



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WELKER® TIMER/CONTROLLER

MODEL

6Tc

DRAWING NUMBERS

AD717B0

EL530

MANUAL NUMBER

IOM-002

REVISION

Rev. G, 08/09/2024

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# IMPORTANT SAFETY INFORMATION

## READ ALL INSTRUCTIONS



Notes emphasize information and/or provide additional information to assist the user.



Caution messages appear before procedures that could result in damage to equipment if not observed.



Warning messages appear before procedures that could result in personal injury if not observed.

*This manual is intended to be used as a basic installation and operation guide for the Welker Timer/Controller, 6Tc. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in Appendix A of this manual.*

*The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker equipment described in this manual. Correct installation and operation, however, are the responsibility of the end user. Welker reserves the right to make changes to this manual and all products in order to improve performance and reliability.*

### BEFORE YOU BEGIN

Read these instructions completely and carefully.

**IMPORTANT** - Save these instructions for local inspector's use.

**IMPORTANT** - Observe all governing codes and ordinances.

Note to Installer - Leave these instructions with the end user.

Note to End User - Keep these instructions for future reference.

Installation of this Timer/Controller is of a mechanical and electrical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Timer/Controller, please contact a Welker representative immediately.

Phone: 281.491.2331  
Address: 13839 West Belfort Street  
Sugar Land, TX 77498

## 1.1 Introduction

We appreciate your business and your choice of Welker products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance (IOM) Manuals* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.\*

If you have any questions, please call Welker at 1.281.491.2331.

*\*The following procedures have been written for use with standard Welker parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.*

## 1.2 Product Description

The Welker 6Tc Timer/Controller is a programmable electronic device used to control sample pumps and oil injection pumps. The 6Tc operates a solenoid for timed or proportional to flow sampling via an open collector or dry contact. Sample frequency and dwell time are set using a bank of twelve (12) switches.

*Welker may custom design the 6Tc to suit the particular application and specifications of each customer.*

## 1.3 Important Wiring Information

The 6Tc is intrinsically safe and can be used in NEC Class I, Div. 1, Groups C and D hazardous locations when powered by the self-contained Welker Lithium Battery Pack and installed in accordance with Welker electrical drawing EL530.



Substitution of components may impair the intrinsic safety of the 6Tc.

When installed in NEC Class I, Div. 1 hazardous locations, all wiring and sealing to the 6Tc must be installed in accordance with *National Electric Code® (NEC®)*, ANSI/NFPA 70, Article 504 for intrinsically safe systems.



Multiple circuits that run into the same multiple-conductor cable must have an insulation thickness of 0.01 inch (0.25 mm) on each conductor.

## 1.4 Specifications



The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. Please note that the specifications may vary depending on the customization of your equipment.

Table 1: 6Tc Specifications

Application	Control of Sample Pumps and Oil Injection Pumps
Temperature Range	-40 °F to 185 °F (-40 °C to 85 °C)
Power	DC 6.0–7.2 V
Battery	Voltage: <b>DC 7.2 V @ 12 A•h</b> Composition: Lithium-Thionyl Chloride Cycles: 150,000 @ 2-Second Dwell Shelf-Life: 10 Years @ 70 °F
Duty	Continuous
Current	Standby: 60 µA @ DC 7.2 V Operation: 120 mA @ DC 7.2 V
Input	Open Collector or Dry Contact Impedance: 470 kΩ (Pull up to 5 V) Maximum Frequency: 1 kHz
Output	Transistor @ 500 mA Blocking Diode for Inductive Protection
Terminal Strip	4-Point Maximum Wire Gauge: 12 AWG
Weight	3 lb (1.3 kg)
Feature	NEMA 4X Enclosure
Electrical Area Classification	NEC Class I, Div. 1, Groups C & D, T3C
Options	AC/DC Converter Door Mount Kit Solar Power-Operated

