Introduction

Purpose

This manual provides information on the Universal Distribution Box [D-Box (PA0261XXXXXXX)]. The D-Box provides either an interface between Gilbarco® consoles and dispensing units with Two-wire Current Loop Interface (TWI) or between Passport® controller and dispensing units or CRIND®s with RS-422 interface. This D-Box works with all Gilbarco electronic fuel dispensing consoles and controllers.

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Required Tools and Materials

Following tools and materials are required for installing the Universal D-Box:

- Multimeter
- Wire Strippers
- Small Slotted Blade Screwdriver
- Small Phillips® Screwdriver
- Needle Nose Pliers
- Wire Nuts

Related Kit

Kit Number	Description
K93391-01	Pigtail Two-wire Cable Kit K93391-01

Required Reading

⚠ WARNING

Where fuels are involved, you are working in a dangerous environment of gasoline, gasoline vapor, and electricity. Failure to install this equipment in accordance with National Fire Protection Association (NFPA) 30A and NFPA 70® could result in severe injury or death.

Before installing the kits, read, understand, and follow:

- This manual.
- The National Electrical Code [NEC® (NFPA 70)].
- The automotive and marine service code (NFPA 30A).
- Any national, state, and local codes that may apply.

Failure to install the equipment in accordance with NFPA 30A and NFPA 70 may adversely affect the safe use and operation of the system.

For installation in Canada the installer must read and understand this manual, Canadian Standards Association (CSA) C22.1 (Canadian Electrical Code) and applicable federal, provincial, and local codes and regulations.

Specifications

Following are the specifications of the Universal D-Box:

Dimensions	
Height	7 13/16”
Width	16 9/32”
Depth	5 15/32”
Weight	5 lbs

Dedicated Isolated Ground Receptacle	
USA/Canada	115 VAC nominal, 50/60 Hz
International	230 VAC nominal, 50/60 Hz

Current
0.5 A @ 115 VAC
0.25 A @ 230 VAC

Operating Environment	
Minimum Temperature	+32 °F (0 °C)
Maximum Temperature	+130 °F (+55 °C)
Humidity	5-95% Rh (non-condensing)

Related Documents

Document Number	Title	GOLD℠ Library
MDE-2072	Transac® 12-G Installation Guide Communications Console	Transac Products
MDE-2383	Transac System 1000™ Installation Manual	Transac Products
MDE-2537	PAM™ 1000 System Controller Installation	Transac Products
MDE-2538	Pigtail Two-wire Cable Kit (K93391-01)	Transac Products
MDE-2713	Universal Distribution Box Installation Manual	• Advantage and Legacy • G-SITE® • POS Peripheral

Abbreviations and Acronyms

Term	Description
CRIND	Card Reader in Dispenser
CSA	Canadian Standards Association
D-Box	Distribution Box
G-CAT™	Gilbarco-Card Authorization Terminal
GND	Ground
GOLD	Gilbarco Online Documentation
LED	Light Emitting Diode
MPU	Microprocessor Unit
MTA	Mass Terminal Assembly
NEC	The National Electrical Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PCA	Printed Circuit Assembly
POS	Point of Sale
TAC	Technical Assistance Center
VDC	Voltage Direct Current

Important Safety Information

Notes: 1) Save this Important Safety Information section in a readily accessible location.

2) Although DEF is non-flammable, Diesel is flammable. Therefore, for DEF cabinets that are attached to Diesel dispensers, follow all the notes in this section that pertain to flammable fuels.

This section introduces the hazards and safety precautions associated with installing, inspecting, maintaining, or servicing this product. Before performing any task on this product, read this safety information and the applicable sections in this manual, where additional hazards and safety precautions for your task will be found. Fire, explosion, electrical shock, or pressure release could occur and cause death or serious injury, if these safe service procedures are not followed.

