



Assembly Technologies

## *PSI-C/C2 Controller*

### *User Manual*

Software Version PCX-2.0.0



### **Important Safeguards**

For your protection, please read these instructions completely, and keep this manual for future reference. Carefully observe and comply with all warnings, cautions and instructions placed on the equipment or described in this manual.

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# PSI-C Controller

## Getting Started

### 1.1 Warnings and Cautions

The safety notices and warnings for protection against loss of life (the users or service personnel) or for the protection against damage to property are highlighted in this document by the terms and pictograms defined here. The terms used in this document and marked on the equipment itself have the following significance:

<b>Danger</b>	Indicates that death or severe personal injury will result if proper precautions are not taken.		Indicates a general hazard. This icon appears as a part of a Danger, Warning, or Caution notice.
<b>Warning</b>	Indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.		Indicates that eye protection should be worn. This icon appears as a part of a Danger, Warning, or Caution notice.
<b>Caution</b>	Indicates that property damage may result if proper precautions are not taken.		Read and understand all the safety recommendations and all operating instructions before operating tools and controllers.
	Indicates an electrical hazard. This icon appears as a part of a Danger, Warning, or Caution notice.		Indicates an item of special interest.



#### WARNING

##### To Avoid Injury:

- Read and understand all the safety recommendations and all operating instructions before operating tools and controllers. Save these instructions for future reference.
- Train all operators in the safe and proper use of power tools. Operators should report any unsafe condition to their supervisor.
- Follow all safety recommendations in the manual that apply to the tools being used and the nature of the work being performed.
- Verify that all warning labels illustrated in this manual are readable. Replacement labels are available at no additional cost from **STANLEY ASSEMBLY TECHNOLOGIES**.

### 1.2 Qualified Personnel



#### WARNING

##### To Avoid Injury:

- Only allow suitably qualified personnel to install, program, or maintain this equipment and or system.
- These persons must be knowledgeable of any potential sources of danger and maintenance measures as set out in the Installation, Operations, and Maintenance manual.
- This product must be transported, stored, and installed as intended, and maintained and operated with care to ensure that the product functions correctly and safely.
- Persons responsible for system planning and design must be familiar with the safety concepts of automation equipment.

### 1.3 Safe Use

This manual is intended to promote proper and safe use and give guidance to owners, employers, supervisors, and others responsible for training and safe use by operators and maintainers. Stanley controllers are intended for use in industrial threaded fastening or precision position and or adjustment applications only. Some instructions may not apply to all applications. Please contact your Stanley Sales Engineer for further information or assistance on Stanley training or assembly tool operations.

### 1.4 Introduction

The PSI-C Controller provides closed-loop torque control and torque validation (available with date and time stamp). It is easy to program, has common network-ready hardware available and uses industry standard protocols.

The PSI-C Controller provides precise torque control as well as multiple parameter set capability and *Poke-Yoke* error proofing to compatible transducer pulse tools. With the available DTU, up to 576 fastening cycles are stored, STATISTICS calculated with DATE/TIME and easily transfers to Microsoft Windows Excel.

Compact in design, the PSI-C Controller provides operator feedback via a large digital display for parameter set identification as well as torque and joint condition status and color LEDs for fastener counting. There are OK / NOK indicator lights for finished cycle or batch evaluation for in and out-of-spec conditions. Available with eight parameter sets allowing different counts and application set-ups, one tool can be set to perform various applications using its full torque range.

The PSI-C2 offers all the same functionality as the PSI-C with the added benefits of running the PSI series tools with memory or an absolute position sensor for controlling/monitoring angle rotation of the fastener.

This manual uses the name PSI-C in the text. This name, PSI-C, is for both the PSI-C and C2 controller. Any differences will be specifically called out.

### 1.5 Electrical Safety

The issue of operator safety is of maximum importance from both the attitude of ergonomic comfort as well as electrical safety.

The PSI-C controller operates from low voltage external AC or DC power. The standard configuration utilizes a CE approved power supply that is UL listed. It consists of a wall mount 120VAC transformer with a 16VAC at 1 Amp power output.

See Table 1, below, for the appropriate power supply for your country.

Country	Voltage	Current	Part #
Japan	100 VAC	1 Amp	24X500143
Australia	240 VAC	1 Amp	24X500144
United Kingdom	240 VAC	1 Amp	24X500145
Europe	220 VAC	1 Amp	24X500146
U.S.A.	110 VAC	1 Amp	24X500092

Table 1

## PSI-C Controller



### WARNING

#### ELECTRICAL HAZARD

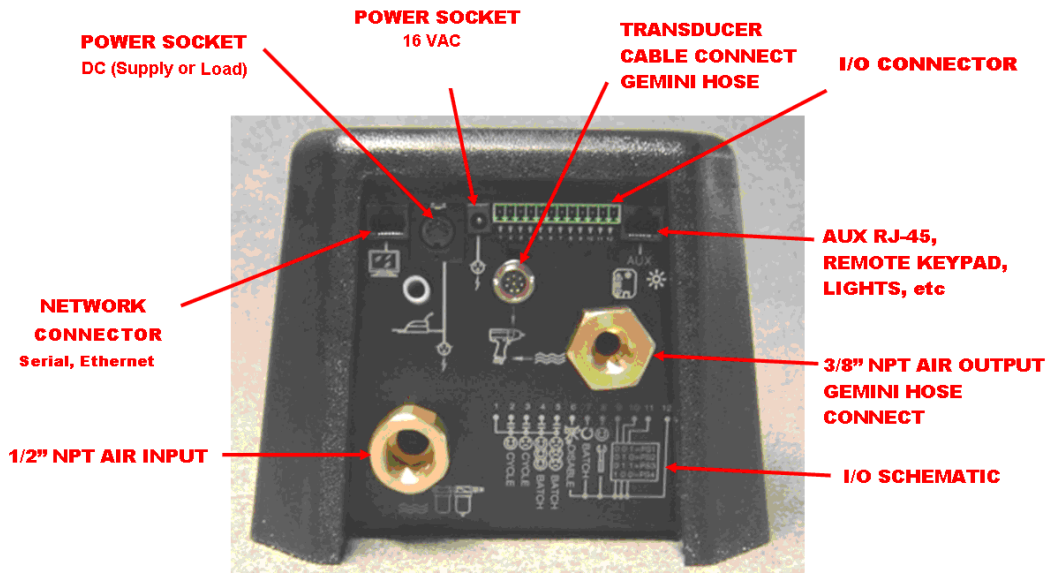
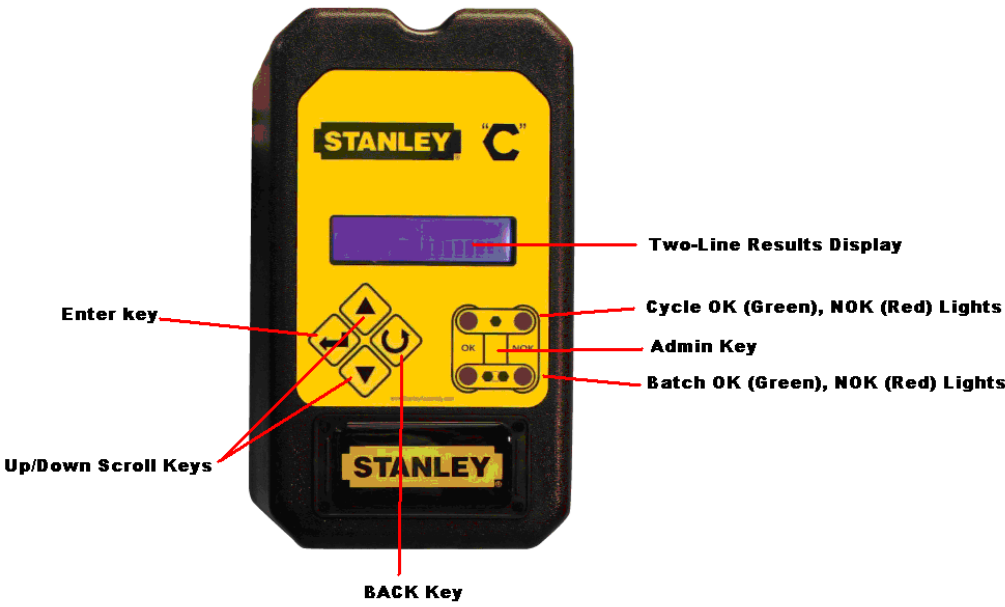
##### To Avoid Injury:

- Plug power cord into a grounded outlet that conforms to National Electric Code standards.
- Do not defeat the grounding pin on plug or substitute a cable that does not conform to the power and safety requirements of system.

## 1.6 Specifications

Specification	Description
Power	External Wall Mount Transformer to 16VAC, 50 Hz, 1 AMP
Pneumatic Source	50 scfm @ 6 bar pressure (87psi)
Operating Conditions	Temperature: 0 to +50 degrees Celsius Humidity: 0 – 95% non condensing
Weight	3.5 kg. (7.8lbs)
Dimensions	8.24” wide X 14.43” height X 6.38” depth
Inputs	Six Discrete 12-24V Optically Isolated Inputs with screw lug terminals Inputs available: Batch Reset, Manual Wrench Accept, Parameter Select (3) and Disable
Outputs	Four Dry Contact Relays with screw lug terminals Outputs available: Cycle Accept / Reject, Batch Accept / Reject CE, UL & VED rated up to 7 amps at 48V AC/DC
Printer (optional)	Internal Thermal Printer for documentation of cycle data onto individual labels; 2” x 4” adhesive backed
Serial Port	RS 232 port; RJ45 connector
Interface	Dual Line 0.5” LCD backlit (16) character
Five-button keypad	Up, Down, Enter (Menu), <i>Back</i> and ADMIN <i>Back</i> button: Momentary for Batch reset, hold down two seconds for override.
LED Indicator	CYCLE OK / NOK and BATCH OK / NOK Indicators
Ethernet (optional)	Separate IP address with buffered memory provides asynchronous network communication. Supports standard Windows based TCP/IP (10baseT) protocol; female RJ-45 connector
DTU - Data Transfer Unit (optional)	Expands PSI-C functions to use eight (8) parameter sets, Storage memory of fastening cycle data (72 readings/PSET) Statistics and date/time information.

