AcraDyne®
A Division of AIMCO

Operation Manual

Gen IV 2000 Series DC Nutrunners

Introduction

Thank you for purchasing this AcraDyne DC electric assembly tool, one of the lightest and fastest DC electric assembly tools on the market. When used with the AcraDyne iEC tool controller, this tool will provide excellent productivity, ergonomics, reliability and quality on a wide range of industrial assembly applications.

SAVE THESE INSTRUCTIONS

Safety Information

1) WORK AREA

a) Keep work area clean and well lit. Cluttered and dark areas invite accidents.

b) 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.

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 of outdoor use reduces the risk of electric shock

f) It is not recommended to use AcraDyne controllers or tools outside or to use an extension cord to connect the controller to a power source.

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 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. If the maximum duty cycle of the attached tool is exceeded or the tool temperature exceeds 50° C., then the operator should wear protective hand wear (gloves).

c) 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.

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 no 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 these devices can reduce dust-related hazards.
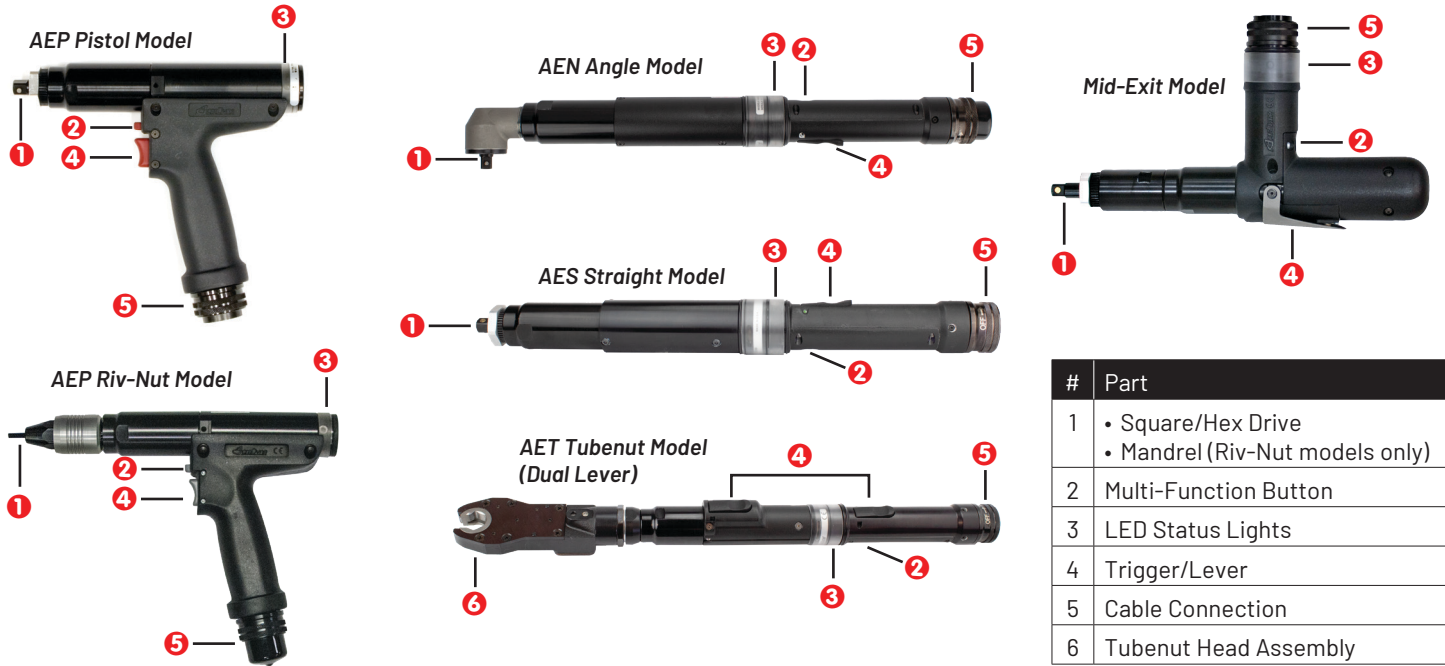
4) POWER TOOL USE AND CARE

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) This product is designed to be used in combination with the AcraDyne iEC DC tool controller for intermittent hand-held or fixtured assembly processes.

