



AcraDyne
iEC31W Series
DC Tool Controllers
Users Guide



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Introduction

Thank you for your purchase of an AcraDyne iEC31W Series DC Tool Controller from AIMCO. The iEC31W Series Controller is capable interfacing with all series of AcraDyne tools.

This manual is designed to provide the user of the AcraDyne iEC31W Series Controller with a guide to understanding the features and functions of the controller. Programming this controller using AcraDyne's ToolWare software package provides a broad range of operating choices to tackle the most difficult assembly projects with ease. Statistical analysis, communication and system diagnostic features are also built in.

For more detailed programming, data analysis and system monitoring information please refer to the AcraDyne ToolWare Operations section at the back of this manual.

For additional service and support, please contact your AIMCO distributor or contact AIMCO at 1-800-852-1368 between the hours of 7:00 AM—4:00 PM Pacific Time.

Table of Contents

Safety Information	3
Front Panel Diagram (Figure 1)	4
Side Panel Diagram (Figure 2)	4
Main Display Panel Diagram (Figure 3)	5
Dimensions(Figure 4)	5
Initial Setup	6
Main Display Functions	
Changing Parameter Sets	8
Programming the Display Options (Steps 1-3)	8
Display Optional Values for Individual Rundowns (Steps 1-2)	10
Networking	11
Appendix A Error Codes and Descriptions	12
Appendix B Frequently Asked Questions	13

Safety Information

WARNING! Read all instructions Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury. The term "power tool" in all of the warnings listed below refers to your mains-operated (corded) power tool or battery-operated (cordless) power tool.

SAVE THESE INSTRUCTIONS

1) WORK AREA

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

2) ELECTRICAL SAFETY

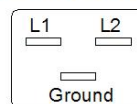
- Power tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) power tools. *Unmodified plugs and matching outlets will reduce risk of electric shock.*
- Avoid body contact with earthed or grounded surfaces such as pipes, radiators, ranges and refrigerators. *There is an increased risk of electric shock if your body is earthed or grounded.*
- Do not expose power tools to rain or wet conditions. *Water entering a power tool will increase the risk of electric shock.*
- 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.*
- 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.*

3) WIRING SAFETY

DANGER: Ground the system. There may be an electric shock or fire risk.

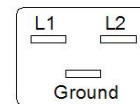
DANGER: Turn off the system before wiring.
There may be an electric shock or fire risk.

Power Cord Connector



120 VAC +/- 10%
50 / 60 Hz
16 Amps

iEC31W-110V



240 VAC +/- 10%
50 / 60 Hz
16 Amps

iEC31W-220V

4) PERSONAL SAFETY

- 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.*
- Use safety equipment. Always wear eye protection. Safety equipment such as dust mask, non-skid safety shoes, hard hat, or hearing protection used for appropriate conditions will reduce personal injuries.
- Avoid accidental starting. Ensure the switch is in the off-position before plugging in. *Carrying power tools with your finger on the switch or plugging in power tools that have the switch on invites accidents.*
- 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.*
- Do not overreach. Keep proper footing and balance at all times. *This enables better control of the power tool in unexpected situations.*
- 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.*
- If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used. *Use of these devices can reduce dust-related hazards.*

5) POWER TOOL USE AND CARE

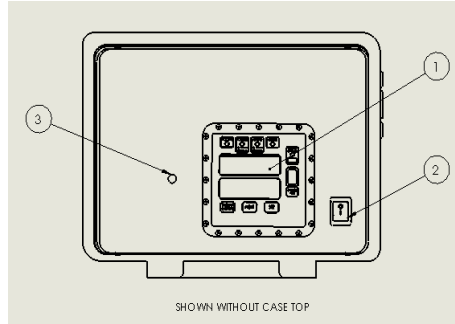
- Do not force the power tool. Use the correct power tool for your application. *The correct power tool will do the job better and safer at the rate for which it was designed.*
- Do not use the power tool if the switch does not turn it on and off. *Any power tool that cannot be controlled with the switch is dangerous and must be repaired.*
- 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.*
- 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.*
- 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 are caused by poorly maintained power tools.*
- Keep cutting tools sharp and clean. *Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.*
- Use the power tool, accessories and tool bits etc. in accordance with these instructions and in the manner intended for the particular type of power tool, 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.*

