



INSTRUCTIONS FOR TC4A AND TC6A TORQUE CONTROLLERS (SERIAL A)

GENERAL SAFETY RULES



USER MUST READ AND UNDERSTAND INSTRUCTIONS TO REDUCE THE RISK OF INJURY.



ALWAYS UNPLUG POWER CORD BEFORE SERVICING UNIT OR REMOVING TOP COVER TO REDUCE THE RISK OF ELECTRICAL SHOCK AND INJURY.

ALWAYS PLUG POWER CORD INTO A PROPERLY GROUNDED OUTLET TO REDUCE THE RISK OF ELECTRICAL SHOCK.



ALWAYS WEAR EYE PROTECTION TO PREVENT INJURY FROM FLYING DEBRIS.



ALWAYS WEAR HEARING PROTECTION TO REDUCE THE RISK OF HEARING LOSS DUE TO NOISY WORK ENVIRONMENTS.

AIR SUPPLY

The operation and life of the torque controller is dependent on a proper supply of clean dry air. Inlet supply air pressure to the controller should not exceed 120 PSIG (8.3 bar). Once the application is setup, the air supply is required to maintain a pressure higher than the air pressure set with the regulator inside the controller enclosure.

The use of a line filter and oiler will insure maximum output and life of the controller and tool. Before connecting the supply line to the controller, blow out the airline to remove water and dirt which may have accumulated.

LUBRICATION

An in-line oiler is recommended and should be placed ahead of the controller. Follow the manufactures recommended lubrication instruction for the tool being used. Do not flood the system with excessive oiling.

HOSE AND HOSE CONNECTIONS

The supply line hose to the controller should have a minimum of ½" (13mm) I.D. and capable of supplying an air flow and pressure above the amount set with the regulator inside the controller enclosure.

The leader hose between the controller and the tool is not to exceed 30 ft (9.1 m) and must be made of rubber. Diameter of leader hose and fittings must be sufficient to supply the tool being used.

Changing the leader hose and fittings after an application has been setup may result in a different resultant torque or error message because the pressure sensor would not be receiving the same pressure signal strength.

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Printed In U.S.A.

GENERAL OPERATION

The TC4 and TC6 Torque Controllers are used with impact or pulse tools for the purpose of controlling applied torque to a fastener by monitoring the air pressure in the leader hose.

The torque controller consists of four main components, an air pressure sensor, an air regulator, a solenoid, and the controller. Each of these components plays an important role in the completion of a successful joint.

The air pressure sensor provides critical information concerning the number of blows and the intensity level of each blow back to the controller. Each time a tool impacts while running down a fastener, the motor is decelerated causing an increase in the inlet air pressure. The air pressure sensor picks up this fluctuation as well as its severity, and sends the signal back to the controller.

Using parameters whose values have been set either automatically or manually, the controller analyzes the signal from the pressure sensor to determine when to shut the tool off. If the signal falls within acceptable values of the parameters, the controller determines that the fastener has been accurately tightened and the solenoid is signaled to shut off the tool, the green light

will be illuminated, display flashes "GOOD". If the controller detects abnormalities in the signal from the sensor, then it will determine the joint was not fastened successfully, and will enter an alarm condition (red light illuminates, buzzer sounds, and display flashes alarm code).

Five alarm settings are included in the parameters, which detect abnormalities in the amount of time or the blow levels during the fastening cycle. Alarm is signaled with a buzzer sound and red light if parameters are not met.

Accuracy and repeatability of tightening fasteners is enhanced when the following external factors are controlled. These external factors can affect the pressure being read by the pressure sensor and can ultimately change the signal sent to the controller.

- Maintain joint consistency.
- Maintain uniform inlet air pressure.
- Do not exceed maximum hose lengths.
- Use hoses giving adequate airflow.
- Maintain tool for proper performance.
- Tool must be sized appropriately for the application.