1.6.1 Layout and Operator Interface



## Installation and Use



### WARNING

#### To Avoid Injury:

- Always wear eye and foot protection when installing equipment.
- Keep the work area clean, well lit and uncluttered.
- Keep unauthorized personnel out of the work area.
- Do not install worn, damaged, or modified equipment that may be unsuitable for safe use.
- Train all operators in the safe and proper use of power tools.
- Operators should report any unsafe condition.
- Install tools in dry, indoor, non-flammable, and non-explosive environments only.

### 2.1 Air Supply Requirement

A supply of compressed, dry, filtered air is required to run the pulse or impact tools connected to a PSI-C controller. Please check the individual tool specification for air flow and pressure requirements. Most tool specifications are based on 90 psi (6 Bar) for full range operation. However, the PSI-C controller will operate at any level as long as the air pressure and volume are sufficient for the tool to reach the required torque. The supply air hose should be a ½ inch (15mm) or 3/8 inch (10 mm) inside diameter with **no restrictions** (fittings) smaller than 3/8 inch inside diameter. If the air pressure and volume are insufficient, the performance of the tool suffers and the full torque range of the tool will not be realized. If the PSI-C controller does not receive sufficient air volume, the tool may operate erratically and the controller indicates a bad cycle or no change on the display.

Install the PSI-C controller with an air filter before the air inlet to the controller. If a lubricator is used, it can be installed before the controller or between the controller and the tool. The lubricator must be a free flowing design and not smaller than ½ inch NPT.

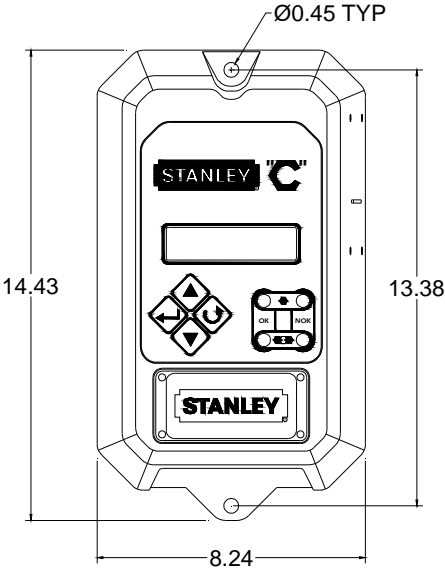


#### NOTE:

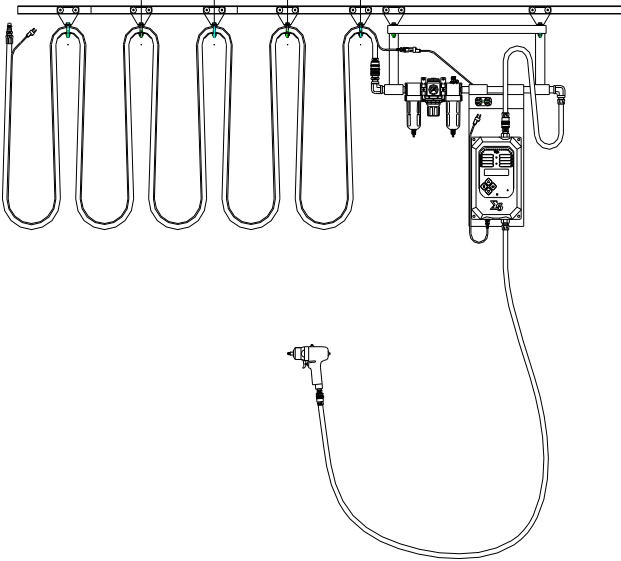
Some lubricators act as a check valve and will not allow air flow back thru the lubricator. **This type is not recommended for use with the PSI-C.**

The air hose/cable for the **AH**, **AM**, **AT** and **AP** series of tools is called the GEMINI. The GEMINI air hose includes an integral transducer cable and is available in 3/8 inch I.D., coiled or straight and available in many lengths. A separate transducer cable is also available. Prevent any unnecessary restrictions, elbows, swivels, etc between the controller and the tool to prevent air flow (volume) restrictions.

### 2.2 Mounting



Mounting Dimensions



Typical Assembly Line Installation



**WARNING**

**To Avoid Injury:**

- - Shutoff valve must be in the closed position until the air lines are installed and properly terminated
- - Do not connect power to the PSI-C Controller until all air line connections are secured.
- - Supply air energizes the outlet port when electrical power is supplied to the PSI-C Controller.

**2.3 Tool Compatibility**

**2.3.1 Transducer Pulse and Impact Tools**

In addition to the PSI series of transducer pulse and impact tools, the PSI-C controller is available to control all other major brands of Transducer Pulse tools including URYU and Yokota/IR.



## PSI-C Controller

Make certain that the range of the tool being used is capable of the torque required. If prevailing torque is present or the joint is very soft, then an over-sized tool may be required.



### NOTE:

With ALL pulse tools, large (heavy) sockets, loose fitting or worn sockets, extensions and universal sockets WILL reduce the efficiency of the tool and increase torque scatter.

All PSI tools should be equipped with EcoDrive sockets and extensions for the AH and AM tools or the Taper Lock sockets and extensions for all AP and AT tools. Performance and capability statements or claims are not ensured without these speciality sockets and attachments.

Oversize the tool as needed to prevent premature tool wear and long cycle times. Prevailing torque and torque losses due to loose and/or worn sockets and extensions will reduce tool life, increase cycle times and increase torque scatter.

AT60PB-675



AM30PB-70

## 2.4 Main Menu and Application Programming



### WARNING

#### To Avoid Injury:

- For maximum tool life do **not** use the tool higher than 90% of the maximum torque output of the tool.

1. The pulse unit adjustment screw in the tool must be set for the highest output of the tool or at least the high limit of your application. Adjust the screw fully clockwise until it seats; then back it out approximately 1-2 turns or until the operation of the tool is uniform and smooth when pulsing.
2. Check the maximum torque of the tool to insure that it can obtain the torque required.
3. Install and attach the GEMINI air hose/transducer cable to the bottom of the PSI-C and the tool. Air hose and transducer cable versions depend upon the PSI-C and tool being used.
4. Upon power up, hold down both the ENTER and BACK keys simultaneously until the display reads CLEAR COMPLETE. This returns all settings to the factory defaults. Observe the display to determine both the type of software and code/revision date installed.
5. The PSI-C automatically *zeros* and checks the tool's transducer, then shows PSET 1 NOT SET UP.
6. Press the ENTER key (left key) after controller power up to display the MAIN MENU. Use the UP/DOWN key to scroll through the MAIN MENU.

### 2.4.1 Check Harness

## 2.4.2 Parameter Set-up

PSET 1 NOT SET UP: Select the PSET desired by scrolling up or down, press ENTER.

NOMINAL CAL: A default value of the transducer's nominal calibration setting appears on screen. The tool has its nominal cal value stated on the tool.



### NOTE:

The cal value is only correct if sensitivity is correctly programmed. Refer to the calibration run-off sheet supplied with the tool.

If required engineering units are different than those shown, calculate the full scale in units, and then scroll up or down to change the value on the screen. Press the ENTER key and the PSI-C automatically checks and sets the ZERO and MAX values of the transducer connected.

TARGET TORQUE: Enter the application's target torque by scrolling up or down, press ENTER.

HIGH LIMIT: Scroll to set the upper torque specification, press ENTER.

LOW LIMIT: Scroll to set the low limit torque specification, press ENTER.

BATCH COUNT: Scroll up to set the number of fasteners per assembly to use the PSI-C to count fasteners. Set this number to zero to stop the PSI-C from counting fasteners.

BATCH TIME: Scroll to the number of seconds adequate to tighten all of the fasteners per assembly. Set this to zero if there is no time limit. BATCH time starts upon completion of the first in a group of fasteners.

### 2.4.2.1 Calibration/Correlation

After the initial set up is complete, the system may need to adjust correlation to the application using an approved method. **It is very important that the final calibration be performed using the same method and equipment that will be used to evaluate the results in production.** Some rotary transducers are compatible with pulse tools and can be used just behind the socket as the master transducer. However, it must be understood that the residual torque measured once the rotary transducer is removed from the drive train will change because of the dynamics change caused by removing the transducer (weight, speed and losses).



### NOTE:

Rotary transducers are **not** compatible with the AM/A, AP, AH or AT series tools.

Include any extensions that will be used in the application as it will affect the final torque if the set-up is changed. This method calibrates to the dynamic torque.

If the fastener torque will be judged using static torque, a digital torque wrench can also be used to calibrate the PSI-C after the fastener has been tightened. Using this method ensures more effective control and correlation of the residual torque on the fastener. This method compensates for the effects of initial torque relaxation in the fastened joint.

When testing for repeatability and accuracy, a TVM measures dynamic applied torque AT THE FASTENER without influence of operator input.



Run the tool on the fastener until the PSI-C controller shuts off the tool, then release the trigger.

## ***PSI-C Controller***

For both OK and NOK cycles, check the master transducer reading, or the residual torque reading from the torque wrench, versus the reading on the PSI-C controller. These numbers generally vary. Use CORRELATION under ADMIN to bring the two readings into correlation (see Correlation Procedure below). A few more fasteners may be run to check the reading consistency between the two.

If the program completes this cycle but LOW TQ or TQ NOT REACHED is received, check for:

- Target torque is above the capacity of the tool
- The pulse mechanism is not adjusted to the maximum.
- Insufficient supply air pressure. Check pressure when free-running tool; air pressure should not drop more than 10 psi from the static air pressure available.
- Incorrect NOMINAL CAL VALUE was entered.

