

RE Qualifier II

Atlas Copco Tools and Assembly Systems

Engineering Document

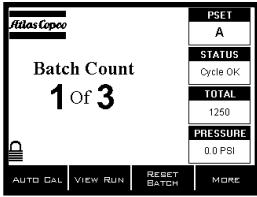
Revision I
10-17-01



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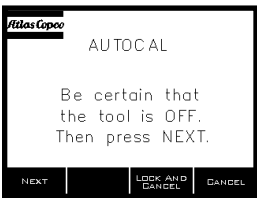
Quick Start Guide



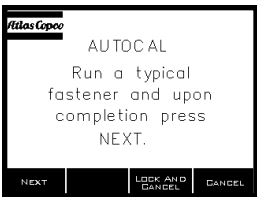
Step 1:
Power up the unit and wait for the MAIN screen to appear. Once it is in view, press the AUTOCAL soft-key.



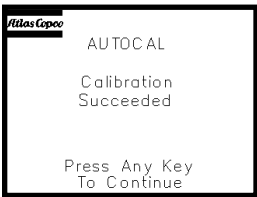
Step 2:
Enter the password to access programming functions. All units ship from the factory with a default password of 0 1 0 4.



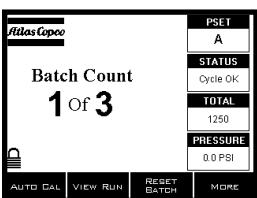
Step 3:
Be sure the transducer is plugged into the RE Qualifier and that the tool is connected to the transducer. Then press the NEXT soft-key.



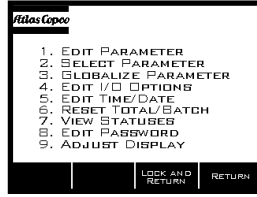
Step 4:
Run the tool on the target fastener and then press the NEXT soft-key. Be certain to run the fastener from beginning to end allowing the tool to clutch out.



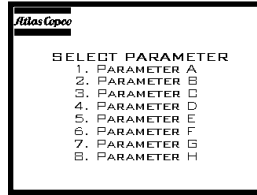
Step 5:
Check the screen and be sure the calibration was successful. If not, return to step 1. If the calibration succeeded proceed to step 6. Press any key to continue.



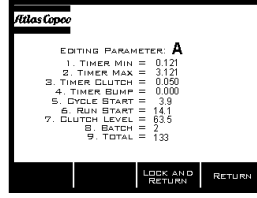
Step 6:
If the batch count needs programmed, press the MORE soft-key.



Step 7:
Once the MORE OPTIONS screen is in view, press '1' on the keypad in order to EDIT THE PARAMETER.



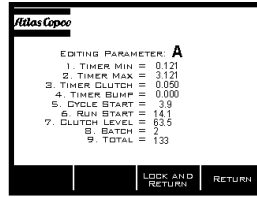
Step 8:
Select the current parameter by pressing the number on the keypad adjacent to the desired parameter.



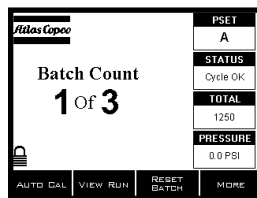
Step 9:
Press the '8' key in order to edit the number of fasteners in a batch.



Step 10:
Enter the desired number for the batch setting. When complete hit ENT.



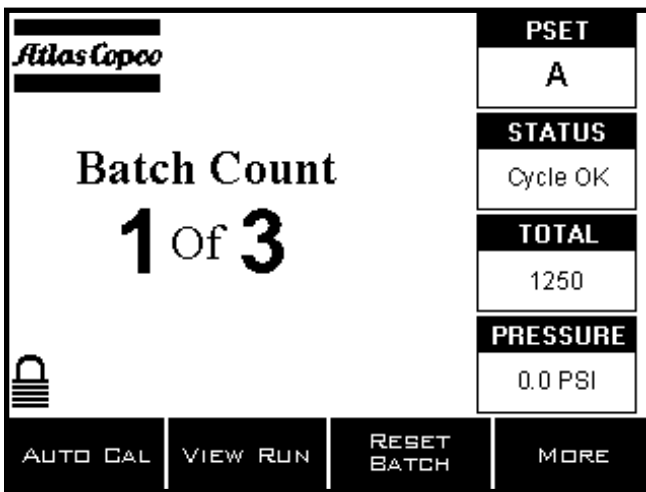
Step 11:
When the EDIT PARAMETER screen re-appears, press the LOCK AND RETURN soft-key.



Step 12:
The unit will return to the MAIN screen and be locked. Run several fasteners to ensure that the unit is working properly.

INTRODUCTION

This document is an operations guide for the Atlas Copco RE Qualifier II. The RE Qualifier monitors a pneumatic signal from inside any Atlas Copco tool equipped with an RE port. By analyzing the pneumatic signal the RE Qualifier can aid in the manufacturing process by determining if a fastener has been installed properly and also by counting the number of fasteners that have been installed.



MAIN SCREEN

To the left is an example of what the main screen looks like. During normal operations, when the unit is monitoring fastening processes, this is the screen that will be in use.

