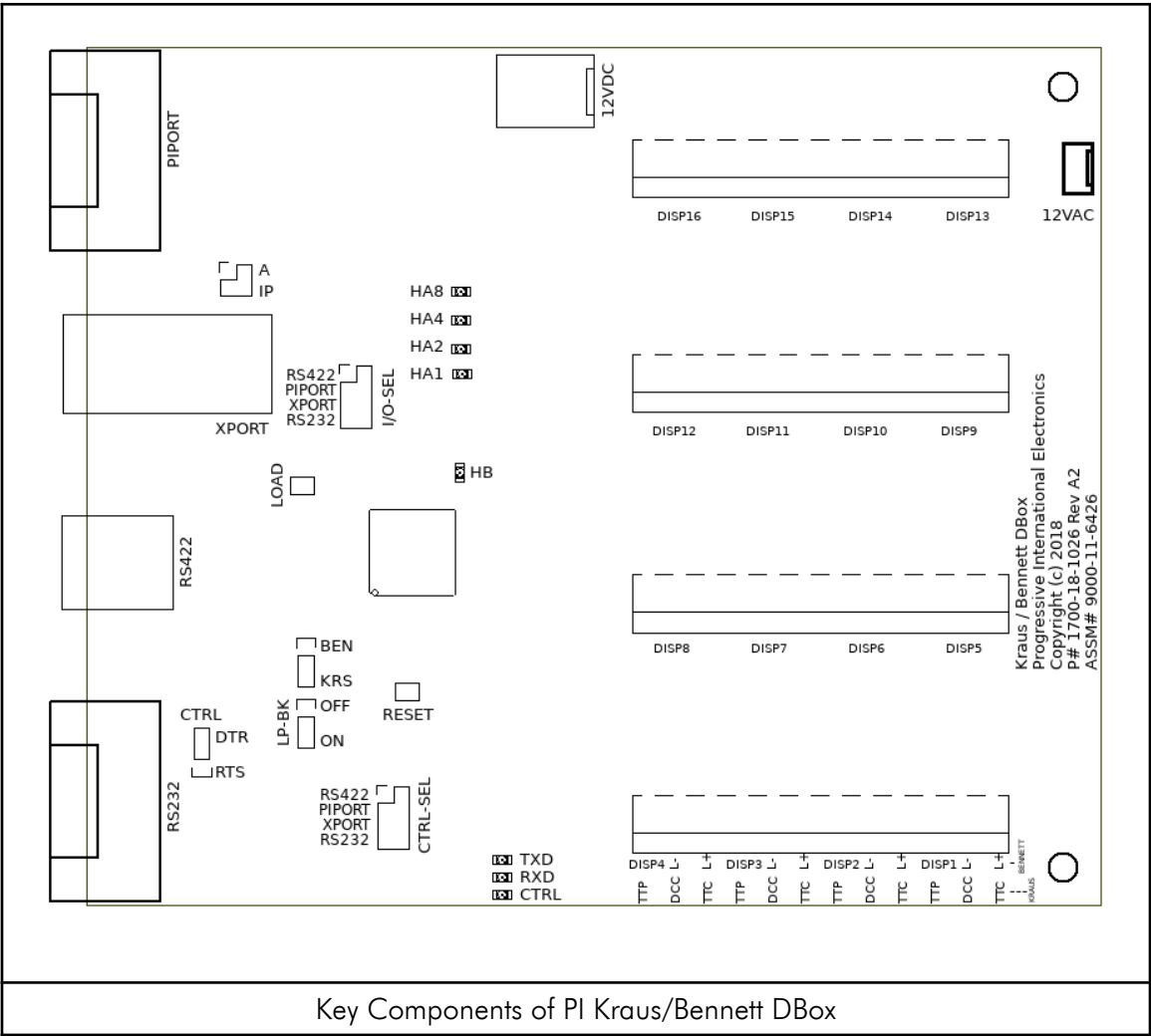
Hybrid Interface board

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Set the jumper (J17 for 9000-11-6601 or P12 for 9000-11-6701) for the desired interface type. Refer to the table below for help.

2. Set the jumper (J13 for 9000-11-6601 or P11 for 9000-11-6701) for the desired control. Refer to the table below for help.

3. Set the jumper (J11 for 9000-11-6601 or P25 for 9000-11-6701) for the desired use of Loopback. Refer to the table below for help.