A complete tool system consists of the following items:

Controller	Power Cord	Tool	Tool Cable

Not to exceed 20M in length

AEP Pistol Model

AEN Angle Model

Mid-Exit Model

AEP Riv-Nut Model

AES Straight Model

AET Tubenut Model (Dual Lever)

#	Part
1	• Square/Hex Drive • Mandrel (Riv-Nut models only)
2	Multi-Function Button
3	LED Status Lights
4	Trigger/Lever
5	Cable Connection
6	Tubenut Head Assembly

1. Connect tool cable to the iEC controller and the tool:

AcraDyne recommends not exceeding 20m length of cable. The tool cable has curved alignment tabs and slots built into the connectors at each end to ensure proper alignment and connection with the tool and controller.

Make sure that power is not turned on at the controller before making any connections. Align the female connector on the cable with the male connector on the tool and insert the cable onto the tool, then slide the connector nut onto the threads on the cable and turn clockwise until hand-tight.

Align the male connector tab on the other end of the tool cable with the female slot on the controller and insert the cable into the connector, then slide the metal outer cover onto the connection threads on the controller and turn clockwise until hand-tight.

2. Multifunction Button Operation:

The tool will flash all LED lights three times when power is first turned on at the controller. After the controller finishes initializing and displays a target toque value, the multifunction button (MFB) is used to toggle the tool from clockwise mode (FWD) to counter-clockwise operation mode (REV). The MFB is the small button opposite the trigger.

The tool will initially start in clockwise mode and will have no LED lights turned on. If the trigger is pressed, the tool will turn on the blue LED meaning the tightening operation is underway. Pressing the MFB will cause the tool to flash yellow and red LED lights. Pressing the MFB again will switch the tool back FWD mode and will indicate this with no LED lights turned on.

AEF fixtured models are not equipped with a multifunction button. Tool operation is handled by the IO of the Gen IV iEC controller.

3. Start Trigger Operation:

To start the tool, depress the start trigger. Blue LED lights will be displayed while tightening a bolt. The tool will stop automatically when it senses its target torque value or if no torque is sensed in a specified time period. After a cycle is complete, the tool will display green LED lights for a success, or red LED lights for failure to reach torque/angle.

AEF fixtured models are not equipped with a start trigger. Tool operation is handled by the IO of the Gen IV iEC controller.

LED Light Assignment

The Buzzer and Multi-Function Button are programmable in the DSP Menu of ToolWare.

Light Color	Meaning
Green Solid	OK
Red Flashing	Torque Low
Red Solid	Torque High
Yellow Flashing	Angle Low
Yellow Solid	Angle High
Blue Solid	Tool In-Cycle/Tool Armed
Blue Flashing	P-Set Change thru MFB
All On Flashing	Tool in Disassembly
Buzzer	Bad Assembly/Tool in Disassembly/Power Up

The following describes the setup required for tube-nut tool operation. This includes determining the values for tube-nut specific TID parameters (parameters residing in the tool memory) and iEC Controller parameters.

Tube Nut Homing

Tube Nut Homing Start Input Logic Selection:

The controller parameters for tube- operation can be viewed and modified from the Controller->Edit Controller Parameter->Tube Nut screen in ToolWare.
- Tube nut Home Strategy:
  ◦ Lever action required to start the home sequence.
  ◦ Options:
    – Home on release and repress of the lever (default)
    – Home on release of the lever

Tube Nut Home TID parameters

The tube nut TID parameters can be viewed and modified from the Tool-> Edit->Tool Setup screen in ToolWare. The tool to be configured must be connected to the controller.

Home Detection Torque - Home (in*Lb)
- When the tool is homing, reaching this torque indicates to the controller the tool output socket has reached the home stop and is in the open position.
- If the tool output does not attempt to return or does not completely reach the home position, this value is too low.
- Attention: Setting this value too high can potentially damage the tool.
- Units: lbf-in
- TID memory location: 53

Hold at Home Torque - Open Loop (in*Lb)

After reaching the home position, this torque is applied against the home stop to prevent the socket from bouncing to a partially closed position.
- This value is typically set to a value slightly lower than the home detection torque.
- If the socket bounces back to a partially closed position after reaching the home stop, this value is too low.
- Attention: Setting this value too high can cause the socket to snap back to the home stop too quickly and potentially damage the tool.
- Units: lbf-in (approximation)
- TID memory location: 54