SETUP PROCEDURE

INSTALLATION OF TORQUE CONTROLLER

1. Place the torque control enclosure in a secure location where it will not be subjected to damage from moving assembly lines, forklift traffic, etc.
2. Secure the enclosure to a shelf, bench, or wall to ensure it will not be knocked off or pulled off by the air hose.
3. Connect the inlet air supply making sure it is connected to the "AIR IN – SUPPLY LINE" fitting.
4. Connect the air hose between the tool and the controller connection labeled "AIR OUT – TO TOOL". Reference section "**HOSE AND HOSE CONNECTIONS**".
5. Connect the grounded 110-volt power cord to the nearest electrical outlet, making sure all electrical connections are in compliance with local electrical codes. Reference section "**GENERAL SAFETY RULES**".
6. Prior to hook-up, the air pressure should be monitored to determine that the air pressure/volume is sufficient to operate the selected tool. Lubricators and filters should be installed ahead of the controller in the supply line. Reference sections "**AIR SUPPLY**" and "**LUBRICATION**".
7. At this time the pressure gauge should be monitored to determine the lowest pressure that will be encountered at the controller when the plant is running at full production. All tools have recommended air pressure for maximum efficiency and

all will be adversely affected by lower than normal pressure. This minimum air pressure that will be encountered during an operating shift must be determined, as the controller will have to be programmed to operate at the lowest pressure it will encounter during the shift. Example: if the system normally runs at 100 PSIG, but occasionally when all tools are operating at the same time, the pressure could fall to 90 PSIG the controller regulator should be set at 88-90 PSIG so all the performance is controlled at the lowest pressure that will be encountered.

8. If a remote light tower kit is to be used with the controller, it should be located so it will be in the operator's line of sight when the tool run is completed and the lights illuminate. The remote light tower kit is connected to the controller by plugging in the end of the cord to the receptacle labeled "REMOTE LIGHT TOWER" on the enclosure.
9. If a remote channel selector switch kit is used with the controller, it should be located so the operator can easily reach the switch to change channels. The remote channel selector switch kit is connected to the controller by plugging in the end of the cord to the receptacle labeled "REMOTE CHANNEL SELECTOR" on the enclosure.
10. The Torque Controller is now ready for configuration checking and programming.

**CONFIGURING THE SYSTEM TO THE APPLICATION
(SYSTEM MODE)**

Upon start-up of the application, various settings can be adjusted to allow the TC4 and TC6 Torque Controllers to most effectively control the tool being used. Once these settings are made they will be common to all the channels. Adjustments to the system settings can be checked or changed as follows:

Depress and continue to hold the “ENTER” button, while turning on the controller power switch. The controller goes into the “SYSTEM MODE” program. Do not release the “ENTER” button until “SET RUN” is displayed. Use the “SELECT” button to scroll through the following settings. Values can be changed by using the “↓” and “↑” buttons and then accepting the value by pressing the “ENTER” button. (Note: Values displayed in red are not accepted till the “ENTER” button is pressed to accept the value and the value changes to green.)

- 1. **SET RUN:** Setting can be “ON” or “OFF”. If the setting is “ON” the results of the last fastener run down will be displayed. If the setting is “OFF” no indication will be shown.
- 2. **CONT:** Setting can be “ON” or “OFF” and controls the tool throttle function. In the “ON” setting the operator can hold the trigger and start a new fastener prior to the solenoid resetting. In the “OFF” setting the operator must release the trigger and pull the trigger again to start a new fastener.
- 3. **NG3:** Setting can be either 50% or 70% and controls the number of “good” blows that the system will allow before a premature shutdown or “NG3” will be indicated with buzzer and red light. Example: If the “count” is set at 20, the NG3 setting is 50% and the operator releases the trigger after 10 good blows (50% of 20) but prior to the full 20 an NG3 buzzer and light will activate. If the setting is 70% the NG3 will indicate between 14 (70% of 20) and 20. This will allow the operator to start a fastener and hold a part in position without indicating a bad run.
- 4. **CH:** Setting can be either CH3 or CH7 and controls the number of channels that can be controlled by a remote channel selector.

- 5. **HOLD:** Setting can be either “HOLD” or “LEVEL” and is normally set on LEVEL unless a count down device or bolt-counter system is installed in the system. In some applications, a fastener is required to be tightened, then loosened, then retightened to eliminate bolt stretch. If a count down device is used, this requirement would result in counting as two bolts when in fact only one was run down. The “HOLD” setting allows the override of the counter and the correct number of fasteners to be registered. This will in most case be set on LEVEL since a counting device is not installed.
- 6. **SIG. TM:** The range is adjustable from 1-99 ms or LATCH. In the adjustable range, the buzzer and light will activate for the adjusted duration and then shut off. In the LATCH mode the buzzer and light will activate and shut off when a new fastener is started. An adjusted amount of time for the auto shut-off is recommended.
- 7. **LINE:** Setting is either RS -232 or RS-485 and is dependent on the type of system the controller will be communicating with.
- 8. If RS-485 is chosen in step 7 then one more display will appear and will allow a tool number to be setup. This screen may not normally be used.