Hybrid Interface Jumper Settings			
Interface Type	Interface Jumper	Control Jumper	Loopback Jumper
PIPort	PIPORT	PIPORT	LB ON
RS232	RS232	NTXD or /TXD	LB OFF
XPort	XPORT	XPORT	LB ON
RS422 (9000-11-6701 only)	RS422	RS422	LB ON

Note: Additional steps are dependent upon the internal board that will be used for the application. Give careful attention to which steps are needed for your particular application. Also, refer to the appropriate drawings for dip switch settings and dispenser wiring.
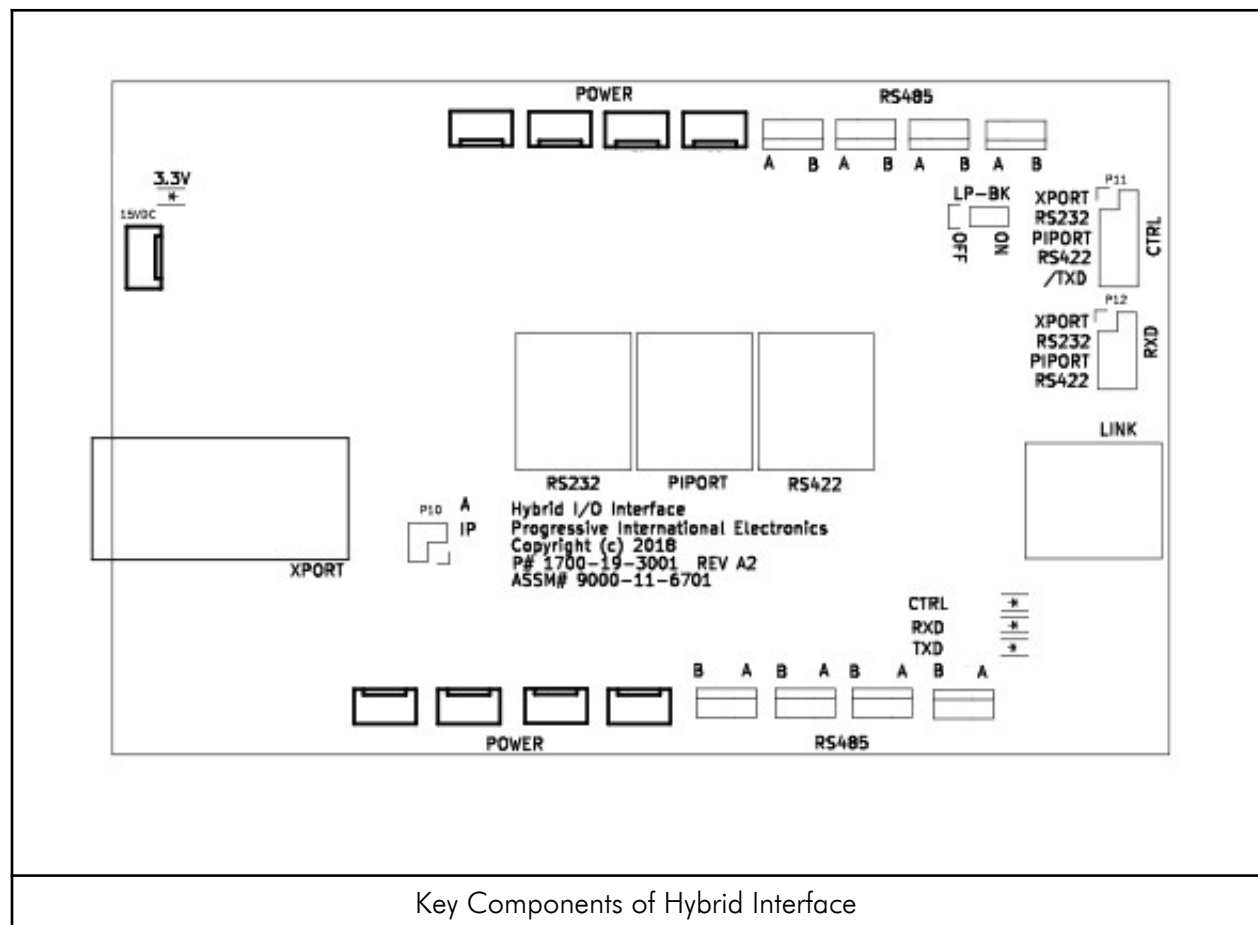
Key Components of Hybrid Interface

For applications using the Mechanical Relay board

1. Connect the dispenser wires to each Mechanical Relay board. Refer to the appropriate wiring diagram below that applies to the application.

2. Set SW4 for MECH.

3. Set the address for each Mechanical Relay board using SW1. Refer to the Mechanical Relay Dip Switch Settings table that follows.

4. Set the Pulser Type, Pulse Input (if necessary) and the Mode. Refer to the Mechanical Relay Dip Switch Settings table that follows.