6) SERVICE

- 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 maintained.*

Front Panel

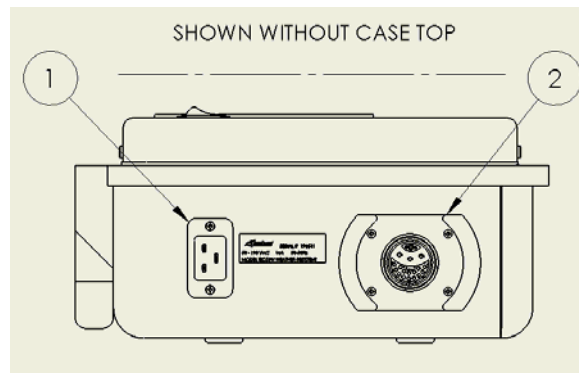
Figure 1



- 1— Main Display Panel—Annunciation and Display programming (see Page 5 for detail)
- 2— Power Switch— Turns controller on and off
- 3— Programming/Data Connection— For connection of AEC-CIM communication module

Side Panel

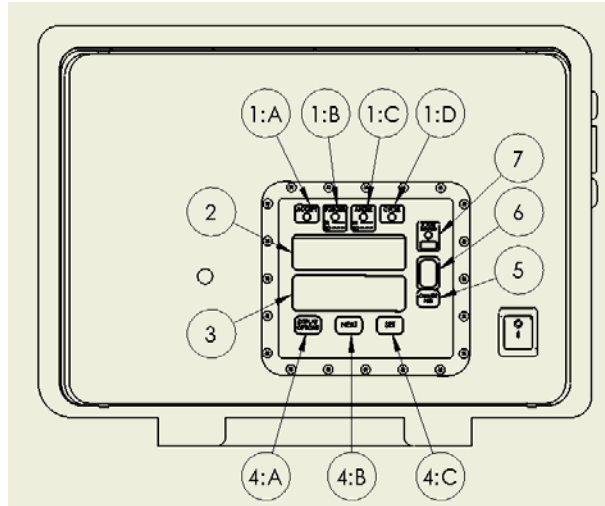
Figure 2



- 1—Power Cord Connection— IPC-29 Connector
- 2—Tool Connector (26 Pin) —Standard connection point for tool cable

Main Display Panel

Figure 3



1—Rundown Feedback Indicators

- A—ACCEPT— Green LED indicates OK rundown
- B—TORQUE— Steady red indicates HI, flashing red indicates LO
- C—ANGLE— Steady yellow indicates HI, flashing yellow indicates LO
- D—CYCLE— Blue LED indicates tool is in rundown cycle

2—Primary Display Field—Displays Parameter Set Target or Rundown torque

3—Secondary Display Field—Selectable Display Choices (Angle etc...)

4—Programmable Display Selection Buttons

- A—DISPLAY OPTIONS —Enters into display options choices for the Secondary Display
- B—NEXT—Scrolls through the different display options for the Secondary Display
- C—SET—Sets the selected display option in the Secondary Display

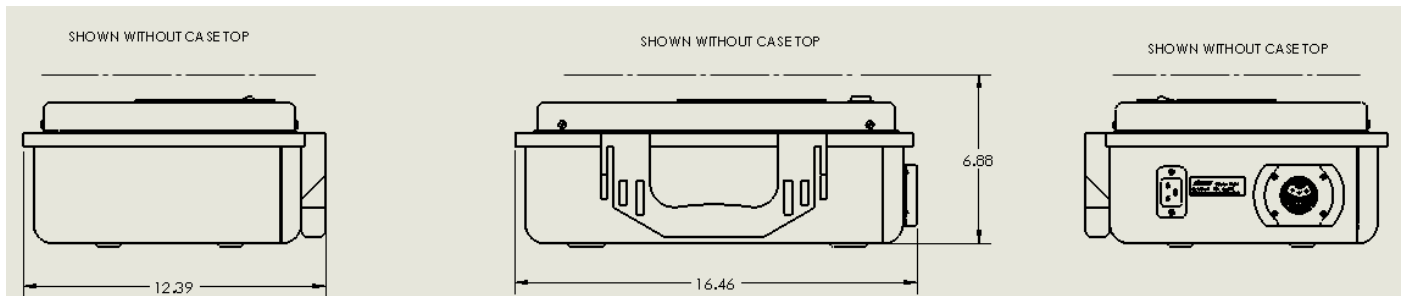
5—CHANGE PSET—Scrolls upwards through programmed Parameter Sets

6—PSET Indicator—displays PSET that is currently operating

7—IR PORT ENABLED—Future function, not currently enabled

Dimensions

Figure 4



Inches / Millimeters

INITIAL SETUP

Step 1

Connect the tool cable to the Tool Connection (Figure 2, pg. 4). The cable consists of a male pin set housed in a molded connection with a MIL-C-5015 connector shell.