Figure 1: UL Label

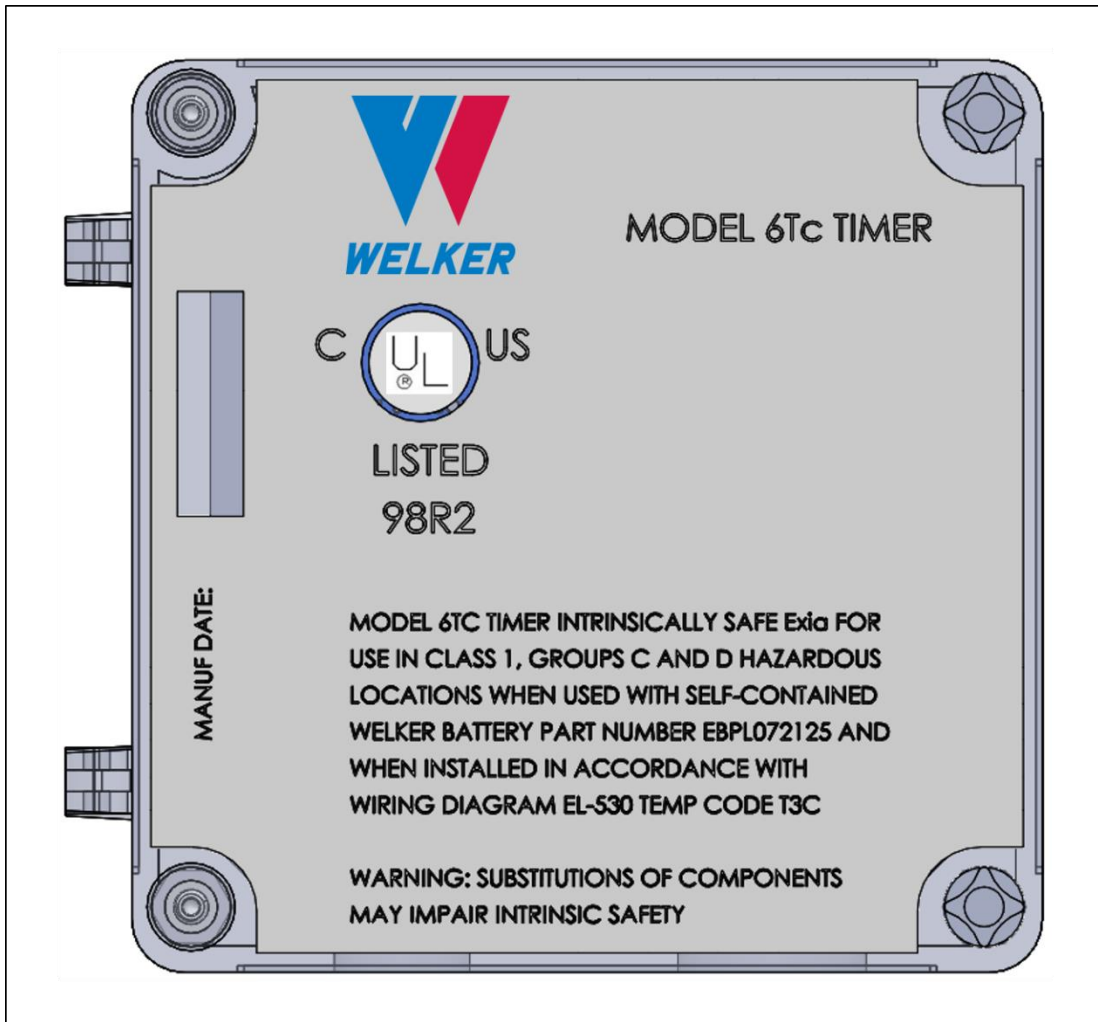
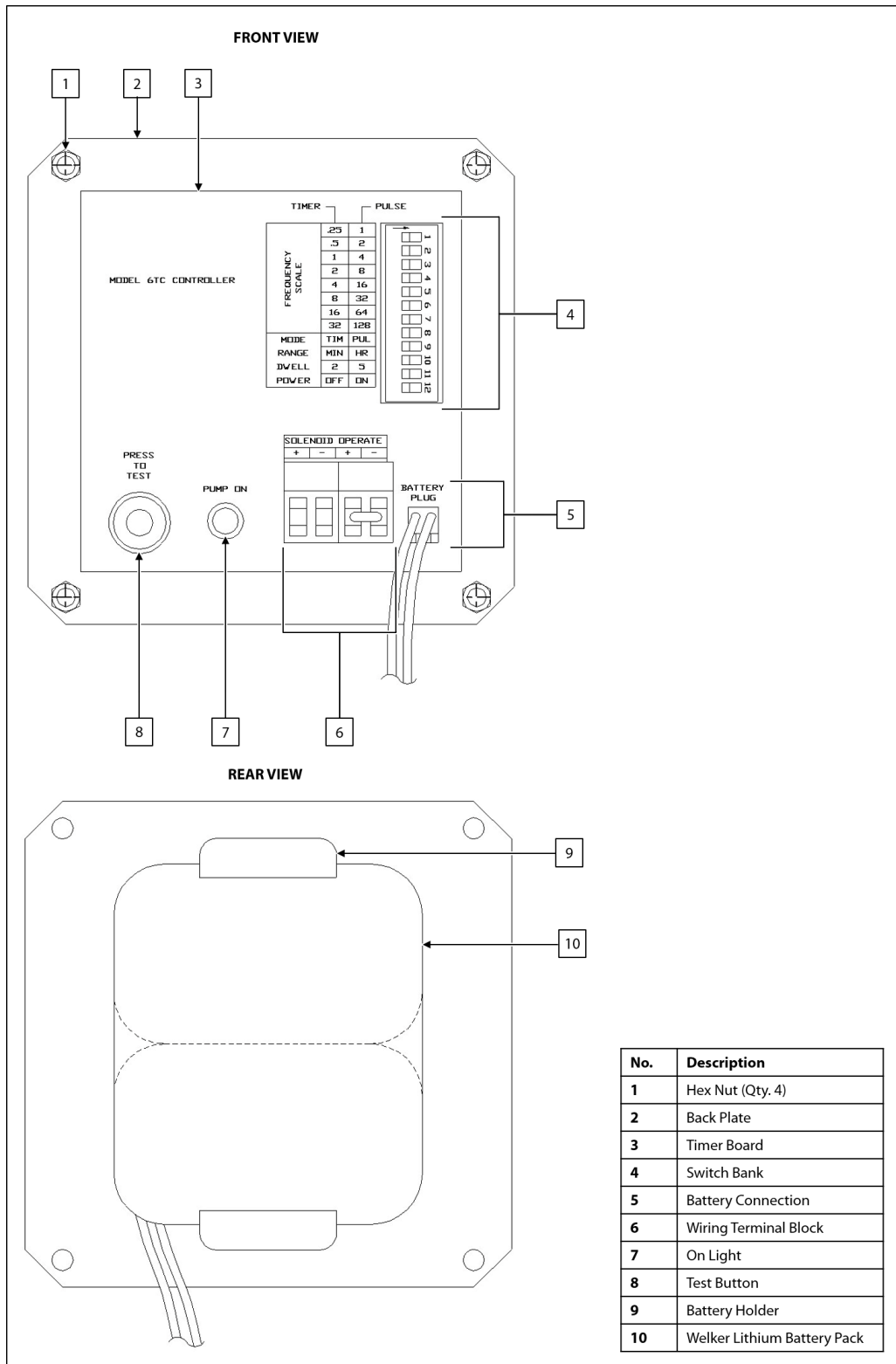