TYPICAL PROCEDURE FOR SETTING THE TOOL'S TUBE NUT HOME TID PARAMETERS
- Set the Hold at Home Torque = 0
- Set the Home Detection Torque = 1
- Free run the tool and watch the homing routine while making the adjustments below
- Gradually increase the value for the Home Detection Torque until the tool reliably returns to the home position
- Once a good value for the Home Detection Torque is found, if the tool is bouncing back to a partially closed position after hitting the home stop
- Gradually increase the value for the Hold at Home Torque until bounce back is eliminated

GEN III CONTROLLER PARAMETERS AFFECTING TUBE NUT HOMING

Controller parameters for tube-nut operation can be viewed and modified from the Controller->Edit Controller Parameter->Tube-nut screen in ToolWare.

- Tube Nut Backoff Speed:
  ◦ This is the speed the tool output socket travels when returning to the home position.
  ◦ Decreasing this can reduce the impact force when hitting the home stop.
  ◦ Attention: Care must be taken, increasing the speed above the default value. Too high of a value can greatly increase how hard the output will hit the home stop and potentially damage the tool.
  ◦ Units: RPM of the tool output socket in the homing direction
  ◦ Default value: 100 RPM.
  ◦ Range: 10 to 500 RPM

- Tube Nut Homing Reverse Dwell Time:
  ◦ The amount of time before the output is allowed to home, after the rundown is complete and the tool lever is released.
    – Units: Seconds
    – Default value: 0.5 Seconds
    – Range: 0 to 2 Seconds
    Tube Nut Home Dwell time:
  ◦ The amount of time the tool holds at home to prevent bounce back
  ◦ Too short of home dwell time can increase the occurrence of bounce back. However, decreasing the homing speed can decrease the severity of bounce back after the home stop is reached and allow for a shorter dwell time.
    – Units: Seconds
    – Default value: 0.5 Seconds
    – Range: 0 to 2 Seconds

GEN IV Controller Parameters Affecting Tube Nut Homing

Controller parameters for tube-nut operation can be viewed and modified from the Controller->Tool Setup->Disassembly and Tube-nut screen.

- Tube Nut Homing Max Speed:
  - This is the speed the tool output socket travels when returning to the home position.
  - Decreasing this can reduce the impact force when hitting the home stop.
  - Attention: Care must be taken, increasing the speed above the default value. Too high of a value can greatly increase how hard the output will hit the home stop and potentially damage the tool.
  - Units: RPM of the tool output socket in the homing direction
  - Default value: 100 RPM.
  - Range: 1 to 200 RPM
- Tube Nut Homing Acceleration:
  - Rate at which the speed of the tool ramps to the homing speed.
  - Units: kRPM/second
  - Default value: 0.5
  - Range: 0.1 to 10

- Tube Nut Homing Reverse Dwell Time:
  - The amount of time before the output is allowed to home, after the rundown is complete and the tool lever is released.
  - Units: Seconds
  - Default value: 0.5 Seconds
  - Range: 0 to 2 Seconds

- Tube Nut Home Dwell time:
  - The amount of time the tool holds at home to prevent bounce back
  - Too short of home dwell time can increase the occurrence of bounce back. However, decreasing the homing speed can decrease the severity of bounce back after the home stop is reached and allow for a shorter dwell time.
  - Units: Seconds
  - Default value: 0.5 Seconds
  - Range: 0 to 2 Seconds

Tube Nut Obstruction Detection

Tube Nut Home TID Parameters

The tube nut TID parameters can be viewed and modified from the Tool-> Edit->Tool Setup screen in ToolWare. The tool to be configured must be connected to the controller.

- Obstruction Detection Torque - (in*Lb)
  - At the start of rundown before the output rotation has passed though the Obstruction Check Zone (where the output is open at the start of the fasting cycle), the tool will stop and fastening cycle will be aborted if this torque is exceeded.
  - If the tool stops, when the output is open during this first part of the rundown, without any obstruction, the value is too low.
  - Units: lbf-in
  - TID memory location: 53

TYPICAL PROCEDURE FOR SETTING THE TOOL'S TUBE NUT OBSTRUCTION DETECTION PARAMETERS

- Set the value for the obstruction torque just high enough so the tool will reliably overcome gear friction and make it past the obstruction checking zone.
- Check the torque of the stop on obstruction feature by measuring the actual "obstruction" torque the tube nut produces at the start of the rundown when the jaws are open (within the obstruction detection angle range). This can be done on a semi-tightened joint simulator set for a hard joint, while auditing the torque.
- Note: Gear friction in the tube-nut head can greatly affect the ability to reliably detect an obstruction.

