

# TAC PACK TELEMETRY CONTROL UNIT



## TCU001 QUICK START GUIDE

## NOTICE

Data Flow Systems, Inc. assumes no responsibility for any errors that may appear in this document, nor does it make any commitment to update the information contained herein. However, questions regarding the information contained in this document are welcomed.

Data Flow Systems also reserves the right to make changes to the specifications of TAC Pack TCU and to the information contained in this document at any time without notice.

© Data Flow Systems, Inc.  
605 N. John Rodes Blvd., Melbourne, FL 32934  
Phone 321-259-5009  
Fax 321-259-4006  
[www.dataflowsys.com](http://www.dataflowsys.com)

DFS-00367-011-01

This document last updated October 10, 2008

This document provides a brief overview of the TCU's features and sufficient information to get the unit mounted and powered. Detailed information on wiring I/O, and configuring and using the TCU can be found in the *TCU Installation and Operation Manual* (see accompanying DFS Resource CD for PDF version of this manual). The CD also includes the *TCU Programming Reference* for those users who will be developing programs for custom TCU applications. The quick start guide and the manuals can be found on DFS' web site at [www.dataflowsys.com](http://www.dataflowsys.com).



### **⚠ WARNING**

This information is provided for qualified personnel only.

Improper installation, service, or maintenance can cause property damage, injury, or death.

Read the installation and operating instructions thoroughly before installing or servicing this equipment.



### **⚠ WARNING**

Precautionary measures must be observed when installing, operating, and servicing the TCU in order to prevent shock from voltages present.

If the TCU is to be installed into an existing control panel, make sure that all breakers are shut off before starting the installation.

All wiring must conform to federal, state, and local electrical codes.

---

## **DESCRIPTION**

---

The TAC Pack Telemetry Control Unit (TCU) is a microprocessor-controlled device.

There are several options for using the TCU's multiple input and output points.

- They can be used as non-intelligent I/O by setting the number of pumps to zero (0).
- They can be used in a pump control application.
- They can be manipulated logically with a DFS BASIC-52 program (much like a PLC).

Additionally, the TCU:

- Can communicate with and manipulate the I/O of up to 15 remote modules via a radio or network link.
- Can be incorporated into a Remote Terminal Unit (RTU) by using a Bus Extender Module (BEM).

The installed pump control application program enables the TCU to be easily implemented in lift station or storage tank applications. For a pump control application, the TCU contains all the hardware and software needed to control up to three motor starters.

Placing a custom BASIC program on the TCU enables it to perform a variety of automated tasks when interfaced with other telemetry equipment (DFS equipment, or RS-485 or RS-232 Modbus compatible devices). When used as a programmable device, the TCU can control up to six digital output devices, and monitor up to 12 digital and two analog input devices.

The TCU's dual functionality (its ability to use the built-in pump control process or a custom program) helps reduce overhead by enabling one unit to be used in either a pump control or programmable application.

---

## **PARTS LIST**

---

- ❖ TAC Pack TCU with integrated radio
- ❖ Installation kit
- ❖ DFS Resource CD

---

## **RECEIPT OF EQUIPMENT**

---

When equipment is received, examine the outside of the carton for any damage incurred during shipment. Remove the packing list and the equipment from the shipping carton. Carefully inspect the equipment for damage. Resolve any damage with the local carrier. Report damages to Data Flow Systems (321-259-5009). Include the serial number of the unit and the extent of damage in your report.



---

## FEATURES

---

- Backward compatibility with DFS' Pump Control Unit (PCU)
- Autodialer (optional) - The TCU001 can be ordered with this feature; an existing unit can be retrofitted at the factory.
- Integrated 10/100 network adapter (optional) - The TCU001 can be ordered with this feature; an existing unit can be retrofitted at the factory.
- Twelve digital inputs for monitoring level, contact closure, or pulse counter (not available with legacy PCU configuration)
- Two 12-bit analog inputs offer enhanced accuracy and increased resolution (not available with legacy PCU configuration).
- Six digital outputs - four solid state and two contact closure (one normally closed).
- Integrated digital radio (2 watts; 200 MHz) is on-site programmable.
- Dual double-speed microcontrollers (one for controlling functions; one for communication).
- True RMS AC phase monitor produces accurate and exact voltage readings for single- and three-phase power.
- RS-485 Modbus fieldbus half-duplex serial interface enables communication with industry standard devices and VFD motor controllers (not available with legacy PCU configuration).
- Configurable, auxiliary digital input can be used with pulse-type flow meters and rain gauges.
- Standard RS-232 Modbus radio interface acts as an interface to external industry standard radios.
- 34 LEDs provide system status at a glance.
- Three fail-safe Hand-Off-Auto (HOA) switches.
- Four connectorized wire terminals allow servicing or replacement of the unit without rewiring the control panel. No user configuration straps or jumpers are required.
- On-board BASIC line editor and 128 Kbytes of non-volatile random access memory (NOVRAM) for storing basic programs and for system use.
- 4 x 20-character LCD provides a large area for displaying data. The LCD's contrast is controlled by an onboard temperature sensor that ensures that the screen is easy to read in both high- and low-temperature conditions.
- 12-key membrane switch keypad and soft-power switch offers ease of use when powering up/down the TCU and when entering TCU configurations, and viewing and resetting alarms.
- Self-monitoring capabilities include an On state self test and monitoring of radio current and unit temperature.
- For each pump, elapsed run time and average run time meters are provided.
- HyperTAC II telemetry interface enables operators to remotely monitor off-site conditions and control equipment from a central location.

- Mounting options allow the TCU to be mounted to a front panel, or mounted flush against or stood off from the back plate of a control panel
- Integrated switching power supply
- Surge protection (non-destructive) and on-board voltage regulation
- Sealed radio compartment protects the internal radio against corrosion
- Battery backup with external battery (12V, 3.0Ah or 12V, 7.0Ah)
- Can be programmed using ladder logic via DFS' Virtual Logic Builder

---

## PIN NAME / WIRING DEFINITIONS

---

The tables below and on the next several pages provide pin names and descriptions for a TCU using the built-in pump controller application. For a custom TCU application, see the tables beginning on page 9.