Step 2

Repeat the above process to connect the cable to the AcraDyne tool that will be used with the controller.

Step 3


Plug the female end of the power cable into the Power Cable connection (Figure 2, pg. 4).

Step 4

Plug the male end of the power cable into the appropriate power source.

WARNING: Verify that the rated voltage of the system matches with the connected AC power. There may be risk of electric shock, fire risk, or damage to the tool and controller.

Step 5

Turn the controller on by pressing the Power Switch (Figure 1, pg. 4), to the POWER ON position, represented by the  symbol.

When an iEC-31W series controller shipped with SCC code 2.0 or higher is powered on, three messages will be shown on the display:

SYS INIT- indicates the system is initializing

EC “#.##” - indicates the firmware version that is operating in the controller

SERVO FIRMWARE (A or B) — indicates the firmware of the controller’s servo module

These messages are normal and will clear as the system finishes initializing.

INITIAL SETUP

! If the controller is powered on without a tool connected the following message will be shown on the display:

AUT FLT 129

This message is normal and will clear once a tool is connected.

* Controller power switch should be OFF when connecting or disconnecting a tool to the iEC controller.

Step 6

To turn the controller off, press the Power Switch to the POWER OFF position, represented by the **0** symbol



To reboot the controller without turning off the Power Disconnect, press and hold the

NEXT

+

SET

Factory & Default Parameter Sets

Before the user programs the iEC controller for the first time, or after resetting the controller to factory default settings, one of three different groups of parameters may be present in the controller:

DEFAULT WITH NO TOOL CONNECTED—These parameters will start at 10 Nm and increase up to 80 Nm in increments of 10 Nm

DEFAULT WITH TOOL CONNECTED—This will create a group of 3 individual parameter sets, one each at 40%, 60% and 80% of the connected tools maximum torque capacity

TEST PARAMETER SETS—Because every AcraDyne iEC controller is tested before being shipped, some parameter sets that were used in this testing may be present in the controller.



If a parameter set is selected that has a target torque above the maximum capability of the tool, the following message will be shown on the display

EXT FLT 4096

This message will clear when an allowable parameter set is selected **or** when the out-of-range parameter set is reprogrammed to be within the capabilities of the tool.

Main Display Functions

Changing Parameter Sets

To change the parameter set that is active, press the **CHANGE PSET** button (Fig. 1) until the desired parameter set number is displayed.

With each separate press of the button the parameter set numeral will advance upwards through the highest parameter set that is programmed and then cycle back to parameter set #1. A maximum of 32 parameter sets can be programmed into the iEC controller that is loaded with SCC code 3.0 or higher.

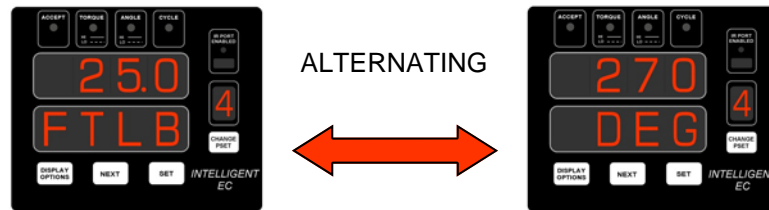
The display for each type of strategy will vary. The main control parameter (Torque, Angle or both) will be displayed when the Parameter Set is selected. The different strategies will display as follows:



Example: PSET #2, Torque Control Strategy, 25 ft-lb Target



Example: PSET #3, Angle Control Strategy, 270 Degree Target



Example: PSET #4, Torque Control / Angle Control Strategy, 25 ft-lb Target, 270 Degree Target

Programming the Display Options

The Programmable Display Options feature in the iEC allows the user to select the information that will be displayed in the Secondary Display Field.

Step 1

Press the **DISPLAY OPTIONS** button (Fig. 1) to access the Display Options Menu.

Immediately a message will appear in the Primary Display Field (Fig. 1) that will indicate which display option is currently selected.



If no rundowns have been conducted since the most recent Power-On of the controller, the Secondary Display Field will display the default information relating to the current display option.

If rundowns have been conducted since the controller was last Powered-On, then the Secondary Display Field will display the value for that option pertaining to the most recent rundown in the current parameter set.

Main Display Functions

Step 2

To scroll through the available display options, press and release the **NEXT** button. Repeated presses will cycle the display options as follows

DFLT > ANGL > BCNT > TOT > OK > NOK > CP > CPK > JTRT



The definition of each Display Option is as follows:

DFLT (Default) Field is blank if a Torque Control Strategy is programmed. For all other strategies the field will display the angle of rotation from Threshold to Final Torque

ANGL (Angle) If selected, field will display angle of rotation for the previous run-down, regardless of strategy for the parameter set

BCNT (Batch Count) Field will display the batch count information for the selected parameter set. Displayed values are current count (**cc**) and batch total (**bt**), with the information displayed as **cc.bt**.