GEN III Controller Parameters Affecting Tube Nut Obstruction Detection

Controller parameters for soft-start operation can be viewed and modified from the Controller->Edit Controller Parameter->Soft Start in ToolWare.

- Soft Start Dwell Speed
  - The Soft Start Dwell Speed is used during the check for obstructions.
  - Decreasing this can reduce the impact force when hitting an obstruction.
  - Attention: Care must be taken, increasing the speed above the default value. Too high of a value can greatly increase how hard the output will hit the obstruction.
  - Units: RPM of the tool output
  - Default: 90 RPM
  - Range: 1 to 500 RPM

GEN IV CONTROLLER PARAMETERS AFFECTING TUBE NUT OBSTRUCTION DETECTION

Controller parameters for tube nut operation can be viewed and modified from the Controller->Tool Setup->Disassembly and Tube-nut screen.

- Obstruction Check Angle
    - Angle of travel from the start of the fasting cycle where if an obstruction is detected inside this zone, the tool will stop and the fastening cycle will be aborted.
    - Units: Degrees of rotation of the output from home to where the output is closed.
    - Default value: 70 Degrees
    - Range: 0 to 180 Degrees

- Obstruction Check Speed Limit
    - Maximum speed the output will run during the check for obstructions.
    - Decreasing this can reduce the impact force when hitting an obstruction.
    - Attention: Care must be taken, increasing the speed above the default value. Too high of a value can greatly increase how hard the output will hit the obstruction.
    - Units: RPM of the tool output
    - Default: 90 RPM
    - Range: 1 to 200 RPM
- Obstruction Check Acceleration Limit
    - Rate at which the speed of the tool ramps to Obstruction Check Speed.
    - Units: kRPM/second
    - Default value: 0.5
    - Range: 0.1 to 10

Environmental
- Operating Temperature: 0°C to 32°C
- Storage Temperature: 0°C to 65°C
- Humidity:
  - 5% to 90% RH, Non-Condensing, for temperatures 0°C to 40°C
  - 5% to 60% RH, Non-Condensing, for temperatures 0°C to 65°C
- Maximum Altitude of Operation: 3000m
- Maximum decibel level: 73 dB(A)

Electrical
- Motor Type: BLDC
  - Motor Phase Voltage: 160 Volts Pulse DC @ Controller Supply Voltage of 120 RMS, or 320 Volts Pulse DC @ Controller Supply Voltage of 230 RMS
- Duty Cycle: The nutrunner tools are intended for intermittent operation with a recommended maximum duty cycle of 25% at 80% of maximum torque capacity on a standard B-joint application.

  Note: Actual maximum duty cycles are dependent upon several factors including: Ambient Temperature, Tool Selection, Joint Conditions, Operating Parameter Set Programming, and Operator Handling.

  For optimum Duty Cycle determination, please contact your authorized AcraDyne® Product Representative.

Physical
- 2000 Series Pistol Tools: 2.4 lbs/1.1 kg
- 2000 Series Angle Tools: 2.7 lbs/1.2 kg – 3.2 lbs/1.5 kg
- 2000 Series Straight Tools: 2.8 lbs/1.3 kg
- 2000 Series Tubenut Tools: 4.1 lbs/1.9 kg – 6.6 lbs/3 kg
- 2000 Series Hold and Drive Tools: 3.4 lbs/1.5 kg – 3.7 lbs/1.7 kg
- 2000 Series Mid-Exit Tools: 2.4 lbs/1.1 kg – 3.3 lbs/1.5 kg
- 2000 Series Riv-Nut Tools: 2.4 lbs/1.1 kg – 2.8 lbs/1.3 kg

Performance
- 2000 Series Tools
  - Torque range: 3.5 – 55 NM
  - Speed Range: 525 – 1,828 RPM