Setting Name	Initial Setting	Suggested Setting
SET RUN	ON	ON
CONT	ON	OFF
NG3	70%	70%
CH	CH3	CH7
HOLD	LEVEL	LEVEL
SIG.TM	LATCH	10
LINE	RS-232	RS-232
TOOL NO	(only shows if RS-485 is selected)	

After the settings are all accepted as green color values; then press the “NR RESET” button. The display of “ESCAPE” appears and then press the “ENTER” button. Display will show the selected channel (CH) number.

RETURNING CONTROLLER TO FACTORY DEFAULT SETTINGS

This procedure will clear all programmed parameter values from the controller, and return all settings to default, as shipped from factory. Recommended before setting the system up for a new application.

Warning! – This procedure will clear all parameters for all channels. Any parameter values stored in the controller prior to this operation will be lost and their values reset to the default.

Note: If a new application is being setup on a channel using the “Auto Setting” procedure, the parameters in the channel being used will automatically have the previous values over written with the new values obtained during the Auto Set.

Procedure for returning the controller to the factory default settings is as follows:

1. Turn controller off.
2. Depress and hold the yellow “MODE” button while pushing the power switch to the “ON” position. Continue to depress the “MODE” button until the display reads “INITIAL” in red color.
3. Release the “MODE” button and press the white “ENTER” button. The word “INITIAL” in the display will change to green color.
4. Settings have now been reset to the factory values.
5. Turn the controller off by pressing the “OFF” button.

AUTOMATIC PROGRAMING SETUP

This procedure automatically determines default settings for the fastening cycle for each of the control parameters. Reference the section “**DEFINITIONS OF PARAMETER SETTING TERMS**” for explanation of terms used in this setup.

When the tool is started the air pressure drops below the reset level and creates a reset signal. After detecting the reset signal, the controller measures the air pressure fluctuation every 1 ms for 3 seconds. The controller tracks the peaks and time, then determines and sets the default parameter values. The amplification parameter value (AMP) is set to 1 for this test. If no air pressure fluctuation is detected for ½ second after the reset signal is detected, the controller will alarm (NG) then will return to the auto setup mode after pressing “NG. RESET”.

Proceed as follows to perform auto setup:

1. Turn controller on and the system is ready when CH# (selected channel number) is displayed.
2. Select channel to be programmed by pressing the “SELECT” button or turning the channel selector switch on the panel.
3. Press and hold the up and down arrow keys simultaneously until the display indicates “CH# AUTO”.
4. Run down a fastener on the actual application. The controller will shut the tool off after 3 seconds if the trigger has not already been released to stop the tool.
5. If the controller determines the rundown was successful, it will display “GOOD” on the display

and automatically enters the manual setting mode. If the rundown was not successful, the controller will display a no-go code (NG1, NG2, NG3, NG4), and sound an alarm. Press “NG. RESET” to reset the alarm and cancel the rundown; the controller will return to the auto setup display. Correct the cause of the error and repeat the rundown procedure.

6. When a “GOOD” rundown is completed, accept the values by pressing the “ENTER” button.
7. Run another fastener and using a torque-measuring device, such as a torque wrench, determine the actual torque developed on the fastener. For example, if the desired torque is 50 ft/lbs and the torque obtained using the settings checks at 40 ft/lbs, the “CN” must be raised. If the torque obtained is 60 ft/lbs or 10 ft/lbs too high, then the “CN” must be lowered. The same run/test sequence must be run repeatedly to zero in on the target torque.
8. Once the target torque is reached, several fasteners must be run down and tested to ensure the accuracy of the settings.
9. When the setup is completed, record the channel number, tool model, job or application and other notes of interest for future reference.

Note: If “NG” alarms continue to cause difficulty in establishing programmed parameters the timers T1, T2, T3, and T4 can be set to “OFF”. After the torque is adjusted, then go back and manually set the timer values.

MANUAL PROGRAMING SETUP

This procedure requires manual settings for the fastening cycle control parameters. Initial manual settings will then be later edited after checking the installed fasteners torque to increase or decrease the torque.

Reference the section “**DEFINITIONS OF PARAMETER SETTING TERMS**” for explanation of terms used in this setup.