### Pin Outs for Pump Controller Application

#### Top Connector 1: P1 (Pump Controller Mode)

PIN#	Name	Description	Electrical Rating
P1-1	PHASE_C	Phase C of the three-phase power monitor	120-240VAC, 60HZ, 100mA, 3-phase
P1-2	PHASE_B	Phase B of the three-phase power monitor	120-240VAC, 60HZ, 100mA, 3-phase
P1-3	PHASE_A	Phase A of the three-phase power monitor	120-240VAC, 60HZ, 100mA, 3-phase
P1-4	UNUSED	DO NOT CONNECT	
P1-5	AC_PWR	TCU's AC power	120VAC, 60HZ, 0.5A
P1-6	AC_NEUT	TCU's AC power neutral	120VAC, 60HZ, 0.5A
P1-7	TGND	Safety ground	Ground
P1-8	BAT+	Backup battery positive terminal	<24V / Not Rated
P1-9	BAT-	Backup battery negative terminal	<24V / Not Rated
P1-10	BEMGND	Isolated ground (wire to BEM001, pin 12)	<24V / Not Rated
P1-11	BEM_PWR	Isolated power (wire to BEM001, pin 10)	<24V / Not Rated
P1-12	BEM_CTS	Isolated clear to send (wire to BEM001, pin 6)	<24V / Not Rated
P1-13	BEM_RXD	Isolated receive data (wire to BEM001, pin 4)	<24V / Not Rated
P1-14	BEM_TXD	Isolated transmit data (wire to BEM001, pin 2)	<24V / Not Rated
P1-15	BEM_RTS	Isolated request to send (wire to BEM001, pin 8)	<24V / Not Rated

<b>PIN#</b>	<b>Name</b>	<b>Description</b>	<b>Electrical Rating</b>
P1-16	ALM_HORN	Load side of alarm horn relay (NO)	120VAC, 60HZ, 0.5A, Tungsten, 0-24VDC, 1A
P1-17	ALM_LITE	Load side of alarm light relay (NC)	120VAC, 60HZ, 0.5A, Tungsten, 0-24VDC, 1A
P1-18	ALM_PWR	Line side of alarm relays	120VAC, 60HZ, 1A, 0-24VDC, 2A, Source
P1-19	AUX_OUT	Load side of auxiliary relay	120-240VAC, 60HZ, 1A, Pilot Duty
P1-20	AUX_PWR	Line side of auxiliary relay	120-240VAC, 60HZ, 1A, Source
P1-21	MTR3_STR	Load side of motor starter 3 relay	120-240VAC, 60HZ, 1A, Pilot Duty
P1-22	MTR2_STR	Load side of motor starter 2 relay	120-240VAC, 60HZ, 1A, Pilot Duty
P1-23	MTR1_STR	Load side of motor starter 1 relay	120-240VAC, 60HZ, 1A, Pilot Duty
P1-24	STRT_PWR	Line side of motor starter relays	120-240VAC, 60HZ, 3A, Source

### Top Connector 2: P3 (Pump Controller Mode)

<b>PIN#</b>	<b>Name</b>	<b>Description</b>	<b>Electrical Rating</b>
P3-1	ST_ADDR0	Station address bit 0 (value 1)	<24V / Not Rated
P3-2	ST_ADDR1	Station address bit 1 (value 2)	<24V / Not Rated
P3-3	ST_ADDR2	Station address bit 2 (value 4)	<24V / Not Rated
P3-4	ST_ADDR3	Station address bit 3 (value 8)	<24V / Not Rated
P3-5	ST_ADDR4	Station address bit 4 (value 16)	<24V / Not Rated
P3-6	ST_ADDR5	Station address bit 5 (value 32)	<24V / Not Rated
P3-7	ST_ADDR6	Station address bit 6 (value 64)	<24V / Not Rated
P3-8	ST_ADDR7	Station address bit 7 (value 128)	<24V / Not Rated
P3-9	ST_ADDR8	Station address bit 8 (value 256)	<24V / Not Rated
P3-10	GND	Station address ground	<24V / Not Rated
P3-11	INV'	Invert data	<24V / Not Rated
P3-12	SWAP'	Swap data	<24V / Not Rated
P3-13	CFG_BIT2	Unused - do not connect	<24V / Not Rated
P3-14	CFG_BIT3	Unused - do not connect	<24V / Not Rated
P3-15	GND	Configuration ground	<24V / Not Rated



PIN#	Name	Description	Electrical Rating
P3-16	EARTH_GND	Earth ground/lanyard	Not Connected
P3-17		Unused	Not Connected
P3-18		Unused	Not Connected

### Bottom Connector 1: P2 (Pump Controller Mode)

PIN#	Name	Description	Electrical Rating
P2-1	MTR1_RUN	Motor 1 run digital monitor input	10-30VAC/DC@10mA
P2-2	MTR2_RUN	Motor 2 run digital monitor input	10-30VAC/DC@10mA
P2-3	MTR3_RUN	Motor 3 run digital monitor input	10-30VAC/DC@10mA
P2-4	EXT_PM	External phase monitor digital monitor input	10-30VAC/DC@10mA
P2-5	IN_COM_1	Common return for motor run and external phase monitor input	10-30VAC/DC@40mA RTN
P2-6	LOW_LVL	Low Level digital monitor input	10-30VAC/DC@10mA
P2-7	OFF_LVL	Off Level digital monitor input	10-30VAC/DC@10mA
P2-8	LEAD_LVL	Lead Level digital monitor input	10-30VAC/DC@10mA
P2-9	LAG1_LVL	Lag1 Level digital monitor input	10-30VAC/DC@10mA
P2-10	LAG2_LVL	Lag2 Level digital monitor input	10-30VAC/DC@10mA
P2-11	HIGH_LVL	High Level digital monitor input	10-30VAC/DC@10mA
P2-12	AUX_IN	Auxiliary digital monitor input	10-30VAC/DC@10mA
P2-13	ALM_SIL	Alarm Silence Switch digital monitor input	10-30VAC/DC@10mA
P2-14	IN_COM_2	Common return for input level, aux inputs, and alarm silence switch	10-30VAC/DC@80mA RTN
P2-15	ISOGND	Internally supplied 24 VDC bias source return	<24V / Not Rated
P2-16	ISO+24V	Internally supplied 24 VDC bias source voltage	<24V / Not Rated
P2-17	TXD_232	RS-232 transmit data to external device	<24V / Not Rated
P2-18	RXD_232	RS-232 receive data from external device	<24V / Not Rated
P2-19	GND	RS-232 ground	<24V / Not Rated

<b>PIN#</b>	<b>Name</b>	<b>Description</b>	<b>Electrical Rating</b>
P2-20	TGND	Shield for analog monitor signals	Ground
P2-21	ANALOG2+ (C2)	4-20mA+ signal from transducer; - signal at pin P2-23	<24V / Not Rated
P2-22	ANALOG1+ (C1)	0-5VDC or 4-20mA+ signal from transducer; - signal at pin P2-23; jump pin P2-24 to P2-23 for a 4-20mA C1 signal	<24V / Not Rated
P2-23	ANALOG-	- signal return for both analog inputs C1 and C2 at P2-22 and P2-21	<24V / Not Rated
P2-24	SHUNT	250 ohm shunt resistor; jump to P2-23 with 4-20mA signal for C1 at P2-22 only	<24V / Not Rated

#### Bottom Connector 2: P4 (Pump Controller Mode)

<b>PIN#</b>	<b>Name</b>	<b>Description</b>	<b>Electrical Rating</b>
P4-1	Unused	Reserved for future use; do not connect	<24V / Not Rated
P4-2	Unused	Reserved for future use; do not connect	<24V / Not Rated
P4-3	RS485_B	RS-485 serial interface B	<24V / Not Rated
P4-4	RS485_A	RS-485 serial interface A	<24V / Not Rated
P4-5	EX_SHIELD	Cable shield for RS-485 or RS-232 cable	Ground
P4-6	EX_GND_RAD	RS-232 ground	<24V / Not Rated
P4-7	RTS_RAD	RS-232 Request to send	<24V / Not Rated
P4-8	EX_TXD_RAD	RS-232 transmit data to external device	<24V / Not Rated
P4-9	EX_RXD_RAD	RS-232 receive data from external device	<24V / Not Rated
P4-10	CTS_RAD	RS-232 clear to send	<24V / Not Rated
P4-11		Unused	Not Connected
P4-12		Unused	Not Connected
P4-13		Unused	Not Connected
P4-14		Unused	Not Connected