Along the right hand side of the screen, four boxes appear vertically and are labeled PSET, STATUS, TOTAL, and PRESSURE.

The box labeled PSET will contain a letter corresponding to the parameter set that is currently in use. The RE Qualifier has eight different parameter sets (A - H).

The STATUS box will be empty when the tool is in cycle. After the completion of a cycle, this box will hold the status from the last fastening process. **Cycle OK**, **Batch OK**, **Rej Tmin**, **Rej Tmax**, and **No Clutch** are all statuses that may appear in this area. **Cycle OK** indicates that the last fastener was installed properly. **Batch OK** means that the last group of fasteners that make up the previous assembly have been installed properly. **Rej Tmin** informs the operator that the minimum run timer was violated and that the last fastener was not installed properly. **Rej Tmax** indicates that the maximum run timer was violated. The status **No Clutch** informs the user that the tool's clutch did not complete the fastening process.

The box labeled TOTAL displays the number of batches that have been completed since the last reset. This number will start at 0 and count up to 65,535 before rolling back over to zero. This value can be reset through the use of the keypad.

A live pressure indication will appear in the final box labeled PRESSURE. This pressure value is given in PSI and it represents the pressure inside the tool's port.

In the center of the screen, a batch count and the number of fasteners in the batch appears. This information is represented as COUNT of BATCH. The count is the number of fasteners that have been completed towards the programmed batch setting. The batch is a number that is programmed into the current parameter. The batch should represent the number of fasteners in the assembly under construction.

Along the bottom of the screen are several "soft" key indications. Below each of these soft key indicators is a button. The function of the button will change as different screens are accessed. The text in the soft key indicators will also change to inform the user of the current function of the button below it.

Above the left most soft key on the main screen is an icon that resembles a padlock. The padlock will be in one of two states either open or closed. If the padlock is closed, the unit is locked and a password will have to be entered in order to access programming features. If the padlock is open, programming features are readily available through the selections on the soft-keys.



PASSWORDS

Users will be prompted to enter a password any time the unit is locked and a programming function is accessed. All units are shipped with the initial password set to 0 1 0 4.

Once prompted to enter a password, use the keypad to enter the four digit code. If any mistakes are made during the entry process, the CLR button can be used to remove one digit at a time.

As each digit is entered, an asterisk (*) will appear indicating that a number has been entered. Once all four numbers have been entered in the proper sequence, the user can

press either the Accept Password soft-key or the ENT button.

If the user wishes to return to the main screen without entering the password, either the Cancel soft-key or the ESC button may be pressed.

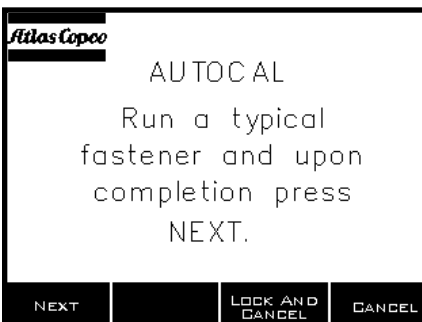
If the password is entered properly, the user will be taken to the function that was requested prior to the Enter Password screen appearing. The password can be changed to any four digit code.



AUTO CAL

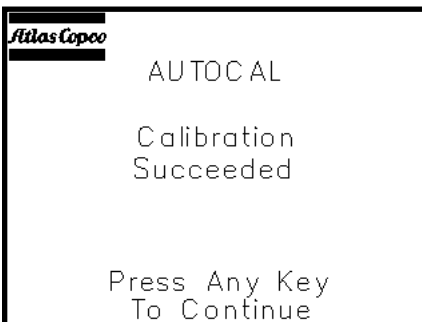
The RE Qualifier has been programmed to automatically recognize the pneumatic signature from several different types of tools. In order to calibrate the RE Qualifier using this feature, press the Auto-Cal soft-key while the unit is showing the main screen.

If the unit is locked, enter the password when prompted for it.



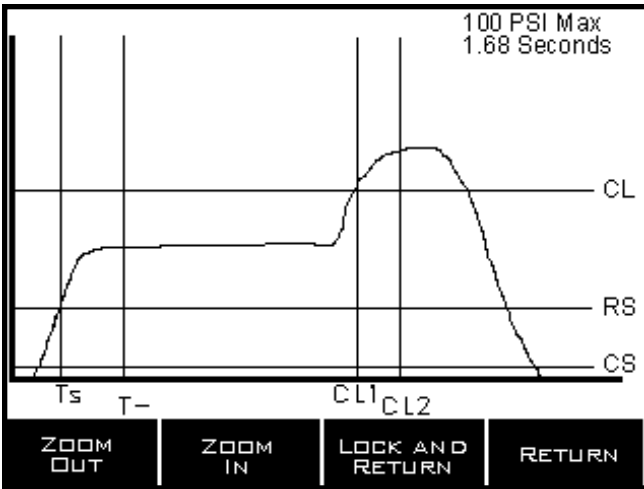
The first screen in the Auto-Cal process will say, "AUTO CAL .. Be certain that the tool is OFF. Then press NEXT.". At this point be sure the pressure transducer is connected to both the tool and to the RE Qualifier and push the soft-key labeled NEXT.