Preliminary Precautions
You are working in a potentially dangerous environment of flammable fuels, vapors, and high voltage or pressures. Only trained or authorized individuals knowledgeable in the related procedures should install, inspect, maintain, or service this equipment.

Emergency Total Electrical Shut-Off
The first and most important information you must know is how to stop all fuel flow to the pump/dispenser and island. Locate the switch or circuit breakers that shut off all power to all fueling equipment, dispensing devices, and Submerged Turbine Pumps (STPs).

⚠ WARNING

The EMERGENCY STOP, ALL STOP, and PUMP STOP buttons at the cashier's station WILL NOT shut off electrical power to the pump/dispenser. This means that even if you activate these stops, fuel may continue to flow uncontrolled.

You must use the TOTAL ELECTRICAL SHUT-OFF in the case of an emergency and not the console's ALL STOP and PUMP STOP or similar keys.

Total Electrical Shut-Off Before Access
Any procedure that requires access to electrical components or the electronics of the dispenser requires total electrical shut off of that unit. Understand the function and location of this switch or circuit breaker before inspecting, installing, maintaining, or servicing Gilbarco equipment.

Evacuating, Barricading, and Shutting Off
Any procedure that requires access to the pump/dispenser or STPs requires the following actions:

- An evacuation of all unauthorized persons and vehicles from the work area
- Use of safety tape, cones, or barricades at the affected unit(s)
- A total electrical shut-off of the affected unit(s)

Read the Manual
Read, understand, and follow this manual and any other labels or related materials supplied with this equipment. If you do not understand a procedure, call a Gilbarco Authorized Service Contractor or call the Technical Assistance Center (TAC) at 1-800-743-7501. It is imperative to your safety and the safety of others to understand the procedures before beginning work.

Follow the Regulations
Applicable information is available in National Fire Protection Association (NFPA) 30A; *Code for Motor Fuel Dispensing Facilities and Repair Garages*, NFPA 70; *National Electrical Code (NEC)*, Occupational Safety and Health Administration (OSHA) regulations and federal, state, and local codes. All these regulations must be followed. Failure to install, inspect, maintain, or service this equipment in accordance with these codes, regulations, and standards may lead to legal citations with penalties or affect the safe use and operation of the equipment.

Replacement Parts
Use only genuine Gilbarco replacement parts and retrofit kits on your pump/dispenser. Using parts other than genuine Gilbarco replacement parts could create a safety hazard and violate local regulations.

Safety Symbols and Warning Words

This section provides important information about warning symbols and boxes.

Alert Symbol

This safety alert symbol is used in this manual and on warning labels to alert you to a precaution which must be followed to prevent potential personal safety hazards. Obey safety directives that follow this symbol to avoid possible injury or death.

Signal Words
These signal words used in this manual and on warning labels tell you the seriousness of particular safety hazards. The precautions below must be followed to prevent death, injury, or damage to the equipment:

DANGER: Alerts you to a hazard or unsafe practice which will result in death or serious injury.

WARNING: Alerts you to a hazard or unsafe practice that could result in death or serious injury.

CAUTION with Alert symbol: Designates a hazard or unsafe practice which may result in minor injury.

CAUTION without Alert symbol: Designates a hazard or unsafe practice which may result in property or equipment damage.

Working With Fuels and Electrical Energy

Prevent Explosions and Fires
Fuels and their vapors will explode or burn, if ignited. Spilled or leaking fuels cause vapors. Even filling customer tanks will cause potentially dangerous vapors in the vicinity of the dispenser or island.

DEF is non-flammable. Therefore, explosion and fire safety warnings do not apply to DEF lines.

No Open Fire

Open flames from matches, lighters, welding torches, or other sources can ignite fuels and their vapors.

No Sparks - No Smoking

Sparks from starting vehicles, starting, or using power tools, burning cigarettes, cigars, or pipes can also ignite fuels and their vapors. Static electricity, including an electrostatic charge on your body, can cause a spark sufficient to ignite fuel vapors. Every time you get out of a vehicle, touch the metal of your vehicle, to discharge any electrostatic charge before you approach the dispenser island.