### **2.4.2.1.1 Correlation Procedure**

1. From this RUN screen, without clearing the last reading, access the ADMIN functions via the ADMIN key. Quickly press the ADMIN key to display options.
2. Use the UP or DOWN keys to scroll through and find the CORRELATION option. Press the ENTER button.
3. MANUAL or AUTO CAL can be selected. Press the UP key or DOWN key accordingly. AUTO CAL allows the entry of the master torque reading to be entered by scrolling up or down until the master value is entered.

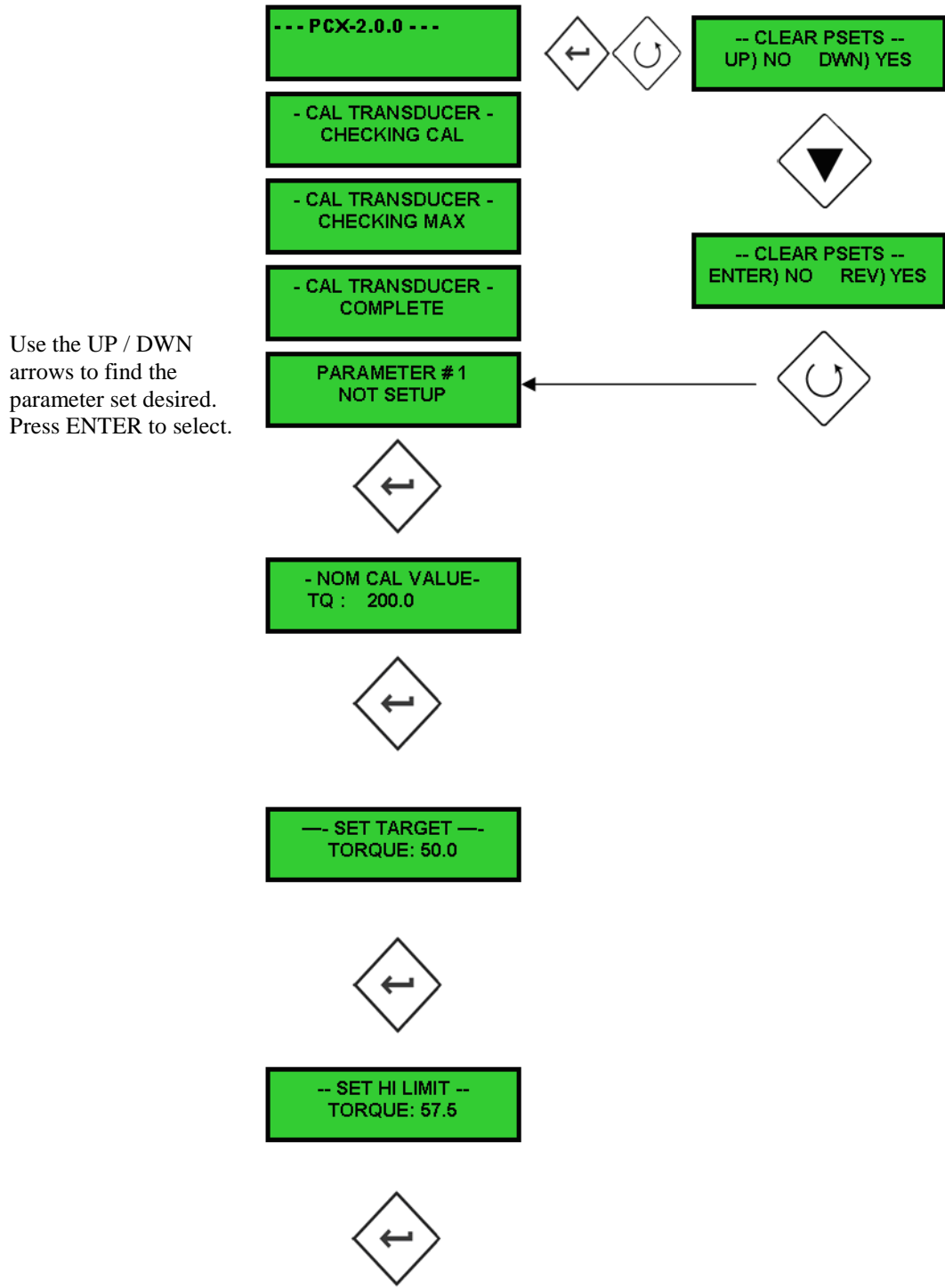


**NOTE:**

Adjust using AUTO CAL by setting the MASTER reading to about 60-70% of the actual measured torque. Repeat as needed until the two readings correlate.

4. Press ENTER and note the *new* Correlation Value which is calculated automatically.
5. Press the BACK button to return to run screen.
6. Repeat this process until the readings from the master and the PSI-C match within 2% or as required by your ISO procedures.

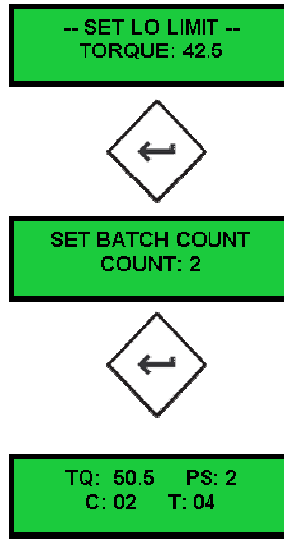
**2.4.2.2 Operation Flowchart Initial Set-up (PSI-C)**



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# PSI-C Controller

## Operation Flowchart Continued



This is the RUN screen.

### 2.4.3 Test

Run a few normal fasteners. The PSI-C shuts off the tool. Release the trigger (the PSI-C resets the internal shut-off valve. If you leave the trigger pressed the tool turns back on). Check torque results.

The system is not defaulted for REHIT error detection, i.e. re-hitting an already tightened fastener. Set up this feature using MIN PULSE COUNT in the ADMIN MENU. Adjust ADMIN functions for the system to detect a REHIT fastener and error or display as a fault.

Run the tool in free air, release the trigger and the program should ignore the run, display LOW TQ or ABORT. Slip off or strip out a fastener and the display should ignore, error or read SLIP.

If the results obtained are not correct, press ENTER and re-program the application or go to the ADMIN functions via the ADMIN key. Use the BACK key to return.

### 2.5 ADMIN Functions

From the RUN screen, access the ADMIN functions via the ADMIN key. Quickly press the ADMIN key, scroll through the functions using the UP and DOWN buttons; the following options display:



**NOTE:**

After adjusting function(s), press ENTER to accept the change, then press the BACK UP key until the run screen appears.

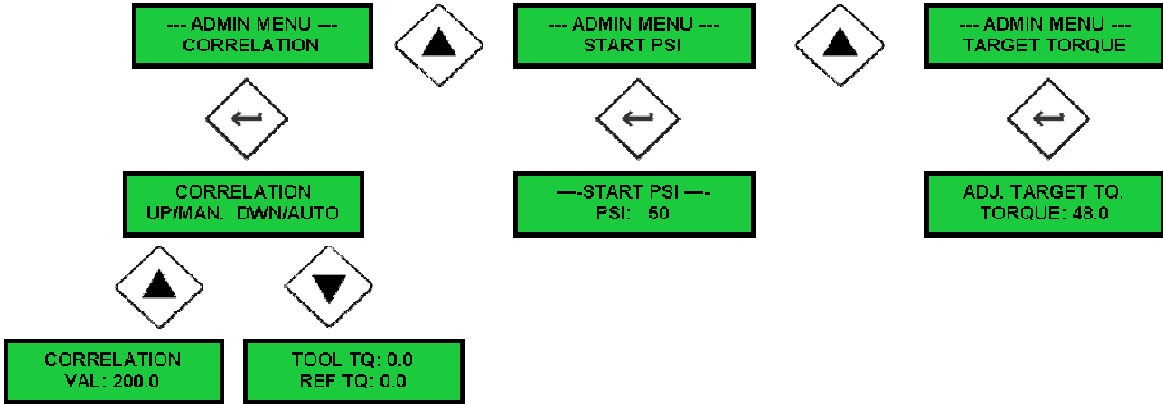
Function	Description
CORRELATION	Provides an easy transducer correlation to an independent measuring system or torque wrench. When using a torque transducer system, make a rundown and compare the torque reading from the controller to the independent system. The torque reading from the last rundown appears in the top line of the display as TQ:. By scrolling up or down, enter the value from the independent measurement in the bottom line of the display as REF TQ. This changes the transducer calibration value by the percent difference of the two. Future readings should agree with the independent system.

Function	Description
START PSI (ADJUST)	Enables changes to be made to the tool's starting PSI level (air pressure). This is called START PSI because the PSI-C default setting operates from this start value. In order to reach TARGET TQ as quickly as possible, adjust this to a higher level and/or enable RAMP SPEED (see below).
PRE-TRIGGER	This allows an early tool shut-off in order to control any torque over-shoot that may occur in certain difficult applications. Press the ENTER button and two values will appear. The A value in the amount of over-torque that occurred from the last rundown. The PT value is the amount of pre-trigger torque. Scroll UP to set the amount of pre-trigger desired, then press ENTER to activate this feature.
THRESHOLD	This is the torque setting where the PSI-C deems that a fastening event has begun. This is automatically set to 30% of the TARGET TQ or another pre-determined value. Scroll to alter. Press ENTER to activate change.
PULSE DELAY	The PSI-C can ignore the initial pulses from the tool. This is required to eliminate any pulse spiking from the initial pulse (s). This can happen due to the high free-speed of the tool. This is defaulted to one (1) pulse. Adjust to a higher number to cover worst case applications such as hard joints and loose sockets/extensions.
DOWNSHIFT	This allows the end of the fastening cycle to be slowed down in order to control torque over-shoot. TORQUE appears when ENTER is pressed showing the TARGET TQ. Scroll down to set the TORQUE to initiate DOWNSHIFT. Press ENTER. PSI appears. Scroll to the PSI level which the tool will run until TARGET TQ is achieved.
MAX PULSE COUNT	This sets a maximum allowable PULSE COUNT before the cycle is REJECTED. If a strip or cross-thread occurs, this can help detect the bad cycle. It can also detect a failing pulse pack unit. Press ENTER and LAST RUN and MAX PULSE CT setting appears. The setting can be tested at this point. Watch the screen and run some good and bad cycles. Adjust MAX PULSE CT setting until satisfied. Press ENTER to activate.
MIN PULSE COUNT	This sets a minimum allowable PULSE COUNT before the cycle is REJECTED. If a previous tightened fastener or a cross-thread occurs, this can detect the bad cycle. Press ENTER and pulse counts from the LAST RUN, then the MIN PULSE CT setting appears. Scroll UP or DOWN to set the MIN PULSE CT. The setting can be tested at this point. Watch the screen and run some good and bad cycles. Adjust MIN PULSE CT setting until satisfied. Press ENTER to activate.
CYCLE COUNTER	This allows a maintenance cycle counter to be set that counts down from a selectable number of cycles. Once this number of cycles is achieved, a MAINTENANCE REQUIRED screen appears so that normal pulse tool maintenance can be performed. Press ENTER and UP/SET, DWN/CLEAR appears. Press UP and CYCLES appear. Scroll UP to set the number of cycles to count.
BATCH COUNT	Press ENTER to adjust the BATCH COUNT or the total fasteners to be run successfully on the part. Press ENTER and scroll UP or DOWN to alter the fastener COUNT per BATCH.
BATCH TIMER	Press ENTER to adjust the BATCH TIME or the total cycle time for all fasteners to be run successfully on the part. Zero is equal to OFF or no timer. Press ENTER and scroll UP or DOWN to alter the number of SECONDS allowed for the BATCH. If all fasteners are not successfully tightened in the allotted time, a Batch NOK occurs.
TARGET TORQUE / HI LIMIT / LOW LIMIT	Adjust the torque target, high or low limit if the specification changes.