5. Proceed with programming of system.

Key Components of Mechanical Relay

Mechanical Relay Dip Switch Settings									
SW1		1	2	3	4	5	6	7	8
Address	1	ON	ON	ON	ON	---	---	---	---
	2	OFF	ON	ON	ON	---	---	---	---
	3	ON	OFF	ON	ON	---	---	---	---
	4	OFF	OFF	ON	ON	---	---	---	---
	5	ON	ON	OFF	ON	---	---	---	---
	6	OFF	ON	OFF	ON	---	---	---	---
	7	ON	OFF	OFF	ON	---	---	---	---
	8	OFF	OFF	OFF	ON	---	---	---	---
	9	ON	ON	ON	OFF	---	---	---	---
	10	OFF	ON	ON	OFF	---	---	---	---
	11	ON	OFF	ON	OFF	---	---	---	---
	12	OFF	OFF	ON	OFF	---	---	---	---
	13	ON	ON	OFF	OFF	---	---	---	---
	14	OFF	ON	OFF	OFF	---	---	---	---
	15	ON	OFF	OFF	OFF	---	---	---	---
	16	OFF	OFF	OFF	OFF	---	---	---	---
Pulser	Dollar Pulses	---	---	---	---	ON	---	---	---
	Volume Pulses	---	---	---	---	OFF	---	---	---
Pulse Input[+]	0.1 Unit per Pulse	---	---	---	---	---	ON	---	---
	0.01 Unit per Pulse	---	---	---	---	---	OFF	---	---
Manual Mode	Console Control	---	---	---	---	---	---	---	ON
	Self Control	---	---	---	---	---	---	---	OFF

[+]*Only used if Switch 5 is OFF*

Preset Dispenser – Suction Pump Wiring Diagram

Preset Dispenser – Sub Pump Wiring Diagram

Preset Dispenser – High Flow Dispenser Wiring Diagram

PIE Relay Board

10	Pulser
9	Pulser
8	Aux Out
7	Aux In
6	Not Used
5	Large Valve
4	MotorReturn
3	Authorize
2	Neutral
1	Hot

Manual Override Switch — Manual / Auto

Breaker Panel — N, H1, H2

Red Jacket Relay

Submerged Pump Motor

Dispenser — Pulser, Large Valve (2 1), Handle Switch

Note: As this is a non-standard application, we recommend the following Operation Sequence:

To begin fueling operation
1 – Reset Mechanical computer on meter to zero
2 – Authorize the dispenser on POS system
3 – Dispense product
4 – Turn off switch when finished dispensing product

Mechanical Relay Board Voltage Readings								
	Idle	Lift Handle at Pump	Authorize	After Pump Reset	Start Flow	Stop Flow	Preset Limit Reached	Hang Up Handle
Hot	125 V	125 V	125 V	125 V	125 V	125 V	125 V	125 V
Authorize	125 V	0 V	125 V	125 V	125 V	125 V	0 V	125 V
Motor Return	0 V	0 V	0 V	125 V	125 V	125 V	0 V	0 V
Slow Down/Valve	0 V	0 V	0 V	0 V	125 V*	125 V	0 V	0 V
Aux In	125 V	125 V	125 V	125 V	125 V	125 V	125 V	125 V
Aux Out	0 V	0 V	0 V	125 V	125 V	125 V	0 V	0 V

* After three (3) counts, it changes from 0 V to 125 V

Notes:

- All measurements are from Neutral at the Mechanical Relay Board

- 0 V can be up to 5-10 V

- 125 V should be at least 110 V. Less than 110 V is a power problem at the site.

For applications using the EMR3 board

1. Connect the dispenser wires to the EMR3 board using the 3 position terminal block at P4.

2. Set SW4 for EMR3.

3. Set the address for each EMR3 board using SW1. Refer to the EMR3 Dip Switch Settings table that follows.

4. Set the Console/Manual Mode. Refer to the EMR3 Dip Switch Settings table that follows.

5. Proceed with programming of system.

Key Components of EMR3

EMR3 Dip Switch Settings									
SW1		1	2	3	4	5	6	7	8
Address	1	ON	ON	ON	ON	---	---	---	---
	2	OFF	ON	ON	ON	---	---	---	---
	3	ON	OFF	ON	ON	---	---	---	---
	4	OFF	OFF	ON	ON	---	---	---	---
	5	ON	ON	OFF	ON	---	---	---	---
	6	OFF	ON	OFF	ON	---	---	---	---
	7	ON	OFF	OFF	ON	---	---	---	---
	8	OFF	OFF	OFF	ON	---	---	---	---
	9	ON	ON	ON	OFF	---	---	---	---
	10	OFF	ON	ON	OFF	---	---	---	---
	11	ON	OFF	ON	OFF	---	---	---	---
	12	OFF	OFF	ON	OFF	---	---	---	---
	13	ON	ON	OFF	OFF	---	---	---	---
	14	OFF	ON	OFF	OFF	---	---	---	---
	15	ON	OFF	OFF	OFF	---	---	---	---
	16	OFF	OFF	OFF	OFF	---	---	---	---
Reserved	Reserved	---	---	---	---	ON	ON	ON	---
Manual Mode	Console Control	---	---	---	---	---	---	---	ON
	Self Control	---	---	---	---	---	---	---	OFF

For applications using the Multi-Pump board

The Hybrid Multi-Pump board can be used to communicate with Electronic dispensers on the same communication loop as Mechanical dispensers. Each board can connect to a maximum of two fueling positions. Configure the Hybrid Multi-Pump board as follows:

1. Connect the dispenser wires to the Multi-Pump board. Refer to the brand-specific sections of this manual for more information regarding the wiring.