After pressing NEXT, the screen will state, "AUTO CAL .. Run a typical fastener and upon completion press NEXT.". Tighten a target fastener using the tool that the RE Qualifier is monitoring. During this process, run the fastener completely allowing the tool's clutch mechanism to turn off the tool. If you make a mistake during this part of the process, run another fastener. The RE Qualifier will use the very last fastening process it sees as the basis for the calibration.



At the end of the fastening sequence, release the tool and press the NEXT soft-key. The RE-Qualifier will try to set-up it's calibration parameters using the pneumatic signature from the last run.

Once the calibration attempt is complete, the RE Qualifier will inform the user if the if the calibration was successful or not. In either case, pressing any key on the key-pad will return the user to the main screen.



VIEWING A RUN

Each time a fastening process occurs, the RE Qualifier captures the analog information associated with the pneumatic signal. The RE Qualifier can hold up to ten seconds worth of analog information.

This analog signature can be viewed with the current parameter set over-layed on top of it. In order to view the run, press the VIEW RUN soft-key while the unit is showing the main screen.

The screen will say “Loading” while the information to generate the graph is collected. Once the data for the graph

is gathered, a screen similar to the one above will appear.

The horizontal axis on this screen represents time. The vertical axis represents pressure. In the upper right hand corner of the screen is a legend that tells the user what the time and pressure scale are for this particular graph.

Horizontal lines will appear on top of the graph. These lines will represent the Cycle Start (CS), Run Start (RS) and Clutch Level (CL). The cycle start level is a parameter setting that tells the unit when to start and stop collecting data. If the pressure is above the cycle start level, data is gathered for viewing and auto-calibration purposes.

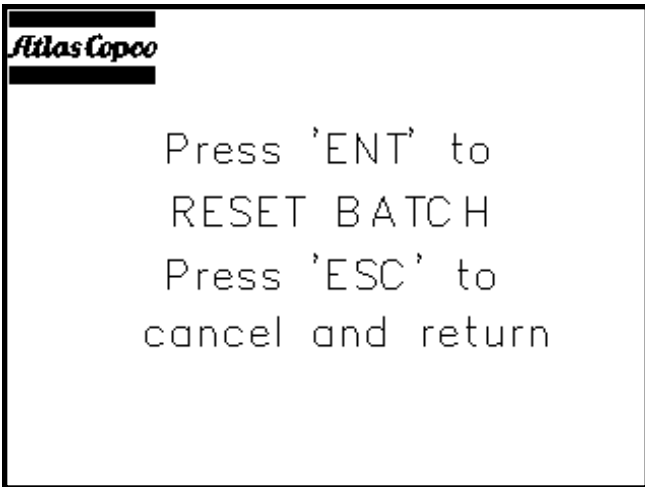
Once the pressure rises above the run start level, some kind of status will be generated at the end of the run (ie. Cycle OK, Batch OK, or a reject of some type).

Once the pressure rises above the clutch level, the RE Qualifier assumes that the clutch has turned the tool off.

The vertical lines on top of the graph represent timers. The line labeled Ts represents the point at which minimum run timer and the maximum run timer start. This line will always be located at the point which the pressure signature crosses the run start level. T- indicates the point at which the minimum run timer was satisfied. T+ indicates the point at which the maximum run timer would be violated. CL1 and CL2 are the beginning and end of the clutch timer. The clutch timer will always begin at the point where the pneumatic signature crosses the clutch level.

Using the ZOOM IN and ZOOM OUT soft-keys, the user can compress and expand the graph along the time scale. This feature may be useful in seeing items that may have occurred after the pneumatic level dropped back below the cycle start level. The maximum run timer is often off screen for the initial plotting of the pneumatic curve.

Pressing the RETURN soft-key will return the software to the main screen without locking the unit. Pressing the LOCK AND RETURN will lock the unit and return the software to the main screen.

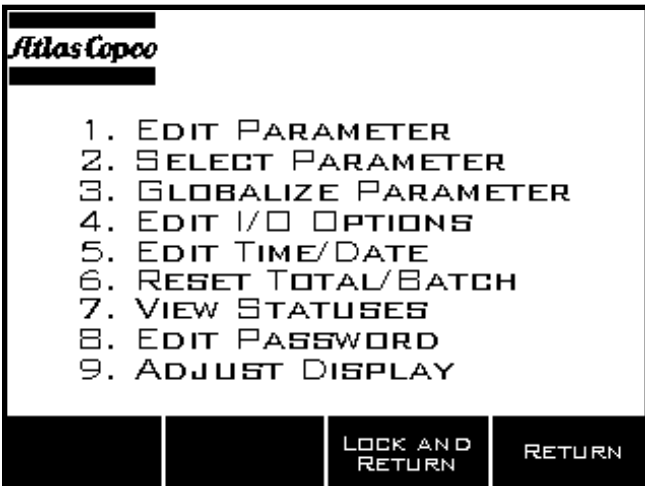


Resetting the Batch

In order to reset the count to zero from the main screen, press the RESET BATCH soft-key. A second screen will appear which reads, "Press 'ENT' to RESET BATCH. Press 'ESC' to cancel and return".