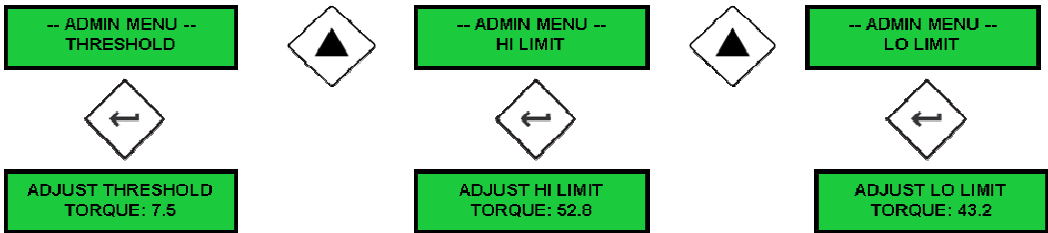
## PSI-C Controller

Function	Description
LOW LIMIT GRN ON	Use the ENTER button to toggle ON/OFF whether the green (OK) LED light turns ON after the LOW LIMIT is crossed. If OFF is chosen, the green LED turns on when TARGET TQ is achieved. Scroll to the next ADMIN function. Press the BACK button to return to the RUN screen.
CYCLE DELAY	This setting determines the off time between the end of one run-down and tool reset for the next cycle. The total range of adjustment is between 10 and 1000 counts. This relates to .25 second to four seconds of off time. The default value of 100 keeps the tool off for about one half second before allowing the operator to press the trigger for the next fastener. If this is too slow, adjust (by using the UP/DWN buttons) the value down to approximately 60-80. Any lower may be too quick and may not allow the operator enough time to release the trigger. A higher value causes the tool to reset slower.
TIME/DATE	Sets TIME and DATE. Press UP to SET. Scroll to change. Press ENTER. Press DOWN to exit.
DATA	Allows the download of all data stored on optional DTU (Data Transfer Unit). Press ENTER and then DOWN to download all RS232 serial data through RJ45 serial port. Press UP to CLEAR all DATA.
I/O (Latched or Momentary)	Allows the outputs to be latched until the next cycle starts or momentary, which turns the outputs off two seconds after the completion of the cycle. Toggle by pressing ENTER. Scroll UP or DOWN to move to the next option.
ADMIN LOCK ON/OFF	Initially turning this feature ON allows the entry of a four button code using the existing four keys in a programmable order. Once this is done, this programmed button order must be entered every time the ADMIN MENU is accessed through the ADMIN button. Turning this OFF allows entry to the ADMIN MENU without a four button code.
SENSITIVITY	Sets the level of sensitivity for the transducer circuit to reduce the negative effects of loose sockets, poor alignment and/or electrical noise from affecting the torque readings. Default setting is seven (7) for most impact tools and 14 for pulse tools. <b>NOTE:</b> A change to the SENSITIVITY setting requires an adjustment or resetting of the CALIBRATION VALUE.
ETHERNET	Allows entry of the UNIT IP ADDRESS. Scroll UP or DOWN to change. Press ENTER. After changing the settings under ETHERNET, it is necessary turn the power to the PSI-C off and on.
PRETORQUE	Allows the setup of a two-step fastening procedure. This is used for wheels, cylinder heads or any assembly that requires a snug torque before a final torque to compensate for relaxation. Press ENTER. Scroll UP to choose PRETORQUE. This is usually 50-60% of the specified final torque. Press ENTER. <b>NOTE:</b> BATCH COUNT must be programmed for correct sequencing. The Run Screen now shows PTQ when running PRETORQUE or snug torque. PRETORQUE all fasteners. When the PRETORQUE BATCH is finished OK. The Run Screen changes to show TQ. Final Torque all fasteners. <b>NOTE:</b> MIN PULSE COUNT may need to be adjusted to accept final torque, while still rejecting a REHIT fastener.
RAMP	ON / OFF can be chosen to enable increased air pressure from the START PSI upon reaching THRESHOLD. The START PSI default value is 40 PSI. This is to control the rundown speed and prevent torque scatter. When the tool runs a fastener, the PSI is RAMPED up to maximum PSI until the TARGET TQ is achieved (the speed at which this PSI is fixed). Press the ENTER button to choose option. Scroll to the next ADMIN function. Press the BACK button to return to the RUN screen.

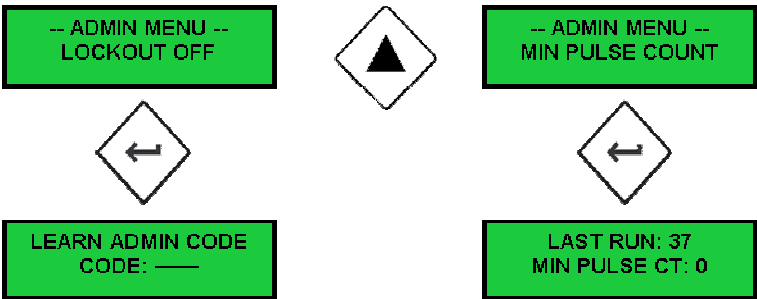
2.5.1 Operation Flowchart Basic ADMIN MENU



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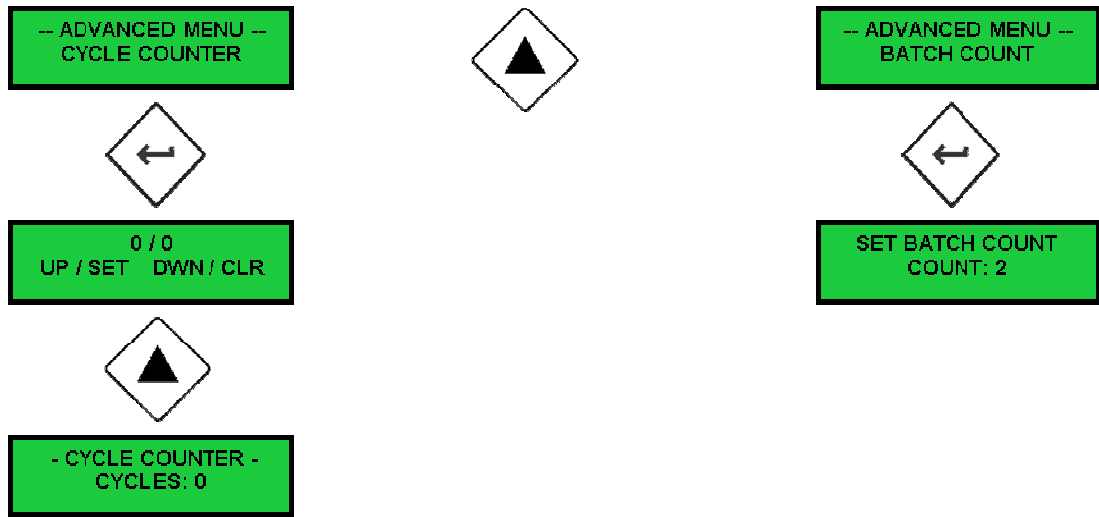
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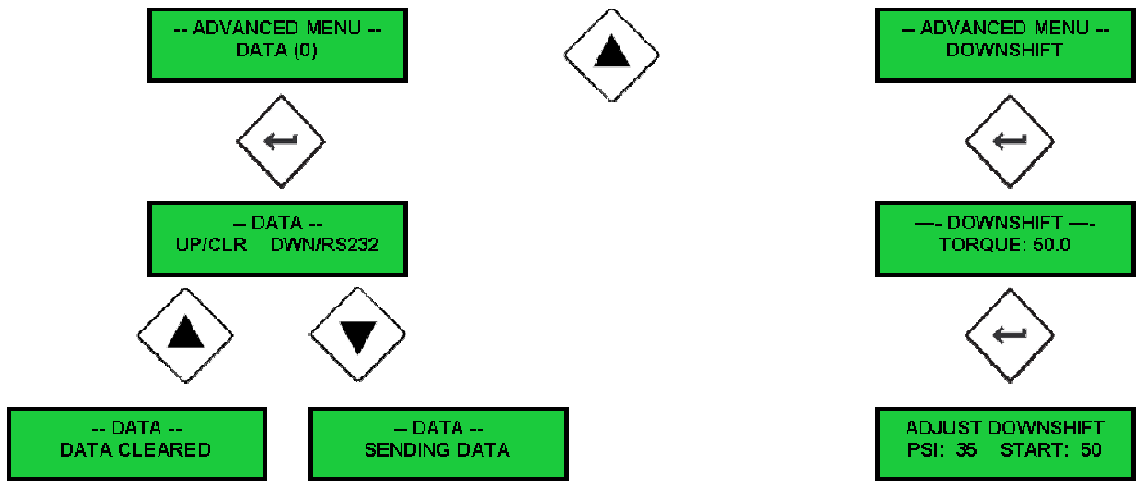