Figure 2: Timer Board Diagram



No.	Description
1	Hex Nut (Qty. 4)
2	Back Plate
3	Timer Board
4	Switch Bank
5	Battery Connection
6	Wiring Terminal Block
7	On Light
8	Test Button
9	Battery Holder
10	Welker Lithium Battery Pack

Figure 3: Enclosure Internal Diagram

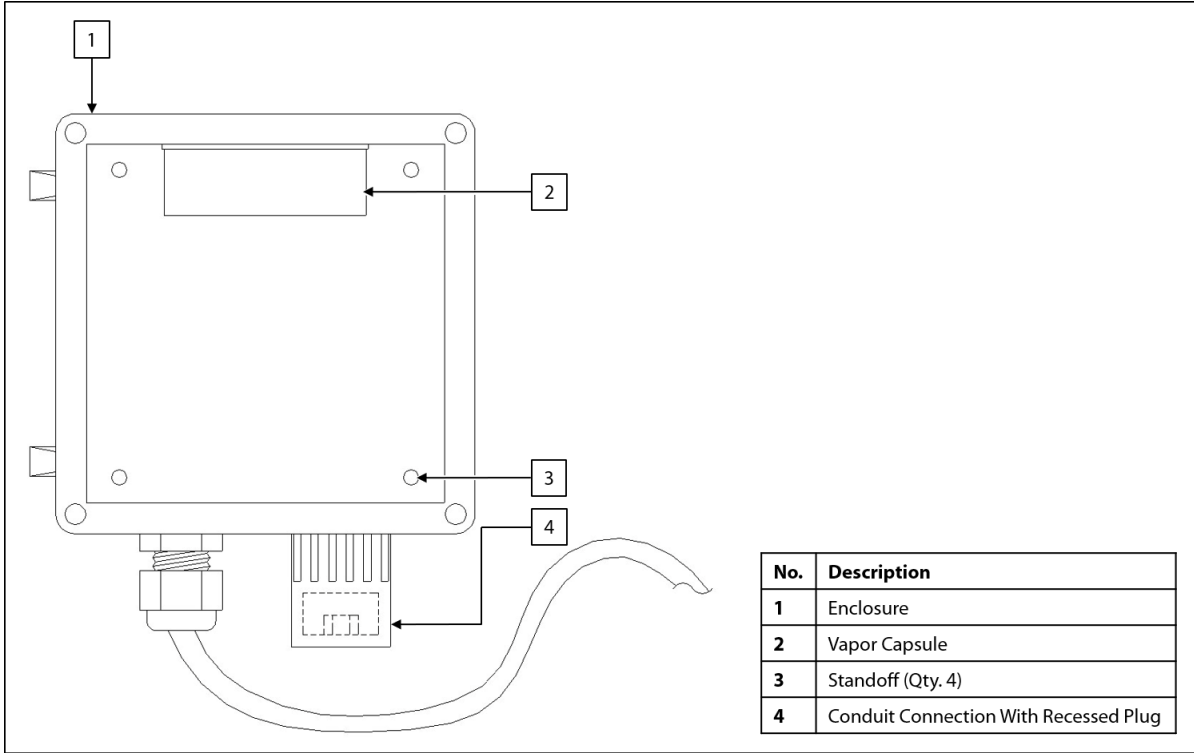
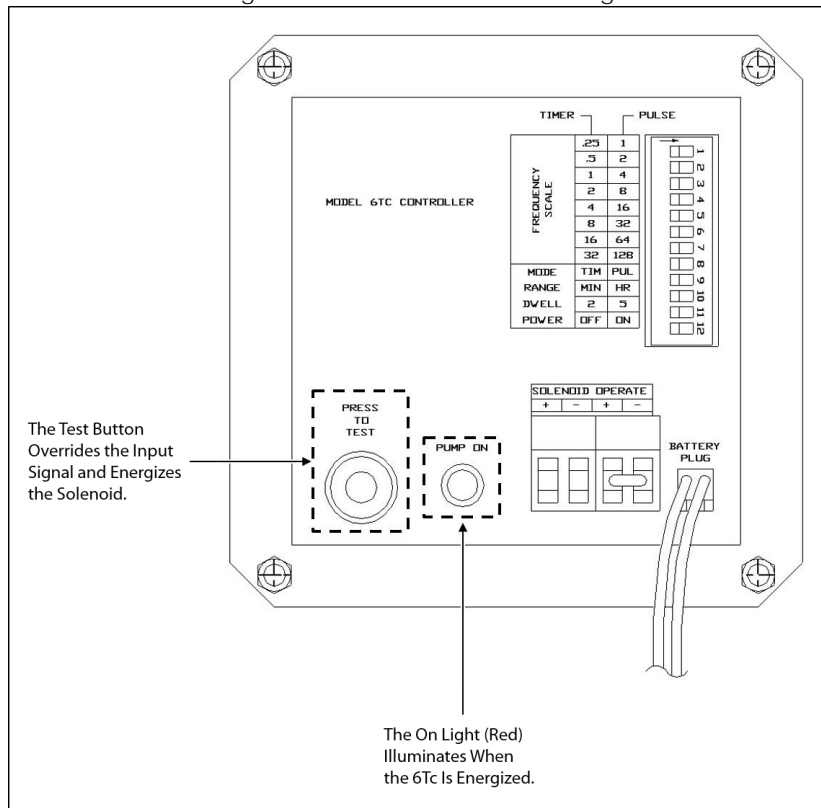


Figure 4: Test Button and On Light





## 2.1 Before You Begin



After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker representative if you received damaged equipment.