If the user presses the ENTER (labeled ENT) button at this point, the batch count will be set to zero. Also, any output status signals that pertain to the previous cycle will be dropped.

If the ESCAPE button (labeled ESC) is pressed, the software will return to the main screen without resetting any values. A batch reset can be performed if the unit is locked or un-locked.



More Options

In order to access the rest of the functions, press the MORE soft-key while the main screen is visible.

A list of nine additional functions will appear and be similar to the picture on the left. In order to access any of the functions on the list, press the number on the keypad that is associated with the desired function from the list.

Pressing '1' will allow the user to edit any given parameter.

Pressing '2' will allow the user to select a new parameter. Parameters can be selected from the menu or electrically

through the I/O port on the side of the unit. A dip-switch setting governs which selection method is in use (front panel selection/electrical I/O selection).

Pressing '3' will allow the user to globalize a parameter set. During globalization, the data from one parameter is selected and copied into all of the other parameter sets.

Pressing '4' allows access to the I/O options.

Pressing '5' allows access to the time and date functions.

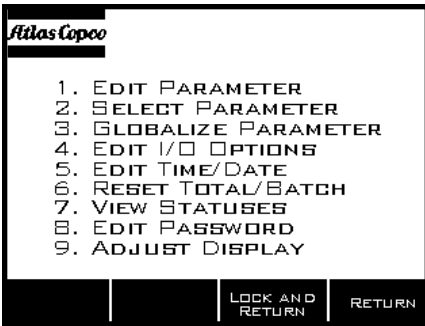
Pressing '6' allows the user to reset the total, the batch, or both the total and the batch.

Pressing '7' allows the user to view past statuses.

Pressing '8' will allow a user to program a new password into the unit.

Pressing '9' allows the user to adjust the LCD's brightness and contrast.

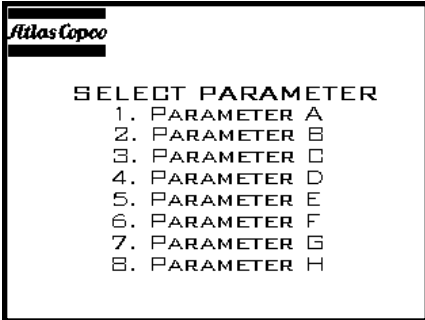
Users may also return to the main screen by pressing either the RETURN or LOCK AND RETURN soft-keys.



Editing Parameter Sets

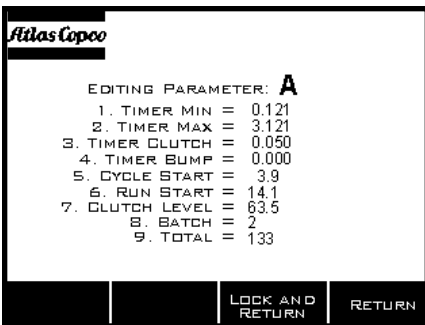
Choosing '1. Edit Parameter' from the MORE OPTIONS menu allows access to timers, pressure levels, totals, and batch settings for any given parameter. In order to edit a parameter, press the 'MORE' soft-key while at the main screen.

If the unit was locked, the password will have to be entered to proceed. Once the 'MORE OPTIONS' screen appears, select 'EDIT PARAMETER' by pressing '1' on the key-pad.



After choosing to edit a parameter a list of the eight possible parameters will appear. Pressing a numeric key 1 through 8 will allow the user to access one of the parameter sets A through H. Pressing 'ESC' at the SELECT PARAMETER screen will return the program to the MORE OPTIONS screen.

Once one of the eight parameters is selected by pressing one of the associated numeric keys, that parameter will appear. Each listing in the parameter set will have a number associated with it, a title, and then a value. For instance the minimum run timer in the example to the left is listed as:



1. Timer Min = 0.121

Pressing the '1' key will allow the user to adjust Timer Min's value. Pressing any of the other number keys will allow the user to adjust the value associated with that setting.



After an item from the parameter list is selected, another screen will appear showing that item's original value. On the screen will also be a new value. A user can edit the new value by typing the desired value on the keypad.

Once the new value is entered and is showing on the screen, pressing the ENT button will store that value into memory. Conversely, the ESC button can be pressed to abort the editing process.

When editing a parameter set it helps to know how each value effects the operation of the RE Qualifier.

Timer Min defines the amount of time that the pneumatic signal must be above the Run Start level but below the Clutch Level. Timer Min is the minimum run-down time for a fastener.

Timer Max is the maximum time the pressure level can be above the Run Start level prior to the signal rising above the Clutch Level. Timer Max is the maximum time for the fastening process.

Time Clutch is the minimum time that the pressure level must be above the Clutch Level setting at the end of a fastening.

Timer Bump is an ignore timer. In most cases, Timer Bump can and should be set to zero.