Note: Each Multi-Pump board can handle only one set of dispenser wires.

2. Set the jumpers for the brand of dispener that is connected to the board. Refer to the Hybrid Multi-Pump Jumper Settings table below for help.

Hybrid Multi-Pump Jumper Settings			
Brand	J1	J2	K1
Gilbarco	CL	G	RS485
Wayne	CL	W	RS485
Deer	CL	20	RS485
Tokhiem	TOK	Not Used	RS485
Kraus	KRS	Not Used	RS485
Bennett 485, PMC, Tatsuno	485	Not Used	RS485

3. Set the address for the Multi-Pump board using SW1. If it is a single-sided dispenser, set the address for Channel 1 and Channel 2 for the same address. Refer to the Multi-Pump Dip Switch Settings - SW1 table that follows for help.

Note: All dispensers need to be addressed for fueling position 1 if it is a single-sided dispenser, or for 1 and 2 if it is a dual-sided dispenser.

4. Set the Dispenser Brand and I/O Type using SW2. The I/O Type will be RS485 for this application. Refer to the Multi-Pump Dip Switch Settings - SW2 table that follows for help.

5. Proceed with programming of system.

Note: Only Kraus 500 dispenser heads are supported. The Pump ID must be set to 1.

Note: Cannot handle Cash & Credit pricing. Cash and Credit prices must be the same.

Key Components of Multi-Pump
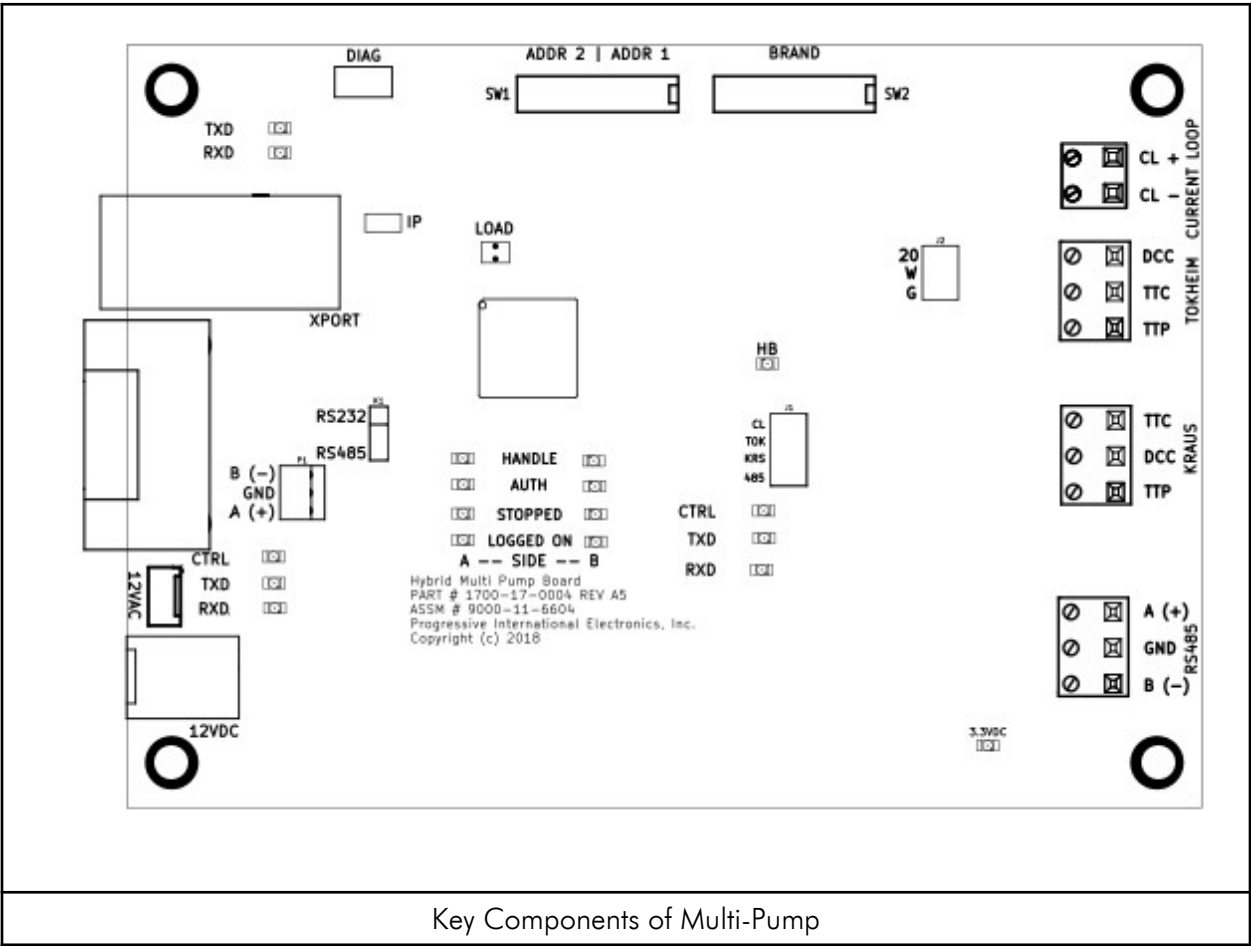
Multi-Pump Dip Switch Settings - SW1								
SW1		1	2	3	4	5	6	7	8
Channel 1 Address	1	OFF	OFF	OFF	OFF	---	---	---	---
	2	ON	OFF	OFF	OFF	---	---	---	---
	3	OFF	ON	OFF	OFF	---	---	---	---
	4	ON	ON	OFF	OFF	---	---	---	---
	5	OFF	OFF	ON	OFF	---	---	---	---
	6	ON	OFF	ON	OFF	---	---	---	---
	7	OFF	ON	ON	OFF	---	---	---	---
	8	ON	ON	ON	OFF	---	---	---	---
	9	OFF	OFF	OFF	ON	---	---	---	---
	10	ON	OFF	OFF	ON	---	---	---	---
	11	OFF	ON	OFF	ON	---	---	---	---
	12	ON	ON	OFF	ON	---	---	---	---
	13	OFF	OFF	ON	ON	---	---	---	---
	14	ON	OFF	ON	ON	---	---	---	---
	15	OFF	ON	ON	ON	---	---	---	---
	16	ON	ON	ON	ON	---	---	---	---
Channel 2 Address	1	---	---	---	---	OFF	OFF	OFF	OFF
	2	---	---	---	---	ON	OFF	OFF	OFF
	3	---	---	---	---	OFF	ON	OFF	OFF
	4	---	---	---	---	ON	ON	OFF	OFF
	5	---	---	---	---	OFF	OFF	ON	OFF
	6	---	---	---	---	ON	OFF	ON	OFF
	7	---	---	---	---	OFF	ON	ON	OFF
	8	---	---	---	---	ON	ON	ON	OFF
	9	---	---	---	---	OFF	OFF	OFF	ON
	10	---	---	---	---	ON	OFF	OFF	ON
	11	---	---	---	---	OFF	ON	OFF	ON
	12	---	---	---	---	ON	ON	OFF	ON
	13	---	---	---	---	OFF	OFF	ON	ON
	14	---	---	---	---	ON	OFF	ON	ON
	15	---	---	---	---	OFF	ON	ON	ON
	16	---	---	---	---	ON	ON	ON	ON