## Pin Outs for Programmable Application

### Top Connector 1: P1 (Programmable Application)

PIN#	Name	Description (Electrical Rating)	HyperTAC II Address
P1-1	PHASE_C	Phase C of the three-phase power monitor (120-240VAC, 60HZ, 100mA, 3-phase)	C4
P1-2	PHASE_B	Phase B of the three-phase power monitor (120-240VAC, 60HZ, 100mA, 3-phase)	C3
P1-3	PHASE_A	Phase A of the three-phase power monitor (120-240VAC, 60HZ, 100mA, 3-phase)	B11
P1-4	UNUSED	DO NOT CONNECT	--
P1-5	AC_PWR	TCU's AC power (120VAC, 60HZ, 0.5A)	B9
P1-6	AC_NEUT	TCU's AC power neutral (120VAC, 60HZ, 0.5A)	--
P1-7	TGND	Safety ground	--
P1-8	BAT+	Backup battery positive terminal (<24V/not rated)	--
P1-9	BAT-	Backup battery negative terminal (<24V/not rated)	--
P1-10	BEMGND	Isolated ground (wire to BEM001, pin 12) (<24V/not rated)	--
P1-11	BEM_PWR	Isolated power (wire to BEM001, pin 10) (<24V/not rated)	--
P1-12	BEM_CTS	Isolated clear to send (wire to BEM001, pin 6) (<24V/not rated)	--
P1-13	BEM_RXD	Isolated receive data (wire to BEM001, pin 4) (<24V/not rated)	--
P1-14	BEM_TXD	Isolated transmit data (wire to BEM001, pin 2) (<24V/not rated)	--
P1-15	BEM_RTS	Isolated request to send (wire to BEM001, pin 8) (<24V/not rated)	--
P1-16	DIGITAL OUTPUT POINT	120VAC, 60HZ, 0.5A, Tungsten, 0-24VDC, 1A output; normally open contact; source from pin P1-18	B5
P1-17	DIGITAL OUTPUT POINT	120VAC, 60HZ, 0.5A, Tungsten, 0-24VDC, 1A output; normally closed contact; source from pin P1-18	B6
P1-18	CONTROL POWER	120VAC, 60HZ, 1A, 0-24VDC, 2A source voltage for outputs at pins P1-16 and P1-17	--

<b>PIN#</b>	<b>Name</b>	<b>Description (Electrical Rating)</b>	<b>HyperTAC II Address</b>
P1-19	DIGITAL OUTPUT POINT	120-240VAC, 60HZ, 1A, Pilot Duty output; source voltage at P1-20	B4
P1-20	CONTROL POWER	120-240VAC, 60HZ, 1A, Source voltage for output at pin P1-19	--
P1-21	DIGITAL OUTPUT POINT	120-240VAC, 60HZ, 1A, Pilot Duty output; source voltage at pin P1-24	B3
P1-22	DIGITAL OUTPUT POINT	120-240VAC, 60HZ, 1A, Pilot Duty output; source voltage at pin P1-24	B2
P1-23	DIGITAL OUTPUT POINT	120-240VAC, 60HZ, 1A, Pilot Duty output; source voltage at pin P1-24	B1
P1-24	CONTROL POWER	120-240VAC, 60HZ, 3A, source voltage for outputs at pins P1-21, P1-22, P1-23	--

### Top Connector 2: P3 (Programmable Application)

<b>PIN#</b>	<b>Name</b>	<b>Description (Electrical Rating)</b>	<b>HyperTAC II Address</b>
P3-1	ST_ADDR0	Station address bit 0 (value 1) (<24V/not rated)	--
P3-2	ST_ADDR1	Station address bit 1 (value 2) (<24V/not rated)	--
P3-3	ST_ADDR2	Station address bit 2 (value 4) (<24V/not rated)	--
P3-4	ST_ADDR3	Station address bit 3 (value 8) (<24V/not rated)	--
P3-5	ST_ADDR4	Station address bit 4 (value 16) (<24V/not rated)	--
P3-6	ST_ADDR5	Station address bit 5 (value 32) (<24V/not rated)	--
P3-7	ST_ADDR6	Station address bit 6 (value 64) (<24V/not rated)	--
P3-8	ST_ADDR7	Station address bit 7 (value 128) (<24V/not rated)	--
P3-9	ST_ADDR8	Station address bit 8 (value 256) (<24V/not rated)	--
P3-10	GND	Station address ground (<24V/not rated)	--
P3-11	INV'	Invert data (<24V/not rated)	--
P3-12	SWAP'	Swap data (<24V/not rated)	--
P3-13	CFG_BIT2	Unused - do not connect	--
P3-14	CFG_BIT3	Unused - do not connect	--
P3-15	GND	Configuration ground	--

PIN#	Name	Description (Electrical Rating)	HyperTAC II Address
P3-16	EARTH_GND	Earth ground/lanyard	--
P3-17			--
P3-18			--

### Bottom Connector 1: P2 (Programmable Application)

PIN#	Name	Description (Electrical Rating)	HyperTAC II Address
P2-1	DIGITAL INPUT POINT	10-30VAC/DC@10mA Digital monitor point (>30V requires resistor); common at pin P2-5	A1
P2-2	DIGITAL INPUT POINT	10-30VAC/DC@10mA Digital monitor point (>30V requires resistor); common at pin P2-5	A2
P2-3	DIGITAL INPUT POINT	10-30VAC/DC@10mA Digital monitor point (>30V requires resistor); common at pin P2-5	A3
P2-4	DIGITAL INPUT POINT	10-30VAC/DC@10mA Digital monitor point (>30V requires resistor); common at pin P2-5	A4
P2-5	DIGITAL INPUT COMMON	10-30VAC/DC@40mA RTN Input Common 1 for digital inputs P2-1 through P2-4 (>30V require dropping resistors)	--
P2-6	DIGITAL INPUT POINT	10-30VAC/DC@10mA Low Level digital monitor input	A5
P2-7	DIGITAL INPUT POINT	10-30VAC/DC@10mA Off Level digital monitor input	A6
P2-8	DIGITAL INPUT POINT	10-30VAC/DC@10mA Lead Level digital monitor input	A7
P2-9	DIGITAL INPUT POINT	10-30VAC/DC@10mA Lag1 Level digital monitor input	A8
P2-10	DIGITAL INPUT POINT	10-30VAC/DC@10mA Lag2 Level digital monitor input	A9
P2-11	DIGITAL INPUT POINT	10-30VAC/DC@10mA High Level digital monitor input	A10
P2-12	DIGITAL INPUT POINT	10-30VAC/DC@10mA Auxiliary digital monitor input	A12
P2-13	DIGITAL INPUT POINT	10-30VAC/DC@10mA Alarm Silence Switch digital monitor input	B7
P2-14	DIGITAL INPUT COMMON	10-30VAC/DC@80mA RTN Input Common 2 for digital inputs P2-6 through P2-13 (>30V require dropping resistors)	--
P2-15	ISOGND	Internally supplied 24 VDC bias source return (<24V/not rated)	--