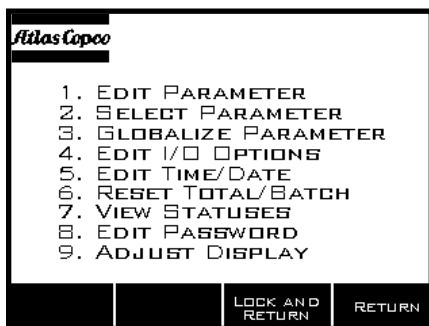
Cycle Start is the pressure level at which the RE Qualifier will store data.

Run Start is the pressure level which starts Timer Min and Timer Max. While the pneumatic signal is above Run Start but below the Clutch Level, the RE Qualifier assumes that the fastener is fastening.

The Clutch Level is the pressure at which the pneumatic signal is considered to be clutched out. Both Timer Min and Timer Max stop running when the pressure reaches this level. Timer Clutch is activated when the pressure rises above the Clutch Level.

The Batch setting represents the number of fastenings that must be completed before a Batch OK signal is asserted.

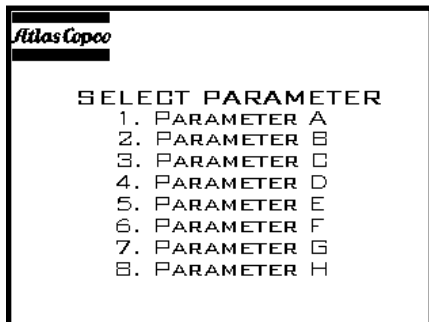
The Total is the number of batches that have been completed.



Selecting a New Parameter

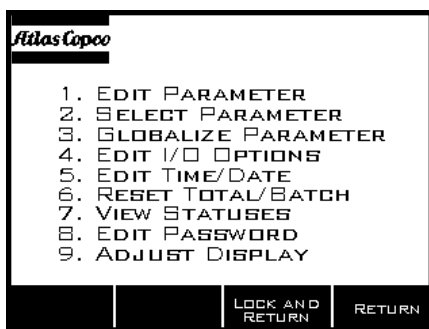
Selecting '2' SELECT PARAMETER from the MORE OPTIONS menu allows the user to choose a new parameter. This only works if the dip-switch is set so that parameter selection is done through the keypad.

After '2' is pressed and released, the SELECT PARAMETER screen appears. Pressing the number on the screen that is associated with the desired parameter tells the RE Qualifier to load a the new parameter set and use it when monitoring fastening processes and batch counting.



If ESC is pressed instead of one of the number keys, no new parameter is selected and the screen will return to the MORE OPTIONS page.

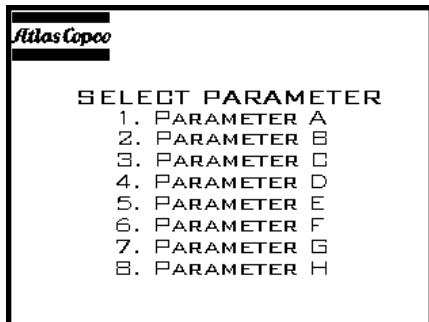
Users may wish to use more than one parameter in order to accomidate different tools. Utilizing multiple parameters will also help if different assemblies are being produced with a varying number of fasteners.



Globalizing a Parameter

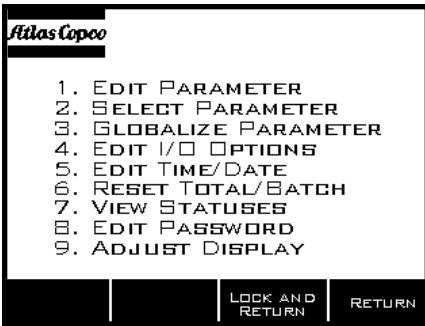
Selecting '3' GLOBALIZE PARAMETER from the MORE OPTIONS menu allows the user to choose the parameter that will be copied into all of the other parameters.

After '3' is pressed and released, the SELECT PARAMETER screen appears. Pressing the number on the screen that is associated with the desired parameter tells the RE Qualifier to copy the selected parameter into all of the other parameter sets.



If ESC is pressed instead of one of the number keys, no parameters are copied and the screen will return to the MORE OPTIONS page.

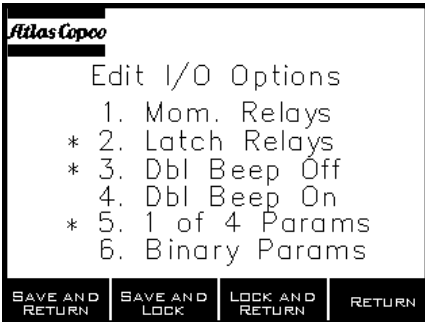
This feature may be useful when setting up several parameter sets where only one variable (like batch) changes between each parameter.



Editing I/O Options

Selecting '4' EDIT I/O OPTIONS from the MORE OPTIONS menu allows the user to program features that relating to the input and output structure.

