



IAC Controller Operator Manual



Important Safeguards

For your protection, please read these instructions completely. 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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1 Safety Information

General Power Tool Safety Warnings

⚠ WARNING Read all safety warnings and instructions. Failure to follow the warnings and instructions may result in electric shock, fire, and/or serious injury.

Save all warnings and instructions for future reference.

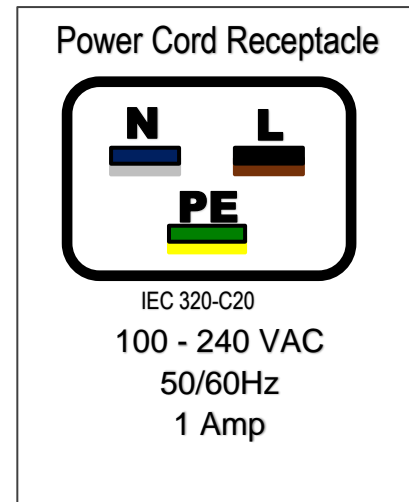
NOTE: The term “power tool” in the following warnings refers to your mains-operated (corded) power tool or battery-operated (cordless) power tool.

1. Work area safety

- a. **Keep work area clean and well lit.** Cluttered or dark areas invite accidents.
- b. **Do not operate power tools in explosive atmospheres, such as in the presence of flammable liquids, gases or dust.** Power tools create sparks which may ignite the dust or fumes.
- c. **Keep children and bystanders away while operating a power tool.** Distractions can cause you to lose control.

2. Electrical safety

- a. **Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools.** Unmodified plugs and matching outlets will reduce risk of electric shock.
- b. **Avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges and refrigerators.** There is an increased risk of electric shock if your body is earthed or grounded.
- c. **Do not expose power tools to rain or wet conditions.** Water entering a power tool will increase the risk of electric shock.
- d. **Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the power tool. Keep cord away from heat, oil, sharp edges or moving parts.** Damaged or entangled cords increase the risk of electric shock.
- e. **When operating a power tool outdoors, use an extension cord suitable for outdoor use.** Use of a cord suitable for outdoor use reduces the risk of electric shock.
- f. **If operating a power tool in a damp location is unavoidable, use a residual current device (RCD) protected supply.** Use of an RCD reduces the risk of electric shock.



NOTE: The term "residual current device (RCD)" may be replaced with the term "ground fault circuit interrupter (GFCI)" or "earth leakage current breaker (ELCB)".

3. Personal safety

- a. **Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired or under the influence of drugs, alcohol or medication.** *A moment of inattention while operating power tools may result in serious personal injury.*
- b. **Use personal protective equipment. Always wear eye protection.** *Protective equipment such as dust mask, non-skid safety shoes, hard hat, or hearing protection used for appropriate conditions will reduce personal injuries.*
- c. **Prevent unintentional starting. Ensure the switch is in the off-position before connecting to power source, and/or battery pack, or picking up tool.** *Carrying power tools with your finger on the switch, or energizing power tools that have the switch on, invites accidents.*
- d. **Remove any adjusting key or wrench before turning the power tool on.** *A wrench or a key left attached to a rotating part of the power tool may result in personal injury.*
- e. **Do not overreach. Keep proper footing and balance at all times.** *This enables better control of the power tool in unexpected situations.*
- f. **Dress properly. Do not wear loose clothing or jewelry. Keep your hair, clothing and gloves away from moving parts.** *Loose clothes, jewelry, or long hair can be caught in moving parts.*
- g. **If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used.** *Use of dust collection can reduce dust-related hazards.*

4. Power tool use and care

- a. **Do not force the power tool. Use the correct power tool for your application.** *The correct power tool will do the job better and safer at the rate for which it was designed.*
- b. **Do not use the power tool if the switch does not turn it on and off.** *Any power tool that cannot be controlled with the switch is dangerous and must be repaired.*
- c. **Disconnect the plug from the power source, and/or the battery pack from the power tool, before making any adjustments, changing accessories, or storing power tools.** *Such preventive safety measures reduce the risk of starting the power tool accidentally.*
- d. **Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool.** *Power tools are dangerous in the hands of untrained users.*
- e. **Maintain power tools. Check for misalignment, or binding of moving parts, breakage of parts and any other condition that may affect the power tools**

operation. If damaged, have the power tool repaired before use. *Many accidents occur due to poorly maintained power tools.*

- f. **Keep cutting tools sharp and clean.** *Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.*
- g. **Use the power tool, accessories and tool bits, etc., in accordance with these instructions, taking into account the working conditions and the work to be performed.** *Use of the power tool for operations different from those intended could result in a hazardous situation.*

5. Service

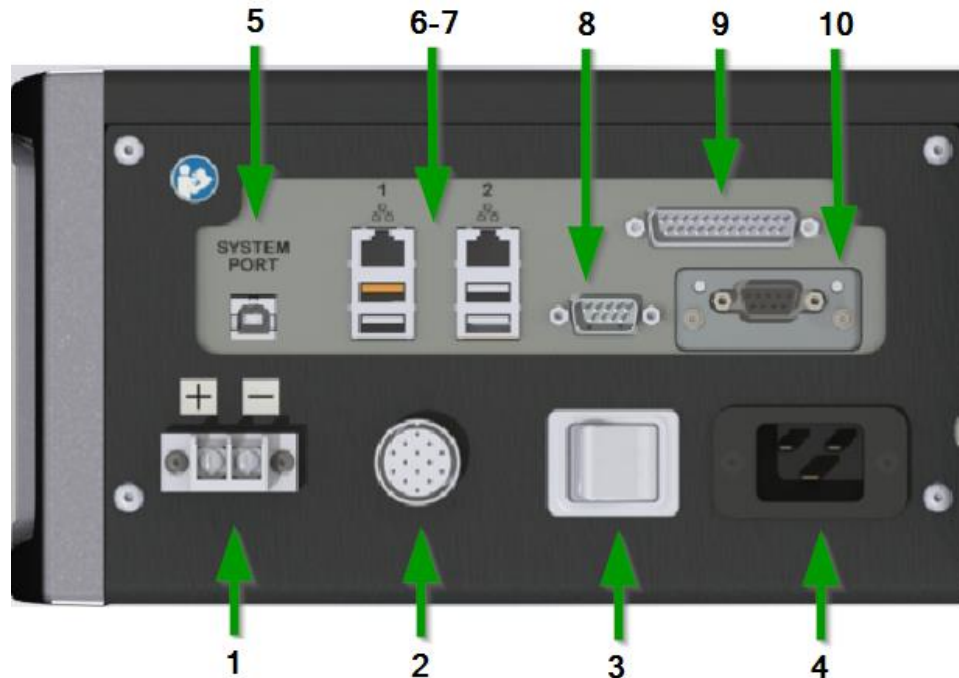
- a. **Have your power tool serviced by a qualified repair person using only identical replacement parts.** *This will ensure that the safety of the power tool is maintain*

Precautions

- **For RS models equipped with an electronic pressure regulator: Do not turn the controller on for an extended period of time without supply air connected. This may shorten the life of the internal regulator.**
- **For proper operation of the tool, the tool ratings, calibration and other information must be entered into the tool setup screen. This is done by navigating from the main menu to Controller->Tool Setup.**
- **Do not preform rundowns with the tool if the shutoff valve has been forced on from the Diagnostics->Live Tool screen. If the solenoid is forced on, the tool will not shutoff at the target torque.**

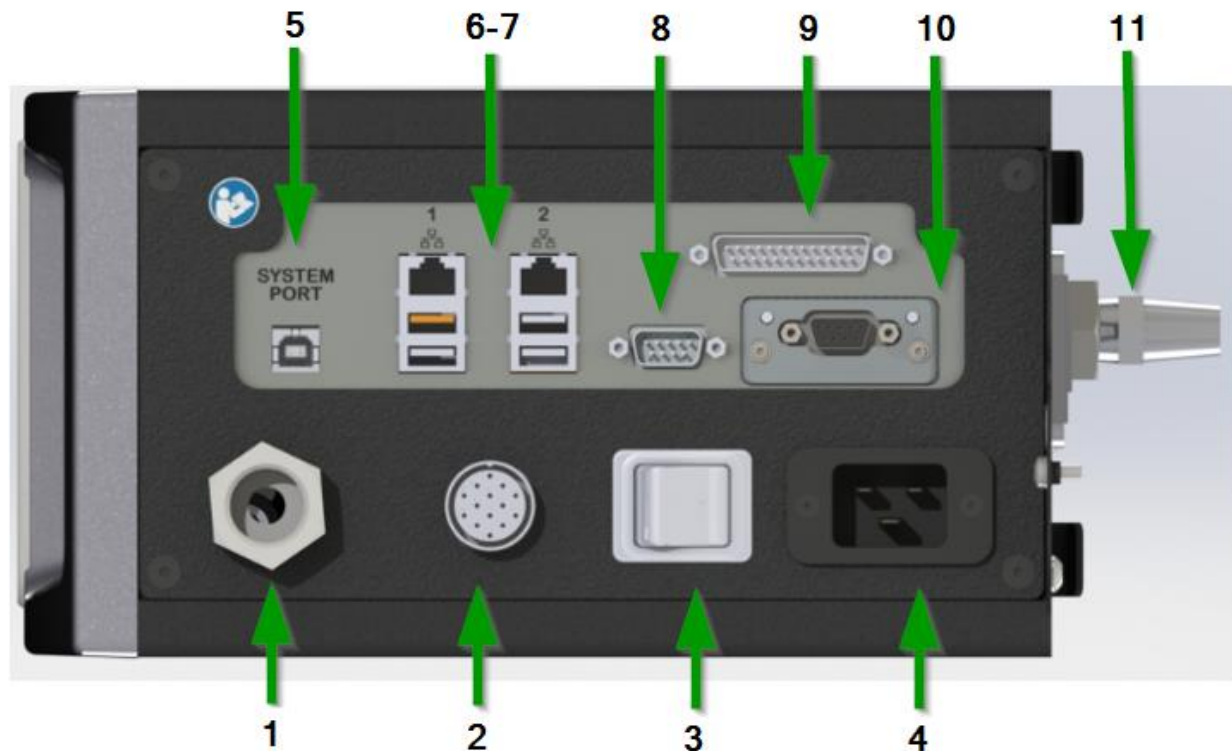
2 Controller Diagrams

2.1 Bottom Panel IAC Basic Model



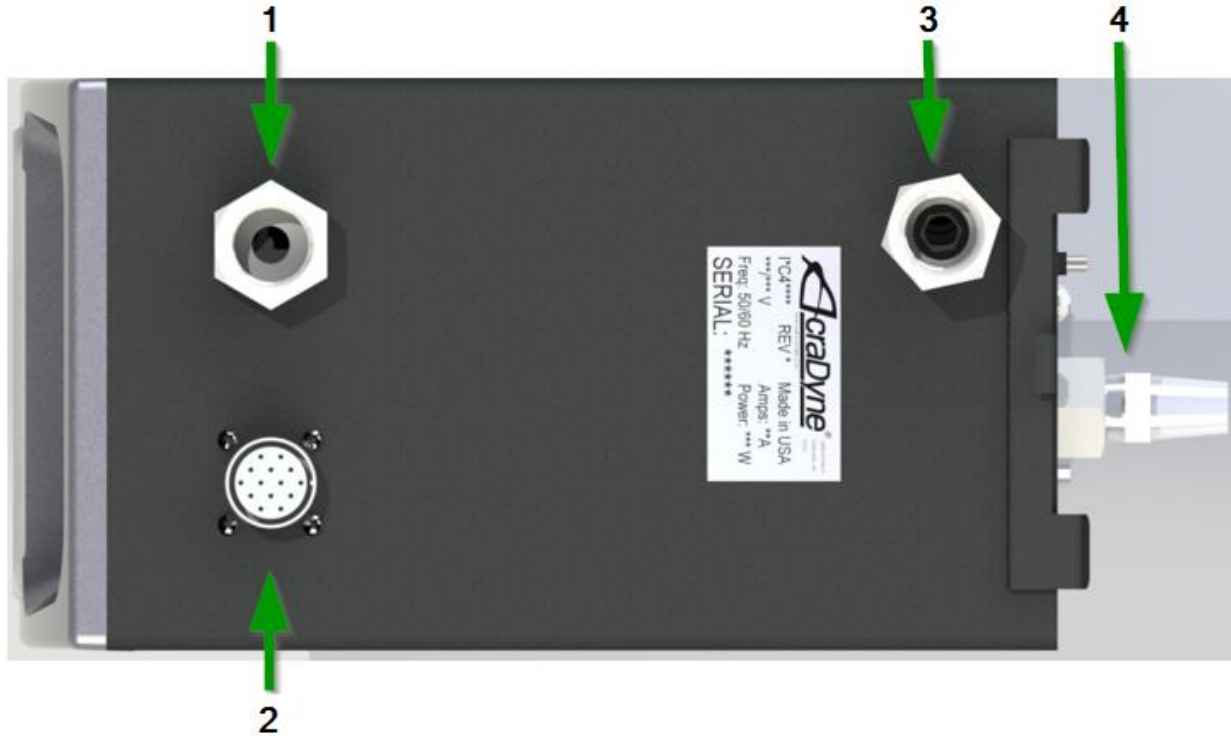
1. External Shutoff Valve Solenoid Connection 24 Volt terminal
2. Tool Connector
3. Power Disconnect Switch- Powers controller on and off
4. Power Supply Cord Connection
5. System Port- USB-B connection used to connect external computer to configure/monitor the controller
6. Ethernet Ports RJ45 connection used to connect external computer to configure/monitor the controller, or connect to plant wide network protocol infrastructure
7. USB-A Ports – Upload or download settings and logs. Controller upgrade.
8. Serial Port (DB-9Pin M) serial data output for communication with peripherals such as barcode readers
9. I/O Connector 24 Volt (DB-25 Pin M) input and output of signals for process control
10. Anybus-To connect customer's field bus network (Ex: Profibus)

2.2 Bottom Panel IAC Models with Shutoff Valve and/or Regulator



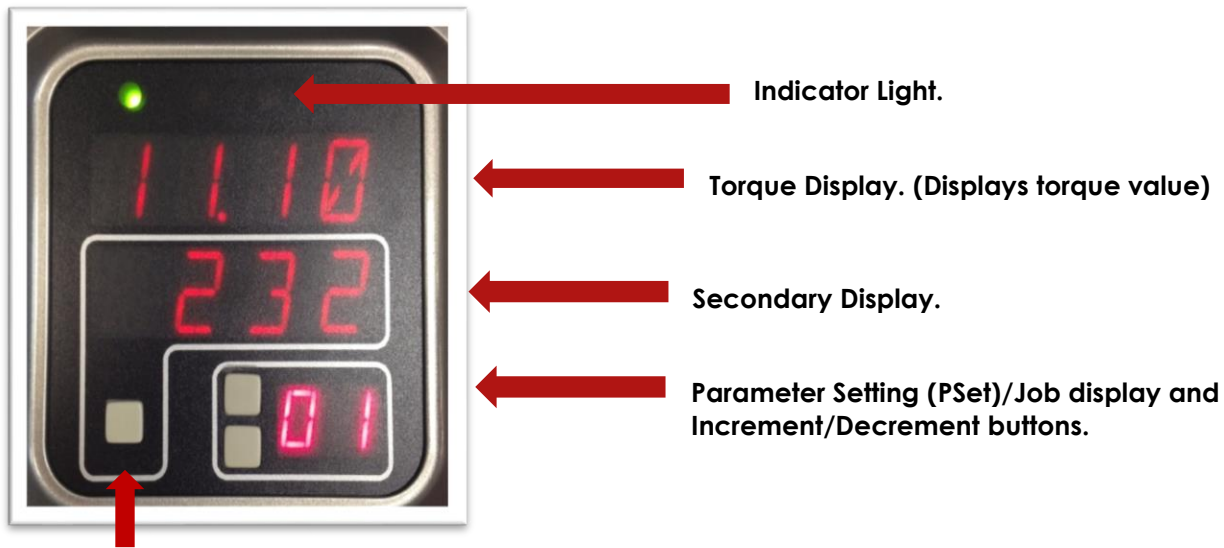
1. Air Outlet to the tool - 1/2" NPT (bottom exit versions)
2. Tool Connector (bottom exit versions)
3. Power Disconnect Switch- Powers controller on and off
4. Power Supply Cord Connection
5. System Port- USB connection used to connect external computer to configure/monitor the controller
6. Ethernet Port RJ45 Connection used to connect external computer to configure/monitor the controller
7. Serial Port (DB-9Pin M) serial data output for communication with peripherals such as barcode readers
8. 24 Volt I/O Connector (DB-25 Pin M) input and output of signals for process control
9. Anybus-To connect customer's field bus network (Ex: Profibus)
10. I/O Connector 24 Volt (DB-25 Pin M) input and output of signals for process control
11. Air Exhaust – 3/8" NPT

2.3 Top Panel IAC Models with Shutoff Valve and/or Regulator



1. Air Outlet – ½" NPT (top exit versions)
2. Tool Connector (top exit versions)
3. Air Supply Inlet – 130 PSI maximum – ½"NPT
4. Air Exhaust – 3/8" NPT

2.3 Front Console LED Display (All Models)



Toggle button

- **Indicator Lights:**
 - **Green LED:** Indicates fastening cycle meets specified parameters.
 - **Red LED:** Indicates fastening cycle rejected for exceeding high torque.
 - **Red Flashing LED:** Indicates low torque. Fastening cycle was rejected for not achieving low torque.
 - **Yellow LED:** Indicates High Angle or High Pulse. Fastening cycle was rejected for exceeding high angle. Note: The angle indication overrides pulse in the case where the angle is high but the pulse is low.
 - **Yellow Flashing LED:** Indicates Low Angle or Low Pulse. Fastening cycle was rejected for not achieving low angle. The angle indication overrides pulse in the case where the angle was low but the pulse was high.
 - **Blue LED:** Tool is in-cycle, above threshold.
- **Increment and Decrement buttons change current PSet or Job number**
- **Toggle button switches secondary display between**
 - Units of measure
 - Ethernet IP address
 - USB (System Port) IP address
 - Angle report

NOTE: If Jobs are enabled, refer to **4.3 Job** section of the manual for Toggle Button function.