Proceed as follows to perform manual setup:

1. Turn controller on and the system is ready when CH# (selected channel number) is displayed.
2. Select channel to be programmed by pressing the “SELECT” button or turning the channel selector switch on the panel.
3. Press the yellow “MODE” button to enter into the manual program mode.
4. Channel number is displayed in the upper left corner as “C#”.
5. Parameter settings can be scrolled through by repeatedly pressing the “SELECT” button.
6. Parameter settings can be changed by using the “↓” and “↑” buttons.
7. When parameters are changed they are displayed in red color. Either each value or all the values can be accepted by pressing the “ENTER” button. The message “SET OK?” will then be displayed and press “ENTER” again and all values will be accepted and shown in green color.
8. Scroll through the following parameters and change values as shown:
 - a. **CN**: range is 5-99, set at 12
 - b. **KN**: range is 0-99, leave at 99
 - c. **CL**: range is 9-99, do not set at this time
 - d. **KL**: range is 8-99, leave at 99
 - e. **CC**: range is 1-99, set at 25
 - f. **RT**: range is 1-99, set at 10
 - g. **AMP**: range is 0-2, leave at 1
 - h. **T1, T2, T3, T4**: range varies, leave set as is
9. Run a test fastener down while observing the sensor reading on the display. This reading will appear as a horizontal line on the display. The lowest line on the display depicts the “CL” and will extend completely across the bottom. The sensor reading will appear just above the “CL”.
10. The “AMP” may have to be adjusted at this point dependent on the intensity of the sensor signal. If the signal is very low and difficult to determine, push the “MODE” button and scroll to the “AMP” display on the display. The setting was not changed, so it will read “1”. Using the “UP” arrow, change the 1 to 2. The 2 will appear in red, so “ENTER” must be pushed. The display will read “SET OK” in red, so the “ENTER” will have to be pushed again. This will accept the change so the display will now read AMP 2 and the signal will be doubled. If the sensor signal reads completely across the display, follow the same procedure, except set the “AMP” number at “0” which cuts the signal to 2/3.
11. After the sensor signal is determined, “CL” can be set. Push the “MODE” button again and using the “SELECT” button, scroll to the “CL” display, which should read C1-CL (C1 is channel number 1 being setup) on the top line and 99 on the second line. The display will be in green. If the sensor signal as explained in No. 10 was determined to be 40% of the way across the display, the “CL” will have to be set at 70% of the 40% or 28%. Using the “UP” button, set the 99 to 28. The display will be in red—push “ENTER” and “SET OK” will appear in red. Push “ENTER” again, and the display will read C1-CL on the top line and 28 on the second line—all in green. The “CL” is now set at 70% of the sensor value previously established.
12. Run another fastener and using a torque-measuring device, such as a torque wrench, determine the actual torque developed on the fastener. For example, if the desired torque is 50 ft/lbs and the torque obtained using the settings checks at 40 ft/lbs, the “CN” must be raised. If the torque obtained is 60 ft/lbs or 10 ft/lbs too high, then the “CN” must be lowered. The same run/test sequence must be run repeatedly to zero in on the target torque.
13. Once the target torque is reached, several fasteners must be run down and tested to ensure the accuracy of the settings.
14. When the setup is completed, record the channel number, tool model, job or application and other notes of interest for future reference.

Be sure the new values are accepted into the system and are shown in green color. Then continue through the next procedure to adjust the controller settings to the desired applied torque.

DEFINITIONS OF PARAMETER SETTING TERMS

CN: Acceptable blow count number the FFC controller will count before shutting the system off.

KN: Cross-thread count number prior to shutdown.

CL: Value established to determine an acceptable or not acceptable blow. This value measures blow intensity.

KL: Cross thread level which measures where a blow has not enough intensity to be an acceptable blow and count toward CN, but too high to be a normal run down blow, therefore must be meeting enough resistance to constitute a cross thread.

CC: Cycle count of the particular tool being used. A setting of 25-30 will cover most tools.

RT: Reset timer and determines the amount of time between shut-off and the resetting of the solenoid so the next fastener can be run.

AMP: Amplification of the of the blow intensity signal coming back to the FFC controller from the pressure sensor. On low torque or small tool applications, the signal may be very low and difficult to read, so the signal can be doubled. Conversely, if the signal is too high, reading maximum, it can be cut to 2/3.

T1: Timer setting that determines if the fastener is already tight. If the right number of good blows comes immediately, the fastener is already tight.

T2: Timer setting that determines if too much time has elapsed without the proper number of good blows occurring, which indicates a strip out.