TOT (Total Count) Value shows the Total number of rundowns for all parameter sets from midnight to midnight

OK (OK Count) Value shows the Total number of **acceptable** rundowns for all parameter sets from midnight to midnight

NOK (NOT OK Count) Value shows the Total number of **unacceptable** rundowns for all parameter sets from midnight to midnight

CP (Cp Value) Statistical value is Cp for selected parameter set based on collection of programmed-minimum number of rundowns. This value is reset upon controller initialization or new Parameter Set Download or Tool Change

CPK (Cpk Value) Statistical value is Cpk for selected parameter set based on collection of programmed-minimum number of rundowns. This value is reset upon controller initialization or new Parameter Set Download or Tool Change

JTRT (Joint Rate) Displays joint rate of selected Parameter Set based on previous rundown. The value is displayed in degrees of rotation from the Joint Rate Threshold (**not Parameter Set Threshold**) to final torque. By default, the Joint Rate Threshold is 10% of target torque

Main Display Functions

Step 3

When the desired Display Option is selected, press the **SET** button (Fig. 1) to lock this option as the visible display. Once the SET button is pressed, the display screens will clear. Upon completing a rundown cycle, the value for the selected Display Option will be shown in the Secondary Display Field (Fig. 1).



The selected Display Option will be displayed for *all* Parameter Sets.

Display Optional Values for Individual Rundowns

By scrolling through the Display Options after a rundown cycle, the value for each option can be quickly viewed.

Step 1

Immediately after a rundown cycle, the selected Display Option will be shown in the Secondary Display Field. To view a different Display Option value, press the **NEXT** button before conducting another rundown.

Step 2

Continue to press the **NEXT** button to scroll through the available options. As each option is selected, the corresponding value will be displayed in the Secondary Display Field.



The Display Option that is last shown before another rundown is conducted will be set as the programmed display option.

To stop viewing the Display Option for the most recent rundown, simply conduct another rundown or press CHANGE PSET to select a different parameter set.

Networking

By connecting the controller to a computer through the CAN connection, ToolWare can be used to conduct a wide range of programming, diagnostic and analytical procedures. For more information on ToolWare, refer to the ToolWare Users Guide section of this manual or contact your AIMCO sales representative.

APPENDIX A: Error Codes & Descriptions

<u>Error Code #</u>	<u>Fault</u>	<u>Description</u>
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AUT1

1	TID Timeout	Tool ID board communication timeout
32	Tool GND	Ground circuit problem between controller and tool
64	Power On Throttle	RUN command on during power up
128	Button Timeout	Button (run, fwd, rev) communication timeout
256	Button State	Illegal button state (example fwd and rev)
512	Undefined Voltage	Tool voltage parameter undefined
2048	Tool Update Req'd.	Tool parameter file is not compatible with controller version
4096	Illegal Tool	Tool type is not compatible with controller

CYC1

1	Free Run Timeout	Tool has run below threshold level with no load for 5+ seconds
2	Load Run Timeout	Tool has run above threshold level for 15+ seconds
4	Hall Error	Motor communication signal error
8	Tool Offset	Tool cannot reach target torque due to transducer error
64	Tool Level	Tool transducer output beyond electrical limits
512	Locked Rotor	Motor has stalled for 100+ milliseconds
1024	Drive Fault	Motor drive shut down or not responding

EXT1

1	PSet Value	Illegal parameter set value
8	TID Param Value	Tool ID board communication error
32	TID Param Timeout	Tool ID board communication error
4096	Target Value Fault	Torque target out of range of tool capabilities

EXT2

1	TID EE Write	Communication timeout while writing to tool memory
2	Drive Comm	Communication timeout reading / writing to motor drive
4	Vbus	Measured controller voltage is not within required limits
8	Drive Update Req	Drive firmware not compatible with low speed control

NOTE—Multiple Error Codes will be displayed as the sum of each error code number indicated in the table above; for example, AUT1: 129 represents AUT1: 128 and AUT1: 1, which would be a tool ID board timeout and a button timeout

APPENDIX B: FAQ'S

Q: HOW CAN I IMPROVE THE TOOL'S REPEATABILITY?