3 Initial Set Up

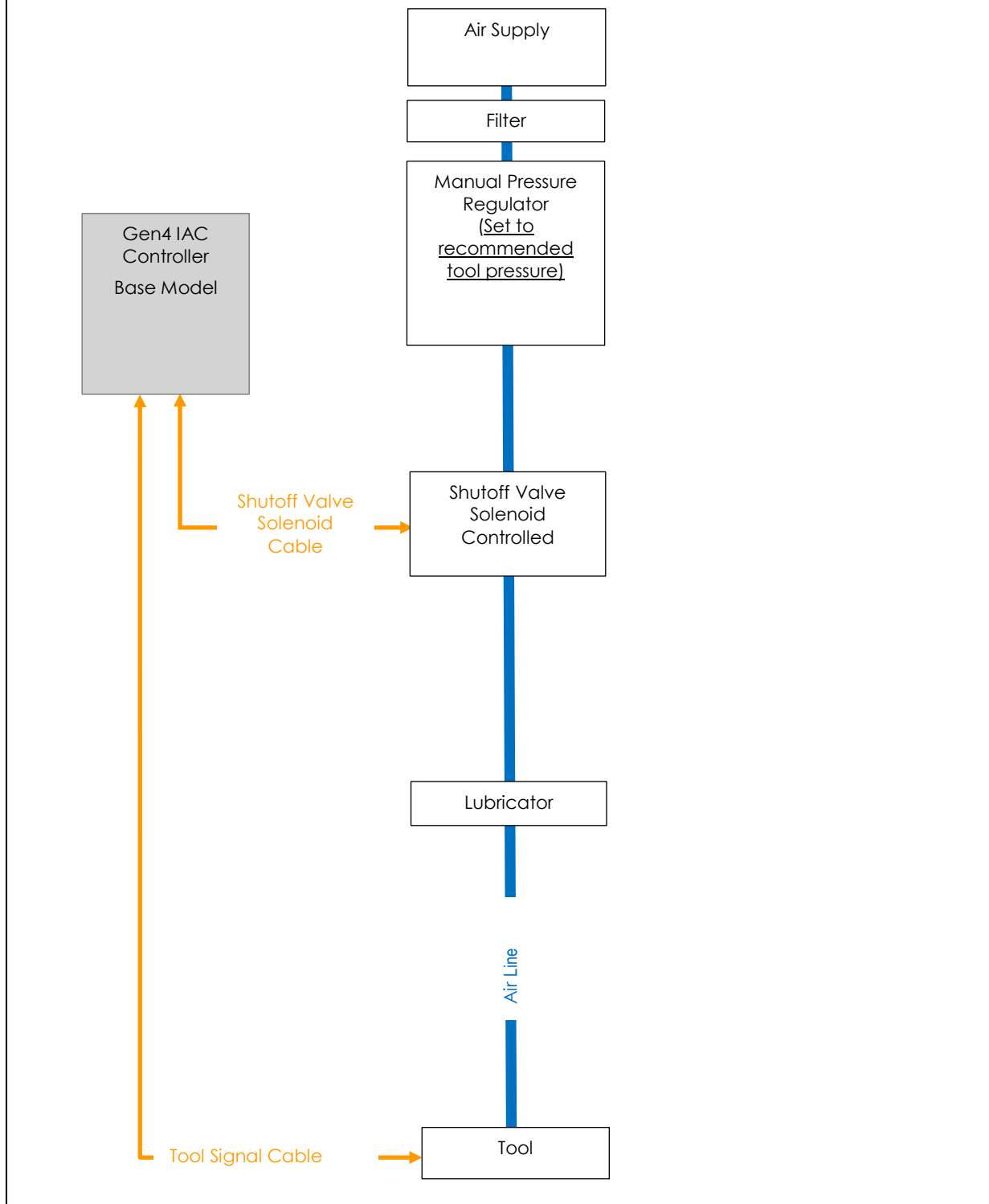
3.1 Air and Electrical Connections

1. Connect the air components to the controller and tool. (see Typical Installation Configurations for the specific controller models below).
2. Connect power cable to the # 5 power supply plug. (see 2.1 Bottom Panel View).
3. Connect sensor cable assembly to the IAC controller connection #2. (see 2.1 Bottom Panel View).
4. Connect the sensor cable to the Uryu tool using the red mark to align pins correctly.
5. Plug male end of power cable into appropriate power source.
6. Connect 24-volt external solenoid valve to 24-volt terminal on controller.
7. Connect power cable to the # 5 power supply plug. (see 2.1 Bottom Panel View)

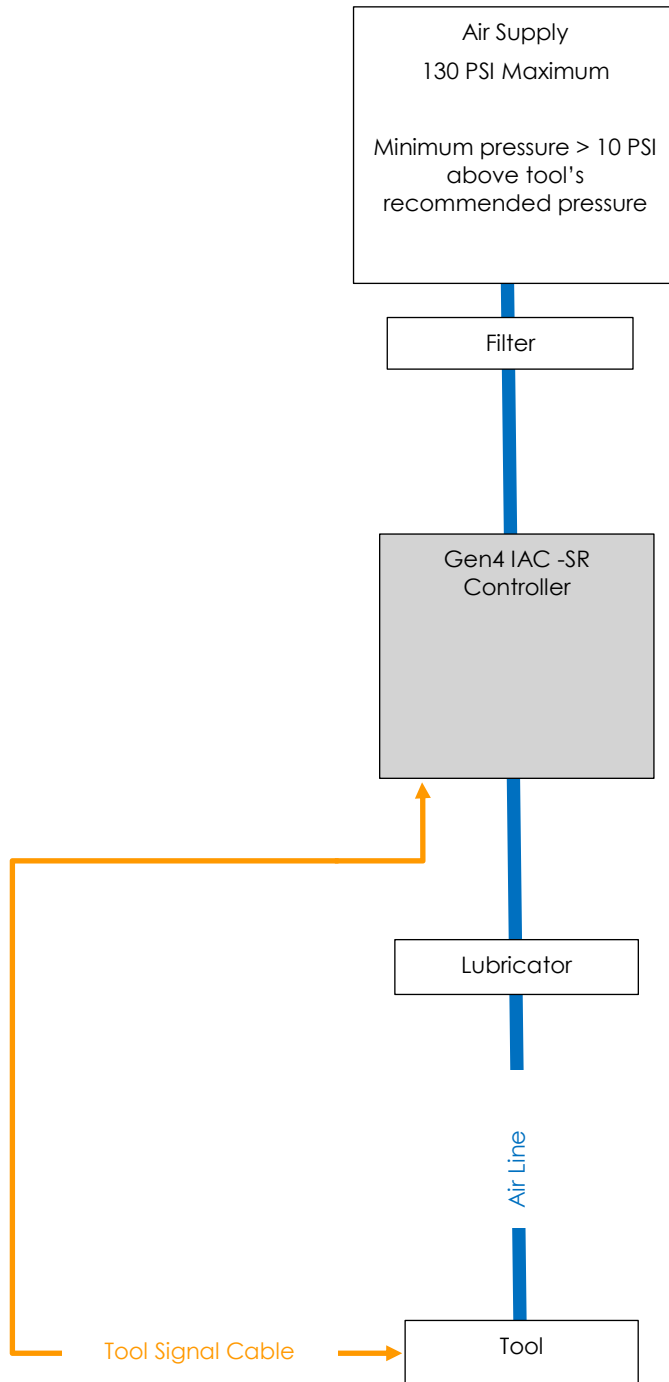
NOTE: Due to a variety of 230Vac power outlets, the standard power cable plug-end provided with the controller **may** need to be modified to connect to local 230Vac power outlets. AIMCO has a wide variety of country specific power cord options available. Check with your authorized AIMCO representatives to see if your specific configuration is available. In any case, connection to local power should be made in consultation with a qualified electrician.

8. Turn controller on by pushing the Power Disconnect Switch #4 (see 2.1 Bottom Panel View) to the POWER ON position, a light indicates power on.

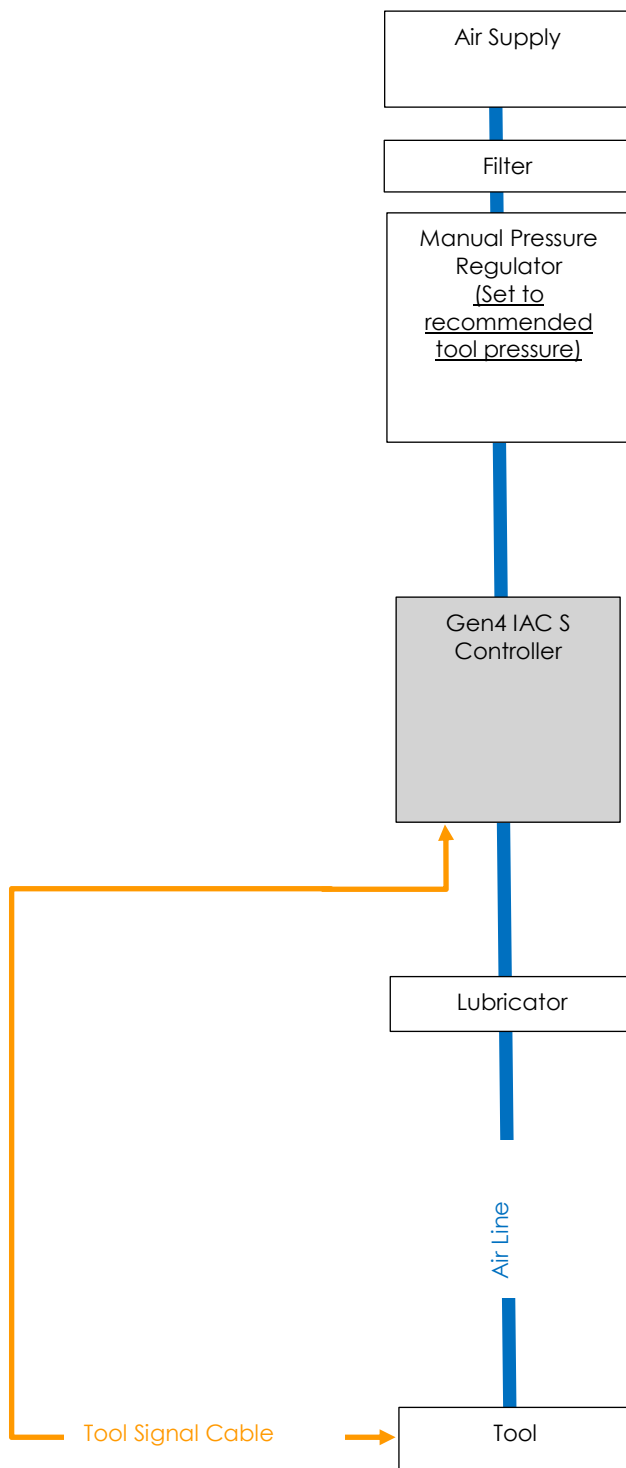
Typical Air Connections for Base Models



Typical Air Connections for SR Models equipped with Internal Shutoff Valve and Digital Pressure Regulator



Typical Air Connections for S Models equipped with Internal Shutoff Valve



3.2 Interfacing with the Controller

There are three ways to program/communicate with the controller:

- Controller touch-screen console
- System Port: (USB connection), Direct connection to controller.
- Ethernet Port: Via direct connection or LAN.

Touchscreen Console

Controller functions and programming can be accessed directly through the touch-screen.

1. Power on controller.
2. Run screen will appear.
3. Controller is ready for use.

Connecting via the System Port directly to PC

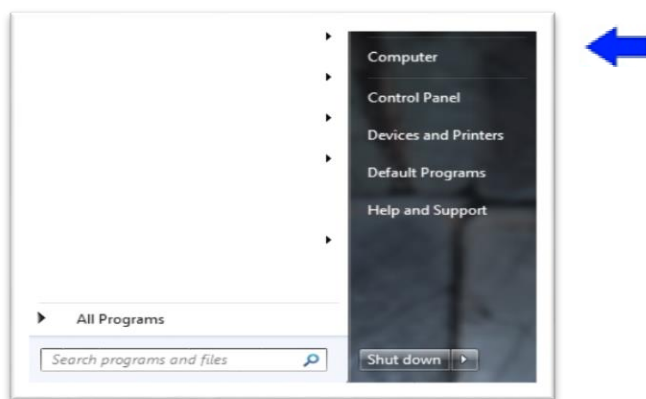
The following is an example using Window 7. Your screen may look different depending on the operating system.

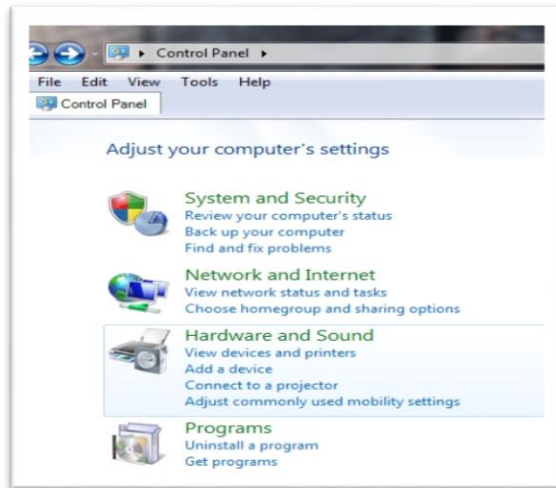
Windows USB Setup

Step 1 Power on PC and controller, allow enough time for them to become fully operational.

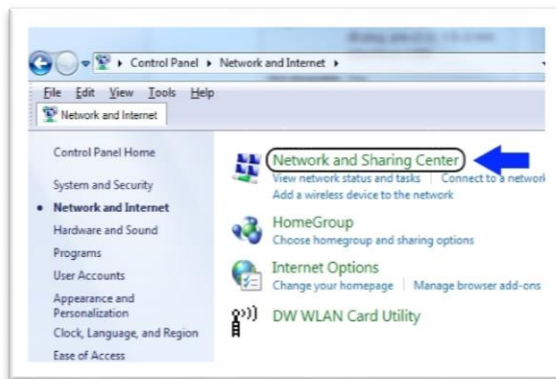
Step 2 Attach controller to PC using a USB 2.0 A-B cable. If this is the first time connecting the devices, wait for Windows to install the RNDIS driver. This should happen automatically.

Step 3 After the driver is installed, go to 'Control Panel'.

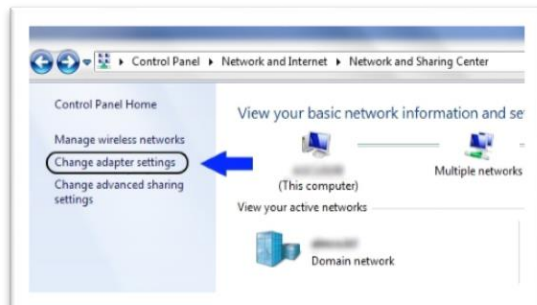




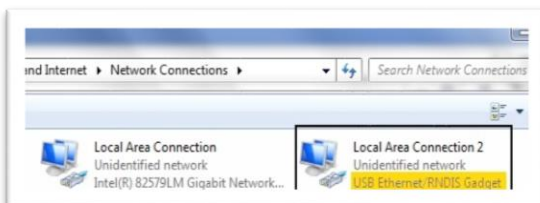
Step 4 Go to 'Network and Internet'.



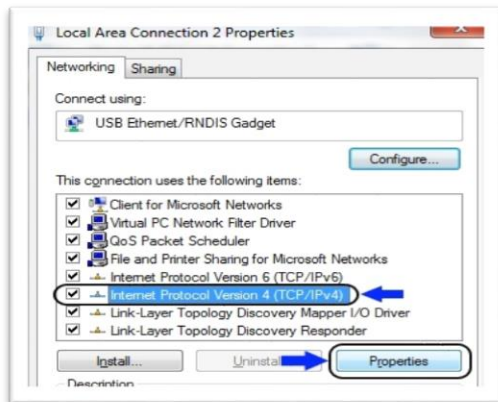
Step 5 Go to 'Network and Sharing Center'.



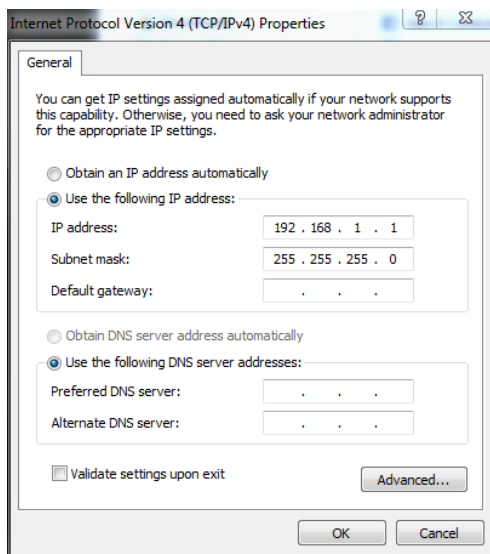
Step 6 Go to 'Change adapter settings'.



Step 7 Find the Local Area Connection that is using the 'USB Ethernet/RNDIS Gadget' network. Right click this network and go to 'Properties'.

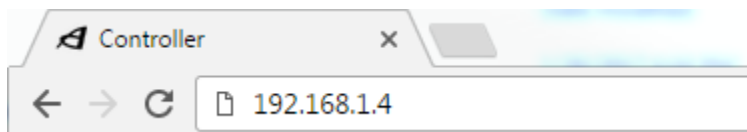


Step 8 In Properties window select 'Internet Protocol Version 4' and click 'Properties'.



Step 9 In 'Properties', set the IP address to a static address.

Type an IP address of 192.168.1.1 (Any address on the same subnet as the controller will work).
Set subnet mask to 255.255.255.0



Step 10 To connect to the controller. Open a browser, such as Chrome or Firefox, enter 192.168.1.4, the default system port IP address.

You will see the controller software on your computer screen.



Connecting using the Ethernet Port Directly or via LAN to PC

Turn on the computer and make a physical connection by using a straight through Ethernet cable.

Turn on controller, verify the controller IP address in 'Communication Interfaces'.

Set a static IP address of the Computer/Laptop to 10.10.30.XX and subnet mask to 255.255.255.0.

(For instructions, see the example earlier in this section.)

To connect to the controller, on the Computer/Laptop, open a browser such as Chrome or Firefox, enter 10.10.30.99, the default Ethernet port IP address.



You will see on your computer screen the controller software



NOTE: Controller does not have a DHCP client, it will not automatically configure itself with a useable IP address. Consult your Network Administrator for configuring a correct IP address for your network. The PC, Laptop or Tablet IP address will need to be configured to communicate with the controller.

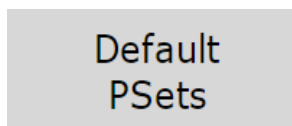
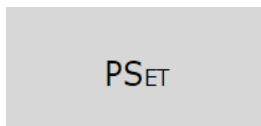
3.3 Enter Tool Information into the Controller

NOTE: For proper operation of the tool, the tool ratings, calibration, and other information must be entered into the tool setup screen.

This is done by navigating from the Main Menu to Controller->Tool Setup

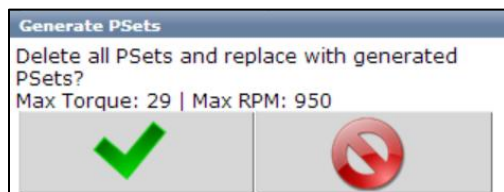
3.4 Quick Set up Default PSets from Tool)

On the Home Page press:



to accept default PSet Parameters.

This will generate three generic PSets for the tool connected to the controller. It will automatically use the 40%, 60%, and 80% of the rated maximum torque of the tool in a two-stage Torque Control Strategy (TC_PM). A prompt will display rated Max Torque and Max RPM of the connected tool for reference. These Psets can be modified to meet application requirements.

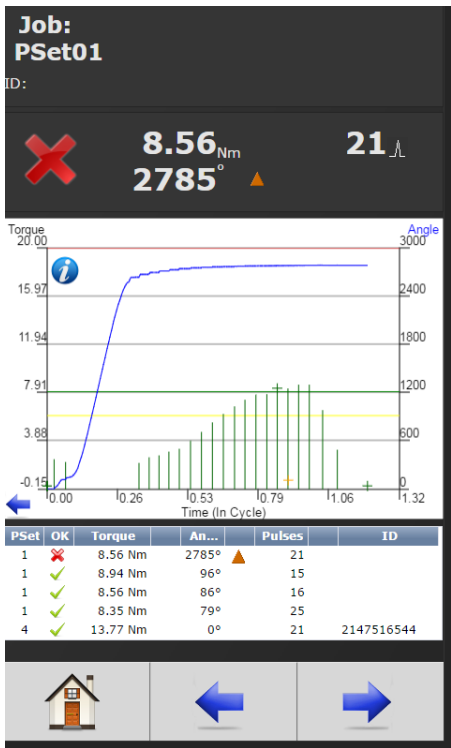


4 Home Page (Main Menu)



4.1 Run

The Run Screen is essentially the dashboard of the IAC controller and provides a look at real time information regarding rundowns.



JOB:

Indicates the current Job.

PSet:01

Indicates the current PSet you are operating in.



Indicates accepted rundown.



Indicates failed rundown.

8.56 Nm
2785°

Displays Torque and Angle for current rundown.

Time (in-cycle) screen

Graph displays curves representing Torque (black trace) and Angle (blue trace). The blue left arrow at the origin of the graph will change the X-axis of the rundown curve from Time (In – Cycle) to Time (Overall) and Angle.

Below the graph is a historical table that will give information and status of the most recent rundowns, including current PSet, accepted/failed rundown status, torque and angle.




Arrows allow user to scroll left or right for viewing real time Job information such as Run Screen or Rundown Indicators.

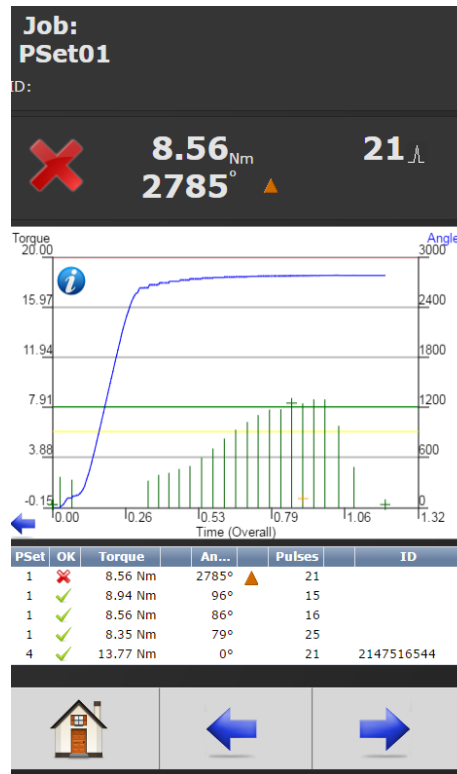


Home tab will return user to the Home Page.