When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.



All electrical connections must meet local and national electric codes, and excessive weight added to the conduit run must be supported.

## 2.2 Installation

1. As necessary, mount the enclosure to the desired location. Ensure that the hinged enclosure door can fully open and that there is sufficient clearance below the enclosure for the cables and conduit to exit.



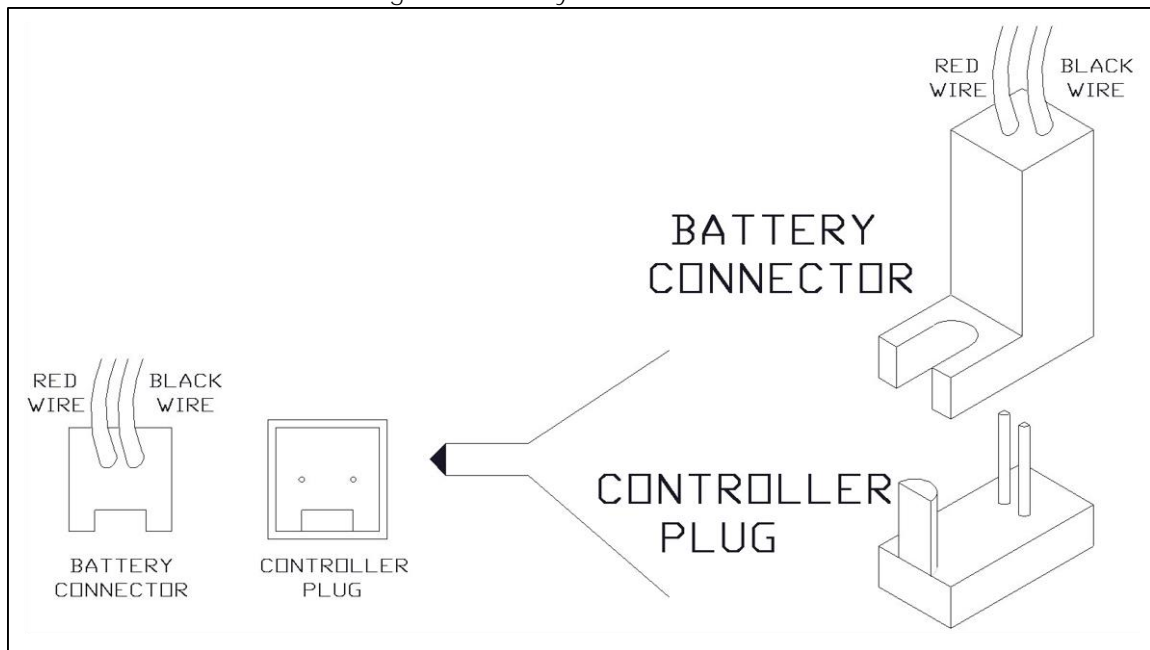
The enclosure can be mounted directly to the pump, on a nearby wall, or to a mounting bracket.

2. Unlatch and then open the enclosure door.
3. Locate the battery connector on the timer board inside the enclosure (*Figure 5*).



The unit is shipped from the factory with the battery disconnected. Improper connection of the battery will cause permanent battery failure. To prevent improper connection of the battery, refer to the battery connection instructions located on the yellow sticker inside the enclosure cover (*Figure 5*).

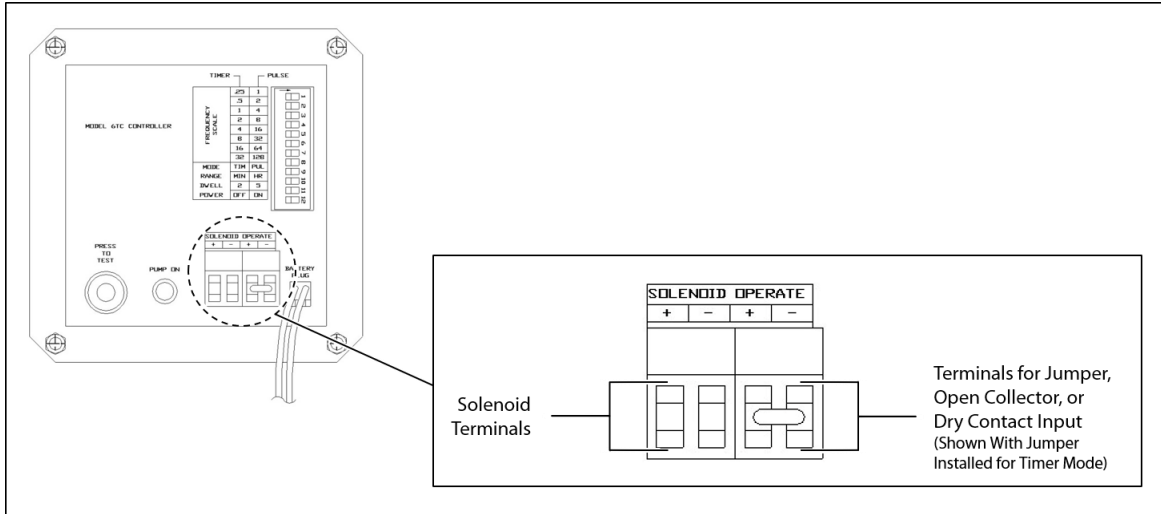
Figure 5: Battery Connection Sticker



4. With the red wire on the left and the black wire on the right, plug the battery connector into the controller plug (*Figure 5*).