# PSI-C Controller

## Operation Flowchart Continued

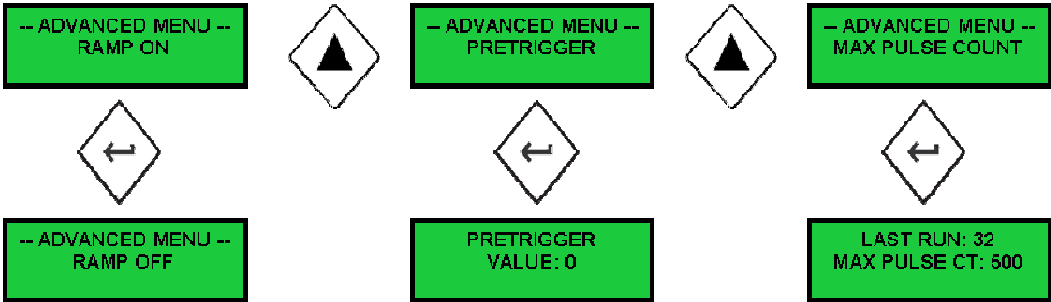


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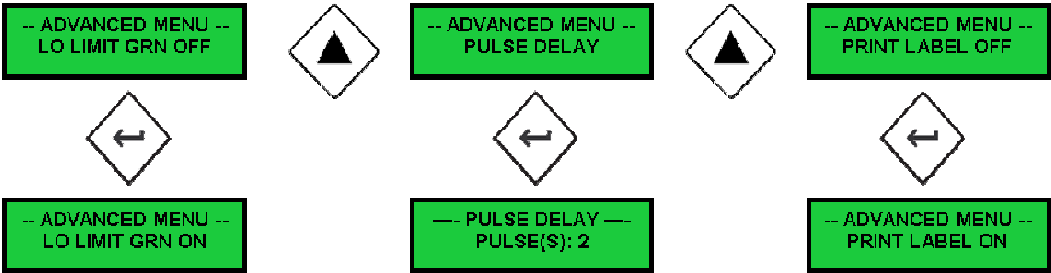


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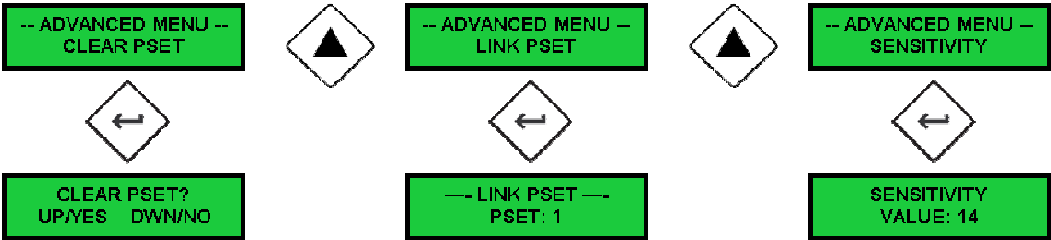
Operation Flowchart Continued



Continued Below



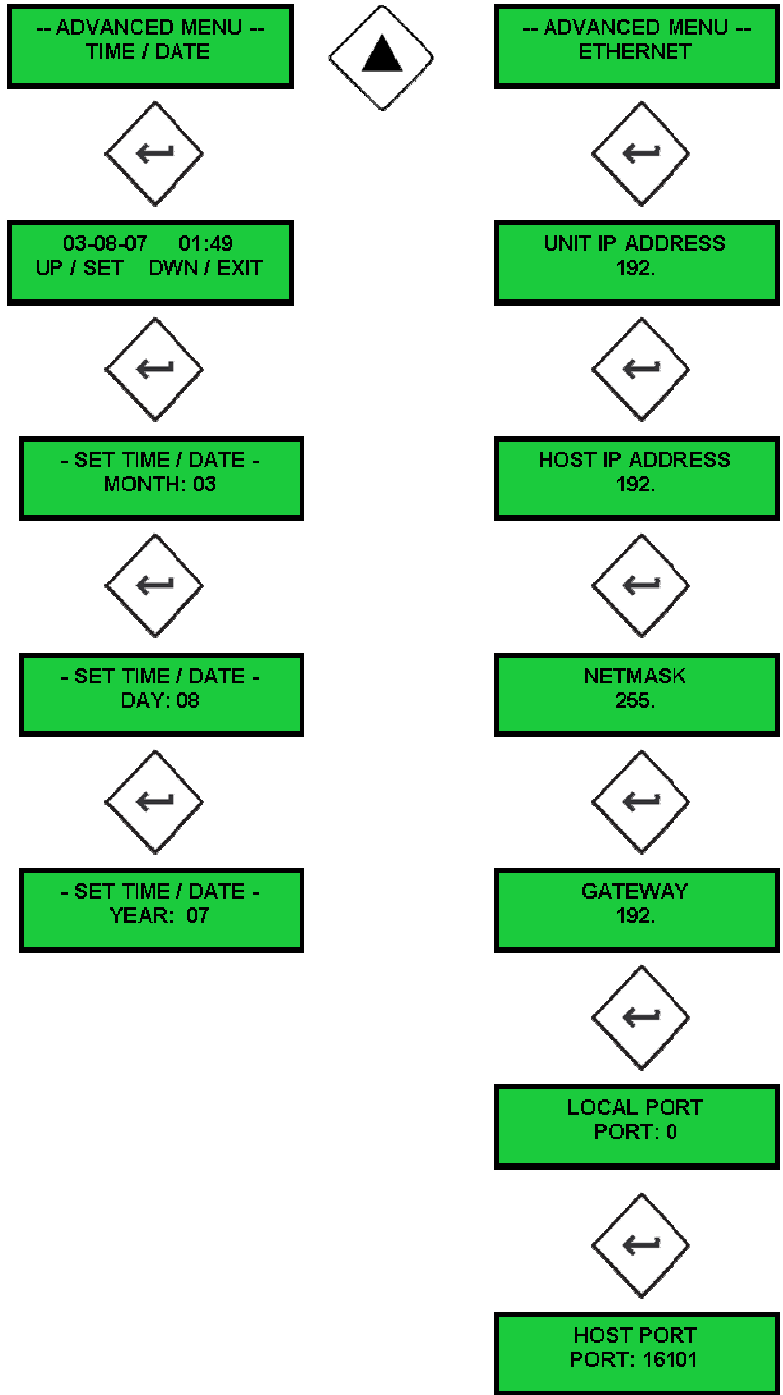
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# PSI-C Controller

## Operation Flowchart Continued



After changing the ETHERNET settings, it is necessary to cycle power on the PSI-C.

### 2.5.2 Error Proofing OK/NOK

Error proofing is one of the most important features of the PSI-C controller. Once an application has been setup, the PSI-C controls the torque applied and discerns between a fastening cycle pass (OK) and error (NOK):

**2.5.2.1 Errors**

Error	Description
LOW TORQUE or Short Cycle	If the tool has run many cycles and the pulse oil or the air motor needs maintenance, the tool may not be able to reach torque. The operator may be stopping the cycle prior to completion of the fastening to TARGET TQ. This sometimes occurs when the operator anticipates the end of cycle and releases the trigger prematurely (before the PSI-C controller has shut-off the tool). If LOW LIMIT GRN ON is chosen in the ADMIN MENU and the operator releases the trigger after the LOW LIMIT has been passed, then a PASS results, even though TARGET TORQUE has not been achieved.
HIGH TORQUE	This can occur if joint conditions change to a harder type joint than the original, or the PSI has been adjusted to increase the tool speed beyond what can be controlled consistently on the application. This can also occur if the CAL VALUE is incorrect.
RE-HIT	This occurs whenever the tool is applied to a pre-tightened fastener. This is not a defaulted error condition. It must be set up through the MIN PULSE COUNT in the ADMIN MENU. Once set up correctly, an NOK displays when the tool is cycled on a previously tightened fastener. If a REHIT is accepted, the MIN PULSE COUNT feature should be adjusted.
MIN PULSE COUNT	If a MIN number of PULSES is not achieved before TARGET TORQUE is reached, an error occurs. Once set up correctly, if a previous tightened fastener or a cross-thread occurs, a NOK results. The system default is zero (0) pulse counts, which means all rundowns which result in a final torque between LOW LIMIT and HIGH LIMIT will be OK.
MAX PULSE COUNT	If a strip or cross-thread occurs, this can cause too many pulses and a bad cycle. This error can also occur if the pulse pack in the tool is in need of service or failing.
Slip-off (or cam out)	If the socket or screwdriver bit slips off the fastener, the controller will not count the cycle or alarm this condition as TQ LOW if the THRESHOLD has not been crossed.
Short cycle (premature cycle abort)	This feature insures that only attempts to tighten fasteners are counted. The controller will not count the cycle or alarm this condition as TQ LOW if the THRESHOLD has not been crossed.



**NOTE:**  
The PSI-C ignores no-load running of the tool unless THRESHOLD is crossed.

**2.5.2.2 Normal Operation / Run Mode**

When operating in the RUN mode, the UP/ DOWN keys allow the operator to change between parameter sets, unless the PSET LOCK OUT is activated. PSET LOCK OUT is recommended when only one PSET is being utilized.

Pressing the BACK button clears the batch. The BATCH NOK output fires and turns on the red BATCH LED.

Pressing and holding the BACK button for one to two seconds puts the PSI-C in OVER-RIDE mode. OVER-RIDE means that the system has full power *without* any torque control or shut-off capabilities.