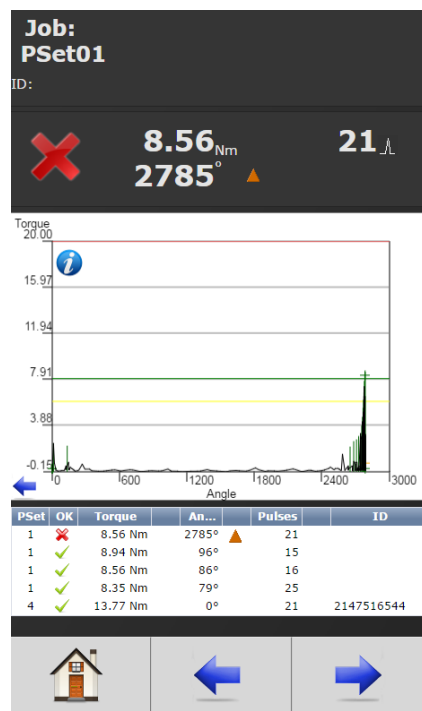
Time Overall Screen

Click  for curve detail.

Click on arrow to change curve X axis.
Choose Time in-cycle, Time Overall
Or Angle screen.



Angle Screen



Run Screen (Job display information)

Run Screen displays real time Job information.

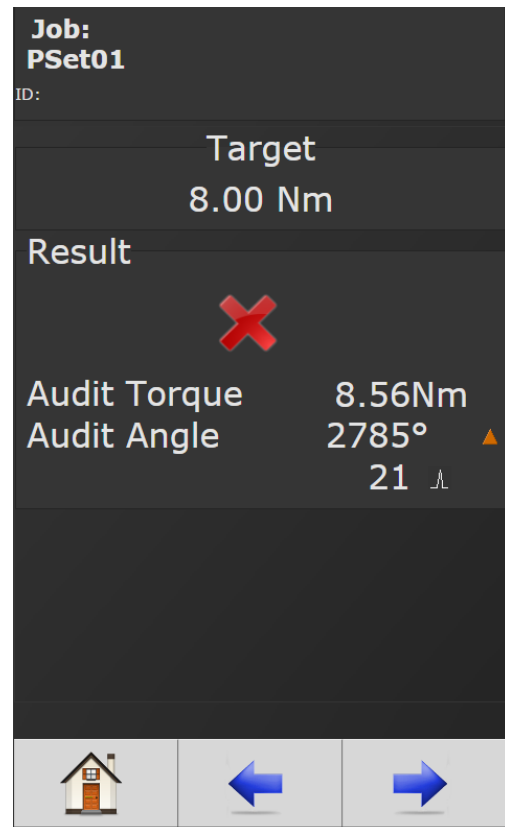
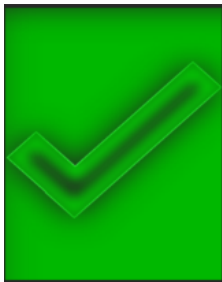


Large Screen Indicators and Audit information

The large screen indicators are helpful in viewing real time results of the rundown from a distance.


Accepted


Failed



4.2 PSet

Parameter Settings (PSets) control the fastening process. The following describes the different fastening strategies and how to setup the basic PSet parameters necessary to perform a fastening. Up to 256 PSets are available.

On Home Page press the  tab.

On **PSets** screen (right) press  to add a new PSet.

Stage parameters at a glance.



Add a PSet



Edit a PSet









Copy a PSet



Delete a PSet

Default PSets (see 4.2.5 Default PSets)

Manage (see 4.2.6 Manage PSets)

PSets	
PSet 1 [8_0-600°_0-100^]	
▼ 1 - TC_APM [8_0-600°_0-100^, 55.00PSI]	
Torque High	20
Torque Target	8
Torque Low	6
Angle High	600
Angle Low	0
Angle Reference	In Cycle An...
Pulse High	100
Pulse Low	0
Additional Pulses	1
Pressure	55
Time Limit	10
► Advanced	
PSet 2 [5_2-100^]	
PSet 3 [15_0-600°_0-100^]	
<div></div>	
<div>Default PSetsManage</div>	
<div></div>	

4.2.1 Add New PSet

On Add New PSet screen(below)enter appropriate values.

PSet Number: Current PSet to be added.

Torque Units: Unit of measure.

In Cycle Torque: Threshold value at which tool is "In Cycle" and results from the Rundown will be reported. This value is also used to count pulses by determining the start of a pulse.

Cycle Complete Torque: Torque level that determines the end of a pulse.

Time Limit(s) (sec): Maximum allowable time tool is allowed to run after going 'In Cycle'.

Advanced Options: (see 4.2.2)

Once PSet values are entered press to enter **Add New Stage** screen.

Add New Stage

A single stage, or multiple stages, build a PSet. Up to 20 stages can be assigned per PSet.

The following stage options are available (see 4.2.3 for stage descriptions).

TC_PM

TC_APM

Once the desired stage(s) is/are selected and configured, press to save stage and again to save the **PSet** and return to initial PSet menu.

Next Press to go to the **RUN** screen or to return to the **Home** page. The tool should now be operational and ready to run a configured PSet.

4.2.2 Advanced Options

Edit PSet: 1
General

PSet Name

Thread Direction Right ▼



Timers

Judgement Delay (s)

Torque Read Delay (s)

Joint Compensation

Joint Compensation Ratio

Pset Name (optional)

Thread Direction: Direction the tool is required to run for fastening.

NOTE: *The actual tool direction is set on the tool.*

Judgement Delay: Delay after the air is shutoff to the tool, where the peak torque, pulse count, and angle are still being recorded. After this delay, the rundown is evaluated and reported as complete.

Torque Read Delay: This timer starts when the torque reaches In-Cycle. During this delay time, torque is not compared to the target. When the time is up, the peak torque is reset. This can be useful if there is an initial spike in the torque when the tool first starts or at the fasteners first seating point.

Joint Compensation Ratio: Additional calibration ratio factor for the specific PSet.

4.2.3 PSet Stages

TC_APM Torque Control Angle Pulse Monitor Only available for tools with Angle Sensing capability 'Resolver'.

PSet 1: Edit Stage 1
Stage Type
TC_APM

Torque	
High	20
Target	8
Low	6
Angle	
High	600
Low	0
Reference	In Cycle Ar
Reference Torque	0
Pulse	
High	100
Low	0
Additional Pulses	1
Pressure	
PSI	55
Time	
Stage Timeout (s)	10

✓

⊘

Torque High: Upper control limit of the rundown.

Torque Target: Final desired torque (CUT Level).

Torque Low: The lower control limit of the rundown.

Angle High: Maximum acceptable angle rotation in degrees.

Angle Low: Minimum acceptable angle rotation in degrees.

Reference Torque: (drop down menu)

In-cycle Angle: Angle is measured from In-Cycle torque value (Determined in PSet screen).

Stage Angle: Angle is measured from Reference Torque.

Pulse High: Maximum acceptable pulses.

Pulse Low: Minimum acceptable pulses.

Additional Pulses: After reaching target torque, additional pulses to be applied before shutting off the air to the tool.

PSI: Desired amount of air pressure supplied to the tool (only

available for RS models).

NOTE: The pressure set in the first stage of the PSet, is applied when the tool is enabled to run.

Stage Timeout: Maximum allowable time in this stage. If time is exceeded, the tool will stop and the Rundown will be terminated.

TC_PM Torque Control Pulse Monitor

PSet 1: Edit Stage 1

Stage Type

TC_PM

Torque

High

20

Target

8

Low

6

Pulse

High

100

Low

0

Additional Pulses

1

Pressure


PSI


65

Time

Stage Timeout (s)

10





(See above for stage information)

4.2.4 Multistage Rundown Evaluation and Reporting

- If a rundown cycle completes, or is terminated early while in, or after, the final stage of the PSet:
 - The overall evaluation of the rundown will be determined using the limits set in the final stage.
 - The peak torque, pulse count, and angle achieved during the rundown are used for the evaluation and reported.

NOTE: *The fastening torque must reach the In-Cycle torque value set in the PSet for the rundown to be evaluated and reported.*

- If a rundown is terminated early before reaching the final audit stage:
 - The overall result of the rundown will be reported as a reject.
 - The torque, pulse, and angle evaluation will be determined using the limits set in the stage that was running when the rundown was terminated.
 - The peak torque, pulse count, and angle, at the point in time when the rundown was terminated, is used for the stage evaluation.
 - The torque, pulse count, and angle status reported will reflect this stage evaluation with the following exception:
 - If torque, pulse count, and angle are all within limits of the stage that was running, the torque, pulse, and angle status will all be reported as low. This is done to further indicate that the rundown terminated before reaching the final audit stage.
 - The peak torque, pulse count, and angle achieved during the rundown, will be reported.
- Angle measurement details:
 - Peak Angle used for overall evaluation and reporting, is the peak angle achieved during the rundown, measured from the angle reference set in the final stage.


NOTE: *If an angle reference is not defined in the final audit stage, the angle is measured from when the torque first crosses the In-Cycle torque set in the PSet.*
 - Angle used for stage evaluation is the angle at the point in time when the stage was terminated, or completed, measured from the angle reference set in the stage.

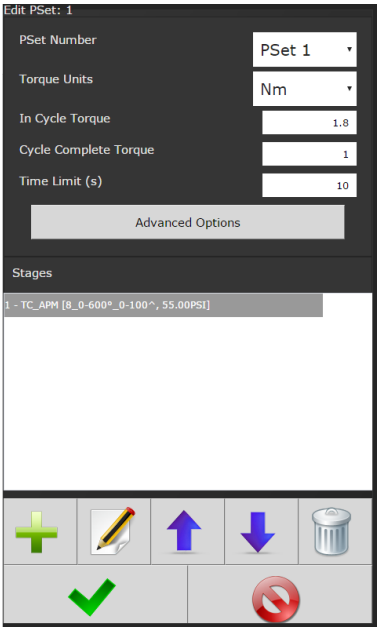
NOTE: *If the evaluation of any stage during the rundown fails, or a bail out limit is exceeded, the fastening cycle will be terminated early and any subsequent stages will not run.*


4.2.5 Edit PSet

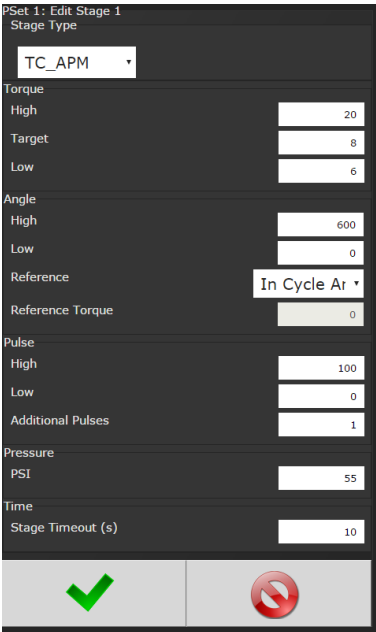


On Home page press: 

On the PSet screen (left) click on the desired PSet you would like to edit. Click on the Edit button  to make changes in the Edit screen (right).



If further Stage changes are needed click the Edit  button again to enter Edit Stage screen (below).

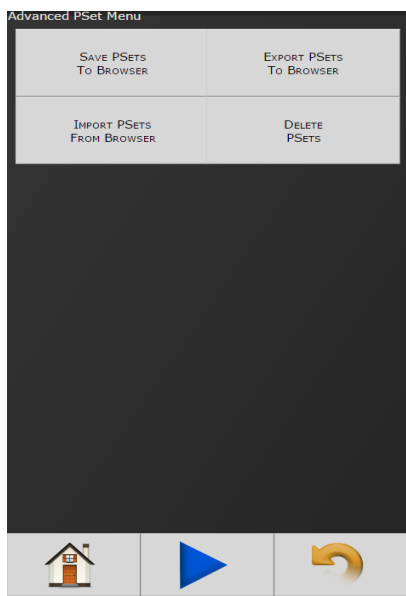
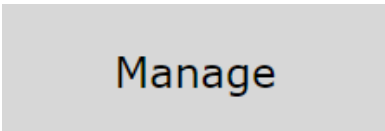


Once desired changes are made click  twice to save changes.

4.2.6 Default PSets

Default PSets will generate three generic PSets for the tool connected to the controller. It will automatically use the 40%, 60%, and 80% of the rated maximum torque of the tool in a two-stage Torque Control Strategy (TC_PM). A prompt will display rated Max Torque and Max RPM of the connected tool for reference. These Psets can be modified to meet application requirements.

4.2.7 Manage PSets



Save PSets to Browser

Allows the PSet information to be saved to the local PC connected to controller. PSet information is saved as a .txt file and can be opened using any text editor such as WordPad. It can also be opened with Excel. The format of the .txt file is tab separated values.

Export PSets to Browser

Save the PSets as a database file to the PC connected to controller. These PSets can later be imported to another controller.

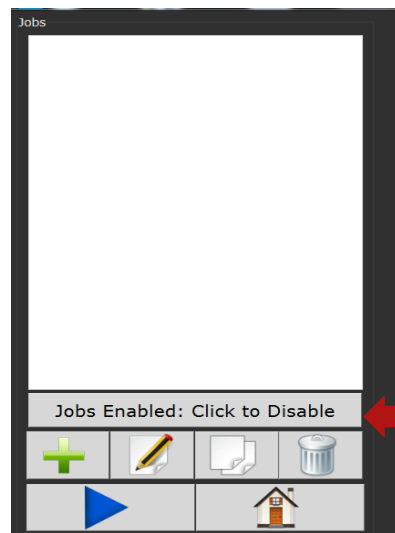
Import PSets from Browser

Import previously exported PSets to controller.

Delete PSets

Enables deletion of selected PSets.

4.3 Job



A Job is a collection of PSets which can be run when performing multiple fastening operations on a single application.


Jobs provide:

- Error proofing
- Logical grouping of PSets
- Fastening order
- Job status

Click to Enable/Disable Job function.

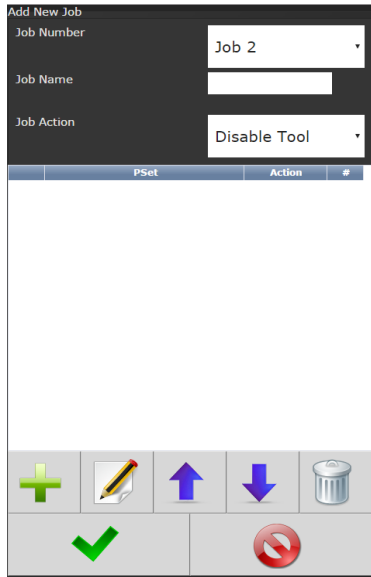
4.3.1 Add New Job

To add a new Job, press on the Home Page.

Press  on Jobs screen (above) to enter Add New Job screen (below).

Job Number: Up to 99 Jobs can be configured.

Job Name: Enter Job Name



Job Action:

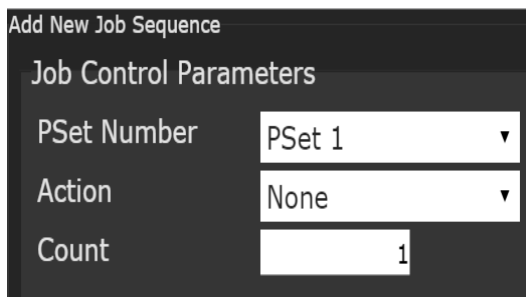
Disable Tool: Disable tool after job is finished. Job complete Icon will appear. Tool will not operate until job is reset.



Reset Job: Will reset after Job is finished.

After appropriate values are entered, press  to go to Add

New Job Sequence screen.



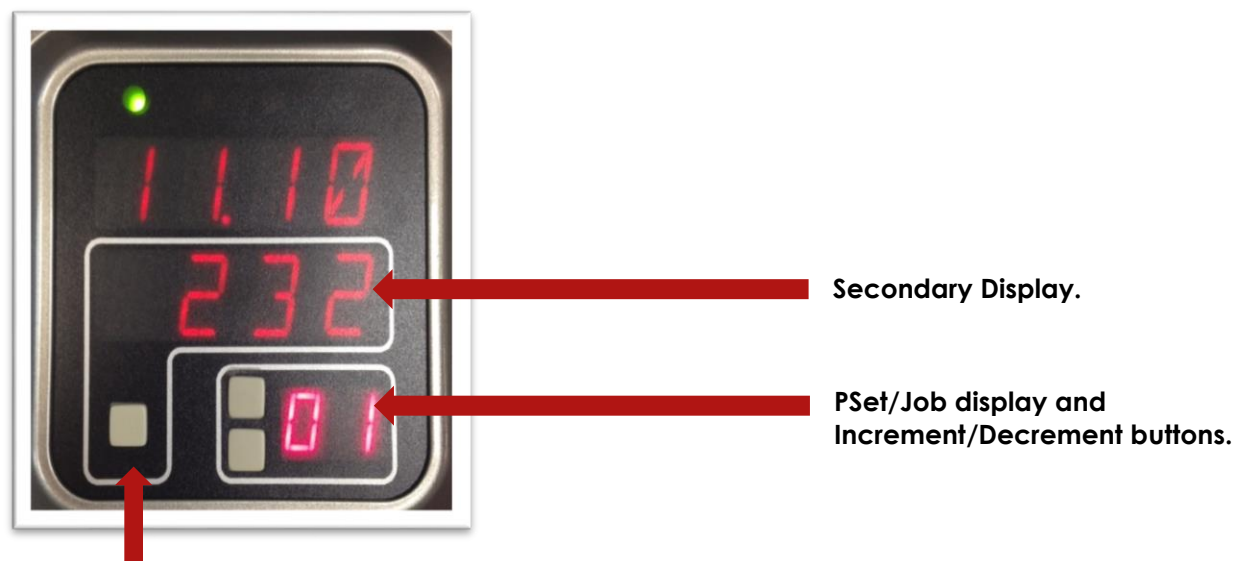
PSet Number: Choose any current PSet already configured in controller.

Action:

- **None:** Will stay in current sequence
- **Next:** will advance to next sequence set up after count is reached
- **Count:** Fastener number required to complete sequence

Once values are entered press  two times to return to Job screen.

Jobs “Enabled” display and button function:



Toggle Button: PSet/Job functions.

- Increment and Decrement buttons change the job sequence. The PSet number will change, as well as, the job sequence number on **secondary display** if jobs are enabled.
- Holding the Toggle button will display the Job number, while pressing Increment or Decrement buttons will change the Job number. The two numbers on the PSet/Job display will be separated by decimals.
- Pressing the Toggle button will change **secondary display** between:
 - Units of measure
 - Ethernet IP address
 - System port IP address
 - Angle report (If tool is equipped with angle resolver)
 - Bolt count
 - Job sequence

NOTE: Job sequence shows which PSet you are currently on in the Job (this is not the PSet number). The first PSet in the Job is always Job Sequence 1, and the next is Job Sequence 2, etc. Bolt count is shown as current bolt count out of total number of bolts. (Example: If you have three total bolts, when you start the job, you will see 0.3; after one rundown, you will see 1.3 and then 2.3 on the next run and so on until the Job is completed.

4.4 Results

ID	Time Stamp	PS...	OK	Torque	Angle
585	01-07 19:13:02	2	✓	17.46 Nm	341
584	01-07 19:12:59	2	✓	17.77 Nm	351
583	01-07 19:12:57	2	✓	17.93 Nm	372
582	01-07 19:12:52	2	✓	18.09 Nm	350
581	01-07 19:12:50	2	✓	17.61 Nm	338
580	01-07 19:12:48	2	✓	18.03 Nm	359
579	01-07 19:12:46	2	✓	17.46 Nm	354
578	01-07 19:12:43	2	✓	18.13 Nm	377
577	01-07 19:12:41	2	✓	17.59 Nm	359
576	01-07 19:12:36	2	✓	17.76 Nm	377
575	01-07 19:12:33	2	✓	17.76 Nm	359
574	01-07 19:12:29	2	✓	17.70 Nm	377
573	01-07 19:12:27	2	✓	17.58 Nm	358
572	01-07 19:12:22	2	✓	17.97 Nm	384

This screen provides a history of rundowns performed. Information such as ID Number, Time Stamp, and Parameter Set#, Accept /Reject status, and Torque and Angle are recorded for each rundown.