Multi-Pump Dip Switch Settings - SW2									
SW2		1	2	3	4	5	6	7	8
Dispenser Brand	No Pump (Demo)	OFF	OFF	OFF	OFF	OFF	---	---	---
	Gilbarco	ON	OFF	OFF	OFF	OFF	---	---	---
	Wayne	OFF	ON	OFF	OFF	OFF	---	---	---
	Tokheim	ON	ON	OFF	OFF	OFF	---	---	---
	Bennett (485)	OFF	OFF	ON	OFF	OFF	---	---	---
	PMC	ON	OFF	ON	OFF	OFF	---	---	---
	Deer	OFF	ON	ON	OFF	OFF	---	---	---
	Kraus	ON	ON	ON	OFF	OFF	---	---	---
	Tatsuno	OFF	OFF	OFF	ON	OFF	---	---	---
	Dong Hwa	ON	OFF	OFF	ON	OFF	---	---	---
	Nuovo Pignone	OFF	ON	OFF	ON	OFF	---	---	---
Reserved	Reserved	---	---	---	---	---	---	---	---
Operation	Clear Prices on Power Up	---	---	---	---	---	---	ON	---
	Normal Operation	---	---	---	---	---	---	OFF	---
I/O Type	RS232	---	---	---	---	---	---	---	ON
	RS485	---	---	---	---	---	---	---	OFF

PI DBox — Model Specific Installation
EZ Wire DBox

Note all warnings in System Installation Warnings section.

EZ Wire Style PI DBoxes are used with Gilbarco electronic dispensers with readers. Note dispenser-specific instructions for use with each dispenser. For overview, see Diagram: PI DBox — EZ Wire Style following these installation instructions.

Follow instructions in the installation section of the accompanying product manual before connecting PI DBox as follows:

1. Connect PI EZ Wire DBox to the single pair of wires connected to each dispenser. Referring to Diagram: PI DBox – EZ Wire – Analog Board, locate the pair of wires for each dispenser and bring them into the EZ Wire DBox. Ignore unused position(s) in the PI EZ Wire DBox. Ensure that the Positive and Negative wires are not crisscrossed, as this will cause communication problems.