The PSI-C has a two line main display. This shows the final TORQUE, Parameter or PSET, the BATCH or fastener COUNT and the BATCH TIMER. BATCH COUNT represents the number of fasteners that the PSI-C has been programmed to count (per BATCH). LED lights change to GREEN upon reaching an OK or GOOD fastening cycle. Outputs and CYCLE lights on the tool, if applicable, fire automatically. CYCLE lights on the tool can be fired after crossing the LOW LIMIT or when TARGET TORQUE is achieved.

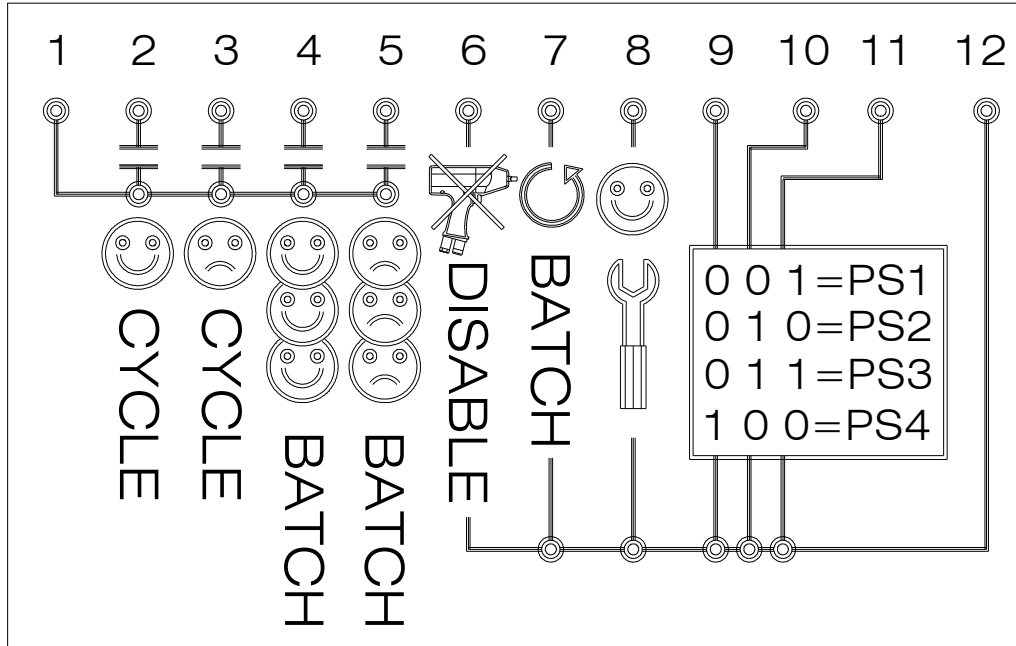
The BATCH light on the PSI-C and internal outputs also fire automatically. Running the next cycle clears these lights and resets outputs automatically. Select I/O MOMENTARY from the ADMIN MENU to clear the cycle lights and reset the outputs after two seconds.

## PSI-C Controller

### 2.5.3 Inputs / Outputs (I/O)

Output signal lines are switched by closing normally open relay contacts. These relays conform to VDE0435, UL508 and CSA22.2. Signal power is customer supplied and may be AC or DC up to 48 volts. The maximum current capacity of the relay circuitry is seven amps per contact with seven amps total.

Inputs are optically decoupled from other circuitry. These signals must be between 12 and 24 volts DC. The design will accept DC input signals of either polarity.



I/O Schematic

Outputs	
Pin #	Description
1	OUTPUT COMMON BUS
2	CYCLE OK
3	CYCLE NOK
4	BATCH OK
5	BATCH NOK

Inputs	
Pin #	Description
6	DISABLE TOOL
7	BATCH / REJECT RESET
8	MANUAL WRENCH ACCEPT
9	PSET Select BIT 3
10	PSET Select BIT 2
11	PSET Select BIT 1
12	INPUT COMMON BUS



**NOTE:**

I/O Connector Plug Part No. 24X500537.

The PSI-C I/O terminal strip is located externally on the bottom of the PSI-C. Certain remote connections are also accessible via the RJ45 socket located on the right side bottom panel and can be easily accessed using the ROI (Remote Operator Interface). Standard I/O is optically isolated and relay operated using dry contacts; normally open. I/O must be powered from a remote source.

Standard INPUTS are: Disable (Part Not-Present) and Batch Clear (Reset). Input terminals 9, 10 and 11 are used to select Parameter Sets according to the following table:

Pin 9	Pin 10	Pin 11	Parameter Set	Binary + 1
Off	Off	Off	Keypad Selects	1
Off	Off	On	1	2
Off	On	Off	2	3
Off	On	On	3	4
On	Off	Off	4	5
On	Off	On	5	6
On	On	Off	6	7
On	On	On	7	8

When all three inputs are OFF the controller returns to manual keypad selection. Choose Binary + 1 mode using the ADMIN button.

Standard OUTPUTS are: Batch NOK, Batch OK, Cycle OK and Cycle NOK.



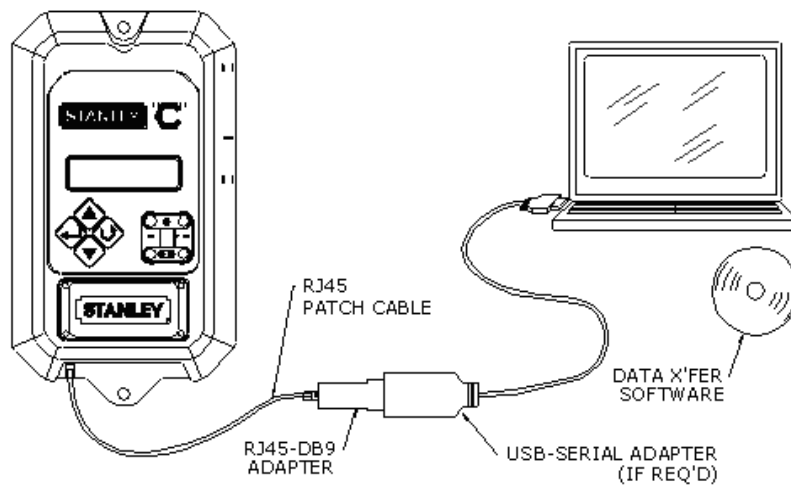
**NOTE:**  
Remote Batch Reset is available by holding the OVERRIDE button for one (1) second, then pressing the UP button once.

**2.5.4 RJ45 Auxiliary Connector**

Located on the right side of the bottom panel, the RJ45 connector provides access to the following functions: Cycle Accept/Reject indicator lights, UP button, DOWN button and RESET/OVERRIDE button.

**2.5.5 Data Collection and Download**

If the PSI-C has the DTU (Data Transfer Unit, Part # 24K500172) all parameter values and fastening cycle data from the last 72 readings per Parameter Set is stored in the memory of the DTU. The Data Transfer Kit (part # 24K500340) can be used to download this data to a Microsoft Excel spreadsheet. The kit includes the Data Transfer Software Program and all cables and adapter required. An RS232 serial bus is ported through the RJ45 connector located on the left side of the bottom panel of the PSI-C. The data is sent through this serial output directly into a Windows Excel file. An RJ45 patch cable and RJ45/F to DB9/S adapter are required to output serial data. The data cable configuration is shown below.



## PSI-C Controller

Data Collection Transfer Kit — Part # 24K500340

Once the Data Collection Cable Assembly is correctly assembled, open the Data Collection software program. Select the COM Port. Go into the ADMIN MENU of the PSI-C and scroll to DATA. Press ENTER. Press DOWN to download all data from the current Parameter Set. Name and save the Microsoft Excel Spreadsheet.

Press UP to clear all DATA.

The data format is as follows:

NOMINAL CAL VALUE (NM)	125.1	MIN
		21
TARGET TQ	21	
HI LIMIT	24	MAX
LO LIMIT	18	21.6
THRESHOLD	10.5	
		AVG
MIN PULSES	0	21.1633
MAX PULSES	500	
		RANGE
DOWNSHIFT TQ	21	0.6
DOWNSHIFT PSI	44	
		STD. DEV.
START PSI	44	0.182857271
NUMBER OF BOLTS	1	
SENSITIVITY	7	6 SIGMA
		1.097143627
		% 6 SIGMA
		0.051841721
		CPK
		5.171003317
		CPR
NUMBER OF READINGS STORED	30	0.008640287
		READING TIME/DATE RESULT
	03-28-08 4:19:22	21.0
	03-28-08 4:19:24	21.1
	03-28-08 4:19:26	21.0
	03-28-08 4:19:28	21.1

Internal Wiring for RJ45 to DB9F Adapters		
	RJ45 Pin	DB9 Pin
Data Collection – RJ45 Serial Adapter to DB9F (Part # 24K500496)	5	5
	7	2
	3	3
Network (Serial) Protocol, PFCS Check & Cooper Cart – RJ45 Adaptor to DB9F (Part # 24K500497)	5	5
	6	2
	3	3

### 2.5.6 Serial Port

If no network card is installed in the PSI-C then the serial port will provide an output string after each rundown that passes the Threshold Torque value. Here is a sample of the output string.

**Message Cycle Rundown Data**

Start	End	Length	Field	Format
1	1	1	Begin measuring data	'*'
2	3	2	Message Type	'13'
4	4	1	Revision	'A'
5	16	12	Time/Date	
17	22	6	'FF0101' or 'PP0101'	
23	23	1	Torque Pass/Fail	'P' or 'F'
24	28	5	Torque High Limit	01000 (100.0)
29	33	5	Torque Low Limit	01000 (100.0)
34	38	5	Torque Final	01000 (100.0)
39	40	1	Pulse/Angle Pass/Fail	'P' or 'F'
40	44	5	Pulse/Angle Max Limit	00005 (5)
45	49	5	Pulse/Angle Min Limit	00005 (5)
50	54	5	Pulse/Angle Final	00005 (5)
55	55	1	<b>UNITS</b>	1 - 5
56	57	2	Current Pset	01 - 08
58	59	2	Batch Count	01 - 99
60	61	2	Current Count	01 - 99
62	63	2	Filter	01 - 64
64	68	5	Transducer Cal	01000 (100.0)
69	73	5	Target Torque	01000 (100.0)
74	78	5	Angle Target	00000 - 99999
79	83	5	Transducer Zero	00000 - 04095
84	88	5	Adc Tq Shutoff	00000 - 04095
89	93	5	Adc Tq Final	00000 - 04095
94	94	1	Early Release	'Y' or 'N'
95	134	40	Barcode	ASCII
135	150	16	Controller Name	ASCII
151	155	5	Packet Number	00000 - 65535
156	156	1	End of Data	'\r' (0x0D)

**2.5.7 Networking**

The PSI-C is Ethernet Network capable through an optional Ethernet Network card.