Deletes individual rundowns by clicking on them separately and deleting them in the next screen or deleting all rundowns by clicking on the icon at the bottom of Results page. A Confirmation screen will appear.



“Save Button” saves rundowns as Txt. File.



“Filter Button” gives filter options in Rundown screen.



“Home Button” returns to main display menu.



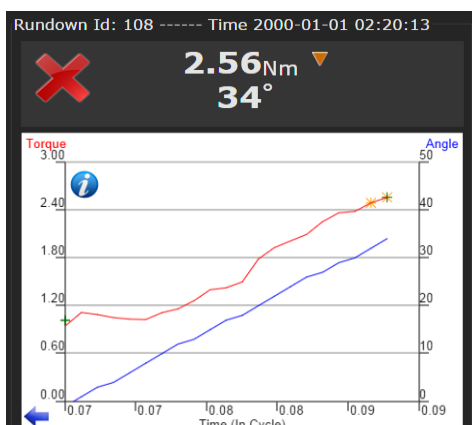
“Play Button” sends you directly to Run Screen.



“Refresh Button” refreshes screen to include latest rundowns.

ID	Time Stamp	PS...	OK	Torque	Angle
112	01-01 02:29:00	1	✓	12.03 Nm	124
111	01-01 02:28:56	1	✓	11.98 Nm	124
110	01-01 02:28:50	1	✓	12.02 Nm	112
109	01-01 02:28:46	1	✓	11.63 Nm	113
108	01-01 02:20:13	1	✗	2.56 Nm	34

Click on Individual Runs for Rundown information.



Example: Rejected Rundown Information.

4.4.1 Saving Rundown(s)

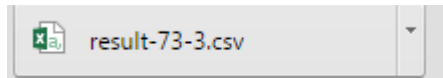
TOTAL RUNDOWNS

Click on



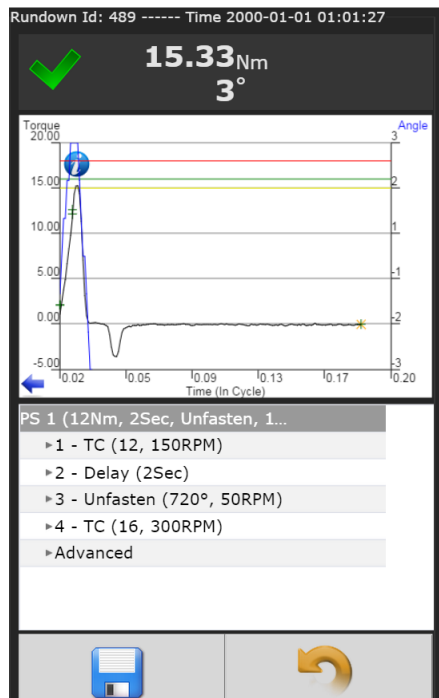
in main rundown screen to view/save total rundowns.

Then click on



the PC to save

or open the file using a text editor such as Notepad. The format of the Rundown file has tab separated variables and can be viewed using Excel. The raw data can now be imported to Excel to build graphs, charts etc. Contact AIMCO Technical Service for pre-made Torque and Angle Templates.



INDIVIDUAL RUNDOWNS

Click on an individual run to view/save rundown information.

224 Total Rundowns

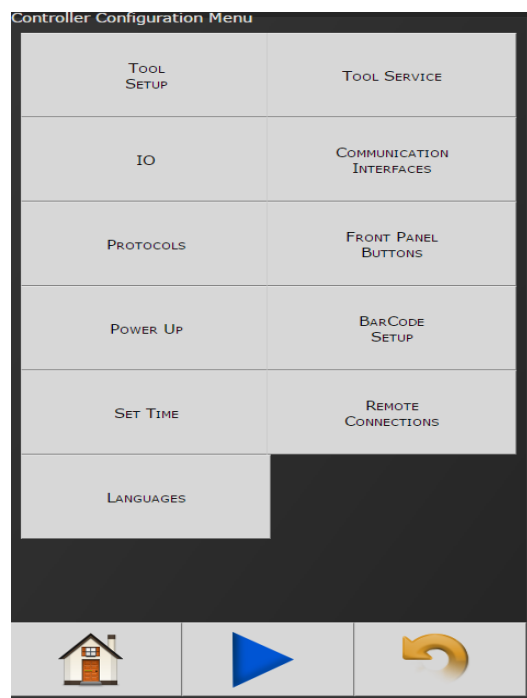
ID	Time Stamp	PS...	OK	Torque	Angle
490	01-01 01:01:28	1	✓	15.69 Nm	3
489	01-01 01:01:27	1	✓	15.33 Nm	3
488	01-01 01:01:27	1	✗	14.91 Nm	5
487	01-01 00:52:25	1	✓	16.12 Nm	192
486	01-01 00:52:11	1	✓	16.56 Nm	142
485	01-01 00:49:58	1	✗	12.11 Nm	67
484	01-01 00:49:33	1	✓	16.21 Nm	177
483	01-01 00:49:14	1	✓	16.12 Nm	199
482	01-01 00:47:25	1	✗	12.06 Nm	59
481	01-01 00:47:01	1	✗	12.41 Nm	81
480	01-01 00:46:54	1	✗	12.44 Nm	89
479	01-01 00:46:47	1	✗	12.02 Nm	71
478	01-01 00:42:42	1	✓	16.21 Nm	201

Icons: Funnel, Floppy disk, Trash, Home, Play, Refresh

SAMPLE OF INDIVIDUAL RUNDOWN INFORMATION

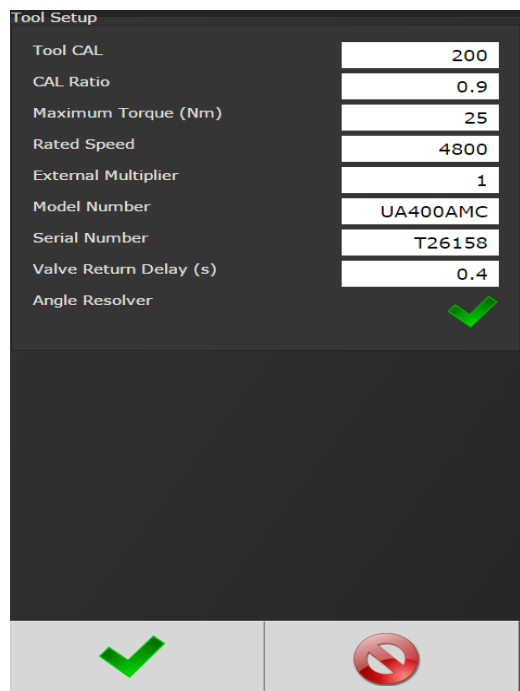
1	Result	65	
2	Job Number	1	
3	Job Name	Paramont	
4	Job Sequence	1	
5	Bolt Count	3	
6	Date	#####	4:18:00
7	Master Run	0	
8	PSet ID	59	
9	PSet Number	1	
10	PSet Name		
11	Tool Model	AEN32030A	
12	Tool Serial	191111	
13	Torque	11.69	
14	Angle	57	
15	Pulses	0	
16	Torque Status	P	
17	Angle Status	--	
18	Pulse Status	--	
19	Rundown P		
20	Tool Cycle	1111	
21	ID1 ("ID #1")	2.2E+10	
22	ID2 ("ID #2")	4.86E+10	
23	ID3 ("ID #3")		
24	ID4 ("ID #4")		
25			
26			
27			
28	Curves		
29	Tick	Torque	Angle
30	0	0.02	0
31	1	0.02	0
32	2	0.05	0
33	3	0.04	0
34	4	0.09	0

4.5 Controller



The controller menu is where all the settings for the IAC controller are configured. All the different configuration capabilities are explained below.

4.5.1 Tool Setup





For proper operation of the tool, this information must be entered each time a new tool is connected to the controller.

- **Tool CAL:** Value stamped on tool.
- **CAL Ratio:** Calibration factor for matching the torque reading of the tool/controller to a torque auditor.
- **Maximum Torque:** Rated maximum torque of the tool. This is used when determining the default PSets.
- **Rated Speed:** Rated catalog speed of the tool. (Optional information only. Does not affect the operation of the tool)
- **External Multiplier:** Gear ratio of any aftermarket gearing installed. (1= No aftermarket gearing installed)
- **Model Number:** (Optional information only. Does not affect the operation of the tool)
- **Serial Number:** (Optional information only. Does not affect the operation of the tool)
- **Valve Return Delay:** Time from when the air to the

- tool shuts off after a rundown, to when the tool air turns back on for the next rundown.
- **Angle Resolver:** Tool is equipped with an angle sensor 'Resolver'.

4.5.2 Tool Service

Tool Service	
Current Status	
Cycles	1013
Pulses	1263
Cycle Limit x1000	1
Pulse Limit x1000	1
Service Due Action	No Action ▼

Service Parameters are stored in the controller and can be viewed in this screen.

Service Due Actions:

- No Action
- Log error
- Display error
- Disable tool

4.5.3 I/O

4.5.3.1 Physical I/O Configuration

Physical IO Configuration			
Input	Function	State	Force
---1---			
---2---			
---3---	Stop		
---4---	Select PSet / [...]		
---5---	Used By Input:...		
---6---	Used By Input:...		
---7---	Reset Job		
---8---			
Output	Function	State	Force
---1---	OK		
---2---	NOK		
---3---	In Cycle		
---4---	Torque High		
---5---	Torque Low		
---6---	Angle High		
---7---	Angle Low		
---8---	Job Complete		

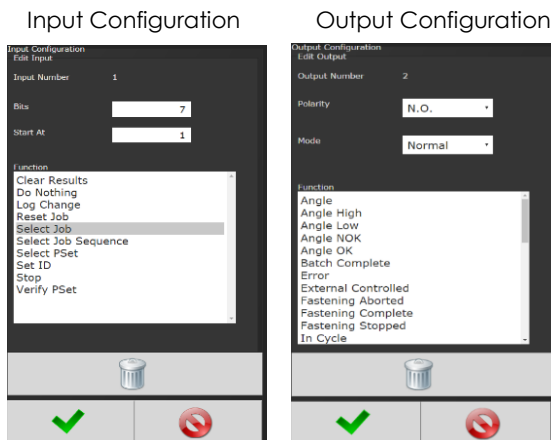
Assign functionality to 24V Input and Output pins. Shows the "live state" of each Input and Output.

Functions shown in screen shot are default settings.

To change these assignments, click on the "Function" column of the any of the I/O pins. This will open a Output/Input Configuration screen (below).

Click on the "Force" column of any of the I/O pins to enable or disable the forcing of the selected input or output.

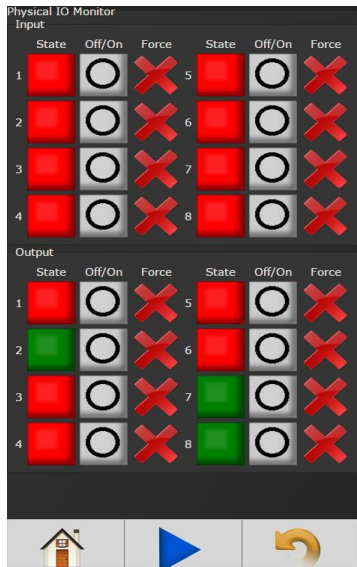
If force is enabled, click on the "State" column to toggle the state of input or output selected.



See [11.0 Assignable IO Details](#) for more detail on available assignment functions and how to configure.

See [10.0 24 Volt I/O](#) for the pinout of the 24Volt Logic IO port, and wiring examples.

4.5.3.2 Physical IO Monitor



Monitoring of Physical 24 Volt I/O. Force on/off the individual I/O pins for testing of field wiring.

Each indicator shows the state of the associated pin.
Green= On
Red= Off

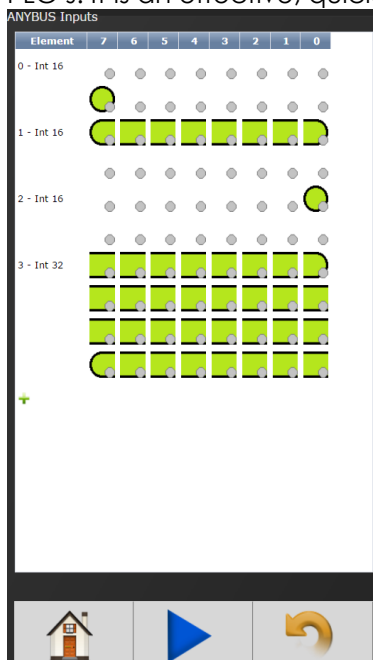
Force Enable/Disable: Enables the forcing of the selected input or output.

Force Off/On: If Force is enabled, this button will toggle the state of input or output selected.

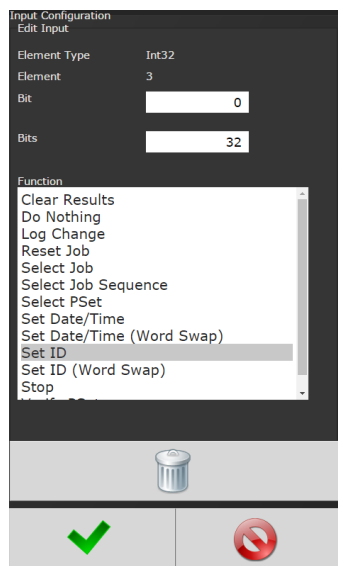
NOTE: See [Section 11 Assignable IO Details](#) for more details.

4.5.3.3 Anybus/ Modbus TCP/Ethernet IP Inputs

These types of communication are useful for data communication between controller and PLC's. It is an effective, quick way for the data transfer of short data packages.



Click on element to enter Configuration Screen (below)



Element Type: Choose from Byte, Int16 or Int32.

Element: Shows element # being configured

Bit: Enter Bit #.

Bits: # of bits the assignment will read.

Start at: Starting bit location.

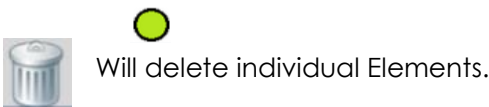
Polarity: Normally Open or Normally Closed Inputs (used in certain Input functions)

Function: See [11.0 Assignable I/O](#) for more detail on available assignment functions

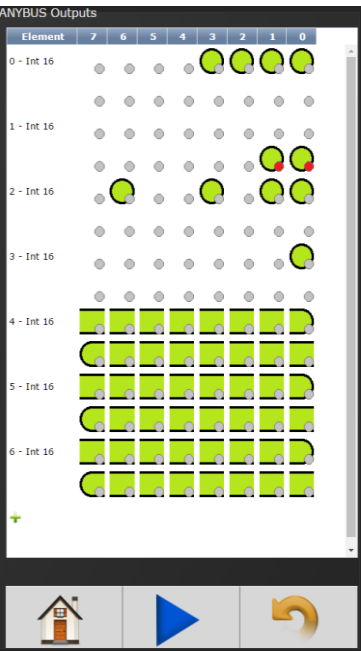
Click on  after appropriate selections are made.

Below is an example of the Anybus Input screen with five Inputs set up.

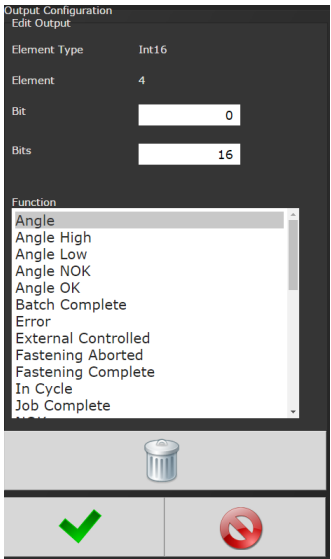
Click on to change an individual Element or return to Input Configuration screen.



4.5.3.4 Anybus/Modbus TCP/Ethernet IP Outputs



Click on element to enter Output Configuration Screen



Element Type:
Choose from Byte, Int16 or Int32.

Element: Shows Element # being configured.

Bit: Enter Bit #

Polarity: Select Normally Open or Normally Closed Outputs.

Mode: Normal - Output signal sent.

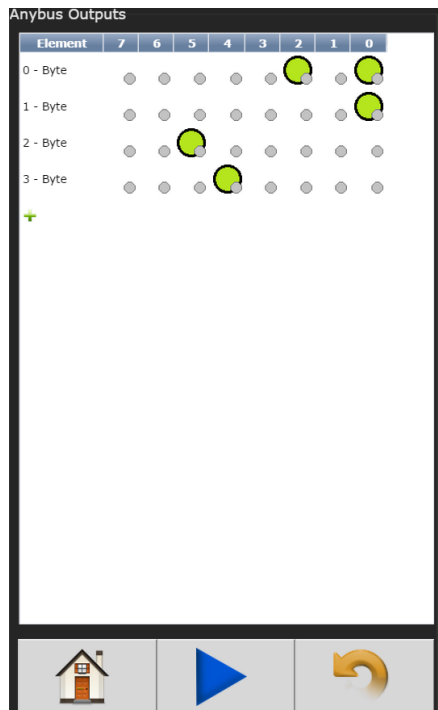
Timed signal sent (Time entered in seconds)


Flash - signal sent (Time entered in Seconds)

Function: See [11.0 Assignable I/O](#) for more detail on available assignment functions.

Click on  after appropriate changes are made.

Below is an example of the Anybus Output screen with five Outputs set up.



Click on  to make changes on an individual Element or return to the Output Configuration screen.





Will delete element.

4.5.4 Communication Interfaces

4.5.4.1 Ethernet

Ethernet
Ethernet

IP Address	10.10.13.45
Subnet Mask	255.255.255.0
Gateway	0.0.0.0



- **IP Address:** IP address of controller's Ethernet port.
- **Subnet Mask:** Subnet mask of the controller.
- **Gateway:** Gateway is the IP address of the gateway computer that provides access beyond the local network.

NOTE: Consult your local System Administrator to connect the controller to your Network and assign IP addresses.

4.5.4.2 Second Ethernet

Second Ethernet Configuration
Second Ethernet Port

IP Address	192.168.100.4
Subnet Mask	255.255.255.0

4.5.4.3 System Port

IP Address: The IP address of controller's System Port (Default is 192.168.1.4).

Subnet Mask: The Subnet Mask of controller's System Port.

NOTE: It is not recommended to change this setting.

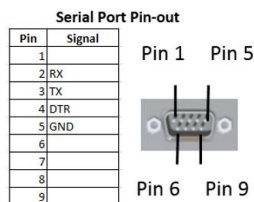
4.5.4.4 Serial Port Configuration

Port Mode: The following modes are available.

- **Serial Output:** A serial data string will be output after each rundown.
- **Barcode Reader** (See Barcode setup for details)
- **Serial Output and Barcode Reader**
- **Open Protocol** (See Open Protocol section for details)
- **PFCS** (See PFCS section for details)
- **MODBUS RTU** (See MODBUS RTU section for details)

Baud: Serial ports can be configured for different baud rates.

- 75, 110, 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200



Serial Output Format Options: The format of the information in the ASCII character serial string packet can be configured.