After '4' is pressed and released, the EDIT I/O OPTIONS screen appears. Six setting are listed on this screen. Pressing the number next to a desired setting will select that setting. Each setting that is active will have an asterisk (*) in front of the number.



Numbers 1 and 2 both relate to how the relays work. If 1 is selected, the relays will be momentary and will come on for 200 milli-seconds each time they are activated by a change in status. If the relays are set to latching (2) the relay will remain on until the beginning of the next cycle.

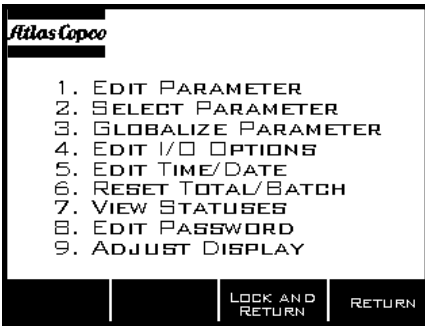
Numbers 3 and 4 control whether a double beep will be generated when a batch is completed. If 3 is selected, the double-beep feature will be turned off and the buzzer will only sound if a reject occurs. If 4 is selected, each batch completion will be announced with a short double-beeping of the buzzer.

Numbers 5 and 6 relate to how parameters are selected by an external device. If number 5 is selected, only 4 parameters can be accessed externally. The table below shows the relationship between the parameters and how they are selected using the inputs.

PRMD	PRMC	PRMB	PARAM
0	0	0	A
0	0	1	B
0	1	0	C
1	0	0	D

If Binary Parameters (number 6) is selected. One of eight parameters can be selected externally. The table below shows the relationship between the parameters and how they are selected using the inputs.

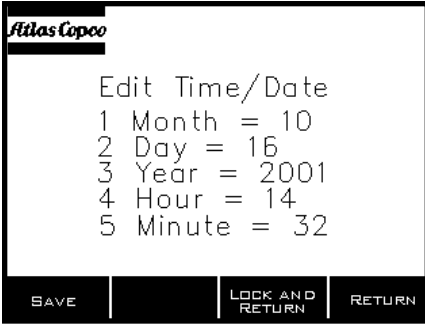
PRMD	PRMC	PRMB	PARAM
0	0	0	A
0	0	1	B
0	1	0	C
0	1	1	D
1	0	0	E
1	0	1	F
1	1	0	G
1	1	1	H



Editing the Time and Date

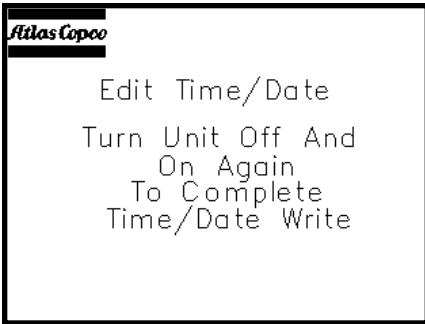
Selecting '5' EDIT TIME/DATE from the MORE OPTIONS menu allows the user to edit the time and date.

After '5' is pressed and released, the EDIT TIME/DATE screen appears. Pressing the number on the screen that is associated with the desired time/date value alters that value.



So, if the user presses '1' the MONTH value will be increased by one. If the user presses '2' the DAY will increase by one etc...

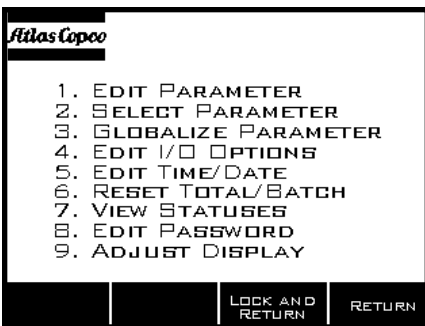
The user may abort setting the time and date and return to the previous screen by pressing the RETURN soft-key. If the LOCK AND RETURN soft-key is pressed, the software will return to the main screen and the unit will be locked.



If the user wishes to store the adjustments that have been made to the time, the SAVE soft-key should be pressed. Once the SAVE soft-key is pressed, the new time and date are written into memory.

A screen that states, "Edit Time/Date .. Turn Unit Off And On Again To Complete Time/Date Write" will appear. The RE Qualifier will not proceed to any other screen until it has been powered down and the powered back up again.

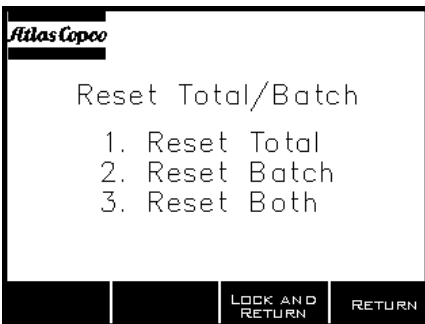
This power down and re-initializing is essential to writing the new time and date.



Resetting the Total and/or Batch

Selecting '6' RESET TOTAL/BATCH from the MORE OPTIONS menu allows the user to reset the total, the batch, or both the total and the batch.