1. Ethernet (TCP/IP): This optional card, part #24B500502, must be factory programmed for Ethernet. It is accessed via an RJ45 port located on the bottom panel of the enclosure. The Ethernet card communicates using TCP/IP and can be configured to utilize communication software programs.

2. PFCS (Chrysler): PFCS is available in both Serial RS 232 and Ethernet formats. If the PFCS Ethernet network card has not been factory installed and the PSI-C is being converted to PFCS communication, follow the instructions below.

PFCS Ethernet network card: Remove jumpers from main control board (JP1 and JP2).

PFCS Serial network card: Remove all jumpers from main control board JP1 and install jumpers onto *all* positions on JP2.

The following JUMPER arrangements must be installed on the PSI-C main board:

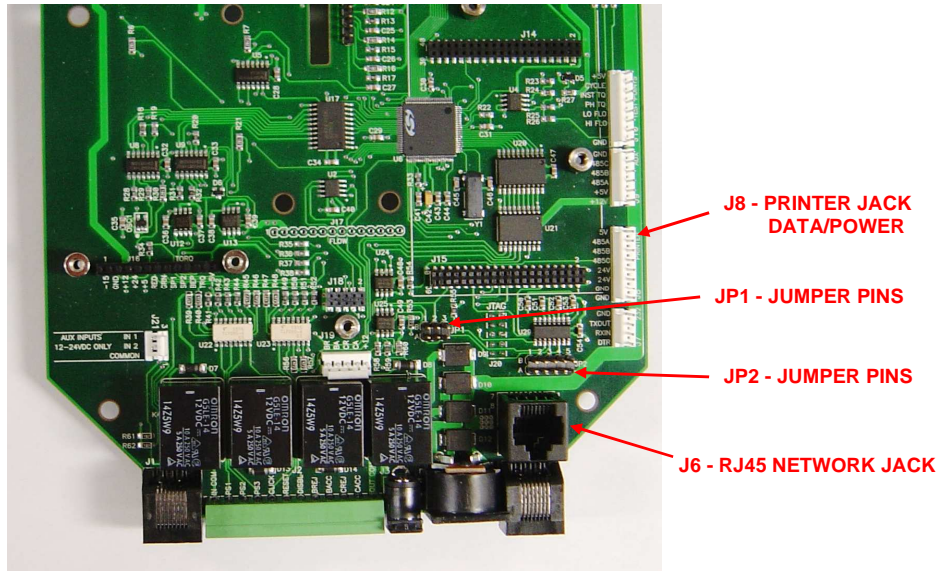
DATA or NETWORK Configurations	
Data Collection and Download (Std. Configuration)	JP1 -Install Jumpers 1,2 JP 2 -Install Jumpers 2,3,5
Network Card – Serial Protocols (PFCS & Std. Serial)	JP 1 -No Jumpers Installed J JP 2 -Install All Jumpers
Network Card – Ethernet Protocols (PFCS Ethernet)	JP 1 -No Jumpers Installed JP 2 -No Jumpers Installed



# PSI-C Controller

## DATA or NETWORK Configurations

	Install Cable (Part # 24C500400) From Network Card Board To J6
Printer Installation (Part #24X500173)	JP 1 -Install Jumpers 1,2
	JP 2 -Install Jumpers 2,3,5
	Cable (Part # 24X500544) From Printer To J8



### 2.5.7.1 Standard Ethernet Protocol

#### 2.5.7.1.1 Theory of Operation:

The PSI-C standard Ethernet protocol supports three messages on port 4240.

Every time the controller has a result (OK, NOK), the network card sends a cycle data packet to the server. The network card attempts to send this packet three times. If an acknowledgement packet is not received, the controller disconnects from the server and attempts a new connection. If the network card has not transmitted a final data packet within two minutes of the last one, it sends a *Keep Alive* message to the server to keep the connection open.

#### 2.5.7.1.2 Packets

Message      Cycle Rundown Data Psi-C, -C2

Start	End	Length	Field	Format
1	1	1	Begin measuring data	'*'
2	3	2	Message Type	'13'
4	4	1	Revision	'A'
5	16	12	Time/Date	
17	22	6	'FF0101' or 'PP0101'	
23	23	1	Torque Pass/Fail	'P' or 'F'
24	28	5	Torque High Limit	01000 (100.0)
29	33	5	Torque Low Limit	01000 (100.0)
34	38	5	Torque Final	01000 (100.0)
39	40	1	Pulse/Angle Pass/Fail	'P' or 'F'
40	44	5	Pulse/Angle Max Limit	00005 (5)
45	49	5	Pulse/Angle Min Limit	00005 (5)
50	54	5	Pulse/Angle Final	00005 (5)
55	55	1	Strategy	'0' - '9'
56	57	2	Current Pset	01 - 08
58	59	2	Batch Count	01 - 99

60	61	2	Current Count	01 - 99
62	63	2	Sensitivity	01 - 64
64	68	5	Transducer Cal	01000 (100.0)
69	73	5	Target Torque	01000 (100.0)
74	78	5	Angle Target	00000 - 99999
79	83	5	Transducer Zero	00000 - 04095
84	88	5	Adc Tq Shutoff	00000 - 04095
89	93	5	Adc Tq Final	00000 - 04095
94	94	1	Early Release	'Y' or 'N'
95	134	40	Barcode	ASCII
135	150	16	Controller Name	ASCII
151	155	5	Packet Number	00000 - 65535
156	156	1	End of Data	'\r' (0x0D)

Direction: Controller to Host  
Retries: 3  
Notes: After three retries the unit will close the connection.

**Message Keep Alive**

<b>Start</b>	<b>End</b>	<b>Length</b>	<b>Field</b>	<b>Format</b>
1	1	1	Begin measuring data	'*'
2	3	2	Message Type	'98'
4	4	1	Revision	'A'
5	20	16	Controller Name	ASCII
21	21	1	End of Data	'\r' (0x0D)

Direction: Controller to Host  
Retries: 3  
Notes: Sent every 30 Seconds. After three retries the unit will close the connection.

**Message Acknowledgement**

<b>Start</b>	<b>End</b>	<b>Length</b>	<b>Field</b>	<b>Format</b>
1	1	1	Begin measuring data	'*'
2	4	3	Message Type	'98R'
5	5	1	End of Data	'\r' (0x0D)

Direction: Host to Controller  
Notes: Sent in reply to Final Data or Keep Alive messages

**2.5.8 Troubleshooting and Adjustments**

**2.5.8.1 Transducer Calibration**

If the controller does not correlate once the NOMINAL CAL VALUE of the tool is programmed, check the cable and connections.

-Substitute a known good cable and then a known good tool to determine if the tool's wiring/transducer or cable is defective.

Should the transducer set-up correctly but the torque value not agree with your MASTER:

- Check that the NOM CAL of the tool is correctly entered;
- Perform a CORRELATION routine described previously.

## **PSI-C Controller**



### **NOTE:**

Any added square drive extension, including a rotary transducer, causes efficiency loss and thus torque loss at the fastener. Use only eCoDrive sockets and extensions for maximum efficiency.

### **2.5.8.2 Set-up Problems**

The inability for the controller or tool to set up correctly may be due to too a bad cable connection or wiring within the tool to the connector. This may be indicated by the controller screen reading XDUCER FAIL or CALIBRATION FAILED. Check cable connections at the PSI-C and at the tool. Change the cable if this does not correct the fault.

### **2.5.8.3 Other Concerns**

#### **2.5.8.3.1 Tool Air Hose Length**

The PSI-C is designed to operate a tool with an 8' - 25' long, 3/8" inside diameter air hose. However, the controller adjusts to any reasonable hose length, provided that the pressure drop and restrictions do not affect the airflow volume. With a longer hose, the system may require a longer dwell time between fasteners. See CYCLE DELAY under ADMIN functions. If the tool is changed, the torque should be checked and the system calibrated with the new tool to ensure proper function.

#### **2.5.8.3.2 Air Pressure and Volume**

Clean air at 90 psi with sufficient air volume is required in cases where the tool is being used at or above 90% of its rated capacity. The air pressure required for a particular application varies depending on the tool and the torque required. If the tool is used at >90% of its specified output, then the available air pressure is critical in order to achieve torque. If the PSI-C setup requires 75 PSI to achieve torque with a particular tool, then the input air pressure to the controller must not fall below 75 PSI when the tool is pulsing (or coming to final torque). If the facilities air pressure falls more than 10 PSI from static reading when a tool is free-running, then the plant air volume may not be sufficient for the application and a tool with more torque capacity may be required.

#### **2.5.8.3.3 Excessive Cycle Time**

If torque scatter is excessive, or the cycle time is too long, suspect the socket and/or extension. Worn or broken sockets can cause erratic torque, long cycle times and excessive pulsing. Extensions can rob the torque from a tool and stop it from reaching the fastener. If increasing the air pressure and torque target does not shorten the cycle time or correct the scatter issue, then remove the extension, shorten the extension or switch to the eCoDrive Fat Boy extension.

For any problem other than a bad socket/extension, substitute a known good cable first, then a known good tool, then a known good PSI-C controller (in that order). One of these or a combination will correct the issue. Send the problematic part in for repair. Please contact your Stanley Sales Engineer for assistance.