- **Format**

- **Standard**

- O P HHHHH LLLLL TTTT P HHHHH LLLLL AAAAA CR CR
 - O: Overall Pass/Fail
 - P: Torque Pass/Fail
 - HHHHH: Torque High Limit
 - LLLLL: Torque Low Limit
 - TTTT: Torque Result
 - P: Angle Pass/Fail
 - HHHHH: Angle High Limit
 - LLLLL: Angle Low Limit
 - CR: Carriage Return
 - CR: Carriage Return

- **Standard with PSet**

- O P HHHHH LLLLL TTTT P HHHHH LLLLL AAAAA 1 CR LF
 - O: Overall Pass/Fail
 - P: Torque Pass/Fail
 - HHHHH: Torque High Limit
 - LLLLL: Torque Low Limit
 - TTTT: Torque Result
 - P: Angle Pass/Fail
 - HHHHH: Angle High Limit
 - LLLLL: Angle Low Limit
 - 1: *Parameter set* ("1" – "9") for PSets 1-9, ("A" – "W") for PSets 10-32
 - CR: Carriage Return
 - LF: Line Feed

- **UEC Serial**

- # P 1 BB TTT.T AAAA 0000 0000 J
 - *P*: *Parameter set* ("1" – "9") for PSets 1-9, ("A" – "W") for PSets 10-32.
 - *BB*: Job count
 - *TTT.T*: Torque result (Notice the decimal point next to the least significant T)
 - *AAAA*: Angle result
 - *J*: Judgment (@=overall pass, H=low torque, I (eye)=hi torque, J=low angle, K=hi angle)

- **Profibus**

- `%CAN O P HHHHH LLLLL TTTT P HHHHH LLLLL AAAAA NAC% CR LF`
 - O: Overall Pass/Fail
 - P: Torque Pass/Fail
 - HHHHH: Torque High Limit
 - LLLLL: Torque Low Limit
 - TTTT: Torque Result
 - P: Angle Pass/Fail
 - HHHHH: Angle High Limit
 - LLLLL: Angle Low Limit
 - 1: PSet ("1" – "9") for PSets 1-9, ("A" – "W") for PSets 10-32
 - CR: Carriage Return
 - LF: Line Feed

- **Output Followed by NULL Control Character:** Will send a null control character at the end of the string.

- **PSet Change Output Send PSet Change:** Will send message each time the selected PSet changes.



- `%CAN8 L NAC% %CAN4 N NAC% CR LF`
 - L: Last PSet ("1" – "9") for PSets 1-9, ("A" – "W") for PSets 10-32
 - N: New PSet ("1" – "9") for PSets 1-9, ("A" – "W") for PSets 10-32
 - CR: Carriage Return
 - LF: Line Feed

4.5.4.5 Spindle USB Port

Spindle USB Configuration
Spindle USB Port

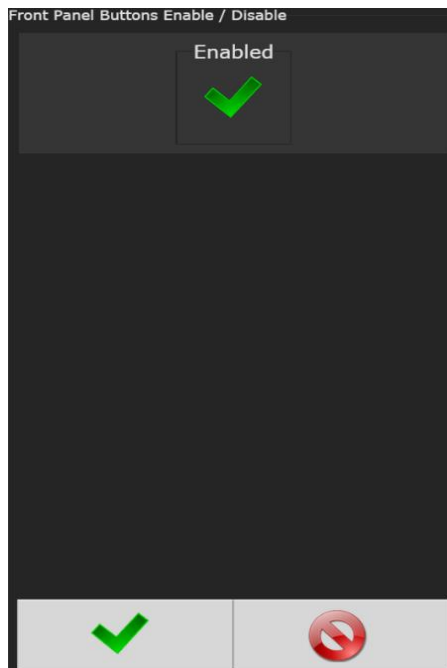
IP Address	192.168.10.4
Subnet Mask	255.255.255.0

Note: Spindle USB port on master controller connects to spindle system port.

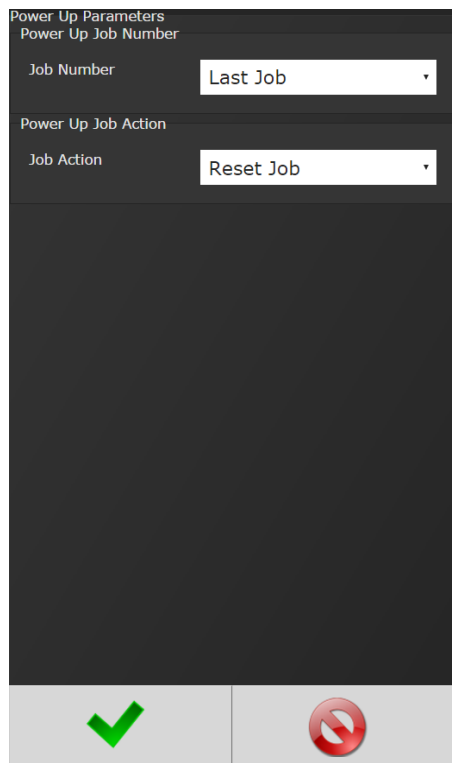
This can be used to set up a two spindle network through the USB port.

4.5.5 Front Panel Buttons



Enable/ Disable front panel buttons on controller console.

4.5.6 Power Up



- Allows user several “Job” choices upon controller power up:
- **Power Up Job Number:** Controller will power up on the Job Number selected. When “Last job” is selected, controller will power up on last Job selected prior to being powered down.
- **Last Job:** Controller will default to last job performed.
- **Power Up Job Action**
- **Reset Job:** Job will be reset when controller is Powered Up.
- **Wait for Job Reset:** Controller will wait for an External Job Reset command upon power up and will retain Job formation existing prior to power down.

4.5.7 Bar Code Setup

The screenshot shows a 'Barcode Configuration' screen. At the top, it says 'Required Identifiers for Tool Enable' and 'Reset Identifiers on Job Complete'. Below these are two rows of four numbered boxes (1-4). In the 'Required' row, boxes 1 and 3 have green checkmarks, while 2 and 4 have red X's. In the 'Reset' row, boxes 1, 2, and 3 have red X's, while box 4 has a green checkmark. Below this is a table with columns: Mask, ID, Action, #, 1, 2, 3, 4. The table body is empty. A red arrow points to the table area. At the bottom are two buttons: a green checkmark and a red circle with a white X.

Mask	ID	Action	#	1	2	3	4
------	----	--------	---	---	---	---	---

- **Required Identifiers for Tool Enable:** Selects which four Identifiers (ID#1-4) are required to enable tool.
- **Reset Identifiers for Job Complete:** Selects which four Identifiers (ID#1-4) to reset on a Job complete. Select Identifiers by clicking on them.

Step 1: Click anywhere in body to enter the Barcode ID Configuration screen or add additional Identifiers.

Step 2: Enter appropriate information on Barcode ID Configuration screen.

Barcode ID Configuration

Identifier Mask: VIN#...3456

Identifier Type: #1

Identifier Description: Vehicle

Action: Select Job : ▾

Action #: 1

Reset Identifiers

1 2 3 4

Save Delete Refresh

• **Identifier Mask:** The Mask is a string used to compare the received barcode against. The received barcode must be at least as long in length as the Mask. The Mask can also contain "don't care" characters of a decimal point or period in the string. These characters are counted in the length, however, the actual received character in that position doesn't matter.

Example:



VIN#123456

• **Identifier Type:** Identifies which Identifier (ID#1-4) received barcode will be stored into.

• **Identifier Description:** Text field can be used to give a description to each identifier type. (Example: Vehicle).


• **Action:** Action executed by controller when barcode with a matching identifier mask is scanned.

The actions are:

- Select Job# (This will require a Job to be configured on the Job page when using this option.)
- Do Nothing
- Select PSet#

• **Action #:** When Select Job# or Select PSet# is selected, this is the number of the Job or PSet that will be selected.

• **Reset Identifiers:** Can reset other identifiers (ID#1-4) when barcode is received. Click on identifiers to reset.

Step 3: Press to  save and re-enter completed barcode configuration screen.

Barcode Configuration

Required Identifiers for Tool Enable

Reset Identifiers on Job Complete

Mask	ID	Action	#	1	2	3	4
VIN#...3456	#1	Select Job..	1	✗	✓	✗	✗
EMP#...321	#2	Select Job..	2	✓	✗	✗	✓
Part# 12...345	#3	Do Nothing	0	✗	✗	✗	✓

Save Cancel

Click anywhere in body if additional identifiers are required.

Press to save barcode configuration.

(See **5.0 Barcode Reader Details** for more information)

To configure Serial Port for Barcode Reader:

On Home page click controller→Communication Interfaces→Serial

Select Barcode Reader and the correct Baud rate.

Press  to save changes.

Serial Port Configuration

Port Mode: Barcode Reader

Baud: 9600

4.5.8 Set Time

Set Controller Time

Time (HH:MM:SS)

Date (mm/dd/yyyy)

☒ ☐

Set time and date. If connected to a PC, use PC Time to set controller time.

4.5.9 Remote Connections

Set Maximum Remote Connections

☒ 0 Connections ☐ 5 Connections

☐ 1 Connection ☐ 6 Connections

☐ 2 Connections ☐ 7 Connections

☐ 3 Connections ☐ 8 Connections

☐ 4 Connections ☐ 9 Connections

Devices with 1 or more Connections

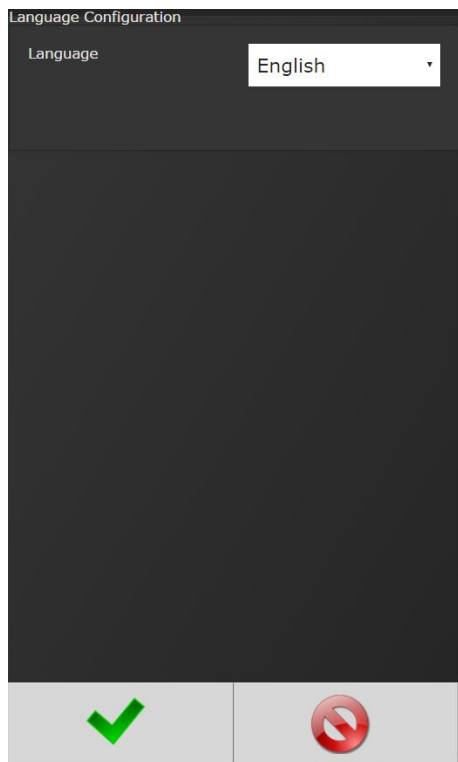
Device	IP
1	10.10.4.24

☒ ☐

Sets number of allowed remote browser connections to controller.

Displays the IP addresses of remote browser connections to the controller.

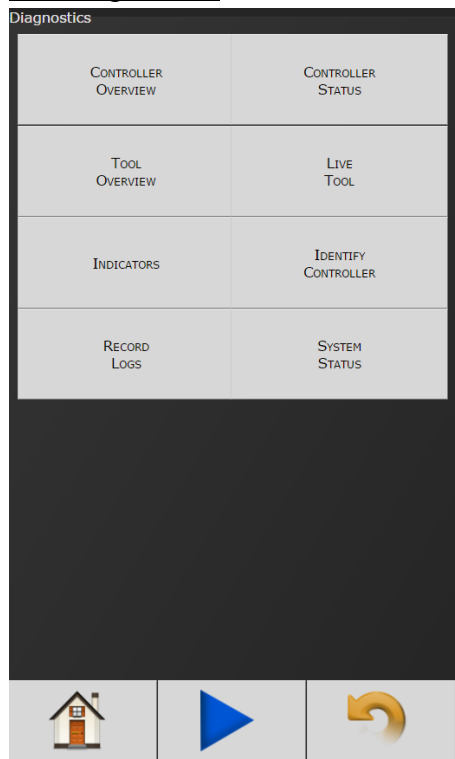
4.5.10 Languages



Select from:

English
Chinese
Japanese
Korean
Spanish

4.6 Diagnostics

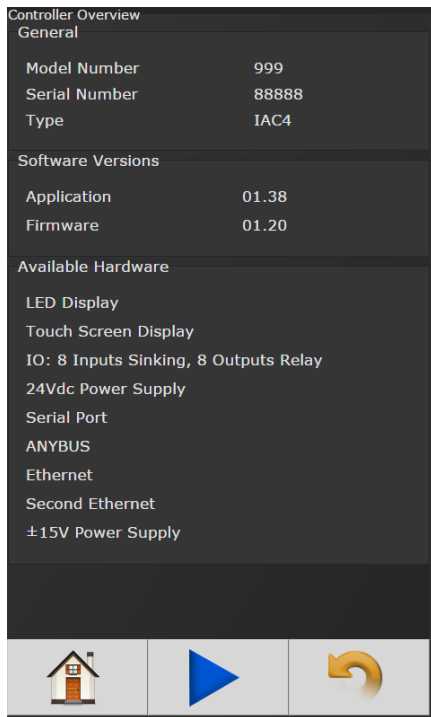


The Diagnostics menu contains all pertinent information regarding unusual behavior of the system. Detailed descriptions are given below.



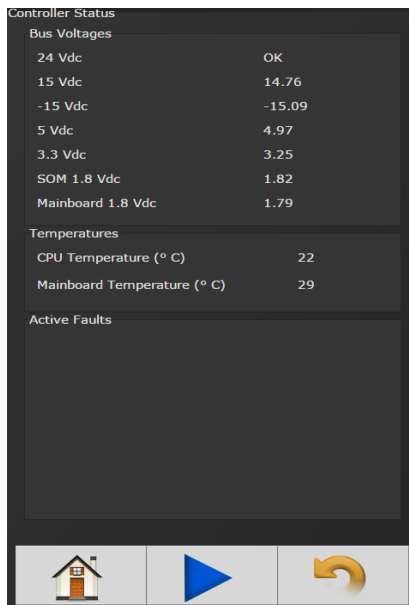
Assignable IO.docx

4.6.1 Controller Overview



- **Model Number:** Model Number of the controller.
- **Serial Number:** Serial Number of the controller.
- **Type:** Type of controller- IAC4 – Intelligent Air Controller
- **Application:** Current Application software version.
- **Firmware:** Current Firmware software version.
- **Available Hardware:** Hardware configuration of the controller.

4.6.2 Controller Status



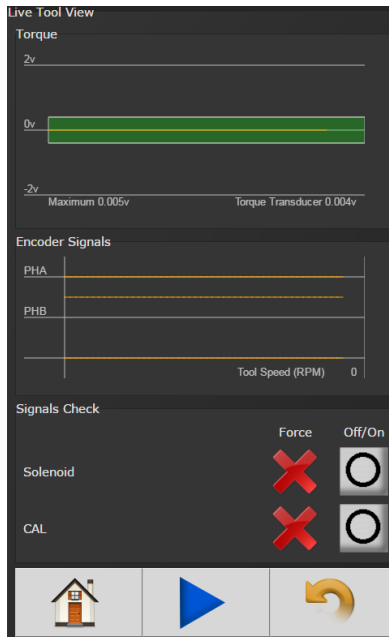
Shows “Live” status of controller, voltages, active faults and temperature.

Power Supplies: Alarm icon will appear on controller console and under “Active Faults” (see below), if any of these values are out of range:

- **24 VDC:** Represents voltage from 24V power supply. Value is reported as on or off (0 or 24.0 volts). This supply is for external use via 24V I/O port.
- **15 VDC:** Represents voltage from 15V power supply powering tool electronics.
- **-15 VDC:** Represents voltage from 15V power supply powering tool electronics.
- **5 VDC:** Represents voltage from 5V power supply powering controller electronics.
- **3.3 VDC:** Represents controller electronics internal 3.3V Bus voltage.
- **SOM 1.8 VDC:** Represents controller electronics internal 1.8V Bus voltage.
- **Mainboard 1.8 VDC** Represents controller electronics internal 1.8V Bus voltage.
- **Mainboard Temperature** Represents temperature inside controller.
- **CPU Temperature:** Represents temperature of CPU.

- **Active Faults:** Any tool/ controller faults will be shown in this area.

4.6.3 Live Tool



Shows a live view of tool transducer in volts. Voltage will be approximately 0 volts when tool is at rest and torque is zero. During a rundown, the tool transducer voltage increases as torque increases.

Encoder Signals will be monitored along with tool RPM. (Only applies for tools with Angle Sensing capability 'Resolver')

Signal Check is also available to force ON and OFF the following:

- Air Shut Off Valve Solenoid
- CAL Signal to the tool – When this is forced ON the torque voltage should be approximately 2 volts.

Attention! Remove all forces before running the tool.

4.6.5 Identify Controller

'Identify Controller' will cause lights on controller to flash making the system easy to locate. This is especially helpful when programming is being done and multiple controllers are being used near each other.

4.6.6 Record Logs

Logs information describing usage of controller and tools that have been used with that controller.

4.6.6.1 Change Log

Log displays changes made to tool or controller.

4.6.6.2 Information Log

Log displays all information entries.

4.6.6.3 Error Log

Log displays ONLY Error Entries.

4.6.6.4 All

Displays all Changes, Information and Error entries.

Log Records	
CHANGE	INFORMATION
ERROR	ALL

4.6.7 System Status

System Status		
Memory Usage		
Startup	Current	Increase
215712	246552	14.30%
Internal Storage		
KB Allocated	KB Available	KB Used
15620038	10934784	30%
USB Flash Drive		
KB Allocated	KB Available	KB Used
0	0	0

4.7 Login

Login

Login Code

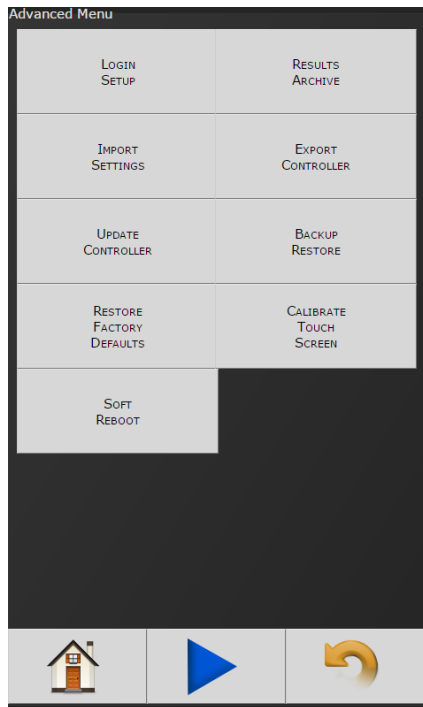
Login

When a password is required it can be entered in this screen.

Three levels of access to the controller are available:

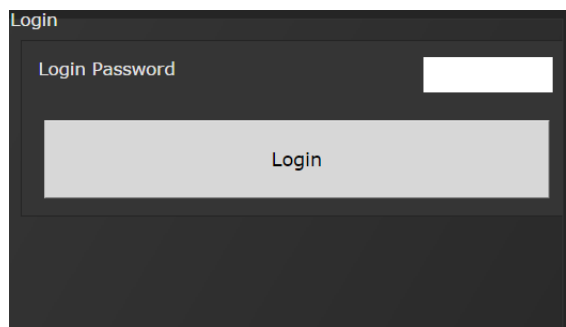
- **Operator:** Run/Login screens available.
- **Technician:** Run/PSet/Job/Diagnostics and Login screens available.
- **Administrator:** All screens available.

4.8 Advanced



The 'Advanced' menu handles complex settings within the controller. Detailed descriptions are given below.

4.8.1 Login Setup



This screen allows the user to select the default Login level upon controller start up:

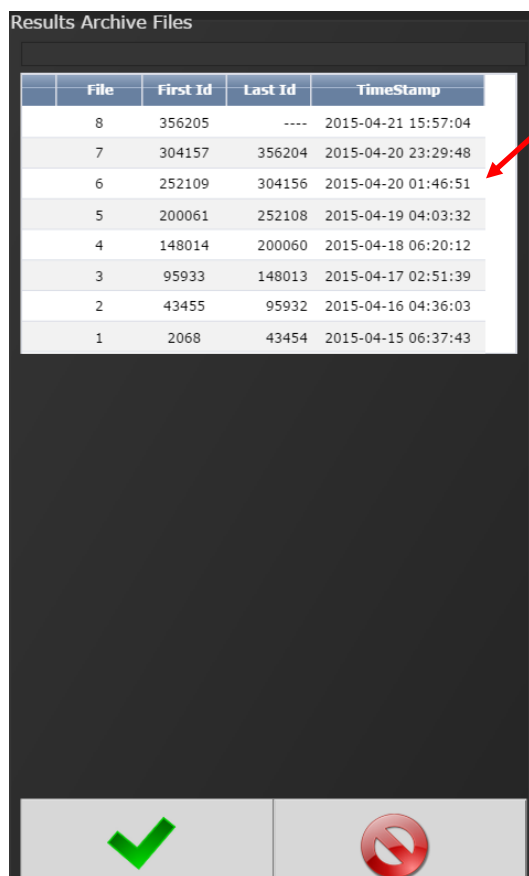
- **Operator**
- **Technician**
- **Administrator**

4.8.2 Results Archive

Approximately one million rundowns can be stored. Twenty files with approximately 50,000 rundowns are maintained at a time. The user can, at any time, save the runs to either a USB stick or to the web as a USV file imported directly into an Excel spreadsheet.

Using the touchscreen console, you can select multiple files to save.

Using the web option, you can select one of these files at a time to save (web option is default).