2. The PI EZ Wire DBox has no Isolation/Normal jumpers. This DBox will automatically isolate a circuit that has an open loop.

Note: The next steps in the EZ Wire Style installation procedure are dependent upon the type of application — PIE application or other. Give careful attention to which steps are needed for your particular application. Also, refer to the appropriate drawings for jumper settings, interface connections and dispenser wiring.
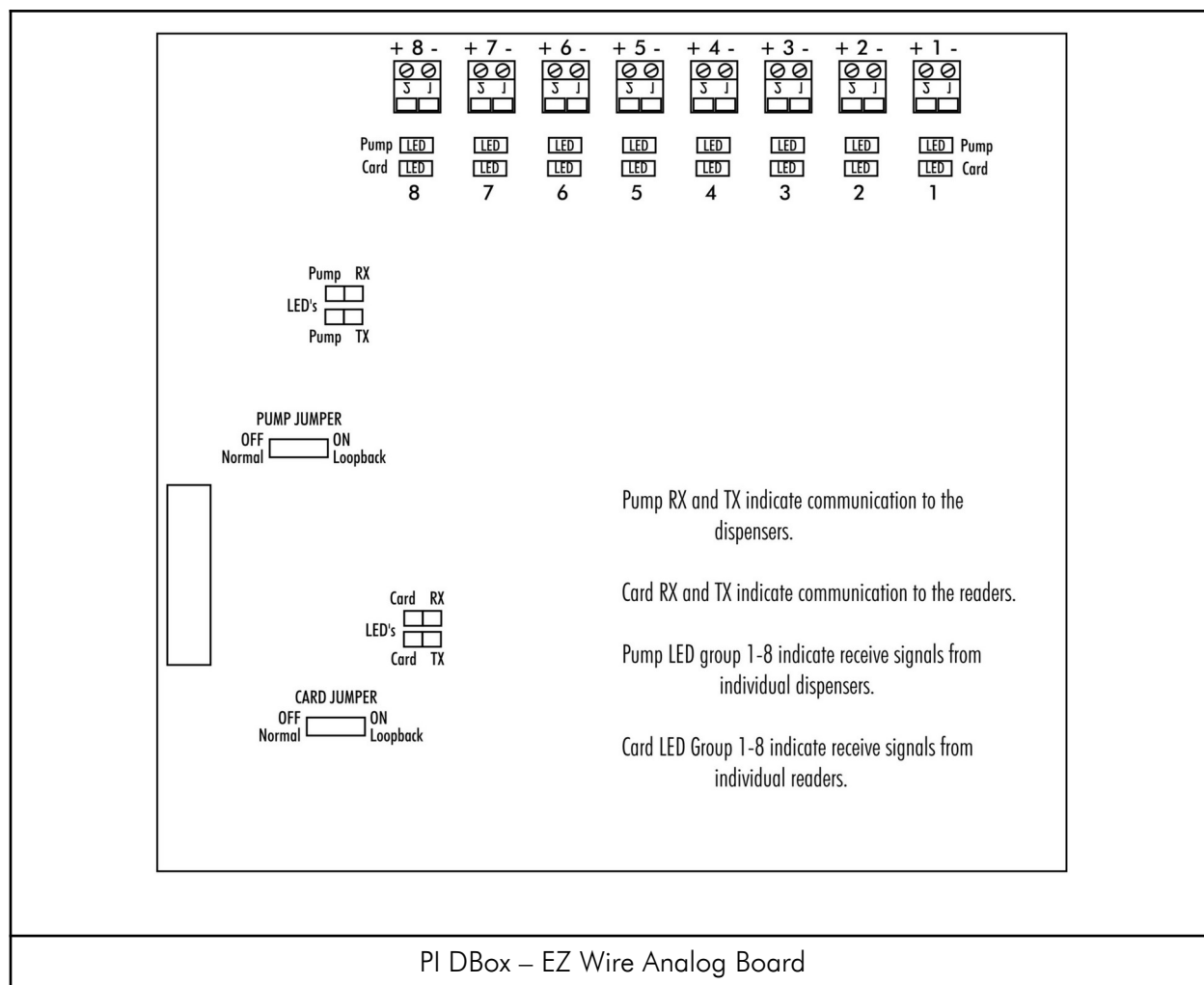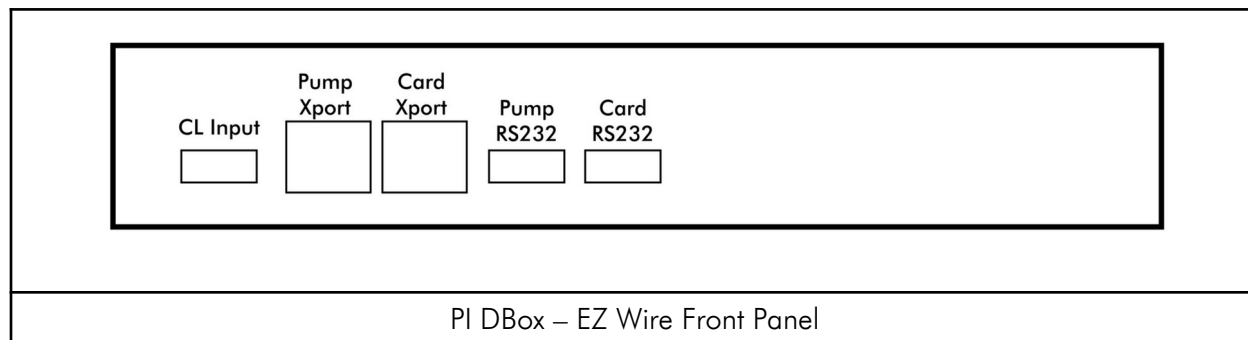