If a CYCLE error displays often after a rundown, check the following settings in the ADMIN MENU:

MIN PULSE COUNT, MAX PULSE COUNT, PULSE DELAY, LOW/HIGH LIMITS, THRESHOLD and TARGET TORQUE. Refer to ADMIN functions section in this manual for proper setup and definitions of these features.

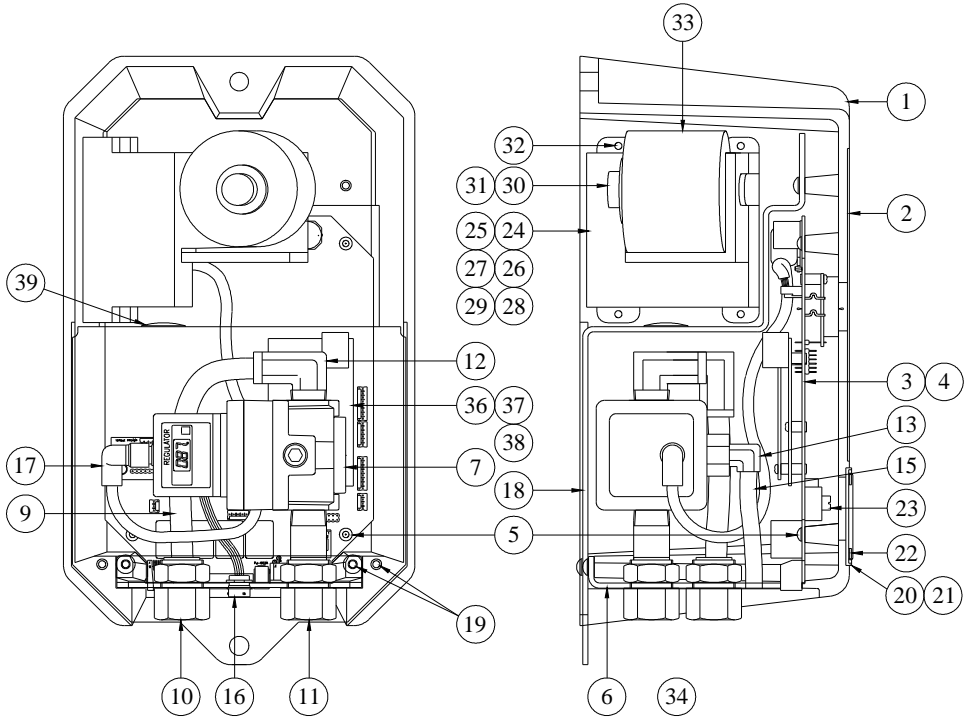
The display will continue to indicate the error condition of the last failed cycle on the second line of the display.

## **2.6 Service and Maintenance**

The PSI-C requires no scheduled adjustments or maintenance. Ensure that the air supply is clean and filtered and that any lubricator (if used) is installed after the box. If a lubricator is installed before the controller, adjust it to the minimum setting. Any moisture present in the input air can foul the main valve and render the controller inoperable.

Should service be required, contact your local distributor or Stanley Assembly Technologies.

2.7 PSI-C Controller Assembly (PSI-C)

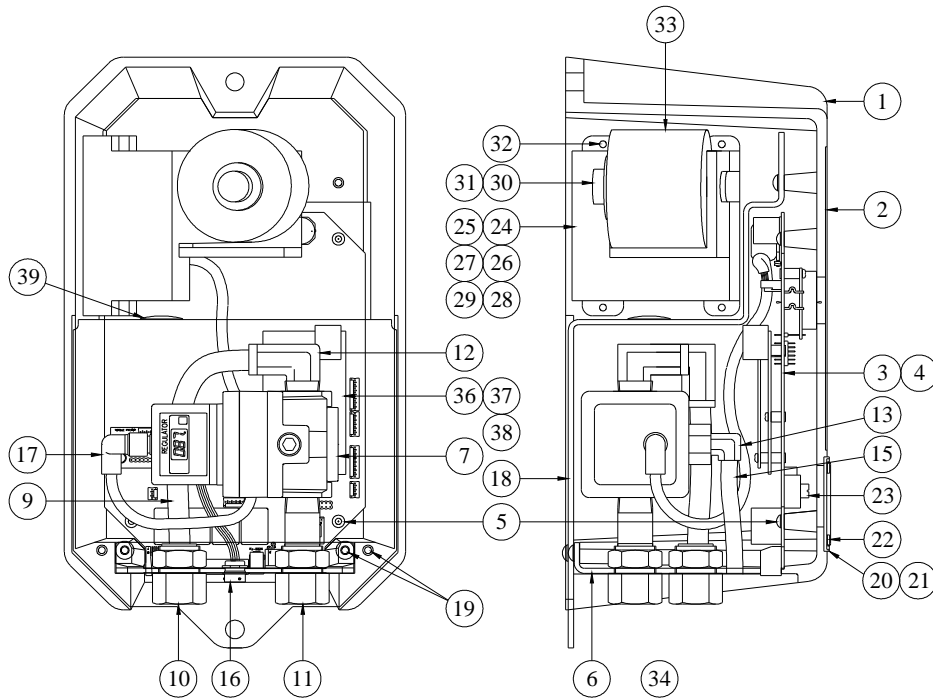


Item	Qty	Part No.	Description
1	1	24E500178	Enclosure – Molded Plastic
2	1	24X500195	Overlay – Keypad
3	1	24B500165	Main Board Assembly
4	1	24B500229	Pre-Amp Board Assembly
5	4	24R500299	Screw-Pan Head-High-Low #8 x ½”
6	1	24X500193	Bottom Panel Cover
7	1	24W510085	Valve – 2000
9	1	24X500008	½” OD Tube
10	1	24X500064	Bulkhead-Output 3/8 NPT – ½ Tube
11	1	24X500192	Bulkhead-Input ½ F NPT – 3/8 M NPT
12	1	24X500328	90 Degree Fitting – 3/8 NPT - ½ Tube
13	1	24X500018	90 Degree Fitting – ¼ NPT – BARB
15	1	24R500257	3/8” OD Tube
16	1	24C501500	Harness-Transducer
17	1	24X500029	Harness-Valve
18	1	24X500194	Rear Panel Cover
19	6	24R500298	Screw-Pan Head- High-Low #10 x ½”
20	1	24X500211	Access Panel – Front-DTU
21	1	24R500028	Label – Logo Bubble
22	4	24R500224	Rivet – Finger
23	1	24K500172	DTU – Data Transfer Unit (optional)
*	24	24X500196	Printer Housing
*	25	24B500225	Printer Board
*	26	24X500331	Printer Head
*	27	24R500332	Screw-Pan Head #2 x 3/8”
*	28	24R500299	Screw-Pan Head-High-Low #8 x ½”

## PSI-C Controller

Item	Qty	Part No.	Description	
*	29	1	24X500544	Harness-Cable-Printer Data/Power
*	30	4	24X500197	Spindle-Paper Roll-Printer
*	31	4	24X500198	Washer-Spindle-Printer
*	32	4	24R500298	Screw-Pan Head-High-Low #10 x 1/2"
	33	1	24X500147	Labels-Printer (Case of 20) (optional)
	34	1	24X500092	Power Supply – Standard
	36	1	24B500032	Network Card (Option - Serial)
		1	24B500502	Network Card (Option - Ethernet)
**	37	1	24C500400	RJ45 Cable – Network
**	38	2	24R500102	Pan Head Screw 4-40 x 3/8"
	39	1	24R500325	Cap Plug
	* Part of Printer Assembly -- #10780 (optional)			
	** Used with Network Card			

### 2.8 PSI-C HI-Flow Controller Assembly (PSI-C/H)



Item	Qty	Part No.	Description	
	1	1	24E500178	Enclosure – Molded Plastic
	2	1	24X500195	Overlay – Keypad
	3	1	24B500165	Main Board Assembly
	4	1	24B500229	Pre-Amp Board Assembly
	5	4	24R500299	Screw-Pan Head-High-Low #8 x 1/2"
	6	1	24X500193	Bottom Panel Cover
	7	1	24X500025	Valve – ITV 3000
	9	1	24X500008	1/2" OD Tube
	10	1	24X500064	Bulkhead-Output 3/8 NPT – 1/2 Tube
	11	1	24X500192	Bulkhead-Input 1/2 F NPT – 3/8 M NPT
	12	1	24R500268	90 Degree Fitting – 1/2 NPT - 1/2 Tube
	13	1	24X500018	90 Degree Fitting – 1/4 NPT – BARB
	14	1	24R500289	Reducer Bushing – 3/8" – 1/4"
	15	1	24R500257	3/8" OD Tube

Item	Qty	Part No.	Description
16	1	24C501500	Harness-Transducer
17	1	24X500029	Harness- ITV Valve
18	1	24X500194	Rear Panel Cover
19	6	24R500298	Screw-Pan Head- High-Low #10 x 1/2"
20	1	24X500211	Access Panel – Front-DTU
21	1	24R500028	Label – Logo Bubble
22	4	24R500224	Rivet – Finger
23	1	24K500172	DTU – Data Transfer Unit (optional)
*	24	24X500196	Printer Housing
*	25	24B500225	Printer Board
*	26	24X500331	Printer Head
*	27	24R500332	Screw-Pan Head #2 x 3/8"
*	28	24R500299	Screw-Pan Head-High-Low #8 x 1/2"
*	29	24X500544	Harness-Cable-Printer Data/Power
*	30	24X500197	Spindle-Paper Roll-Printer
*	31	24X500198	Washer-Spindle-Printer
*	32	24R500298	Screw-Pan Head-High-Low #10 x 1/2"
	33	24X500147	Labels-Printer (Case of 20) (optional)
	34	24X500092	Power Supply – Standard
	36	24B500032	Network Card (Option - Serial)
		24B500502	Network Card (Option - Ethernet)
**	37	24C500400	RJ45 Cable – Network
**	38	24R500102	Pan Head Screw 4-40 x 3/8"
	39	24R500325	Cap Plug

\* Part of Printer Assembly -- 24X500173 (optional)

\*\* Used with Network Card

## ***PSI-C Controller***

### **Contacts**

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