Select a file and press



Select either USB or Web Archive location




4.8.3 Import Settings

This allows the user to download any previously saved settings onto the controller (refer to 'Export Controller' for help with saving data).

EXAMPLE OF SAVED EXCEL FILE

Rundown	Job Num	Job Name	Sequence	Bolt count	Status	Date	Time	Torque	Status	Angle	Status	PSet Num	PSet Name	Tool Mode	Tool Serial	Id1 (ID #1)	Id2 (ID #2)	Id3 (ID #3)	Id4 (ID #4)
2068	0		0	0	P	#####	11:13:42	5.08	P	480	--	1			0				
2069	0		0	0	P	#####	11:13:49	5.054	P	535	--	1			0				
2070	0		0	0	P	#####	11:13:50	5.002	P	450	--	1			0				
2071	0		0	0	P	#####	11:13:52	5.013	P	595	--	1			0				
2072	0		0	0	P	#####	11:13:53	5.085	P	495	--	1			0				
2073	0		0	0	P	#####	11:13:54	5.1	P	440	--	1			0				
2074	0		0	0	P	#####	11:13:56	5.089	P	575	--	1			0				

1. Plug in the USB with an export file into any port on the controller.
2. From the Home screen, navigate to Advanced→Import Settings.




3. Select the settings to be changed by pressing  thus Changing it to 

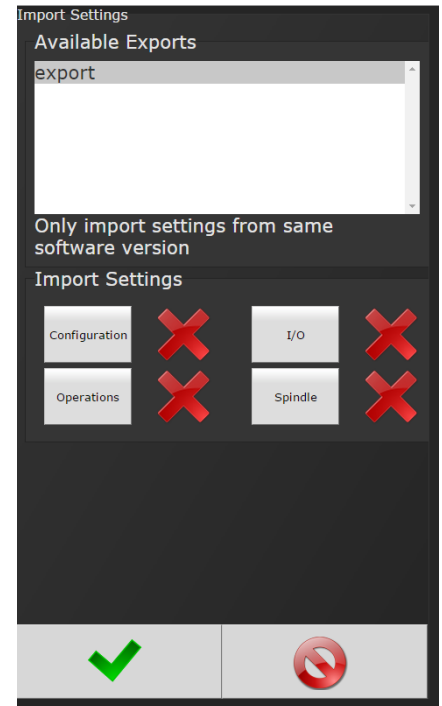
Configuration: This includes all settings of the controller except I/O, Master Spindle, Rundowns, PSets or Jobs.

Operations: This includes PSets and Jobs.

I/O: This includes I/O settings for the local I/O, Anybus, Modbus, and Ethernet/IP.

Spindle: This includes any Master Spindle setup (i.e. number of spindles, slave IP addresses, etc.).

4. Press  to accept the changes.
5. Press  to proceed.
6. Press  when the import is complete the controller will restart.





Import settings that were exported from another controller via a USB flash drive. Use this to “quickly apply” the same settings across several controllers. For example, it is common to have multiple controllers with the same IO configuration. Set up one controller with the correct IO configuration and export the controller from Advanced->Export Controller. Now the IO settings can be imported using this screen.

NOTE: Setting can only be imported from controllers running the same version of software.

4.8.4 Export Controller

This allows the user to save Configuration, Operations, I/O, and Spindle settings onto a USB drive.

1. Plug a USB into any port on the controller.
2. From the Home screen, navigate to Advanced→Export Controller.
3. Press  to continue, the controller will begin the export process.
4. Press  to complete the export.

4.8.5 Update Controller

NOTE: Updated firmware versions will typically be sent via email zip file; always save PSet and IP address information before upgrading controller.

Upgrading the AIMCO IAC Controller

Using the touch-screen or a System Port browser session, navigate to the 'Advanced' menu. Click 'Update Controller' and select the latest release. See Figure 1 as an example.

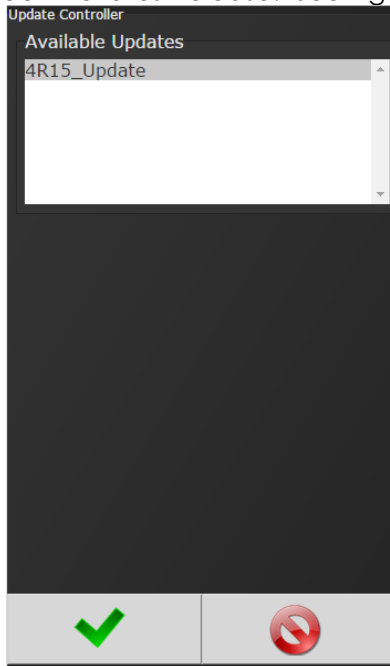


FIGURE 1 AVAILABLE UPDATES

Click the green checkmark when ready.

After the controller restarts, the user should see the messages in Figure 2

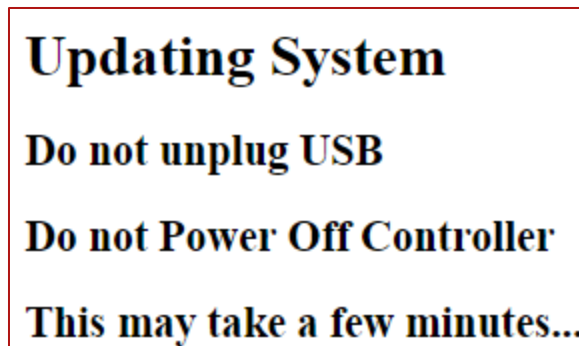


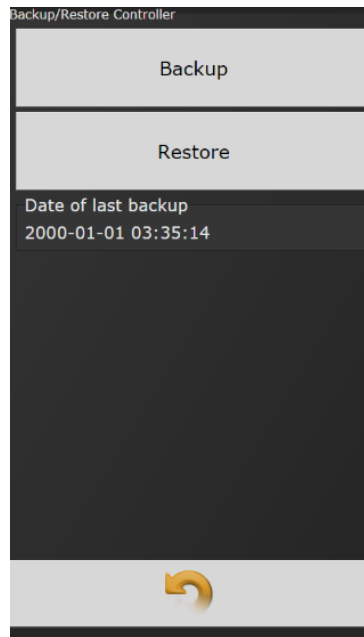
FIGURE 2 CONTROLLER UPGRADE NOTIFICATION



When the controller has finished, navigate to Diagnostics→Controller Overview to view any changes to the 'Software Versions'. Any system settings (Ethernet IP address, PSets, Jobs, etc.) will remain unchanged.

4.8.6 Backup Restore

The Backup function allows the user to create an image of the controller software/firmware including all Configurations, Operations, I/O, and Spindle settings. This is used to create a point in which the controller can restore to if the need arises. In that case, the Restore function would be used.

1. From the Home screen, navigate to Advanced → Backup Restore.




2. Press Backup to initialize the backup process.
3. Press  to replace previous backup with current system, the backup process will begin.
4. Press Restore to initialize the restore process.
5. Press  to restore all settings and firmware to last backup, the restore process will begin.
6. The controller will restart when finished.


4.8.7 Restore Factory Defaults

This allows the user to reset the controller's parameters to factory settings

1. From the Home screen, navigate to Advanced → Restore Factory Defaults.

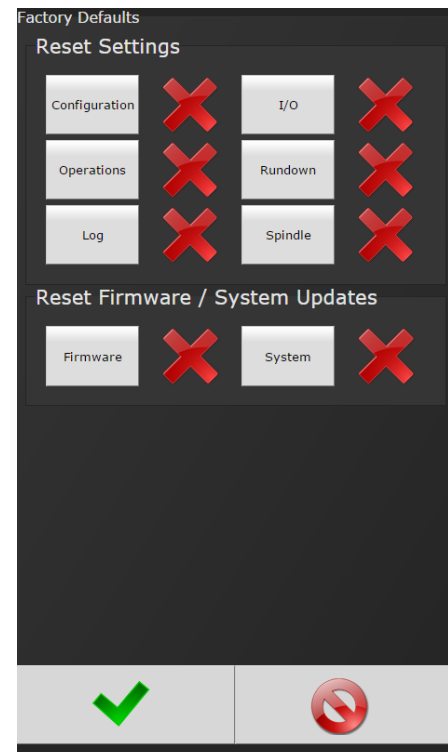
2. Select the settings to be changed and accept 

- **Configuration:** This includes all settings of the controller except I/O, Master Spindle, Rundowns, PSets or Jobs.
- **Operations:** This includes PSets and Jobs.
- **I/O:** This includes I/O settings for the local I/O, Anybus, Modbus, and Ethernet/IP.
- **Spindle:** This includes any Master Spindle setup (i.e. number of spindles, slave IP addresses, etc.).
- **Rundown:** This includes all rundown data /information
- **Log:** This includes the Change, Information, Error, and Combined logs.
- **Firmware:** This includes the firmware/software.
- **System:** This includes miscellaneous system files.

3. Press  to accept the changes.

4. Press  to proceed.

5. Press  when the restore is complete, the controller will restart.



4.8.8 Calibrate Touch Screen

Calibrate Touch Screen

Custom and factory default calibrations are available on the controller console.

1. From the Home screen, navigate to Advanced→Calibrate Touch Screen.

2. Press  to disable the tool.

3. Select the settings to be changed by pressing  changing it to 

4. Press  to accept the changes.

5. Press  to proceed.

6. Press  when the calibration is complete, the controller will restart.

Custom Calibration: This allows the user to create a custom calibration setting for the touch screen.

NOTE: *The controller may need to be reset before the custom calibration is possible.*

Factory Default Calibration: This calibrates the touchscreen to the factory defaults.

4.8.9 Soft Reboot

Restart the controller without turning the power off.

1. From the Home screen, navigate to Advanced→Soft Reboot.

2. Press  to proceed, the controller will restart.

5 Barcode Reader Details

The IAC controller supports the following barcode reader functionality:

- Support up to four identifiers.
- Each rundown result can be associated with up to four identifiers.
- Identifier(s) can be used to select a Parameter Set or a Job.
- Display identifier(s) on controller.
- Ability to lock-out tool until correct identifier(s) is entered.
- Ability to block barcode reads while a Job is in progress.
- Barcode reads (identifiers) can come from any or all the following sources.
 - Serial barcode reader
 - Open protocol
 - Fieldbus network
 - Telnet port

Solution

Regardless of the source (serial barcode reader, telnet, fieldbus, or protocol), each new string is passed through the same process:

- All four identifiers are reset to an empty string on power-up.
- Each received barcode is processed through a Barcode Match Table to look for a match, if one is found the barcode is accepted.
- Each fastening will then be associated with the received barcode(s) until a new one is received or they are reset.

Parameters

The parameters that pertain to the processing of barcode strings:

- The Barcode Match Table is used to identify the newly received barcode string.
- Which of the four Identifiers (ID# 1-4) are required to enable the tool?
- Which of the four Identifiers (ID# 1-4) to reset on a Job complete?
- Parameter to disable all barcode reads while a Job is in progress. If set, barcode reads will be disabled after the first fastener is ran until Job is complete.

Barcode Match Table

The Barcode Match Table is used to identify which barcode have been received. The controller can have up to 99 entries (rows) in the table. Each entry has actions that will be performed when a matching barcode is received. The table is searched from top to bottom to find a matching barcode; if none are found, the barcode is ignored.

Mask

The Mask is a string used to compare against the received barcode. The received barcode must be at least as long in length as the Mask. The Mask can also contain "don't care" characters of a decimal point or period in the string. These "don't care" characters are counted in the length but the actual received character in that position doesn't matter.

Identifier Type

The "Identifier Type" field identifies which identifier (ID# 1-4) the received barcode will be stored in.

Action

Action can be one of the following:

- None
- Select PS# 1-256
- Select Job# 1-20

Reset ID

The "Reset ID" can reset other identifiers (ID# 1-4) when barcode is received.

Examples:

Operator Scans

When a vehicle enters the station, the operator scans the VIN. The controller selects the correct Job number and enables the tool. Each fastener will be identified with this VIN stored locally, and/or, sent to a server for storage. The Job settings will disable the tool when the Job is complete.

Setup

In this example, there are three possible vehicle types each with its own Job. The barcode scan will select the correct Job (enabling the tool) and the scan will be stored into ID# 1.

Mask	ID type	Action		Reset ID			
				ID#1	ID#2	ID#3	ID#4
"VIN.....7..."	ID#1	Select Job#	1	No	No	No	No
"VIN.....8..."	ID#1	Select Job#	2	No	No	No	No
"VIN.....9..."	ID#1	Select Job#	3	No	No	No	No

The tool enable/disable will be controlled by the Job settings; the correct Job will be selected by the barcode scan. The "ID Required to Enable the Tool" feature does not need to be utilized.

Required Identifiers for Tool Enable			
ID#1	ID#2	ID#3	ID#4
No	No	No	No

These settings are irrelevant as the only way to enable the tool is with a new Job and the only way to select a new Job is to scan a new barcode.

Reset Identifiers on Job Complete			
ID#1	ID#2	ID#3	ID#4
Yes	No	No	No

Examples

This is what the 'Operator Scans' example looks like once set up in 4.5.7 Barcode Configuration Screen.

Airbag Install

The customer wants to track the serial number of each airbag being installed, as well as the operator installing it. When the operator reports to the station, they will scan their Employee ID. When the vehicle comes into the station, the operator scans the VIN of the vehicle and the serial number of the airbag. Once all three scans are received, the tool is enabled. Once the correct number of fasteners are installed, the tool is disabled by the Job settings. From that point, the operator only needs to scan the vehicle and the airbag to enable the tool.

Setup

We will assign the Employee ID to ID#1, the vehicle VIN to ID#2, and the airbag serial number to ID#3. Scanning a new Employee ID will reset the other IDs and force a scan of the vehicle VIN and airbag serial number. The scan of the vehicle VIN will also select the correct Job number.

Mask	Store to	Action		Reset ID			
				ID#1	ID#2	ID#3	ID#4
"EMP...."	ID#1	None		No	Yes	Yes	No
"VIN....."	ID#2	Select Job#	1	No	No	No	No
"SN....."	ID#3	None		No	No	No	No

Once all three scans are received, the tool will be enabled.

Required Identifiers for Tool Enable			
ID#1	ID#2	ID#3	ID#4
Yes	Yes	Yes	No

When Job is complete, the vehicle VIN will be reset and the airbag serial number, but not the Employee ID; to allow subsequent vehicles to only require a VIN and S/N to enable tool.

Reset Identifiers on Job Complete			
ID#1	ID#2	ID#3	ID#4
No	Yes	Yes	No



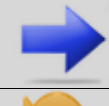










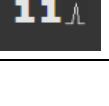

This is what the Airbag Install example looks like set up in 4.5.7 Barcode Configuration Screen.



6 Glossary of Terms





















Accept Tone	Controls tone made from handle of handheld tools for accepted fastening cycles.
Angle	Degree fastener rotates from snug, or threshold level, to peak torque.
Cycle Complete	Torque level that determines completion of a fastening cycle.
High Angle	When peak angle recorded exceeds High Angle, the fastening cycle is recorded as a reject for High Angle, the High Angle light (solid yellow) illuminates and fastening cycle is given an overall status of NOK.
High Torque	When peak torque recorded exceeds the High Torque, the fastening cycle is recorded as a reject for High Torque, the High Torque light (solid red) illuminates and fastening cycle is given an overall status of NOK.
High Pulse	When pulse count recorded exceeds the High Pulse, the fastening cycle is recorded as a reject for High Pulse, the High Pulse light (solid yellow) illuminates and fastening cycle is given an overall status of NOK.
Job	A Job is a collection of PSets or Multi-stages, which are useful when performing several multiple fastening operations, each with different requirements. This is convenient since the operator does not have to select a new PSet or Multistage for every fastening.
Low Angle	When the peak angle recorded during the Angle Audit Step fails to reach the Low Angle, fastening cycle is recorded as a reject for Low Angle, the low angle light (flashing yellow) illuminates and fastening cycle is given an overall status of NOK.
Low Torque	When the peak torque recorded fails to reach the Low Torque, fastening cycle is recorded as a reject for Low Pulse, the Low Pulse light (flashing yellow) illuminates and fastening cycle is given an overall status of NOK.
Low Pulse	When the pulse count recorded fails to reach the Low Pulse, fastening cycle is recorded as a reject for Low Torque, the Low Torque light (flashing red) illuminates and fastening cycle is given an overall status of NOK.
Parameter Set	A Parameter Set is a collection of instructions that define how the tool should perform the fastening process. It may be selected from the console or device such as a socket tray or PC.
In-Cycle Torque	Controller begins to monitor tool for angle at a preselected threshold torque. Any increase in angle, after the In-Cycle point, results in a corresponding increase in tension or clamp load within the joint.
Speed	Speed at which tool operates during the initial portion of the fastening cycle prior to downshift.
Spindle	A spindle represents a connection to a handheld, or fixtured, tool connected to a controller.
Strategy	Identifies the variables being used to control tool during a fastening.
Threshold Torque	Sets point at which tool is "In Cycle".
Torque Calibration	Determines how torque values are assigned to the electrical signals for torque transducer on tool. Value is unique to each tool and changes over time.
Torque Target	When the tool is being controlled for torque, the torque target instructs controller when to shutoff tool. Torque target should be greater than Low Torque and less than High Torque, this is required for torque.





7 Icons Defined

ICON	DESCRIPTION	FUNCTION	WHERE USED
	Home Navigation Button	Navigate to the main menu ("HOME") screen.	All screens except for edit screens.
	Run Navigation Button	Navigate to the Run Screen.	All screens except for edit screens.
	Run Screen Select Buttons	Switch between the different run screen pages.	Run Screen
	Go Back Button	Navigate to one menu level back.	All screens except for edit screens.
	Accept Changes Button	Accept the changes made and return to the parent screen.	Edit screens
	Cancel Changes Button	Reject the changes made and return to the parent screen.	Edit screens
	Add New Button	Add a new item (Pset, Stage, Job, and other).	PSet and Job edit screens.
	Edit Button	Edit selected Item.	PSet and Job edit screens.
	Move Up and Down Buttons	Move selected item up or down in the sequence order.	PSet and Job edit screens.
	Copy Button	Copy selected Items.	PSet, Job, and other edit screens.
	Delete Button	Remove or un-assign selected items.	Edit and list view screens.
	Filter Button	Filter Items in a list or table.	List view screens.
	Save Button	Save selected item to file.	List view screens.
	Disassembly	A disassembly event has been detected.	Run Screen
	Pulses	Number of pulses during rundown.	Run Screen (Pulse tools only).

8 Stop Codes

If a Stop condition is detected that prevents the tool from running, a code will appear on the LED display. Any active stop conditions are also displayed on the RUN screen.

CODE	ICON	Description
IO		Stopped or Disabled from Physical 24 volt IO input
ABUS		Stopped or Disabled from ANYBUS
MODB		Stopped or Disabled from Modbus
EIP		Stopped or Disabled from Ethernet IP
RTU		Stopped or Disabled from Modbus RTU
OP		Stopped or Disabled from Open Protocol
OP		Lost Open Protocol Connection
REV		Disassembly Disabled
ARM		Tool Requires Arming – MFB button configured to enable the tool to run.
JOB		Job Sequence Complete
JOB		Job Complete
JOB		XML Count Complete
LOR		Locked on Reject
BRCD		Bar Code ID scan required to enable tool.
SRVC		Tool Disabled For Service - Tool service or calibration interval has expired.
INVP		Invalid PSet - Parameter set number for a non-existent Pset has been selected to run. Most likely via one of the following methods: <ul style="list-style-type: none"> o Job o MFB o IO
INVP		PSet outside of Job - Parameter set number outside of the job has been selected. Most likely via one of the following methods: <ul style="list-style-type: none"> o MFB o IO
INVJ		Invalid Job - Job number for a non-existent Job has been selected to run. Most likely via one of the following methods: <ul style="list-style-type: none"> o MFB o IO
PSET		PSet Mismatch
SPND		Spindle Not Configured – Spindle selected to run from a Multi-Spindle Job has not been configured.

NET		XML Disconnected
XML		Stop from XML
NOK		XML Max Rejects Exceeded
FLT		Controller Fault - Error has been detected. See error code list for details.

9 Error Codes

If an error condition is detected that prevents the tool from running, a fault code will appear on the LED display. Any active faults are also displayed on GUI RUN screen. Fault history can be viewed in the Controller Error Log.