Working Alone

It is highly recommended that someone who is capable of rendering first aid be present during servicing. Familiarize yourself with Cardiopulmonary Resuscitation (CPR) methods, if you work with or around high voltages. This information is available from the American Red Cross. Always advise the station personnel about where you will be working, and caution them not to activate power while you are working on the equipment. Use the OSHA Lockout/Tagout procedures. If you are not familiar with this requirement, refer to this information in the service manual and OSHA documentation.

Working With Electricity Safely

Ensure that you use safe and established practices in working with electrical devices. Poorly wired devices may cause a fire, explosion, or electrical shock. Ensure that grounding connections are properly made. Take care that sealing devices and compounds are in place. Ensure that you do not pinch wires when replacing covers. Follow OSHA Lockout/Tagout requirements. Station employees and service contractors need to understand and comply with this program completely to ensure safety while the equipment is down.

Hazardous Materials

Some materials present inside electronic enclosures may present a health hazard if not handled correctly. Ensure that you clean hands after handling equipment. Do not place any equipment in the mouth.

⚠ WARNING

The pump/dispenser contains a chemical known to the State of California to cause cancer.

⚠ WARNING

The pump/dispenser contains a chemical known to the State of California to cause birth defects or other reproductive harm.

In an Emergency

Inform Emergency Personnel

Compile the following information and inform emergency personnel:

- Location of accident (for example, address, front/back of building, and so on)
- Nature of accident (for example, possible heart attack, run over by car, burns, and so on)
- Age of victim (for example, baby, teenager, middle-age, elderly)
- Whether or not victim has received first aid (for example, stopped bleeding by pressure, and so on)
- Whether or not a victim has vomited (for example, if swallowed or inhaled something, and so on)

⚠ WARNING

Gasoline/DEF ingested may cause unconsciousness and burns to internal organs. Do not induce vomiting. Keep airway open. Oxygen may be needed at scene. Seek medical advice immediately.

⚠ WARNING

DEF generates ammonia gas at higher temperatures. When opening enclosed panels, allow the unit to air out to avoid breathing vapors.
If respiratory difficulties develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention.

⚠ WARNING

Gasoline inhaled may cause unconsciousness and burns to lips, mouth, and lungs. Keep airway open. Seek medical advice immediately.

⚠ WARNING

Gasoline/DEF spilled in eyes may cause burns to eye tissue. Irrigate eyes with water for approximately 15 minutes. Seek medical advice immediately.

⚠ WARNING

Gasoline/DEF spilled on skin may cause burns. Wash area thoroughly with clear water. Seek medical advice immediately.

⚠ WARNING

DEF is mildly corrosive. Avoid contact with eyes, skin, and clothing. Ensure that eyewash stations and safety showers are close to the work location. Seek medical advice/recommended treatment if DEF spills into eyes.

IMPORTANT: Oxygen may be needed at scene if gasoline has been ingested or inhaled. Seek medical advice immediately.

Lockout/Tagout

Lockout/Tagout covers servicing and maintenance of machines and equipment in which the unexpected energization or start-up of the machine(s) or equipment or release of stored energy could cause injury to employees or personnel. Lockout/Tagout applies to all mechanical, hydraulic, chemical, or other energy, but does not cover electrical hazards. Subpart S of 29 CFR Part 1910 - Electrical Hazards, 29 CFR Part 1910.333 contains specific Lockout/Tagout provision for electrical hazards.

Overview

The Universal D-Box provides either an interface between:

- Gilbarco consoles and dispensing units with TWI or
- Between Passport controller and dispensing units or
- CRINDs with RS-422 interface

The distribution board(s) are configured with jumpers for either the TWI or RS-422 interface. The proper interface connector(s) to the controller is provided based on the model number of the Universal D-Box. This Universal D-Box works with all Gilbarco electronic fuel dispensing consoles and controllers.