T3: Timer setting that monitors the erratic blows of a cross thread where several blows occur that almost, but not quite reach the acceptable "good" blow established level.

T4: Time setting that measures the deterioration of the tools performance. This will usually hit one good blow, then several weak blows, then another good blow, etc.

TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
Resultant torque is too low	Controller is set on the wrong channel	Select the proper channel
	Air pressure is low	Reprogram the controller based on lower air pressure
	Tool is worn	Replace or repair tool
Resultant torque is too high	Another tool has been put on the application	Reprogram the controller based on the new tool
	Operator is "double hitting" the fastener	Instruct the operator on the use of the controller
No electrical power at the controller	Power cord is unplugged	Plug the power cord in
	Disconnect switch on enclosure is turned off	Turn the switch on
	Main power circuit breaker has tripped	Reset the breaker
	Controller fuse has blown	Replace the fuse (see section "CONTROLLER FUSE REPLACEMENT").
Cannot change channels on controller	Selector switch on the front panel is set to "remote"	Turn selector switch to "panel" position
Cannot change channels on front panel channel switch	Selector switch on the front panel is set to "remote"	Turn selector switch to "panel" position

CONTROLLER FUSE REPLACEMENT

The FFC-3-1 Controller has a fuse for electrical protection. The fuse is located inside the cord plug fitting in the back of the controller. Procedure for replacing the fuse is as follows:

- 1. Turn off disconnect switch on the right side of the enclosure.
- 2. Unplug the power cord to the enclosure.
- 3. Remove the top cover of the enclosure by removing the six screws.
- 4. Remove the bolts that fasten the FFC-3-1 controller to the bottom of the enclosure.
- 5. Pick the controller up and slowly rotate the controller forward so the front face of the controller is down.

Place a rag in the bottom of the enclosure to set the controller on. The wires have enough length so they do not need to be unhooked. Take care not to pull on the wires.

- 6. Unplug the power cord to the controller.
- 7. Open the fuse holder in the power cord plug in the controller. (An extra fuse is stored in the fuse holder.)
- 8. Replace the fuse.
- 9. During reassembly, take care while positioning of the controller so that no wires are pinched or loosened.

Part Number Description

SERVICE PARTS LIST OF MAJOR COMPONENTS FOR TC4A AND TC6A

Part Number	Description	Part Number	Description
68641	Buzzer assembly—24VDC	E-017024-00	Pressure sensor
68659	Cable to pressure sensor	AR4000-1/2	Regulator 1/2" NPT (TC4A)
FFC-3-1	Controller	AR4000-06	Regulator 3/4" NPT (TC6A)
68634	Gauge—pressure	ESV-VP742-5	Solenoid valve 1/2" NPT (TC4A)
68681	Hose assembly—exhaust 1/2" NPT (TC4A)	ESV-VG342-5	Solenoid valve 3/4" NPT (TC6A)
68684	Hose assembly—exhaust 3/4" NPT (TC6A)	68656	Switch assembly—power disconnect
68679	Hose assembly—inlet 1/2" NPT (TC4A)	68655	Switch assembly—selector (7 channel)
68682	Hose assembly—inlet 3/4" NPT (TC6A)	68655N	Switch faceplate for 7 channel selector switch
68680	Hose assembly—outlet 1/2" NPT (TC4A)	68657	Switch assembly—selector (panel—remote)
68683	Hose assembly—outlet 3/4" NPT (TC6A)	68629-12	Wire harness assembly
68642	Light—green LED pilot —24 VDC		
68643	Light—red LED pilot—24 VDC		
68636	Muffler		
18641R	Power cord		

SERVICE PARTS LIST OF MAJOR COMPONENTS FOR 3401 REMOTE SELECTOR SWITCH KIT AND 3402 REMOTE LIGHT TOWER KIT.

Part Number	Description
68669	Cord—4 conductor, 20 ft (6 m) long (3402)
68670	Cord—5 conductor, 20 ft (6 m) long (3401)
68668	Light tower (3402)
68655	Switch assembly—selector 7 channel (3401)
68655N	Switch faceplate for 7 channel selector switch (3401)

**FURNISH CATALOG, SERIAL, AND MODEL NUMBER
WHEN ORDERING PARTS**



⚠ WARNING



Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm.

⚠ ADVERTENCIA



El polvo generado al lijar, aserrar, afilar, taladrar y realizar otras tareas de construcción contiene sustancias químicas que podrían causar cáncer, malformaciones congénitas y otras alteraciones del aparato reproductor.

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