- Locate the wiring terminal block on the timer board (Figure 6).

Figure 6: Wiring Terminal Block



- Make the terminations for the solenoid. Connect the positive lead of the solenoid to SOLENOID (+) and the negative lead to SOLENOID (-). Refer to Table 2 for wire colors and polarity notation for the solenoid models.



The 6Tc is capable of operating one (1) solenoid. The only solenoid acceptable for use with the 6Tc is a Welker solenoid. If a solenoid other than a Welker solenoid is used, the integrity of the intrinsically safe system will be violated.



Connecting the solenoid incorrectly will damage the unit.

Table 2: Wire Colors and Solenoid Polarity

Solenoid Model	Positive (+)	Negative (-)
Clippard (Welker ESVCL30E0E110)	Red	Black
Versa (Welker ESVVE41AF11)	Brown	White

- Determine if the 6Tc will be set to Timer or Pulse mode. If the 6Tc will be set to Timer mode, continue to step 8. If the 6Tc will be set to Pulse mode, proceed to step 9.

### Timer Mode



The 6Tc will not function unless the circuit is complete across the OPERATE terminals.

- As necessary, install a jumper to the OPERATE (+) and OPERATE (-) terminals to complete the circuit.



An auxiliary on/off switch, such as a flow switch, can be installed to the OPERATE terminals.

## Pulse Mode



The 6Tc will not function unless the circuit is complete across the OPERATE terminals.

9. Remove the jumper from the OPERATE terminals.
10. Determine if an open collector or dry contact input will be used.



When operating in Pulse mode, the 6Tc is capable of receiving one (1) open collector or dry contact input. This signal can represent the flow rate.

11. If connecting an open collector to the 6Tc, connect the positive lead of the signal to OPERATE (+) and the negative lead to OPERATE (-) (*Figure 6*).



If polarity is not correct, the pulse input will not be received.

12. If connecting a dry contact closure to the 6Tc, connect one of the wires to OPERATE (+) and one of the wires to OPERATE (-) (*Figure 6*).



The dry contact is not polarity-sensitive.

13. If using an auxiliary on/off switch, such as a flow switch, make connections to the auxiliary switch in accordance with its *Installation, Operation, and Maintenance (IOM) Manual* to complete the circuit. Ensure that the circuit of the switch is closed before testing the unit.

## 2.3 Operation

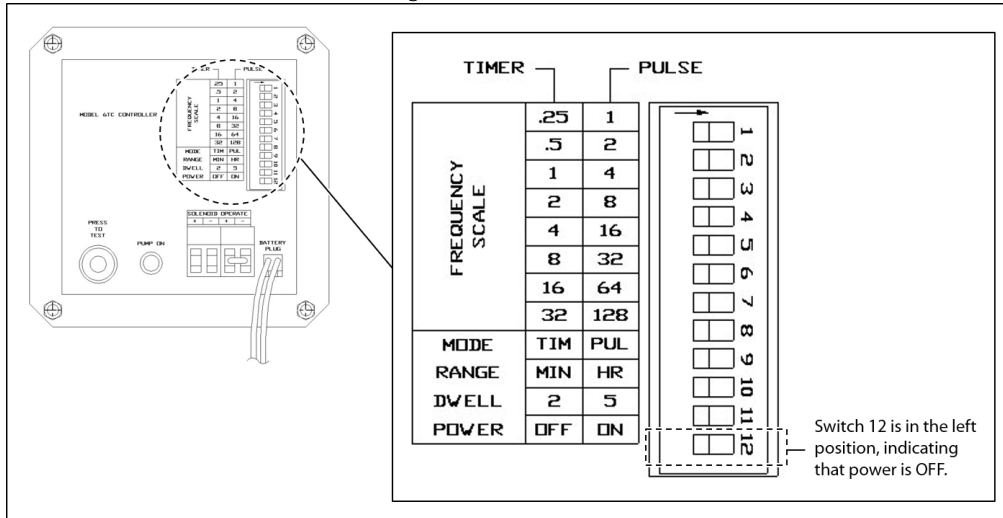


The 6Tc is programmed by setting the switch bank on the timer board.



If settings are changed during the middle of a cycle, the 6Tc needs to be reset. See *Section 3.2, Troubleshooting*, for instructions on resetting the 6Tc.

Figure 7: Switch Bank

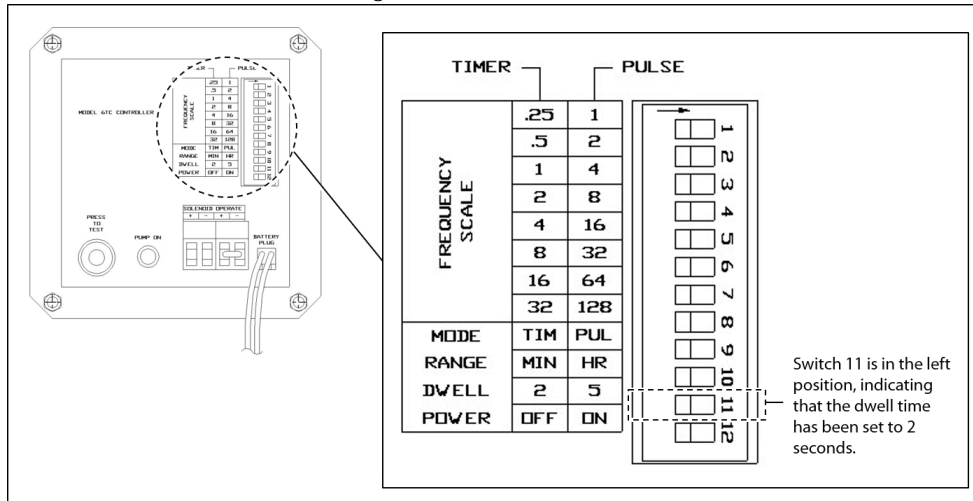


1. If the desired dwell time is two (2) seconds, slide switch 11 to the left position (*Figure 8*). If the desired dwell time is five (5) seconds, slide switch 11 to the right position (*Figure 8*).