<b>PIN#</b>	<b>Name</b>	<b>Description (Electrical Rating)</b>	<b>HyperTAC II Address</b>
P2-16	ISO+24V	Internally supplied 24 VDC bias source voltage (<24V/not rated)	B10
P2-17	TXD_232	RS-232 transmit data to external device (<24V/not rated)	--
P2-18	RXD_232	RS-232 receive data from external device (<24V/not rated)	--
P2-19	GND	RS-232 ground (<24V/not rated)	--
P2-20	TGND	Shield for analog monitor signals	--
P2-21	ANALOG2+ (C2)	4-20mA+ signal from transducer; - signal at pin P2-23 (<24V/not rated)	C2
P2-22	ANALOG1+ (C1)	0-5VDC or 4-20mA+ signal from transducer; - signal at pin P2-23; jump pin P2-24 to P2-23 for a 4-20mA C1 signal (<24V/not rated)	C1
P2-23	ANALOG-	- signal return for both analog inputs C1 and C2 at P2-22 and P2-21 (<24V/not rated)	--
P2-24	SHUNT	250 ohm shunt resistor; jump to P2-23 with 4-20mA signal for C1 at P2-22 only (<24V/not rated)	--

#### Bottom Connector 2: P4 (Programmable Application)

<b>PIN#</b>	<b>Name</b>	<b>Description (Electrical Rating)</b>	<b>HyperTAC II Address</b>
P4-1	Unused	Reserved for future use; do not connect	--
P4-2	Unused	Reserved for future use; do not connect	--
P4-3	RS485_B	RS-485 serial interface B (<24V/not rated)	--
P4-4	RS485_A	RS-485 serial interface A (<24V/not rated)	--
P4-5	EX_SHIELD	Cable shield for RS-485 or RS-232 cable	--
P4-6	EX_GND_RAD	RS-232 ground (<24V/not rated)	--
P4-7	RTS_RAD	RS-232 Request to send (<24V/not rated)	--
P4-8	EX_TXD_RAD	RS-232 transmit data to external device (<24V/not rated)	--
P4-9	EX_RXD_RAD	RS-232 receive data from external device (<24V/not rated)	--
P4-10	CTS_RAD	RS-232 clear to send (<24V/not rated)	--

PIN#	Name	Description (Electrical Rating)	HyperTAC II Address
P4-11		Unused	--
P4-12		Unused	--
P4-13		Unused	--
P4-14		Unused	--

---

## SAFETY PRECAUTIONS

---

Review the following statements before installing, servicing, or replacing the Tack PAC Telemetry Control Unit (TCU) or any of its components.

### General Precautions

- Only trained and qualified personnel should install, service, or replace this equipment.
- Carefully read the installation and wiring instructions before connecting the TCU to its power source.
- Do not work on the TCU, or connect or disconnect any of its cables, during periods of lightning activity.
- To prevent overheating the TCU, do not operate it in an area that exceeds the maximum recommended temperature of -10°C to 60°C (14°F to 140°F). The upper temperature limit is 50°C (122°F) when using the recommended backup battery.
- Ensure that the unit is connected to earth ground during normal use.
- Precautionary measures must be observed when installing, operating, and servicing the TCU in order to prevent shock from voltages present.
- If the TCU is to be installed into an existing control panel, make sure that all breakers are shut off before starting the installation.
- All wiring should conform to federal, state, and local electrical codes.

### Working with the TCU

Before working with the TCU where the removal of components is necessary, perform the following steps in the sequence indicated:

1. Power down the unit.
2. Turn off all circuit breakers to the TCU.
3. Ensure that any cables connected to the TCU will not become entangled in or caught on anything in the surrounding area.

**IMPORTANT:** If the TCU's Power LED is not lit, you should assume that the TCU is still powered. The Power LED indicates only that the TCU is in the off state, not that AC power has been removed. To remove power, you must turn off the external circuit breaker.

When disconnecting a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; when disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. When pulling connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before connecting a cable, make sure both connectors are correctly oriented and aligned.

### **Protecting Against Electrostatic Discharge**

Static electricity can harm delicate components inside the TCU. To prevent static damage, put on an electrostatic discharge wrist strap before touching any of the TCU's electronic components.

In addition to the preceding precautions, the following steps can be taken to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until ready to install the component in the TCU. Be sure to put on an electrostatic discharge wrist strap before unwrapping the antistatic packaging.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. Place the equipment on a grounded surface. If possible, use antistatic floor pads and workbench pads.

**Note:** Contact DFS if electrostatic discharge packaging is needed for return shipments. See Return Authorization (RA) Procedure, p. 15 for more information on returning equipment.

### **Using the TCU**

When using the TCU, observe the following safety guidelines:

- To help prevent electric shock, wire the TCU and peripheral power cables into properly grounded power sources.
- Be sure nothing rests on the TCU's cables and that the cables are not located where they can be stepped on or tripped over.



---

## INSTALLATION

---

### Site Selection

When selecting a site for the TCU, keep the following in mind:

- The TCU requires a 120 VAC power supply.
- The TCU is designed to operate at recommended temperature range of -10°C to 60°C (14°F to 140°F). The upper temperature limit is 50°C (122°F) when using the recommended backup battery.
- The TCU is intended to be permanently installed in a NEMA 12 or higher rated panel that prevents access to live parts without a tool.
- Attention should be given to the location of the TCU to provide accessibility for wiring and servicing. Leave enough space around the TCU to access the TCU's fuse and to remove the connectorized terminal strips. Install the TCU in the panel at a position where the LCD display can be read comfortably. The LCD is best viewed at slightly below eye level.

### Mounting Instructions

The TCU is intended to be permanently installed in a NEMA 12 or higher rated panel that prevents access to live parts without a tool. The TCU can be mounted in a control panel in several different ways. The unit can be mounted flush to the back plate of the panel, stood off the back plate, or mounted to a front panel. Mounting brackets are provided with the TCU that can be used to mount it in any of these positions. Optional connectors to facilitate the various types of mountings are available as shown on page 13, "Attaching Connectors" and may be specified as described in Appendix C: Parts List of the *TCU Installation and Operation Manual*.

#### **IMPORTANT**

A qualified technician should install the TCU.