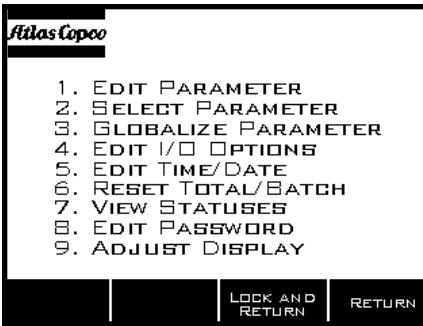
After '6' is pressed and released, the RESET TOTAL/BATCH screen appears. Pressing the number on the screen that is associated with the total, batch, or both reset that value to zero.



Once one of the numbers has been pressed, the value is reset to zero and the software returns to the MORE OPTIONS screen.

If the user chooses not to reset any values, the RETURN soft-key can be pressed. This actions will not reset any of the values and the software will return to the MORE OPTIONS screen.

If LOCK AND RETURN are pressed, the unit is locked and the software returns to the MAIN screen.



Viewing Past Statuses

Selecting '7' VIEW STATUSES from the MORE OPTIONS menu allows the user to view the statuses that have been generated in the past along with a time and date stamp.

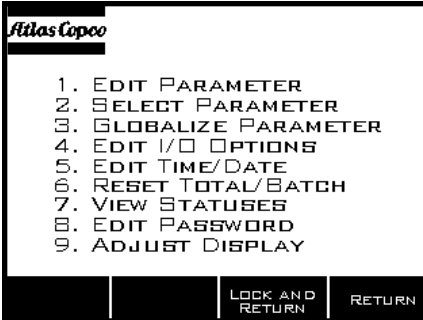
After '7' is pressed and released, the VIEW STATUSES screen appears. The last 15 statuses are listed sequentially on this screen. Each status lists the parameter set that the status was generated under, the date the status occurred, the time the status occurred, and what the status was.

P:A	10/16/01	14:58:11	Batch OK
P:A	10/16/01	14:58:10	Cycle OK
P:A	10/16/01	14:58:09	Batch OK
P:A	10/16/01	14:58:07	Reject T+
P:A	10/16/01	14:58:02	Reject Tc1
P:A	10/16/01	14:57:59	Reject T-
P:A	10/16/01	14:57:58	Reject Tc1
P:A	10/16/01	14:57:57	Cycle OK
P:A	10/16/01	14:57:56	Reject Tc1
P:A	10/16/01	14:57:55	Batch OK
P:A	10/16/01	14:57:54	Cycle OK
P:A	10/16/01	14:57:53	Batch OK
P:A	10/16/01	14:57:52	Cycle OK
P:A	10/16/01	14:57:50	Reject Tc1
P:A	10/16/01	14:57:49	Batch OK

At the bottom of the screen are four soft-key options: PAGE DOWN, PAGE UP, LOCK AND RETURN, and RETURN.

The PAGE UP and PAGE DOWN soft-keys can be used to go forward and backwards in time. The RE Qualifier has the ability to store 1000 statuses.

The user may choose to RETURN to the previous screen or LOCK AND RETURN to the main screen through the use of the soft-keys.



Choosing a New Password

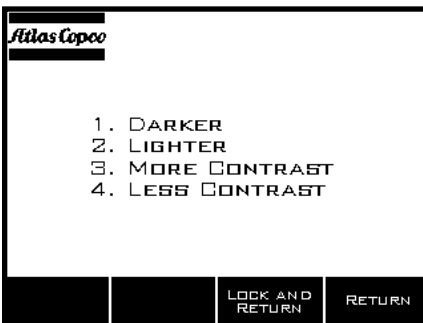
Selecting '8' EDIT PASSWORD from the MORE OPTIONS menu allows the user to choose a new password.

After '8' is pressed and released, the EDIT PASSWORD screen appears. The user may type a new four digit password. As each number is entered, an asterisk (*) will appear to represent that number. If a mistake is made, the CLR button can be used to remove one number in the password at a time (an asterisk will be removed as well).



Once the new password is entered, the value can be saved by pressing either the SAVE AND RETURN soft-key or the SAVE AND LOCK soft-key. (The SAVE AND LOCK soft-key will lock the unit and place the screen back into the MAIN mode).

If the user wants to exit without saving, either the LOCK AND RETURN soft-key or the RETURN soft-key may be pressed.