Dwell time is the length of time the output remains energized.

Figure 8: Dwell Time Switch



- If the 6Tc will be set to operate in Timer mode, continue to step 3. If the 6Tc will be set to operate in Pulse mode, proceed to step 9.



Setting the 6Tc to Timer mode allows for an actuation frequency between 15 seconds and 255 hours.



Setting the 6Tc to Pulse mode allows for a pulse count range of 1–255. The Pulse mode accepts input from a proportional to flow signal producing device, such as a flow computer or turbine meter with signal conditioner.

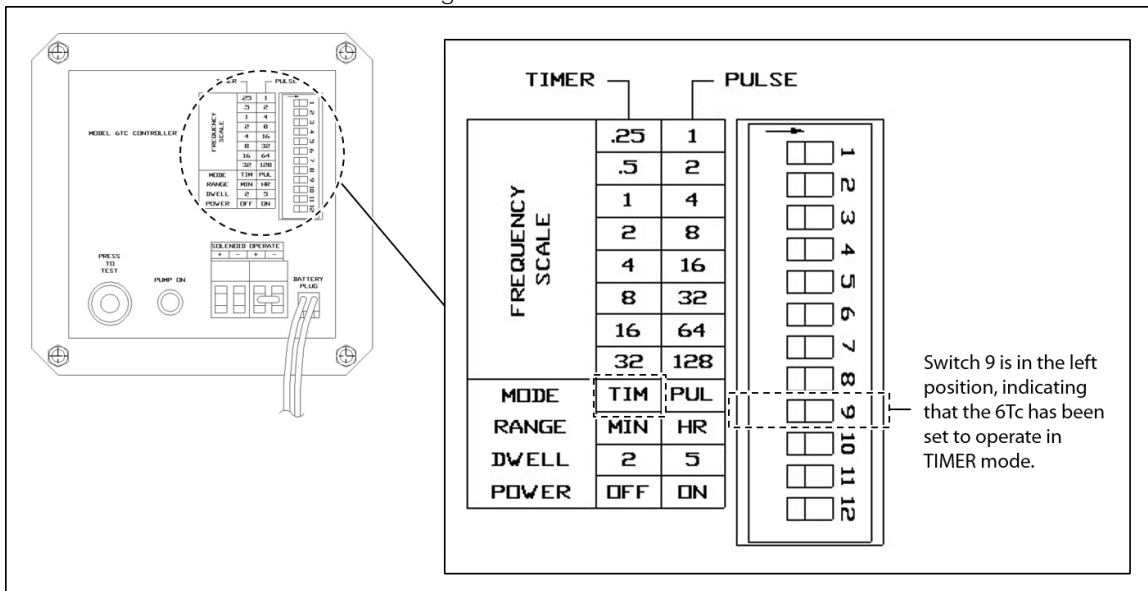
## Timer Mode



A jumper must be installed to the OPERATE (+) and OPERATE (-) terminals to operate the 6Tc in Timer mode.

- Slide switch 9 to the left to set the 6Tc to operate in Timer mode (*Figure 9*).

Figure 9: Set to Timer Mode



- Determine if the time range between pump strokes will be in minutes or hours, and then set the range accordingly.



If the time range is in minutes, slide switch 10 to the left and use the frequency scale in the Timer column. If the time range is in hours, slide switch 10 to the right and use the frequency scale in the Pulse column.

- Calculate the desired sampling frequency using the provided equations (Figure 10).

Figure 10: Sampling Actuation Frequency Equations for Timed Collection

<b>Gas or Liquid Sampling, Timed Collection (Timer Mode)</b>	
<b>Equation 1: Number of Samples Needed</b>	
$Number\ of\ Samples\ Needed = \frac{Cylinder\ Size\ (cc)}{Bite\ Size\ (cc)}$	or
$Number\ of\ Samples\ Needed\ to\ Fill\ to\ 80\% = \frac{(Cylinder\ Size\ (cc) * 0.8)}{Bite\ Size\ (cc)}$	
<b>Equation 2: Sample Frequency</b>	
$Samples\ per\ Hour = \frac{Number\ of\ Samples\ Needed\ (Eq.\ 1)}{Total\ Time\ in\ Sample\ Period\ (hr)}$	
<b>Equation 3: Switch Setting*</b>	
$Switch\ Setting\ (min) = \frac{60\ min}{1\ hr} \times \frac{1\ hr}{Samples\ per\ Hour\ (eq.\ 2)}$	
*Round the switch setting to the nearest whole number and the nearest 15-second increment.	



If product flow is not continuous, ensure that the *Total Time in Sample Period* used to calculate the sampling frequency is adjusted to reflect the actual amount of time product is flowing to the pump during the sample period.

- Set switches 1–8 on the 6Tc to the desired sampling frequency based on the equations (Figure 11).