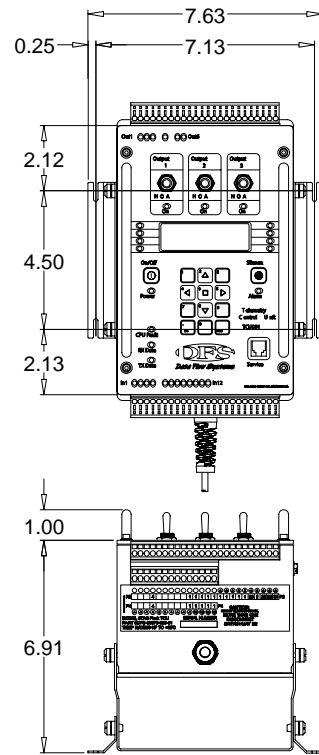
Precautionary measures must be observed when installing, operating, and servicing the TCU in order to prevent shock from voltages present.

If the TCU is to be installed into an existing control panel, make sure that all breakers are shut off before starting the installation.

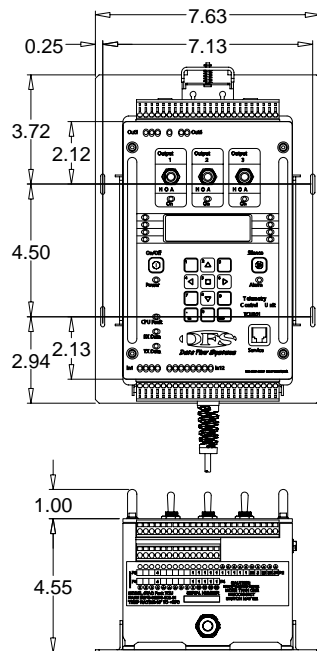
### TAC Pack Adapter

This mounting option is available when a TCU is replacing a rear-panel mounted PCU. It uses the preinstalled PCU mounting bracket and brings the TCU to the same level as the PCU it is replacing.

This option uses the Retro installation kit (Basic Install Kit or Full Install Kit). See Appendix C: Parts List in the *TCU Installation and Operation Manual*.



### Snap-In (Back Panel) Mount



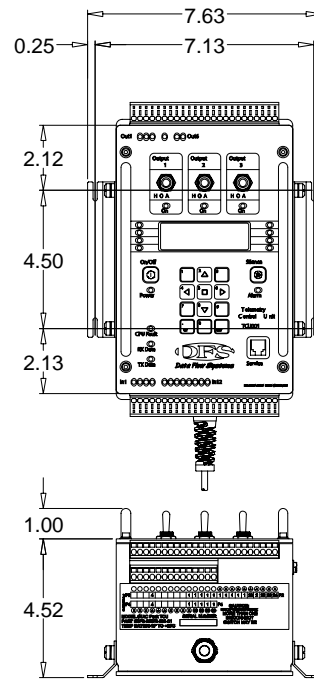
The snap-in mount is available for new installations (i.e., TCU is not replacing a PCU). The mounting bracket is attached to the back of the control panel, and the TCU is snapped into place. With this mounting option, the TCU can be installed and removed quickly and easily.

This option uses the Snap In installation kit (Basic Install Kit or Full Install Kit). See Appendix C: Parts List in the *TCU Installation and Operation Manual*.

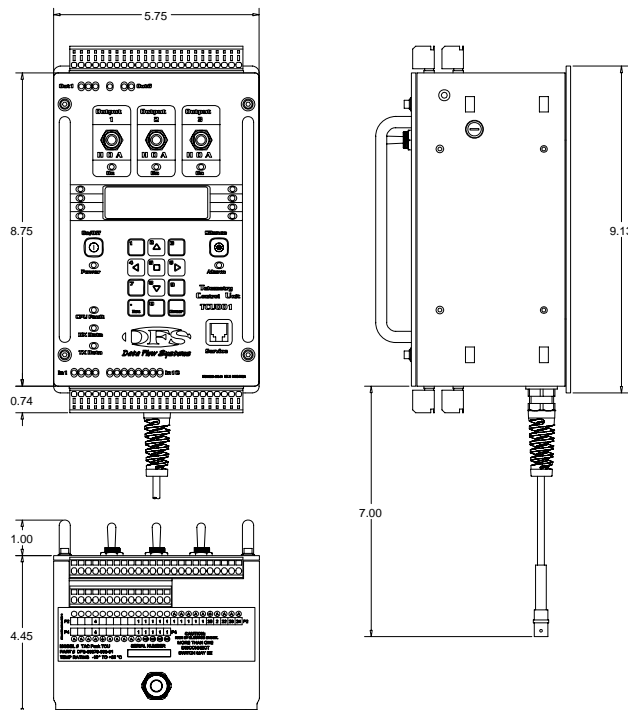
### PCU Front Panel Mount

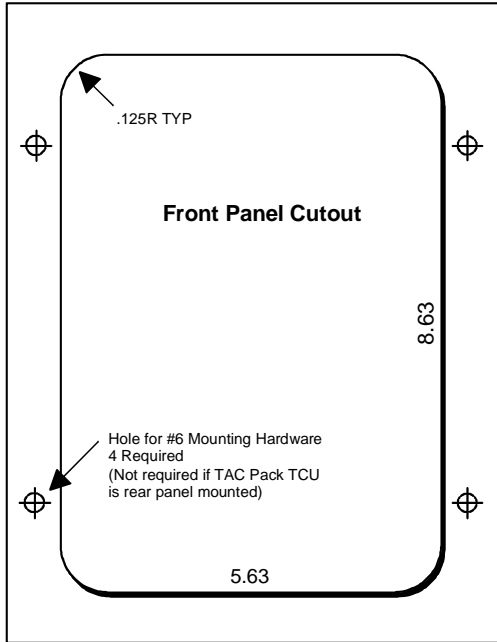
This mounting option uses a PCU-type mounting bracket that is attached to the front of a control panel. With this mounting option, the TCU is attached to the mounting bracket with screws instead of being snapped into place.

This option uses the Front Mount installation kit (Basic Install Kit or Full Install Kit). See Appendix C: Parts List in the *TCU Installation and Operation Manual*.

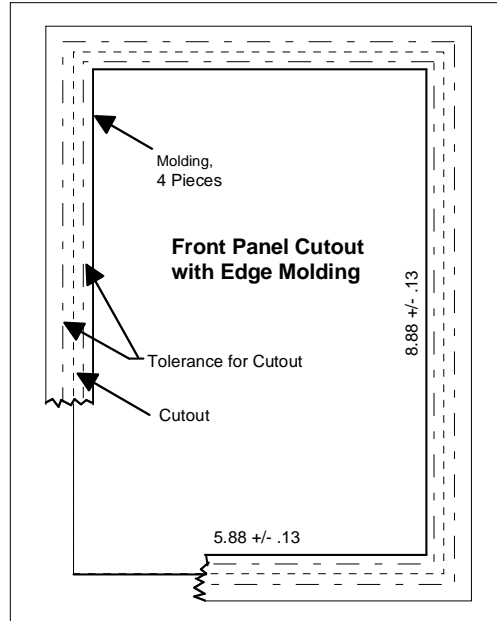


This dimensional drawing is provided to aid in installation. If a panel cutout is required, the TCU can be installed with or without edge molding around the front-panel opening. The panel cutout is different for each mounting configuration. See "Control panel installation with TCU mounted to dead front" and "Control panel installation with TCU mounted to front panel," on the next page.