Adjusting the Display

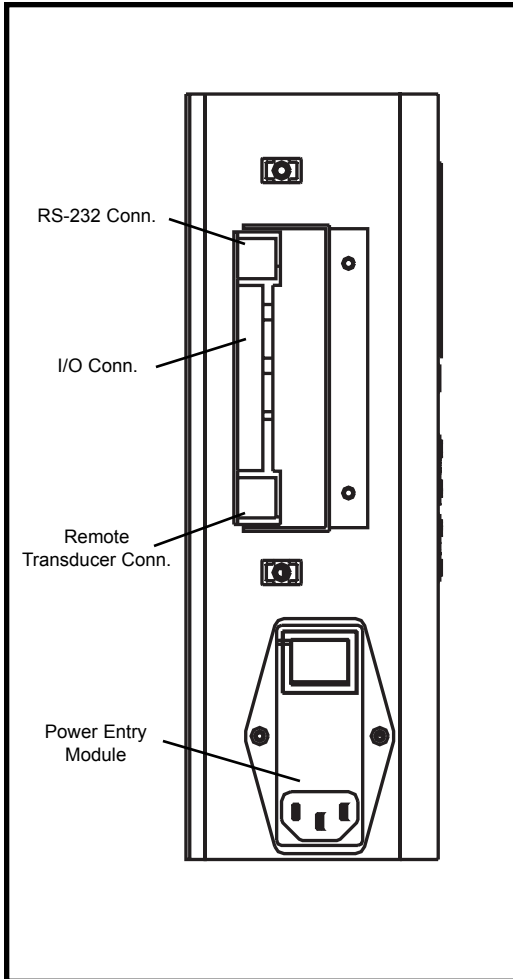
Selecting '9' ADJUST DISPLAY from the MORE OPTIONS menu allows the user to make adjustments to the brightness and contrast of the display.

Once '9' has been pressed and the ADJUST LCD screen is in view, the brightness of the screen can be controlled by pressing keys '1' and '2'. The contrast may also be adjusted by pressing keys '3' and '4'.

These adjustments will be remembered by the unit and used every time the display powers up. If the display gets adjusted too far it may become hard to read. Pressing the '.' button at the MAIN screen will reset the display to the factory settings.

The soft-key labeled RETURN and LOCK AND RETURN may be used to exit from this mode.

I/O Structure



RS-232 Connector

The RS-232 Connector is used to communicate with external serial devices (like a computer). The connector is a standard RJ-11 connector. Pin 1 on the connector is the top-most pin as pictured in the figure to the left. The pin-out is as follows:

1	N/C
2	N/C
3	RX
4	TX
5	GND
6	N/C

I/O Connector

The I/O Connector is used to provide discreet signals to external devices (like a PLC). Pin 1 is located at the top of the connector as pictured in the figure to the left. The pin-out is as follows

1	RS485-	7	GND/OPTO COM
2	RS485+	8	RESET INPUT
3	REJECT RELAY	9	SUSPEND INPUT
4	BATCH RELAY	10	PARAM B INPUT
5	CYCLE RELAY	11	PARAM C INPUT
6	+24VDC/RLY COM	12	PARAM D INPUT

A series of jumpers control how the relays function. There is one jumper for each relay (JP8-JP10). These jumpers will allow each relay to either be normally open or normally closed. Relays may be wetted with +24VDC or be dry contacts depending upon the setting of jumper JP5.

There is a software setting that controls whether the relays come on momentarily or remain latched at the end of a cycle.

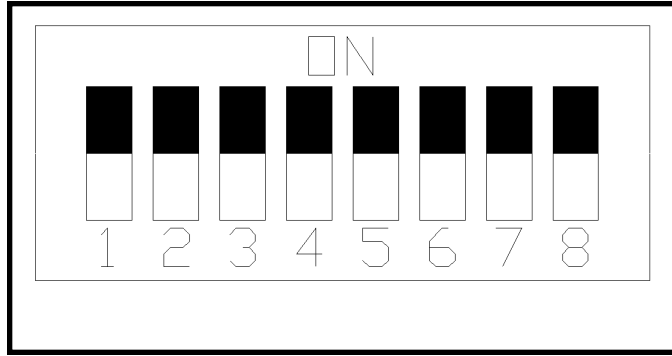
The inputs are all optically isolated. Each opto-isolator has a 1.5K input impedance, which will work well if +24VDC signals are used to assert the inputs. When connected, jumper JP3 makes the opto-inputs common with the system ground. When removed, the opto-isolators are completely isolated and inputs need to be referenced to PIN 7, OPTO COM.

Remote Transducer Connector

The remote pressure transducer plugs into the bottom most RJ11 connector as seen in the picture above. The pin-out for that connector is as follows:

1	+5VDC
2	ANALOG SIGNAL IN
3	RS-485+
4	RS-485-
5	GND
6	N/C

Dip-Switch Settings



Dip-Switch

The dip-switch (located in the corner on the CE2731 board) controls certain aspects of the units functionality. Those functions are listed below.

Position	ON	OFF
1. Parameter Selection	Software Select	External Input Selection
2. No Function		
3. No Function		
4. Test Mode	Test Mode ON	Normal Operation
5. Test Selection 1	See Below	See Below
6. Test Selection 2	See Below	See Below
7. Beeper	Beeps ON	Beeps OFF
8. RS-485 Terminator	Termination ON	Termination OFF

Test Modes

When dip-switch four is in the ON position, the backboard (CE2731) enters a test mode. The possible tests are as follows:

DIP 5	DIP 6	FUNCTION
OFF	OFF	Digital Outputs Test (each output is turned on one at a time).
OFF	ON	Digital Inputs Test (digital input will appear as a segment on bar LED).
ON	OFF	Analog Test CH0 (analog input on CH0 will appear as % on bar LED).
ON	ON	Analog Test CH1 (analog input on CH1 will appear as % on bar LED).