Figure 11: Example – Timer Mode Setting

<b>Timed Collection (Timer Mode)</b>	
<b>Equation 1: Number of Samples Needed</b>	
$1363.6\ Samples\ Needed = \frac{300\ cc\ Cylinder\ Size}{0.22\ cc\ Bite\ Size}$	
<b>Equation 2: Sample Frequency</b>	
$1.89\ Samples\ per\ Hour = \frac{1364\ Samples\ Needed\ (Eq.\ 1)}{720\ hr}$	
<b>Equation 3: Switch Setting*</b>	
$32\ min\ Between\ Samples = \frac{60\ min}{1.89\ Samples\ per\ Hour\ (Eq.\ 2)}$	
*Rounded up to 32 minutes from 31.75.	

		TIMER	PULSE	
FREQUENCY SCALE		.25	1	
		.5	2	
		1	4	
		2	8	
		4	16	
		8	32	
		16	64	
		32	128	
				1
				2
			3	
			4	
			5	
			6	
			7	
			8	
			9	
			10	
			11	
			12	

Switch 8 is in the ON position, indicating its Timer frequency scale value is 32 minutes.

- Once the 6Tc has been set, slide switch 12 to the right to turn on the 6Tc (Figure 7). The on light should illuminate (Figure 4).
- Close and latch the enclosure door.

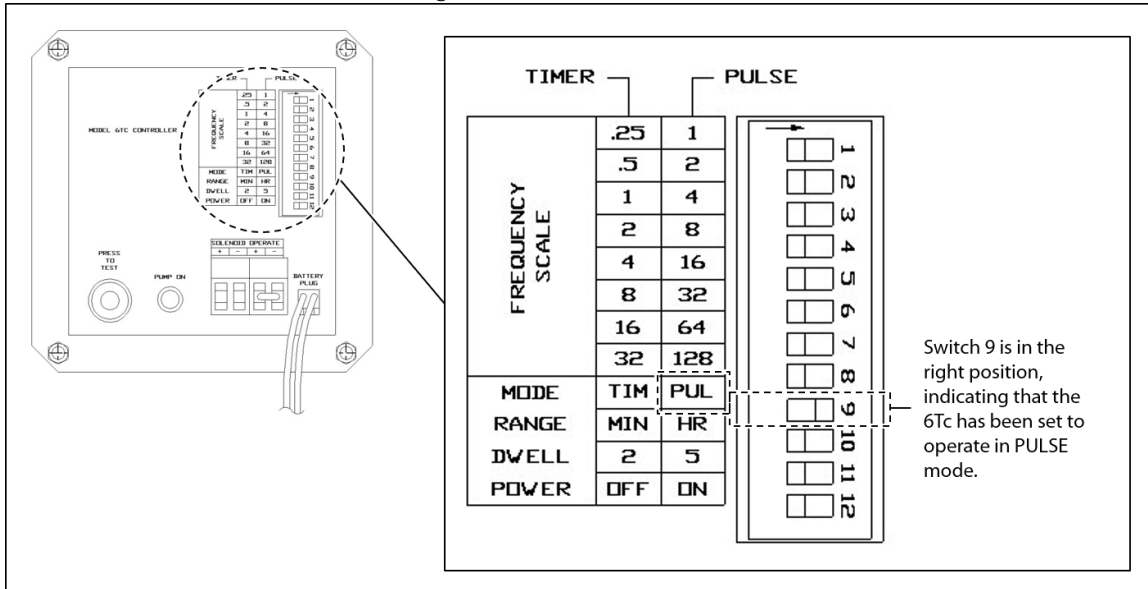
## Pulse Mode



The 6Tc will not function unless the circuit is complete across the OPERATE terminals.

- Slide switch 9 to the right to set the 6Tc to operate in Pulse mode (*Figure 12*).

Figure 12: Set to Pulse Mode



When operating in Pulse mode, the range can be set to minutes or hours, as it does not impact operation.

- Determine the scale of pulses being sent to the 6Tc.
- Calculate the desired sampling frequency using the provided equation (*Figure 13*).

Figure 13: Sampling Actuation Equation for Proportional to Flow Sampling

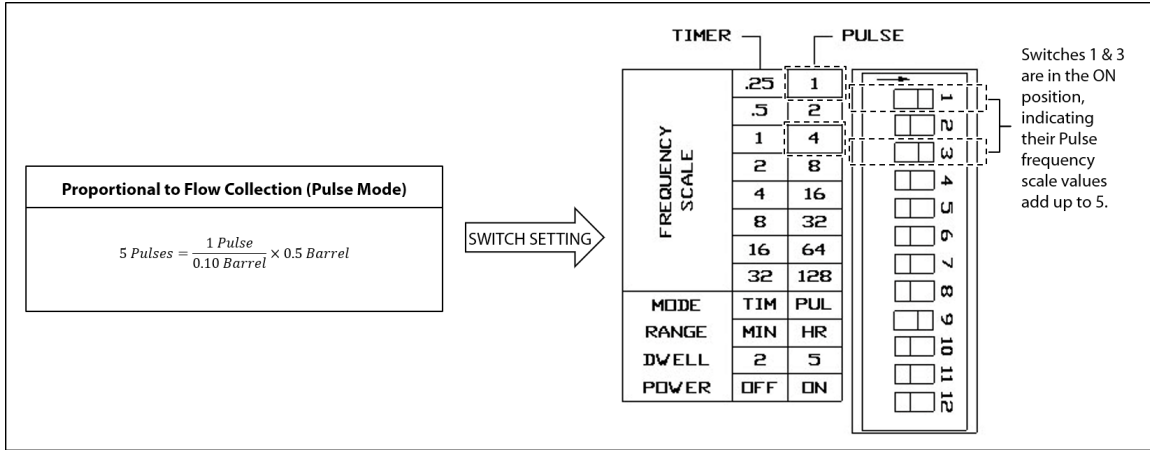
### Gas or Liquid Sampling, Proportional to Flow Collection (Pulse Mode)

$$\text{Switch Setting (Pulses)} = \frac{1 \text{ Pulse}}{\text{Volume of Flow Between Pulses}} \times \text{Volume of Flow Between Sample Grabs}$$



12. Set switches 1–8 on the 6Tc to the desired sampling frequency based on the equation (Figure 14).

Figure 14: Example – Pulse Mode Setting



13. Once the 6Tc has been set, slide switch 12 to the right to turn on the 6Tc (Figure 7). The on light should illuminate (Figure 4).
14. Close and latch the enclosure door.