Note: Interface cables between the D-Box and the console/controller are not included, and must be ordered separately. For information on proper length and type of cable, refer to MDE-2713 Universal Distribution Box (D-Box) Installation Manual.

The D-Box houses the power supply transformer and a removable tray with one or two Printed Circuit Assembly (PCA)s. The T17651 PCA contains a power supply, an opto-coupled current loop interface, an RS-422 interface, eight dispenser current loops, and automatic isolation circuitry. Two 4-channel Mass Terminal Assembly (MTA) pigtails are provided for each circuit board for field wiring.

Similarly, M14301 PCA contains power supply, opto-coupled current loop interface, an RS-422 interface, 16 dispenser current loops, and automatic isolation circuitry. All field wires will be terminated directly on box type connectors and there is no need of MTA pigtails.

Each data loop for both boards have current regulation and automatic isolation circuitry. The dispenser data loop drivers operate from an unregulated 12 V DC supply at 45 mA for dispensers and CRINDs, or 20 mA for G-CATs.

Notes: 1) Ensure that the boards are properly configured for 20 mA current loops when you are connecting the G-CATs to Universal D-Box to avoid any damage to the G-CAT Microprocessor Unit (MPU) boards.

2) Each Distribution Board (T17651) must be dedicated for use with either dispensing units, CRINDs, G-CATs, or (in the case of Transac System 1000 multiple consoles) consoles. On the distribution board mixing of the equipment are not allowed.

3) The M14301 Board contains two sections - A&B. Each section can handle eight loops. Each section must be dedicated for use with either dispensing units, CRINDs, G-CATs or consoles. On the distribution board mixing of the equipment is not allowed on any of the sections.

4) You can connect only one dispenser, CRIND, or G-CAT to any one data loop channel. The wiring length between the D-Box and the dispenser, CRIND, or G-CAT must not exceed 2,600 feet, and must contain a stranded or solid 14 AWG wire. Daisy chaining is not allowed with this unit. For Transac System 1000 three or four console installation, or for installing console data wiring into conduit, refer to MDE-2538 Pigtail Two-wire Cable Kit (K93391-01).

Components of D-Box

Each distribution board contains the following:

- Power supply
- TWI
- RS-422 interface
- Eight dispenser loop drive circuits with auto-isolation (T17651) or sixteen dispenser loop drive circuits with auto-isolation (M14301)

Both input interfaces provide opto-coupled isolation between the controller and the dispensers. The dispenser loop drive is configured in a star drive and operates from 12 V DC at 45 mA for dispensers and CRINDs or 20 mA for G-CATs.

Power Supply Circuit

Each board has two separate isolated power supply sections. One section is to provide voltage for the dispenser loop drivers (and associated logic) while the other section provides the voltage to operate the RS-422 interface. Each section uses a separate winding on the secondary of the transformer.

The dispenser loop drivers are powered from the filtered, but unregulated, 12 VDC. The unregulated 12 V may be between + 9 and + 15 VDC because of AC line variations. This unregulated 12 VDC is also regulated down to + 5 VDC for the loop driver logic.

The RS-422 section is powered from the 10 V secondary of the transformer. The unregulated 10 V may be between + 7 and + 13 VDC because of AC line variations. This voltage is rectified and filtered to provide the input current for the opto-couplers when the RS-422 interface is used. This filtered voltage is also regulated down to the + 5 VDC for the RS-422 driver.

The following three test points are provided for T17651 Board:

- RS +10 (unregulated + 10 VDC)
- RS + 5 (regulated + 5 VDC)
- RS GND (reference)

In case of M14301 Board above test points are brought to a header. Following are header TP1-7 details:

- RS_422_5 VDC (+ 5 VDC)
- RS_422_GND (RS-422 Ground)
- RS_422_RAW_DC (unregulated +10 VDC)
- VCCA (TWI + 5 VDC)
- VCCB (TWI + 5 VDC)
- GND (TWI Ground)
- VSS (TWI unregulated +12 VDC)

Notes: 1) These supplies are isolated. You must use the ground associated with the voltage test points to obtain meaningful readings.