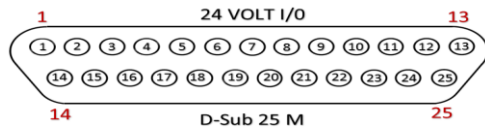
CODE	Fault Type	Description	Possible Causes
FA01	Torque signal out of Range	Tool torque signal voltage is beyond electrical limits.	<ul style="list-style-type: none"> • Tool not connected • Faulty tool cable • Faulty transducer • Transducer electronics not calibrated • Faulty tool electronics or wiring
FA02	Torque tare value out of range	Tool torque signal no load voltage is out of range.	<ul style="list-style-type: none"> • Transducer electronics significantly out of calibration • Faulty transducer
FA03	Torque Cal signal out of Range	Tool does not respond to the full-scale voltage CAL single.	<ul style="list-style-type: none"> • Tool not connected • Faulty tool cable • Faulty transducer • Transducer electronics not calibrated • Faulty tool electronics or wiring
FH17	1.8vdc MB out of tolerance	Main board 1.8 bus voltage exceeds electrical limits.	<ul style="list-style-type: none"> • Faulty Controller main board or other Controller electronics
FH18	1.8vdc SOM out of tolerance	System on Module 1.8 bus voltage exceeds electrical limits.	<ul style="list-style-type: none"> • Faulty Controller main board or other Controller electronics
FH19	3.3vdc out of tolerance	Main board 3.3 bus voltage exceeds electrical limits.	<ul style="list-style-type: none"> • Faulty Controller main board or other Controller electronics
FH20	5vdc out of tolerance	5 Volt bus voltage out of range.	<ul style="list-style-type: none"> • Faulty power supply or wiring • Faulty Controller main board or other Controller electronics
FH22	24 volt level low	24 Volt IO power not detected.	<ul style="list-style-type: none"> • Faulty power supply or wiring • Short or other problem with external connections to the 24Volt IO port
FH23	Controller temp high	Controller's internal temperature exceeds limit	<ul style="list-style-type: none"> • Ambient air temperature exceeds rating of Controller

FH24	+15vdc out of tolerance	+15 Volt bus voltage out of range.	<ul style="list-style-type: none"> Faulty power supply or wiring Faulty Controller main board or other Controller electronics Faulty tool cable Faulty tool electronics or wiring
FH25	-15vdc out of tolerance	-15 Volt bus voltage out of range.	<ul style="list-style-type: none"> Faulty power supply or wiring Faulty Controller main board or other Controller electronics Faulty tool cable Faulty tool electronics or wiring
FS26	Power on throttle	Run command on power up.	<ul style="list-style-type: none"> Tool laying on lever on power up Tool buttons out of calibration Run command from logic IO on power up.
FS27	Locked rotor	Motor has stalled for more than 100 milliseconds.	<ul style="list-style-type: none"> Poor parameter settings for application. Torque signal out of calibration Faulty tool gearing or motor Corrupted TID parameters Faulty Controller or tool electronics
FS28	Target out of range of tool	Parameter set torque target out of range of rated tool capability.	<ul style="list-style-type: none"> Target torque exceeds tool capability Corrupted TID parameters
FS29	Invalid tool	Tool configuration not compatible with parameter set.	<ul style="list-style-type: none"> Tube nut tool commanded to run a parameter set with left hand thread direction or with an unfastening stage Tube nut tool commanded to go in the disassembly direction
FS31	Lost Master Start Signal	Lost Connection to Master Spindle.	<ul style="list-style-type: none"> Faulty Ethernet Connection RTOS processor firmware corrupted or not loaded Faulty SOM board or connector
FH32	Processor Fault	RTOS processor not communicating with the Application processor.	<ul style="list-style-type: none"> Faulty mainboard electronics RTOS processor firmware corrupted or not loaded Faulty SOM board or connector

10 24 Volt I/O

10.1 Port Pinout and Diagrams

A connector kit is available (PT #**27348**) from AIMCO to make connection to I/O port on the Controller easier. Contact your AIMCO Sales Representative for ordering information. Toll Free: 1-800-852-1368.



Pin #	Function	Default Assignment	Pin #	Function	Default Assignment
1	Output 1	Accept	14	Output 5	Torque Low
2	Output 2	Reject	15	Output 6	Angle High
3	Output 3	In Cycle	16	Output 7	Angle Low
4	Output 4	Torque High	17	Output 8	Job Complete
5	Output's 1-4 common		18	Output's 5-8 common	
6	Input 1	N/C	19	N/C	
7	Input 2	N/C	20	N/C	
8	Input 3	Disable Tool	21	24 V Return	
9	Input 4	PSet Bit 1	22	24 V Return	
10	Input 5	PSet Bit 2	23	+24 Vdc	
11	Input 6	PSet Bit 3	24	+24 Vdc	
12	Input 7	Reset Job	25	+24 Vdc	
13	Input 8				

NOTE: The Default Assignments in Table above are factory defaults and can be changed. (See Assignable I/O section)

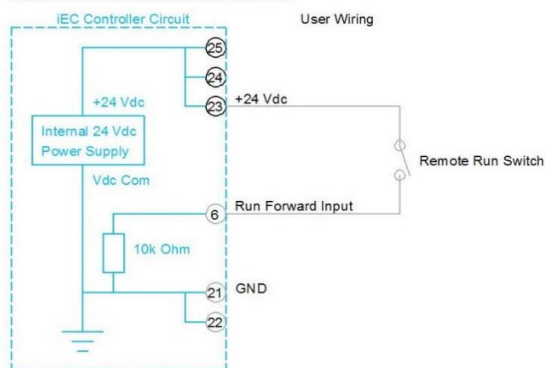
10.2 24 Volt I/O Connections

Turn off system before connecting to the LOGIC I/O port. There may be risk of damaging the controller.

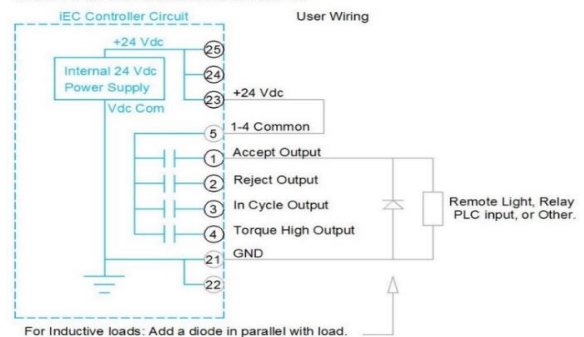
- **24Vdc Supply:** The internal 24Vdc power can supply up to 1 amp.
- **Inputs:** Inputs are a sinking configuration with the common connected to the ground pins. 24Vdc is logic ON and 0Vdc is logic OFF.
- **Outputs:** Outputs are normally open relay contacts. The relays are rated for 24Vdc, 1 amp.

NOTE: If Outputs are driving an inductive load, such as a solenoid or large relay, it is recommended to add a diode in parallel with the load to prevent voltage surges.

LOGIC I/O INPUT CONNECTION EXAMPLE



LOGIC I/O OUTPUT CONNECTION EXAMPLE



11 Assignable IO Details

Introduction

The IAC controller supports assignable I/O.

Buses

The controller is divided up into buses. Each bus has a set of inputs and a set of outputs.

Currently the controller supports two buses:

Bus Number	Bus
1	Physical I/O
2	Fieldbus (Anybus module) I/O

All assignments have a Bus, Element, and Bit Configuration to define its location in the system. The Bus value needs to be set from the list above. The Element and Bit define the location in the Bus. The first element on the Bus is 0 and goes up the last legal Element for the given Bus. The Bits in each Element is referenced from 0(LSB) to 31 (MSB).

Inputs

All input assignments have a Bus, Element, and Bit configuration to define its location in the system. Along with the basic configuration many also have other configuration(s) that allow its behavior to be modified to suit the application.

	Supported Feature					
	Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
Do Nothing	√	√	√			
Reverse	√	√	√	√		
Disable	√	√	√	√		
Reset Job	√	√	√	√		
Select PSet	√	√	√		√	√
Select Job	√	√	√		√	√
Select Job Sequence	√	√	√		√	√
Disable Assembly	√	√	√	√		
Set ID	√	√	√		√	
Set ID (word swap)	√	√	√		√	
Set Date/Time	√	√	√		√	
Set Date/Time (word swap)	√	√	√		√	
Verify PSet	√	√	√		√	√
Clear Results	√	√	√	√		
Log Change	√	√	√		√	√

Polarity

When the polarity is set to N.O. the input is considered active high (24vdc for physical inputs and logic 1 for all network type Buses). When the polarity is set to N.C. the input is considered active low (0vdc for physical inputs and logic 0 for all network type Buses).

Width and Offset

For multiple Bit inputs (for example "Select PSet") the width variable defines the number of Bits the assignment will read for its input. This allows the input size to be restricted to a few Bits saving space for other assignments.

The offset variable allows a fixed value to be added to the read value.

For example, to use Bits 4 & 5 of the physical inputs to select parameter sets 1-4 the assignment would look like:

Select PSet		
Bus	1	For the physical bus
Element	0	For the first element on the bus
Bit	4	For the starting bit location
Bits	2	To span the two bits 4 & 5
Start at	1	Adding 1 to the read input value so we get... Binary 00 = 1 Binary 01 = 2 Binary 10 = 3 Binary 11 = 4

Assignments

Do Nothing

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√			

The "Do Nothing" assignment will run do nothing if it is active or inactive.

Stop

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√	√		

The "Stop" assignment will stop the tool if it is running and prevent it from being started.

Disable

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√	√		

The "Disable" will disable the tool while the input is active. It will not stop a fastening cycle that is progress.

Reset Job

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√	√		

On the transition of inactive to active the "Reset Job" assignment will reset the active Job.

Select PSet

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	√

The "Select PSET" input will select the parameter set according to the input value. Uses the width parameter limit the width of the input bits read. The minimum width is 1 and the maximum is 8. After the input is read the offset parameter will be added to the value do get the actual parameter set number. Selecting an invalid parameter set number will disable the tool.

Select Job

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	√

The "Select Job" input will select the job number according to the input value. Uses the width parameter limit the width of the input bits read. The minimum width is 1 and the maximum is 8. After the input is read the offset parameter will be added to the value do get the actual job number. Selecting an invalid job number will disable the tool.

Select Job Sequence

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	√

The "Select Job Sequence" input will select the job sequence number according to the input value. Uses the width parameter limit the width of the input bits read. The minimum width is 1 and the maximum is 8. After the input is read the offset parameter will be added to the value do get the actual job sequence number. Selecting an invalid job sequence number or a sequence that is already complete will disable the tool.

Disable Assembly

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√	√		

The "Disable Assembly" assignment will disable the tool in the assembly direction. It will not disable the tool in disassembly or tube nut homing. It will not stop a fastening cycle that is progress.

Set ID

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	

The "Set ID" assignment will set the ID to an integer value of the input value. The width can be set from 1 to 32 bits. The input value will read as an integer value and an ASCII string with leading zeroes will be produced and passed to the ID recognition system. The length of the string is based on the width of the assignment. The string will always be sized to accommodate the maximum value of the input. For example, a width setting of 16 can have an integer value of 0-65535 so the produced ID would be "00000" to "65535" (always five character long).

Width setting	Length of ID string	ID value
1 - 3	1	"0" – "n"
4 - 6	2	"00" – "nn"
7 - 9	3	"000" – "nnn"
10 - 13	4	"0000" – "nnnn"
14 - 16	5	"00000" – "nnnnn"
17 - 19	6	"000000" – "nnnnnn"
20 - 23	7	"0000000" – "nnnnnnn"
24 - 26	8	"00000000" – "nnnnnnnn"
27 - 29	9	"000000000" – "nnnnnnnnn"
30 - 32	10	"0000000000" – "nnnnnnnnnn"

Set ID (word swap)

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	

The "Set ID (word swap)" assignment is the same as the "Set ID" assignment except the high and low words (16 bit) are swapped prior to evaluation. This is to correct the mixed endianness of some PLC. See the "Set ID" for behavior.

Set Date/Time

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	

The "Set Date/Time" assignment will set the date and time of the controller. The width can be set from 1 to 32 bits but should always be set to 32 bits to get the correct results. The input value will be read as the number of seconds since 00:00:00 January 1, 1970 (POSIX time or Epoch time). If the input value changes and it is non-zero the date and time of the controller will be set to the new value.

Set Date/Time (word swap)

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	

The "Set Date/Time (word swap)" assignment is the same as the "Set Date/Time" assignment except the high and low words (16 bit) are swapped prior to evaluation. This is to correct the mixed endianness of some PLC. See the "Set Date/Time" for behavior.

Verify PSet

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset

√	√	√		√	√
---	---	---	--	---	---

The "Verify PSET" input will compare the current parameter set to the input value. Uses the width parameter limit the width of the input bits read. The minimum width is 1 and the maximum is 8. After the input is read the offset parameter will be added to the value to get the actual parameter set number. If the parameter set input value does not match the current parameter of the controller the tool will be disabled.

Clear Results

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√	√		

The "Clear Results" assignment will clear the latest results outputs (Ok, Nok, etc.) on the same bus.

Log Change

Supported Feature

Bus	Element	Bit 0-31	Polarity N.O./N.C.	Width	Offset
√	√	√		√	

The "Log Change" assignment will add entries to the controller event log when the input changes.

Outputs

All output assignments have a Bus, Element, and Bit configuration to define its location in the system. Along with the basic configuration, many also have other configuration(s) that allow its behavior to be modified to suit the application.

	Supported Feature										
	Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Bits	Start at	Input Bus	Input Element	Input Bit
Ok	√	√	√	√	√						
Nok	√	√	√	√	√						
Torque Ok	√	√	√	√	√						
Torque Nok	√	√	√	√	√						
Low Torque	√	√	√	√	√						
High Torque	√	√	√	√	√						
Angle Ok	√	√	√	√	√						
Angle Nok	√	√	√	√	√						
Low Angle	√	√	√	√	√						
High Angle	√	√	√	√	√						
Fastening Complete	√	√	√	√	√						
In Cycle	√	√	√	√	√						
Fastening Aborted	√	√	√	√	√						
Batch Complete	√	√	√	√	√						

Job Complete	√	√	√	√	√						
Error	√	√	√	√	√						
Tool Enabled	√	√	√	√	√						
Service Indicator	√	√	√	√	√						
ToolsNet Connected	√	√	√	√	√						
Open Protocol Connected	√	√	√	√	√						
PFCS Connected	√	√	√	√	√						
Running PSet Number	√	√	√				√	√			
Running Job Number	√	√	√				√	√			
External Controlled	√	√	√						√	√	√
Torque	√	√	√				√				
Torque (x10)	√	√	√				√				
Torque (x100)	√	√	√				√				
Angle	√	√	√				√				
Pulse OK	√	√	√	√	√						
Pulse NOK	√	√	√	√	√						
Low Pulse	√	√	√	√	√						
High Pulse	√	√	√	√	√						
Pulses	√	√	√				√				

Mode

Normal

In the "Normal" mode, the output will track the state of the assignment (while still observing the polarity setting). If the polarity is set to N.O. and the assignment has an active output, the output will be on and stay on until the assignment goes to inactive.

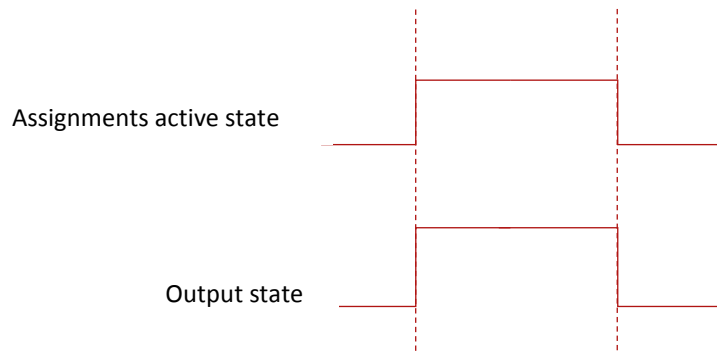


Figure 1 Normal Mode

Timed

In the “Timed” mode, the output will come on when the assignments state goes active and go off based on the time value or the assignment state going inactive (while still observing the polarity setting).

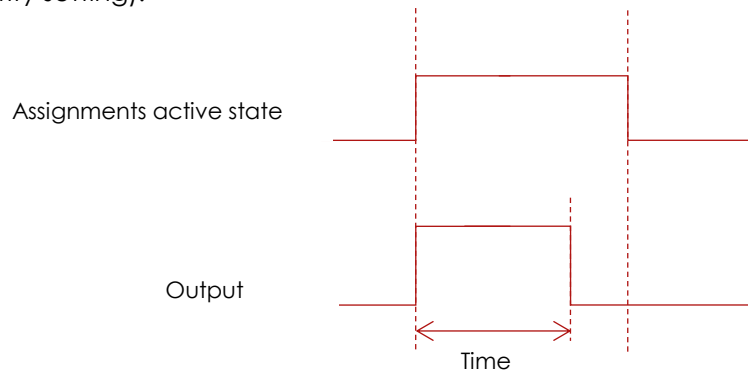


Figure 2 Timed Mode (assignment deactivates before time expires)

Flash

In the “flash” mode the output will flash at the time rate while the assignments state is active (still observing the polarity setting).

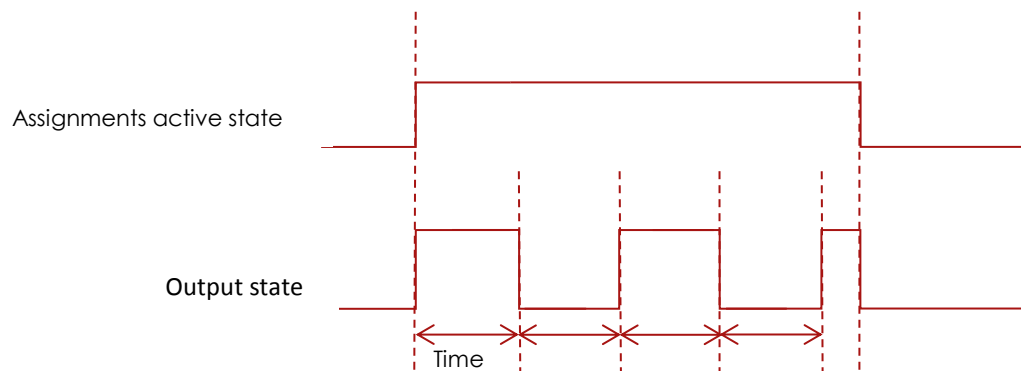


Figure 3 Flash Mode

Bits and Start at????

For multiple bit outputs (for example "Running PSet Number") the width variable defines the number of bits the assignment will output. This allows the output size to be restricted to a few bits saving space for other assignments.

The offset variable allows a fixed value to be added to the value before it is output.

For example, to use bits 4 & 5 of the physical outputs to indicate the selected parameter set number 1-4 as binary 0-3 the assignment would look like:

Running PSet Number		
Bus	1	For the physical bus
Element	0	For the first element on the bus
Bit	4	For the starting bit location
Width	2	To span the two bits 4 & 5
Offset	-1	Adding -1 to the read input value so we get... 1 = Binary 00 2 = Binary 01 3 = Binary 10 4 = Binary 11

Assignments

Ok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Ok" output assignment will go active at the completion of an acceptable fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Nok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Nok" output assignment will go active at the completion of an unacceptable fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Torque Ok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Torque Ok" output assignment will go active at the completion of a fastening that has an acceptable torque value. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Torque Nok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Torque Nok" output assignment will go active at the completion of a fastening that has an unacceptable torque value. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Low Torque

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Low Torque" output assignment will go active at the completion of a fastening that has a low torque result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

High Torque

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "High Torque" output assignment will go active at the completion of a fastening that has a high torque result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Angle Ok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Angle Ok" output assignment will go active at the completion of a fastening that has an acceptable angle result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Angle Nok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit

√	√	√	√	√						
---	---	---	---	---	--	--	--	--	--	--

The "Angle Nok" output assignment will go active at the completion of a fastening that has an unacceptable angle result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Low Angle

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Low Angle" output assignment will go active at the completion of a fastening that has a low angle result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

High Angle

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "High Angle" output assignment will go active at the completion of a fastening that has a high angle result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Fastening Complete

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Fastening Complete" output assignment will go active at the completion of a fastening. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

In Cycle

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "In Cycle" output assignment will go active at the start of the fastening cycle (the torque exceeds the threshold value). It will go inactive when the fastening cycle ends.