For applications using PIE ethernet connections (i.e., FuelDirect):

3. On the Main board, set jumpers JP1 and JP2 to the XPort setting or RS232. See Diagram: PI DBox – EZ Wire – Main Board

4. Referring to Diagram: PI DBox – EZ Wire – Front Panel, which follows, connect the computer with the FuelDirect software to either the XPort for the ethernet or to the RS232 port for RS232.

5. Proceed with programming the system.

For non-PIE applications, determine the type of connection required (i.e., Current Loop or RS232):

3. On the Main board, set dispenser jumper JP1 to either the Current Loop (CL) or RS232 setting. Set reader Jumper, JP2 to RS232.

4. Referring to the diagram of the front panel which follows, connect the dispenser/reader controller to either the Current Loop or RS232 for dispensers and to RS232 for readers.
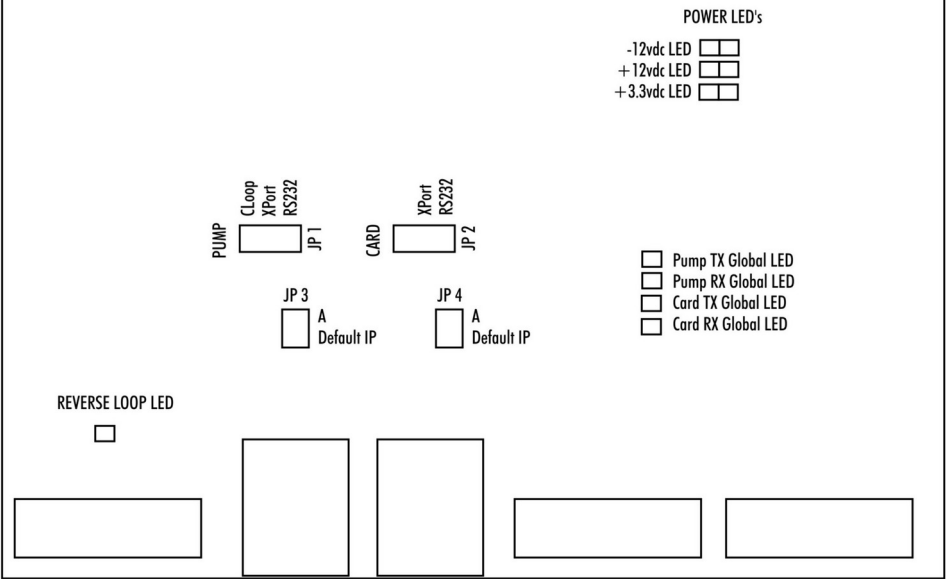
5. Determine whether the application requires loop back when using the RS232 connections. On the Analog board, set H3 and H4 to the appropriate positions (LB= loop back).

6. Proceed with programming the system.

CL Input   Pump Xport   Card Xport   Pump RS232   Card RS232
PI DBox – EZ Wire Front Panel

+ 8 -   + 7 -   + 6 -   + 5 -   + 4 -   + 3 -   + 2 -   + 1 -
Pump LED LED LED LED LED LED LED LED Pump
Card LED LED LED LED LED LED LED LED Card
8   7   6   5   4   3   2   1
Pump RX
LED's
Pump TX
PUMP JUMPER
OFF ─── ON
Normal   Loopback
Pump RX and TX indicate communication to the dispensers.
Card RX and TX indicate communication to the readers.
Card RX
LED's
Card TX
Pump LED group 1-8 indicate receive signals from individual dispensers.
CARD JUMPER
OFF ─── ON
Normal   Loopback
Card LED Group 1-8 indicate receive signals from individual readers.
PI DBox – EZ Wire Analog Board

Power LED's indicate corresponding voltages are present.