## 3.1 Maintenance



The only maintenance required is periodic testing of the system to ensure that the battery pack is working and to replace the battery pack as necessary.

Testing the Battery Pack

1. Push and release the test button (*Figure 2* or *Figure 4*). If the on light illuminates, the battery pack is still functioning properly. If the on light does not illuminate when the battery pack is connected and the 6Tc is on, the battery pack must be replaced.

Replacing the Battery Pack

The only battery pack acceptable for use with the 6Tc is a Welker Lithium Battery Pack. If any other battery pack is used, the integrity of the intrinsically safe system will be violated.

2. Unlatch and open the enclosure door.
3. Disconnect the battery connector from the controller plug (*Figure 5*).
4. Remove the hex nuts on the back plate (*Figure 2*).
5. Carefully lift the back plate from the standoffs (*Figure 2*).
6. Remove the battery pack from the battery holder on the rear of the back plate (*Figure 2*).
7. Properly dispose of the battery pack.



Disposal of lithium battery cells is regulated by the United States Environmental Protection Agency (USEPA). Contact your local EPA representative for proper disposal methods.

8. Install a new Welker Lithium Battery Pack to the battery holder (*Figure 2*)
9. Return the back plate to the standoffs, ensuring that the timer board is oriented correctly (*Figure 2*).
10. Secure the back plate to the enclosure using the hex nuts (*Figure 2*).
11. Carefully plug the battery connector into the controller plug. See *Section 2.2, Installation*, for instructions on correctly connecting the battery.



The unit is shipped from the factory with the battery disconnected. Improper connection of the battery will cause permanent battery failure. To prevent improper connection of the battery, refer to the battery connection instructions located on the yellow sticker inside the enclosure cover (*Figure 5*).

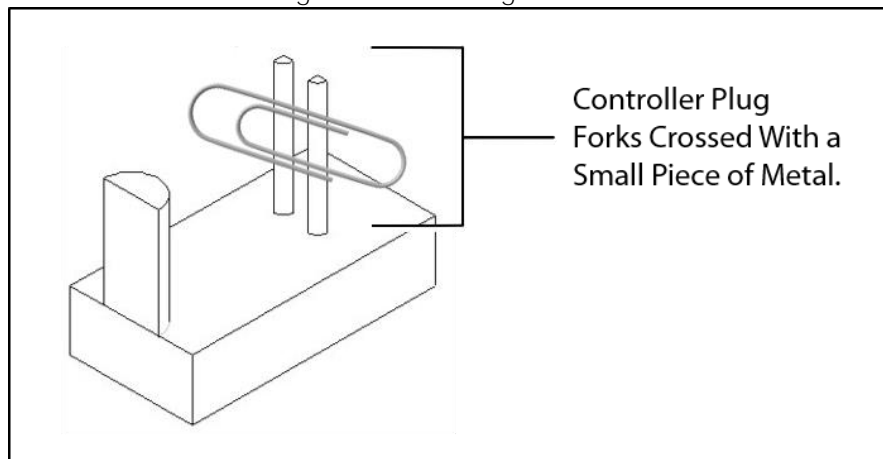
### 3.2 Troubleshooting Guidelines



The most common issues for the 6Tc are described in *Table 3*. If an issue is encountered that is not described below, contact Welker for service options.

Table 3: 6Tc Troubleshooting Guidelines		
Issues	Possible Causes	Solutions
The on light does not illuminate when the test button is pressed.	<p>The unit is not turned on.</p> <p>The battery is not connected.</p>	<p>Ensure that the power switch (switch 12) is in the ON position (to the right).</p> <p>The unit is shipped from the factory with the battery disconnected. See <i>Section 2.2, Installation</i>, for instructions on correctly connecting the battery.</p>
<p>The on light illuminates only when the test button is pressed.</p> <p>OR</p> <p>The 6Tc does not appear to be working in accordance with the settings.</p>	<p>The circuits need to be reset. (If settings are changed during the middle of a cycle, the 6Tc needs to be reset.)</p>	<p>Reset the 6Tc. Disconnect the battery connector from the controller plug. Briefly (for 1 second) cross the two forks of the controller plug with a small piece of metal, such as a paperclip, screwdriver, quarter, or knife blade, and then remove the small piece of metal from the controller plug (<i>Figure 14</i>). Take care not to cross the battery connection wires, as the battery will have permanent battery failure. Carefully plug the battery connector into the controller plug. See <i>Section 2.2, Installation</i>, for instructions on correctly connecting the battery.</p>

Figure 15: Resetting the Circuit



Welker *Installation, Operation, and Maintenance (IOM) Manuals* suggested for use with this unit:

- None

Other *Installation, Operation, and Maintenance (IOM) Manuals* suggested for use with this unit:

- Clippard Instrument Laboratory, Inc. 3-Way Fully-Ported Valves (Welker IOM-V138)
- Versa Products Company, Inc. C Series Solenoid Valves (Welker IOM-V041)

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD717BO (6Tc Assembly)
- Electrical Drawing: EL530 (6Tc Timer Board)

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