Generally speaking, slowing the tool down will improve its repeatability. Reducing the RPM FREE% value will give the tool more time to react as it approaches the target torque. Reducing the DOWNSHIFT TQ and/or RPM DOWN% may also have the same effect. Keep in mind that tool's RPM and Downshift points can affect ergonomics and overall productivity also; testing and running the tool on an application are the only ways to verify that the parameter set meets all requirements of the manufacturing process. Consistency of the joint characteristics must also be considered.

Q: HOW SHOULD I ADJUST THE SETTINGS FOR HARD JOINTS?

Because of how quickly torque rises upon reaching threshold torque, the tool should slow down to minimize overshooting the target torque. Two speed adjustments may be necessary. Maintain a reasonable RPM FREE% and RPM DOWN% during the rundown. Reduce the DOWNSHIFT (downshift torque) setting to give the tool more time to react once hitting the threshold torque. A value slightly above the THOLD (threshold torque) is recommended.

Q: HOW SHOULD I ADJUST THE SETTINGS FOR SOFT JOINTS?

A softer joint requires more tightening time. You can afford to increase the speed during the rundown and still maintain acceptable repeatability. Increase the DOWNSHIFT (downshift torque) setting a little at a time to decrease cycle time while still meeting the torque limit requirements.

Q: THE TOOL DOESN'T OPERATE WHEN I PRESS THE LEVER.

One common cause of this is choosing the improper tool for the parameter set; if the target torque value is above the tool's maximum rating then the tool will not run and "FLT EXT1 4096" will be displayed on the Main Display Panel. Another common reason for this problem is that the control ring on the tool is in a position that is programmed as NEUTRAL, the MFB button has been programmed for a non running scenario or the tool is running off I/O. Refer to the ToolWare Users Guide to correct this situation.

Q: HOW DO I CHANGE THE UNITS OF MEASURE?

The units of measure for torque is a universal setting for all parameter sets. To change the units, go to the Admin menu on the KDM and choose Pset Defaults. Keep in mind that the controller does not convert values for you. If you have a parameter setting of 10 Nm and you change the units to ft-lbs, the new setting is 10 ft-lbs. Changing the units of measure using Toolware allow for calculation of values. Refer to the Toolware users guide for more details. Lastly, being a universal setting, all parameter sets will use the same unit of measure.

APPENDIX B: FAQ'S

Q: ANGLE MEASUREMENT SEEMS TOO HIGH.

The controller starts to measure angle of rotation during the rundown when THOLD (threshold torque) is reached. If the threshold torque setting is below the prevailing torque of the joint, the tool will start measuring angle before the fastener is seated, resulting in a higher angle reading than anticipated. Ensure that the threshold torque value is above any anticipated prevailing torque of the joint.

Q: HOW CAN I RESET TO ALL THE FACTORY SETTINGS?

There are three groups of settings that can be reset - parameter sets, logic inputs/outputs, and calibration value. Within the ADMIN menu of the KDM, select RESET DEFAULTS. Resetting the parameter sets will erase all existing parameter set values. Resetting logic inputs/outputs will revert to the factory installed settings. Resetting the calibration value will revert the tool's calibration value to the factory setting burned into the tool's identification board. Resetting defaults is easily done using Toolware as well. Refer to the Toolware users guide for details.

Q: WHAT IS ADAPTIVE CONTROL?

Upon reaching target torque, the controller signals the tool to shut off and the tool stops. Depending on the speed of the tool and the joint rate, the final torque output may be higher than the target torque. This difference in torque is called "overshoot". Adaptive Control averages and centers the final torque readings around the target torque value. It averages the overshoot torque on 10 consecutive rundowns. After that, it pre-targets the tool to shut off before reaching the target so that the final reading is closer to your target torque setting. For example, if the target torque is 10 Nm, and the average of 10 readings is 10.2 Nm, using adaptive control will calculate the average overshoot torque of 0.2 Nm (10.2 - 10.0) and the tool will shut off at 9.8 Nm, so that the final torque reading is 10.0 Nm. Because of the way Cpk is measured, having more readings above the target torque decreases the Cpk value. Using Adaptive Control will result in a higher Cpk value since the range of the final torque readings is more centered on your target torque setting.

Q: WHAT IS THE CAL VALUE?

The cal value of an AcraDyne tool is based on a scale of 0 - 256 points. By adjusting this value, the torque values generated by the tool's transducer can be correlated with a torque value as determined by a master calibration transducer. Using the Calibrate Torque or Calibrate Angle features in Toolware with a Master Transducer can insure that your AcraDyne tool is operating in specification against the Master Transducer in your facility. Refer to the Toolware user's guide for details



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