Fastening Aborted

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit

√	√	√	√	√						
---	---	---	---	---	--	--	--	--	--	--

The "Fastening Aborted" output assignment will go active at the completion of a fastening that was aborted by the system. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Batch Complete

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Batch Complete" output assignment will go active at the completion of a fastening that satisfies the bolt count of a Job sequence. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or the job is reset.

Job Complete

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Job Complete" output assignment will go active at the completion of a fastening that satisfies all the sequences. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or the job is reset.

Error

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Error" output assignment will be active while the controller has an error.

Tool Enabled

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Tool Enabled" output assignment will be active if the tool is enabled.

Tool Running

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Tool Running" output assignment will be active while the tool is running.

Service Indicator

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Service Indicator" output assignment will be active if the system needs service.

ToolsNet Connected

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "ToolsNet Connected" output assignment will be active if the controller has an active connection to a ToolsNet server.

Open Protocol Connected

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Open Protocol Connected" output assignment will be active if the controller has an active Open Protocol connection.

PFCS Connected

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "PFCS Connected" output assignment will be active if the controller has an active PFCS connection.

Running PSet Number

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√				√	√			

The "Running PSet Number" output assignment will output the current PSet number.

Running Job Number

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit

√	√	√				√	√			
---	---	---	--	--	--	---	---	--	--	--

The "Running Job Number" output assignment will output the current Job number.

External Controlled

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√						√	√	√

The "External Controlled" output assignment will reflect the state of an input. Use the "Input Bus" "Input Element" and "Input Bit" to specify the input to reflect.

Torque

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√				√				

The "Torque" output assignment will output the final torque value of the most recent rundown. The value will be cleared to 0 at the start of a new fastening cycle or a Job reset. At the end of the fastening cycle the final torque will be truncated to an integer and output.

Torque (x10)

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√				√				

The "Torque (x10)" output assignment will output the final torque value of the most recent rundown. The value will be cleared to 0 at the start of a new fastening cycle or a Job reset. At the end of the fastening cycle, the final torque will be multiplied by 10, truncated to an integer and output.

Torque (x100)

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√				√				

The "Torque (x100)" output assignment will output the final torque value of the most recent rundown. The value will be cleared to 0 at the start of a new fastening cycle or a Job reset. At the end of the fastening cycle, the final torque will be multiplied by 100, truncated to an integer and output.

Angle

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit

√	√	√				√				
---	---	---	--	--	--	---	--	--	--	--

The "Angle" output assignment will output the final angle value of the most recent rundown. The value will be cleared to 0 at the start of a new fastening cycle or a Job reset.

Pulse Ok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Pulse Ok" output assignment will go active at the completion of a fastening that has an acceptable pulse results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Pulse Nok

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Pulse Nok" output assignment will go active at the completion of a fastening that has an unacceptable pulse results. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

Low Pulse

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "Low Pulse" output assignment will go active at the completion of a fastening that has a low pulse result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

High Angle

Supported Feature

Bus	Element	Bit 0-32	Polarity N.O., N.C.	Mode Normal, Timed, Flash	Time	Width	Offset	Input Bus	Input Element	Input Bit
√	√	√	√	√						

The "High Pulse" output assignment will go active at the completion of a fastening that has a high pulse result. It will go inactive when the next fastening is started (the torque exceeds the threshold value) or a Job reset.

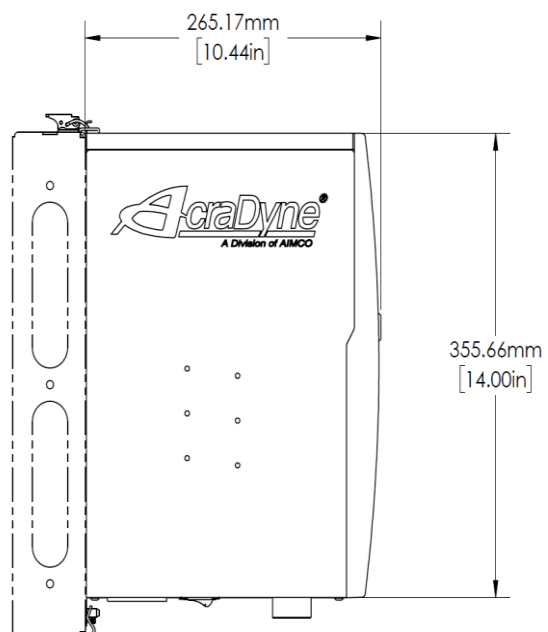
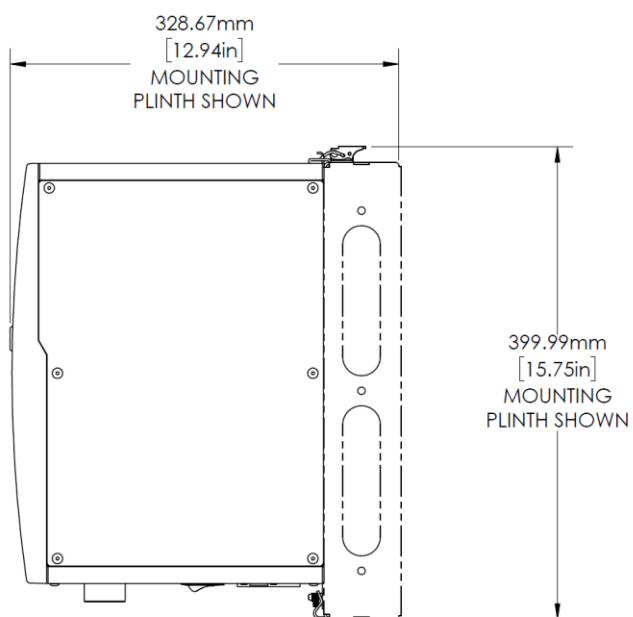
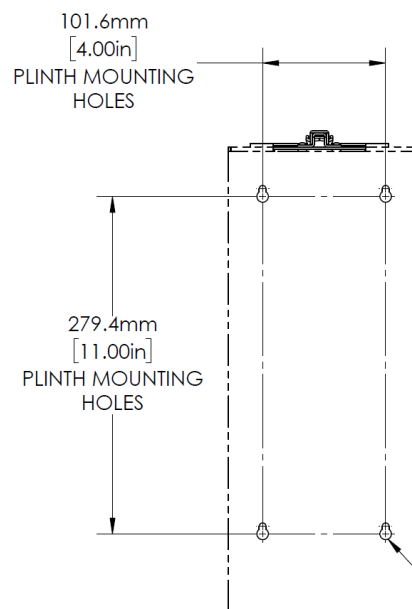
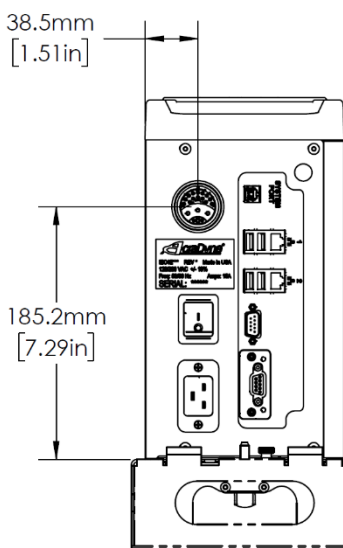
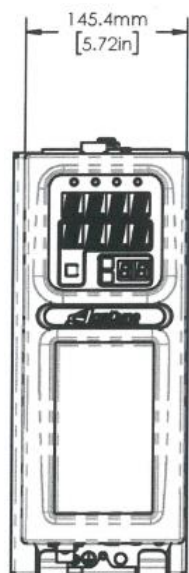
12 Open Protocol Message IDs

Open Protocol Supported MID			
MID	Description	Revisions	Note
1	Communication start	1,2,3	
2	Communication start acknowledge	1,2,3	
3	Communication stop		
4	Command error		
5	Command accepted		
10	Parameter set ID upload request		
11	Parameter set ID upload reply		
14	Parameter set selected subscribe		
15	Parameter set selected		
16	Parameter set selected acknowledge		
17	Parameter set selected unsubscribe		
18	Select Parameter set		
20	Reset Parameter set batch counter		
30	Job ID upload request		
31	Job ID upload reply		
34	Job info subscribe		
35	Job info		
36	Job info acknowledge		
37	Job info unsubscribe		
38	Select Job		
39	Job restart		
40	Tool data upload request	1,2	
41	Tool data upload reply		
42	Disable tool		
43	Enable tool		
50	Vehicle ID number download request		
51	Vehicle ID number subscribe	1,2	
52	Vehicle ID number		
53	Vehicle ID number acknowledge		
54	Vehicle ID number unsubscribe		
60	Last tightening result data subscribe	1,2,3,999	
61	Last tightening result data		
62	Last tightening result data acknowledge		
63	Last tightening result data unsubscribe		
64	Old tightening result upload request		
65	Old tightening result upload reply		
70	Alarm subscribe		
71	Alarm		

72	Alarm acknowledge		
73	Alarm unsubscribe		
76	Alarm status		
77	Alarm status acknowledge		
80	Read time upload request		
81	Read time upload reply		
82	Set time		
113	Flash green light on tool		
127	Abort Job		
130	Job off		
150	Identifier download request		
157	Reset all Identifiers		
200	Set external controlled relays		Only supports 0 (off) and 1 (on)
210	Status external monitored inputs subscribe		
211	Status external monitored inputs		
212	Status external monitored inputs acknowledge		
213	Status external monitored inputs unsubscribe		
214	IO device status request	1,2	
215	IO device status reply		
216	Relay function subscribe		See supported relay functions below.
217	Relay function		
218	Relay function acknowledge		
219	Relay function unsubscribe		
9999	Keep alive open protocol communication		

Open Protocol Supported Relay Functions	
Number	Function
1	OK
2	NOK
5	Low Torque
6	High Torque
7	Low angle
8	High angle
9	Cycle complete
10	Alarm
11	Batch NxOK
12	Job OK
19	Tool ready
20	Tool start switch
21	Dir. switch = CW
22	Dir. switch = CCW
26	Tool running
276	Cycle abort

13 Dimensions



14 Specifications

Mechanical:

Dimensions:	Width:	6.25 in	159 mm
	Height:	15.75 in	400 mm
	Depth:	12.5 in	316 mm
Weight:	Controller:	11 – 151bs depending on options	5 – 6.8 kg depending on options
	Plinth	4.5lbs	2 kg

Operating Conditions:

Temperature:	32 to 122 °F (0 to 50 °C)
Humidity:	Non-condensing
Ingress Protection:	IP20

Air Connections (models with internal shutoff valve and/or electronic regulator):

Supply Air Inlet:	130 PSI Maximum, Clean, Dry Air	Fitting Type: ½" NPT Female
Air Outlet to Tool		Fitting Type: ½" NPT Female
Exhaust		Fitting Type: 3/8" NPT Female

Electrical:

AC Power Source:	100 - 240 VAC, 50/60 Hz, 1Amp, 100 Watts
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Standards Compliance: Contact AIMCO for details.

13 Trouble Shooting

SD Card

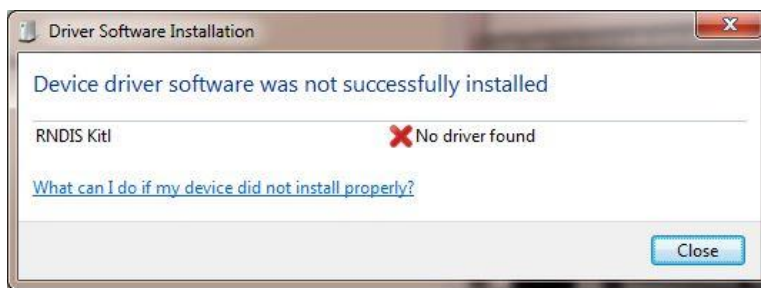
The rear SD card can be used to easily move the software, firmware, configuration, and rundowns to a new controller in the event of hardware failure. This allows the controller to be replaced with a new unit while retaining all the rundown information and configuration settings. Remove the rear SD card from the damaged unit and insert it into a functioning unit to perform the replacement. It is highly recommended that the controller settings are backed up and saved by exporting the controller to a USB flash drive.

System port IP Address

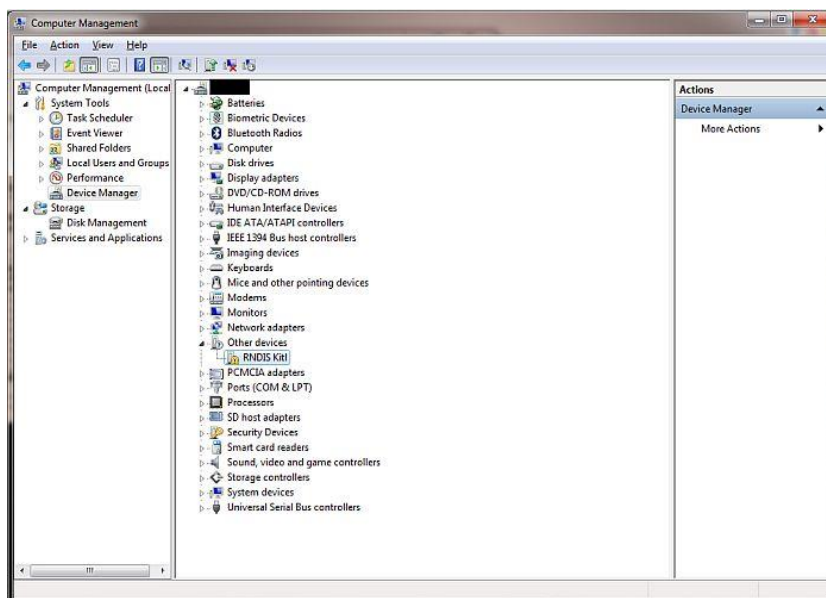
NOTE: In the event the RNDIS drivers do not install themselves, the following are the steps to install new drivers to get the system port working.

The RNDIS driver is a part of the Windows 7 operating system, but the OS fails to detect it automatically. The following steps will help the user to install the RNDIS driver:

Step 1 After the device is connected to the development PC, OS will automatically search for the RNDIS driver; after it fails to find the driver, the following message will be shown:



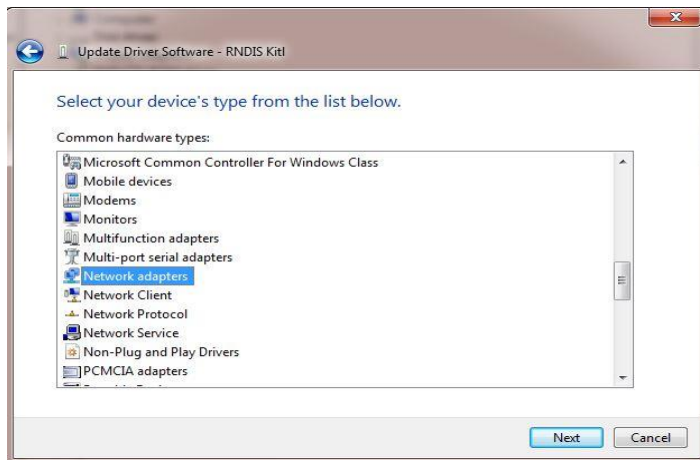
Step 2 Right click on **Computer** and select **Manage**. From **System Tools**, select **Device Manager**. It will show a list of devices currently connected with the development PC. In the list, RNDIS Kit! can be seen with an exclamation mark implying that driver has not been installed.



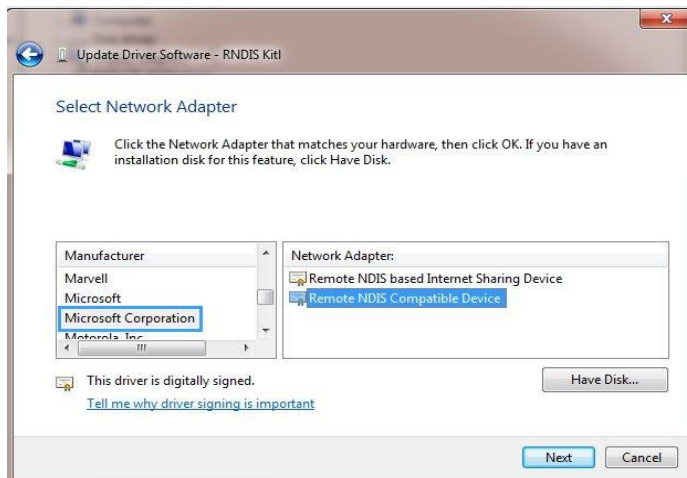
Step 3 Right click on the RNDIS Kit1 and select **Update Driver Software**. When prompted, choose "**Browse my computer for driver software**" to search for device driver software.

Step 4 "**Browse for driver software on your computer**" will come up. Select "**Let me pick from a list of device drivers on my computer**".

Step 5 A window will come up asking to select the device type. Select **Network Adapters** as RNDIS emulates a network connection.



Step 6 In the **Select Network Adapter** window, select **Microsoft Corporation** from the **Manufacturer** list. Under the list of **Network Adapter**, select **Remote NDIS Compatible Device**.



Step 7 The RNDIS Kit1 device is now installed and ready for use.

14 AIMCO Warranty

NEW TOOL AND ACCESSORY WARRANTY

Any new tool or accessory branded with the AIMCO, Uryu, AcraDyne or Eagle Group name, and purchased from AIMCO, or through one of its authorized distributors or agents, is warranted to the original buyer against defects in materials and workmanship for a period of one (1) year* from date of delivery. Under the terms of this warranty, AIMCO agrees, without charge, to repair or replace, at its option and Ex-Works (EXW) its authorized service centers, any product or accessory warranted hereunder proving to AIMCO's satisfaction to be defective as a result of defective workmanship or material. To qualify for this warranty, written notice to AIMCO must be given immediately upon discovery of such defect, at which time AIMCO will issue an authorization to return the tool. The defective item must be promptly returned to an authorized AIMCO service center with all freight charges prepaid.

REPAIRED TOOL WARRANTY

Once a tool is beyond the new product warranty period as detailed above, AIMCO will provide repair subject to the following warranty periods: pneumatic tools: 90 days*; electric tools and AcraFeed: 90 days; battery tools: 30 days*; DC Electric tools: 90 days*

EXCLUSION FROM WARRANTY

This warranty is valid only on products purchased from AIMCO, or thru its authorized distributors or agents. AIMCO shall have no obligation pursuant to the AIMCO Warranty with respect to any tools or accessories which in AIMCO's sole judgment have been altered damaged, misused, abused, badly worn, lost or improperly maintained. This Warranty is null and void if the customer, or any other person other than an authorized representative of AIMCO, has made any attempt to service or modify the tool or accessory prior to its return to AIMCO under this Warranty.

The warranty provision with respect to each such product may be amended by AIMCO from time to time in its sole discretion. The liability of AIMCO hereunder shall be limited to replacing or repairing, at its option, any defective products which are returned freight pre-paid to AIMCO or, at AIMCO's option, refunding the purchase price of such products.

AIMCO reserves the right to make periodic changes in construction or tool design at any time. AIMCO specifically reserves the right to make these changes without incurring any obligation or incorporating such changes or updates in tools or parts previously distributed.

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THIS WARRANTY IS THE ONLY WARRANTY MADE BY AIMCO WITH RESPECT TO THE GOODS DELIVERED HEREUNDER, AND MAY BE MODIFIED OR AMENDED ONLY BY A WRITTEN INSTRUMENT SIGNED BY A DULY AUTHORIZED OFFICER OF AIMCO.

LIMITATION OF LIABILITY

AIMCO'S LIABILITY PURSUANT TO WARRANTY OF THE PRODUCTS COVERED HEREUNDER IS LIMITED TO REFUND OF THE PURCHASE PRICE. IN NO EVENT SHALL AIMCO BE LIABLE FOR COSTS OF PROCUREMENT OF SUBSTITUTE GOODS BY THE BUYER. IN NO EVENT SHALL AIMCO BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES (INCLUDING WITHOUT LIMITATION, LOSS OF PROFIT) WHETHER OR NOT AIMCO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH LOSS, HOWEVER CAUSED, WHETHER FOR BREACH OR REPUDIATION OF CONTRACT, BREACH

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NOTE: The AIMCO Warranty confers specific legal rights, however some states or jurisdictions may not allow certain exclusions or limitations within this warranty. ***Note – All warranty periods addressed herein are determined using a standard shift, eight-hour work day.**