2) If the D-Box has two Distribution Boards (T17651), you will need to check the test points on both boards to ensure that all required voltages are present.

Controller Interface (TWI)

The distribution board accepts current loop signals from a controlling device (console) through P102 (T17651 Board) or P102A/B (M14301 Board). These signals are isolated by opto-coupled isolators. The distribution board converts these signals into control voltages for driving the dispensing unit current loops.

The data from the dispenser current loops is converted to a control voltage, which in turn controls the current isolators.

The following three status indicators Light Emitting Diodes (LED)s are provided:

- Reverse Loop
- Point of Sale (POS) Transmit
- Pump Transmit

Reverse Loop

Lights if the input current loop from the controller are connected with reversed polarities.

Reverse Loop		
T17651 Board	-	LED CR37
M14301Board	-	LED D18 (A)
		LED D21 (B)

POS Transmit

Lights if current is flowing through the input loop. This LED will blink rapidly when data is present.

POS Transmit		
T17651 Board	-	LED CR39
M14301Board	-	LED D19 (A)
		LED D22 (B)

Pump Transmit

Blinks rapidly when dispenser data is being received.

Pump Transmit		
T17651 Board	-	LED CR38
M14301Board	-	LED D17 (A)
		LED D20 (B)

Controller Interface (RS-422)

The RS-422 Interface converts the 5 V signals (used by Passport controllers) to the 45 mA required by the opto-coupled isolators.

The three status LEDs - Reverse Loop, POS Transmit, and Pump Transmit operate in the same manner as with the TWI interface.

Notes: 1) During new installation and when replacing boards, verify jump jack settings for the proper site configuration. Prior to applying power, refer to MDE-2713 Universal Distribution Box Installation Manual.

2) If G-CATs are connected to boards configured for 45 mA operation, the MPU boards will be damaged.

Current Loop Interface

The dispenser current regulator section ensures that the proper current (selected by the 45 mA/20 mA jumper) flows through the loops. All dispensers and CRINDs must have the distribution board set for 45 mA. The loop voltage will vary with changes in the AC line voltage, but should always be between + 9 VDC and +15 VDC (Open Loop). When dispensers are connected, and operating normally, the voltage reading across the loop will be about 1.5 VDC (pulsing).

There is one indicator LED for each current loop. The LED status can be interpreted as:

Current Loop Interface - LED Status	
ON	Open current loop or isolate
OFF	Current loop OK, no data transmission
FLASHING	Normal operation, data being transmitted. (The LED normally appears to be dimly lit. This is because it is flashing so fast it cannot be detected).

Current Loop Test

To verify the dispenser/G-CAT current loop setting for proper settings, proceed as follows:

1. Disconnect the field wiring connectors from the board.

2. If the unit is set for TWI input, change to RS-422 and remove JP14 (for T17651 Board) or JP17A/B (for M14301). For more information on jumper settings, refer to *MDE-2713 Universal Distribution Box Installation Manual*.

3. Set multimeter for current (mA) measurement.

4. Set NORMAL/ISOLATE jumpers to NORMAL.
   Note: When jumpers are set to isolate; there is no voltage on the "+" pin of the MTA connector.

5 Connect the positive meter lead to the "+" pin of any output channel. Connect the negative meter lead to the corresponding "-" pin. Measure the current:
   - 45 mA - meter should show 42 to 48 mA.
   - 20 mA - meter should show 18 to 24 mA.

6 If unit is intended for TWI input, change jumpers from RS-422.

7 Replace JP14 (for T17651 Board) or JP17A/B (for M14301).

8 Replace field wiring connectors. Set NORMAL/ISOLATE jumpers for each channel.

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GILBARCO VEEDER-ROOT

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