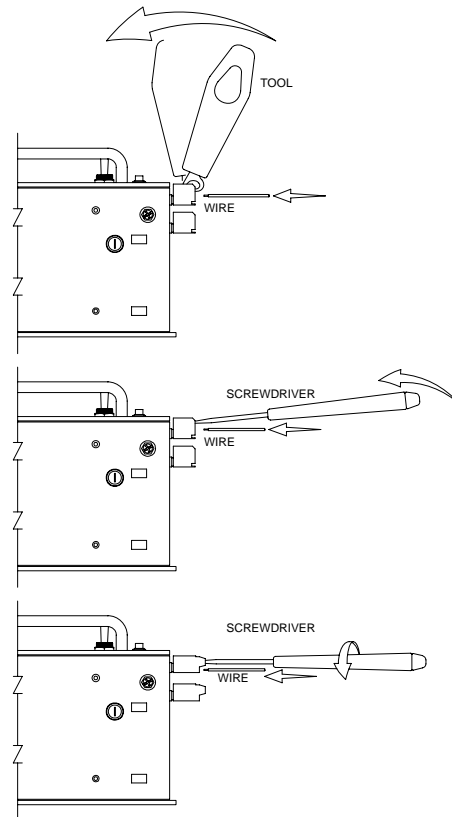
Control panel installation with TCU mounted to dead front



Control panel installation with TCU mounted to front panel

### Attaching Connectors

The graphic to the right depicts how each of the TCU's three optional connector types can be attached to the unit. The first option uses the Spring-Clamp Connector Tool, which can be ordered from DFS. See Appendix C: Parts List in the *TCU Installation and Operation Manual* for information on ordering connectors and the connector tool.



## Wiring AC Power



### CAUTION

Maximum wire size to TCU connectors is 12 AWG.

Use copper conductors only with a minimum rating of 75°C.

Recommended circuit breaker is 10 Amp maximum.

When using connectors with screw-type terminals, tighten screw terminals to a maximum 7 in-lb (.79 Nm).

All AC source power wired to the TCU should be from the same leg of the three-phase system. (Diagrams in this section show Phase C (L3) being used.)

The Power LED does not indicate that AC power has been removed. Even if the TCU's Power LED is not lit, you should assume that the TCU is still powered. To remove power, you must turn off the external circuit breaker.

The TCU operates from 120 VAC. Verify the input voltage on the TCU's connector label before wiring.

Three terminals are provided for wiring power:

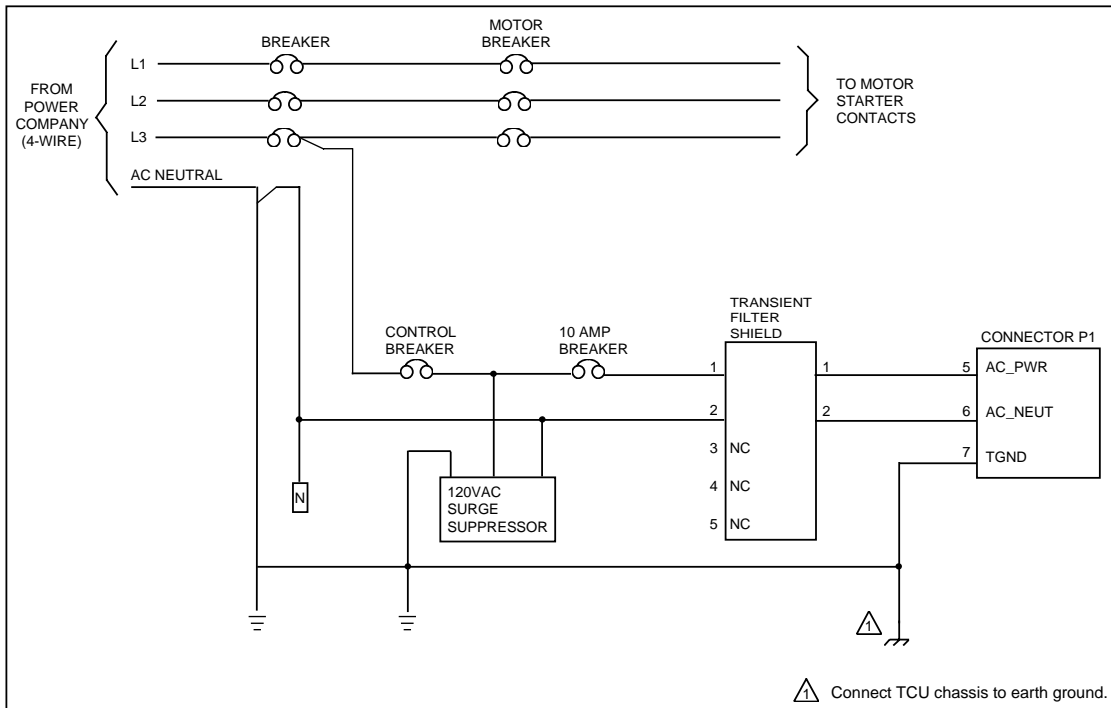
- P1-5, AC\_PWR (AC power)
- P1-6, AC\_NEUT (AC neutral)
- P1-7, TGND (earth ground)

Terminal P1-7 is designated Earth or Safety ground. The TCU's case is also connected to the TGND terminal. Wire in accordance with Federal, State, and Local Electrical Codes.

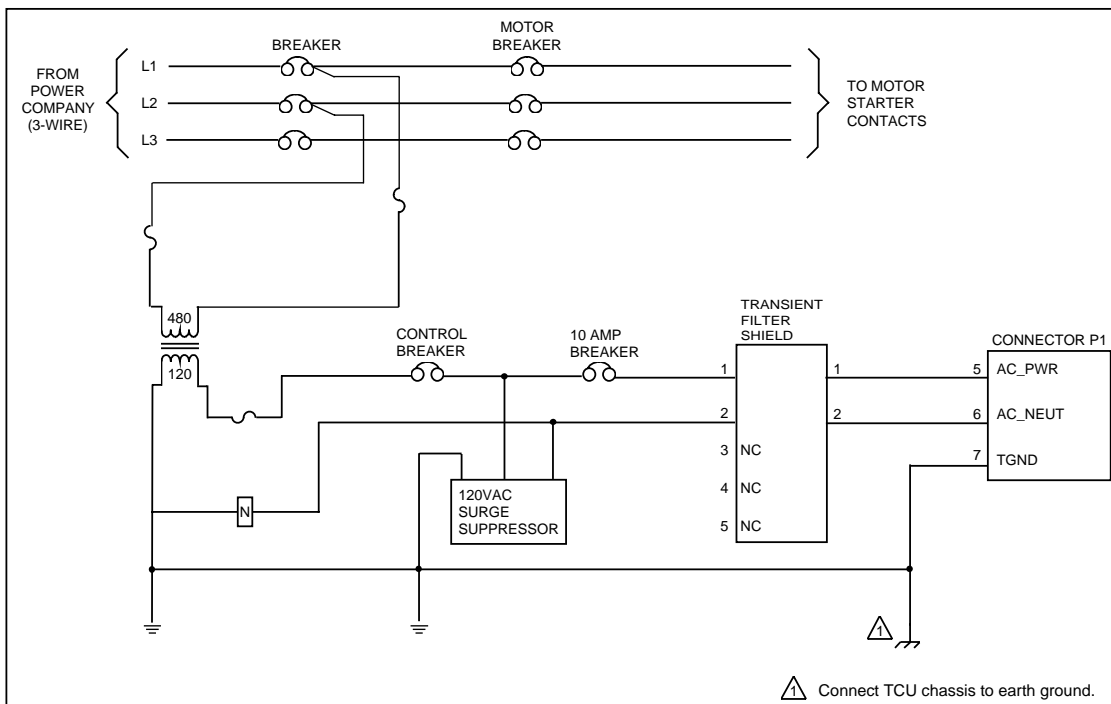
**IMPORTANT:** The transformer must provide AC neutral. When wiring to a typical three-phase, 4-wire, 240 volt transformer that provides AC neutral, refer to "Typical 240 Volt, 4-Wire Transformer" (next page). Refer to "Typical 480 Volt, 3-Wire Transformer" (next page) when connecting to a typical three-phase, 3-wire 480 volt transformer with no neutral provided.