Global LED's indicate communication to dispensers and
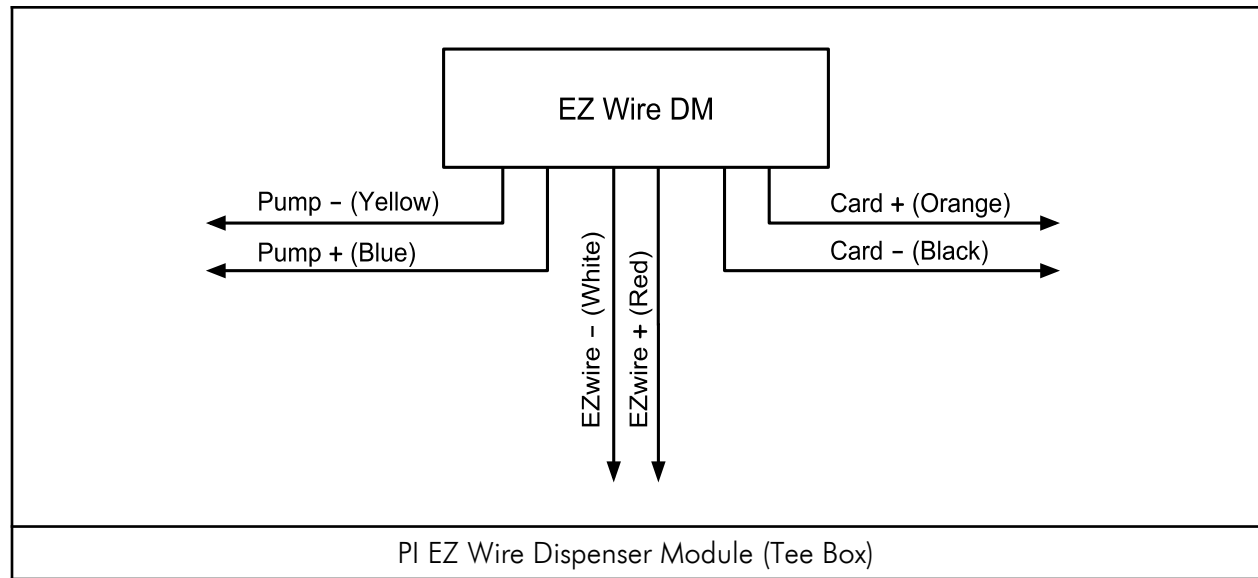   readers from the front-end connectors.

Jumpers J3 and J4 are only used with XPort.

POWER LED's

-12vdc LED
+12vdc LED
+3.3vdc LED

PUMP
CLoop
XPort
RS232
JP 1

CARD
XPort
RS232
JP 2

JP 3
A
Default IP

JP 4
A
Default IP

Pump TX Global LED
Pump RX Global LED
Card TX Global LED
Card RX Global LED

REVERSE LOOP LED

PI DBox – EZ Wire Main Board

EZ Wire Dispenser Module (Tee Box)

To use only a single pair of wires to the EZ Wire DBox, each dispenser must have an EZ Wire Dispenser Module (Tee Box) installed in the cabinet. Referring to Diagram: PI EZwire Dispenser Module, connect the Pump wires to the Blue and Yellow wires of the EZwire DM, connect the Card Reader wires to the Orange and Black wires, and connect the Red and White wires to the EZwire DBox.

| EZ Wire DM |
| Pump – (Yellow) | | Card + (Orange) |
| Pump + (Blue) | EZwire – (White) EZwire + (Red) | Card – (Black) |

PI EZ Wire Dispenser Module (Tee Box)

PI DBox
Troubleshooting and Diagnostics

LED Indicators

> When installing the PI DBox, refer to on-board LED indicators for troubleshooting assistance. LED layout is illustrated for all PI DBoxes in Diagram: Key Components of PI DBox under the manual section for each of these specific styles.

Additional Troubleshooting Steps for Unsuccessful Communications

1. Run one dispenser only by isolating all the rest at the site.

2. Recheck wires at dispenser junction box, as well as in the PI DBox.

3. On PI DBox models with power supply, make sure power is applied.

4. Make sure console or controller is plugged into the correct interface connector on the front of the PI DBox.

5. Ensure that all configuration jumpers or switches are set correctly for the application.

PI DBox
IP Addressing

The default IP address for the PI DBox is 192.168.0.200 for a dispenser DBox and 192.168.0.201 for a reader DBox. When the IP jumper is installed, the default address changes to 192.168.0.199. Since each device at the site must have a unique IP address, it may be necessary to reconfigure all DBoxes to avoid conflicting addresses on the network. The IP address for each PI DBox may be changed by using the following procedure.

Changing IP Address

Device Installer

1. Download Device Installer from the Support page of www.pie-corp.com.

2. After installation, open Device Installer and click on Search.

3. Select the xPort device listed on the right section of the program.

4. Click on Assign IP

    a) Verify that "Assign a specific IP address" is selected, then press Next.

    b) Type in the new IP Address (should automatically fill in Subnet Mask and Default Gateway) then press Next.

    c) Press Assign.

    d) Press Finish when it is complete.

5. Verify that the IP Address has changed to the new IP Address.

6. Once the update is complete, power cycle the DBox.