Note that these diagrams are for typical installations. If your installation deviates from that shown here, refer to the National Electrical Code® (NEC®) Handbook.

### Typical 240 Volt, 4-Wire Transformer

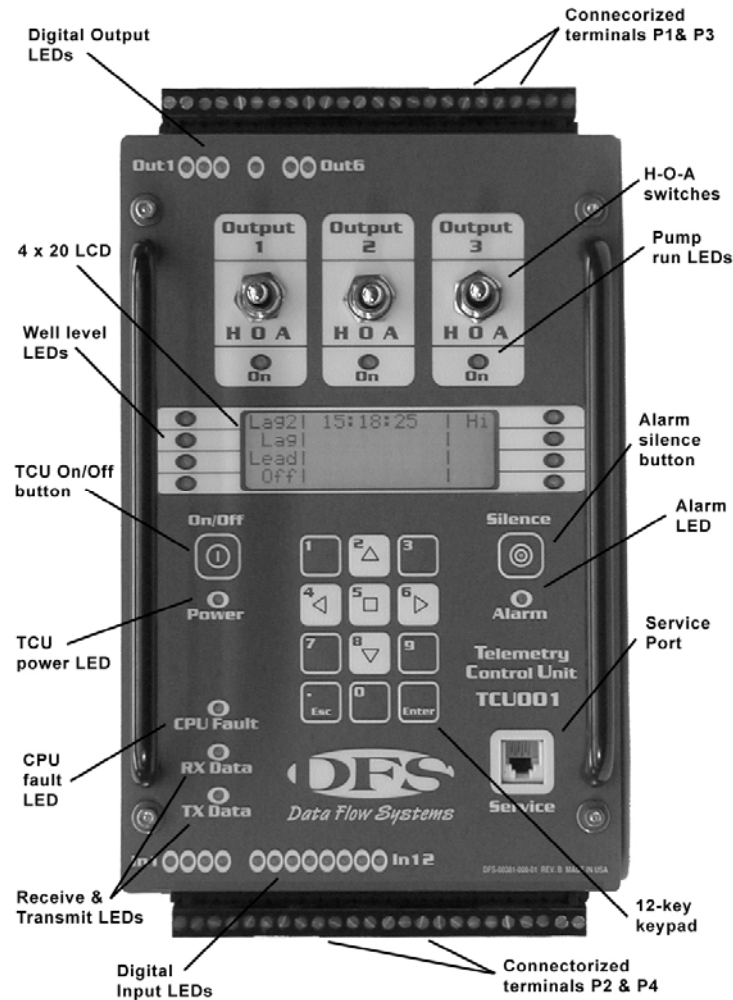


### Typical 480 Volt, 3-Wire Transformer



## GENERAL OPERATING INSTRUCTIONS

This section provides an overview of the TCU's user interface. For detailed descriptions and instructions on use, refer to the *TCU Installation and Operation Manual*, which can be found on the DFS Resource CD and the DFS website ([www.dataflowsys.com](http://www.dataflowsys.com)).



### On/Off Button and Power LED

Press and hold the TCU001's soft power On/Off key to turn the unit on and off. The Power LED indicates the state (on or off) of the TCU001.



### WARNING

The Power LED does not indicate that AC power has been removed. Even if the TCU's Power LED is not lit, you should assume that the TCU is still powered. To remove power, you must turn off the external circuit breaker.

## Keypad and LCD

The 4-line x 20-character LCD, in conjunction with the 12-key keypad, provides an interface for configuring the TCU, viewing and resetting alarms, and analyzing status information. The keys on the TCU's keypad can be used to page through menu items, scroll through configuration options, and enter numeric data. The keypad includes the numbers 0-9, scrolling keys (up ▲, down ▼, left ◀, and right ▶), an ENTER key, and an ESC (escape) key. Some keys have two functions. For example, the number 2 key is also the "up" scrolling key. The function of the key is dependent on the TCU's current mode.

## Connectorized Terminals

The TCU001's four connectorized wire terminals (P1, P2, P3, and P4) allow the unit to be serviced or replaced without rewiring the control panel. No user configuration straps or jumpers are required.

## H-O-A Switches and LEDs

Three Hand-Off-Auto (H-O-A) switches on the TCU's front panel are provided to manually override the TCU's automated control. They can be used to manually control the pumps connected to the unit. The H-O-A switches are fail-safe; they remain operational even if the TCU fails or loses power.

Each of the TCU's three H-O-A switches has an LED that provides motor run and motor start fault status. Under normal operation, the LEDs indicate if the corresponding pump is on or off. This LED flashes when a starter circuit fault is detected.

## Activity LEDs

On each side of the TCU's LCD screen are four LEDs (8 total). Six of these LEDs are used to show the current well or tank staging level (Low, Off, Lead, Lag, Lag2, High). Functional names for each of the LEDs are displayed directly beside them on the TCU's LCD. These staging levels can be from discrete switches or analog set points.

## Alarm Silence Button and LED

The Alarm LED flashes when there are active alarms and is continuously lit until all alarms have cleared and all corresponding alarm messages have been viewed. The Alarm LED is cleared when the alarm screen is exited and there are no active alarms. The Silence key is used to silence the TCU's own alarm horn and an external alarm horn if one has been connected.

## CPU Fault LED

Internal circuitry is used to monitor the TCU's microcontroller. If the circuitry detects a fault with the microcontroller, it resets the microcontroller and strobes



the CPU Fault LED. If the microcontroller fails to reset, a circuit disables the outputs and the CPU Fault LED flashes. A steady light indicates that the TCU's radio processor is locked in reset mode. When this LED is lit (flashing or steady), all automated controls are disabled. Only using the H-O-A switches, which continue to function under a CPU Fault condition, can continue operation of the pumps. The disabled state of the alarm light relay activates an alarm light connected to the TCU.

### **Receive (RX Data) and Transmit (TX Data) LEDs**

The RX and TX Data LEDs are part of the telemetry and service port interface and are provided to verify the communications function. The RX Data LED strobes each time the TCU receives data; the TX Data LED strobes each time the TCU transmits data.

### **Service Port**

The TCU's front panel features an RS-232 interface that can be used for diagnostics and configuration storage and updating.

### **Digital Input and Output LEDs**

At the top and bottom of the TCU's front panel are LEDs that work independently of the TCU's internal computer. These LEDs provide you with a visual indication that the corresponding output or input is on.

---

## **TELEMETRY CONFIGURATION**

---

Setting up the TCU as a component of the telemetry system enables you to remotely monitor conditions at the site and control equipment from a central location via the HyperTAC II SCADA software. For example, you can determine if a pump is currently running and manually turn it on if necessary.

In order for the TCU to interface with the central site and the HyperTAC II server, it must have access to radio or network communications and be properly configured in HyperTAC II's Configuration Editor.

There are several options for connecting the TCU to the telemetry system. A TCU can be installed with a DFS RTU station, or it can interface with industry standard radios using the TCU's RS-232 Modbus radio interface. Alternately, the TCU can operate as a stand-alone unit and communicate with the central computer or server via its integrated radio or network interface.

Using the TCU in conjunction with a radio-based telemetry system requires that you obtain an FCC-licensed radio frequency if you do not already have a licensed frequency that can be used. Even when adding a site to an existing frequency, the FCC requires that a complete application be submitted. DFS can

assist you in obtaining a new licensed frequency or adding a site to an existing frequency.

For detailed instructions for integrating the TCU with your telemetry system, see Chapter 7: Telemetry Configuration in the *TCU Installation and Operation Manual*.

---

## KEY-INVOKED FUNCTIONS

---

Detailed information on these key-invoked functions can be found in the *TCU Installation and Operation Manual*.

View process ID and version level	With the TCU powered, press and hold the 3 button
View serial number, station address, radio configuration, and firmware version	With the TCU powered, simultaneously press and hold the 3 and Alarm Silence buttons
Place TCU in radio test mode	Press and hold the 2 button while cycling power
Key radio and measure antenna reflective power	With the TCU in radio test mode, press the 2 button
Auto download TCU configuration	Press and hold the 3 button while cycling power
Place TCU in debug mode	Press and hold the 1 button while cycling power
Adjust LCD contrast	Press and hold the 5 button while cycling power

---

## MAINTENANCE

---

The TCU itself is designed for a minimum amount of maintenance. It is more important to maintain the station and the components connected to the TCU.

When cleaning the TCU's front panel, use only mild detergents and a damp rag. Do not use solvents to clean the TCU's front panel.

### Recommended Backup Batteries

- 12V, 7.0Ah Rechargeable Battery (Part No. DFS-00363-008-01)
- 12V, 3.0Ah Rechargeable Battery (Part No. DFS-00363-008-02)

The TCU001 includes one replaceable fuse. If this fuse should fail, replace it with a new identical one (.375AT).

---

## REPLACEMENT PARTS

---

Parts should only be replaced with parts recommended and approved by Data Flow Systems. Placing unapproved parts in the TCU001 voids the safety certification. See the Return Authorization (RA) Procedure (next section) for instructions on obtaining replacement parts.

---

## RETURN AUTHORIZATION (RA) PROCEDURE

---

In the event that a function module fails, during or after the warranty period, it may be returned to Data Flow Systems to be repaired or replaced.

All RA's will be subject to standard shipping and handling charges. Minimum handling charges will be assessed in most cases for work such as Radio Tuning, Backplanes, "No Problem Found," and other minor repairs. Handling charges will be waved on warranty equipment. Standard shipping charges will be based on UPS ground, please advise if other arrangements are needed (UPS Red, FedEx, Pickup, Freight...). Standard cost of repairs and shipping charges can be obtained by contacting our RA Department by phone or e-mail.

**STEP 1:** Replace the failed module with a spare module of the same type, if one is available.

**STEP 2:** Contact Data Flow Systems Inc. in one of the following ways to receive an RA#:

- Email DFS at [rma@dataflowsys.com](mailto:rma@dataflowsys.com).
- Call DFS at 321-259-5009 ext. 1142 during normal operating hours.

The following information must be provided.

- Customer/Utility Name and Ship to Address
- Contact Name and Phone Number
- Products to be returned and Serial Numbers
- Detailed description of failure
- PO#

**Note:** The lack of "Detailed description of failure" could result in a bench test fee and equipment returned due to the inability to properly determine the nature of the failure or testing resulting in "No Problem Found."

**STEP 3:** Place the function module(s) individually in an electrostatic discharge bag and then wrap with foam or bubble wrap. Pack the wrapped module(s) in a sturdy box filled with popcorn-type or bubble wrap packing material. Include a packing slip with the following information:

- Module(s) model, serial number, probable cause of failure, and the RA number
- Shipping address
- Shipping instructions (shipping costs greater than UPS ground are charged to the customer)

**STEP 4:** Address the box to:

RA Department # {the RA number you received here}  
 Data Flow Systems, Inc.  
 605 N. John Rodes Blvd.  
 Melbourne, FL 32934-9105

**STEP 5:** Ship the box to DFS using any typical shipping carrier (for example, UPS, FedEx, etc.). **Note:** DFS employees are not permitted to hand carry RMA materials.

Modules are typically repaired and shipped back to the customer within a 2-week period starting at the time the module reaches the RA Department. If additional information is required during the repair of the module(s), the DFS service department will contact you.

To get information on the progress of any of your equipment in for repair, contact the DFS RA Department at [rma@dataflowsys.com](mailto:rma@dataflowsys.com) or 321-259-5009 ext. 1142.

Replacement of equipment may be necessary in the event that the equipment and/or parts are unrepairable. Warranty equipment will be replaced without prior notification as warranty replacement. The customer will be notified by phone with information of available options if equipment not under warranty cannot be repaired.

DFS reserve the right to return any material received without an RA# or not conforming to the requirements of this RA process.

---

## WARRANTY

---

The warranty details Data Flow System's commitment to repairing or replacing parts and providing support during the warranty period. Refer to your Warranty Certificate, or the Warranty Statement included with your contract, for details on the terms of your warranty. If you lose your Warranty Certificate/Statement, contact Data Flow Systems' Sales Department to obtain the warranty terms and to replace your Warranty Certificate/Statement.

- Call 321-259-5009
- Email [sales@dataflowsys.com](mailto:sales@dataflowsys.com)

The intended purpose of the TCU is telemetry control. Using the TCU for purposes other than telemetry control is not recommended and will void the warranty.

**Notes:**

**Notes:**

**Notes:**



Data Flow Systems, Inc.  
605 N. John Rodes Blvd.  
Melbourne, FL 32934  
321-259-5009  
[www.dataflowsys.com](http://www.dataflowsys.com)