

# HRRF Series

## ClearPath Electric Drive

### User Manual

Manual Revision 0.00



These instructions are intended as an aid to qualified, licensed installers and service personnel for proper installation, adjustment and operation of this unit. Read and understand these instructions thoroughly before attempting installation or operation. Failure to follow these instructions may result in improper installation, adjustment, service or maintenance possibly resulting in fire, electrical shock, carbon monoxide poisoning, explosion, personal injury or property damage.

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[www.engineeredair.com](http://www.engineeredair.com)

## INTRODUCTION

Read this manual thoroughly before operating or servicing this unit.

If any errors or omissions are noted, please contact the nearest Engineered Air Technical Service Department.

To ensure warranty is honored, only qualified personnel should be employed for service or troubleshooting. If further information is required, please contact the nearest Engineered Air sales office.

The information in this manual should be used in conjunction with the unit function sheet(s) and the HRRF series Installation, Operation, and Maintenance manuals.

There are two sets of electrical drawings and function sheets provided with the appliance. One set is in an envelope which also contains the Operation, Installation and Maintenance manual(s). This package is for copying, then should either be returned to the appliance or stored in a safe place. The other set is attached to the control panel door and should never be removed.

The HRRF SERIES ELECTRIC DRIVE is designed to control only Engineered Air equipment. Various upgrades and improvements have been made over time. Always include any motor or controller model numbers and suffix letters for troubleshooting and/or replacement.

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## WARNINGS, CAUTIONS AND NOTICES

Warning, Caution and Notice statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent damage.

**⚠ WARNING:**

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

**⚠ CAUTION:**

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

**⚠ NOTICE:**

Indicates information considered important, but not hazard related.

**⚠ WARNING:**

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

**⚠ ⚠ WARNING:**

This unit is connected to high voltages. Electrical shock could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work must be performed by a qualified technician. Always disconnect and lock out power before servicing. **DO NOT** bypass any interlock or safety switches under any circumstances.

**⚠ CAUTION:**

All the remote wiring must be complete and functional before attempting to start the appliance.

**⚠ CAUTION:**

Adding a variable air volume system to equipment originally designed with constant air flow will void warranty, unless approved and recorded by Engineered Air.

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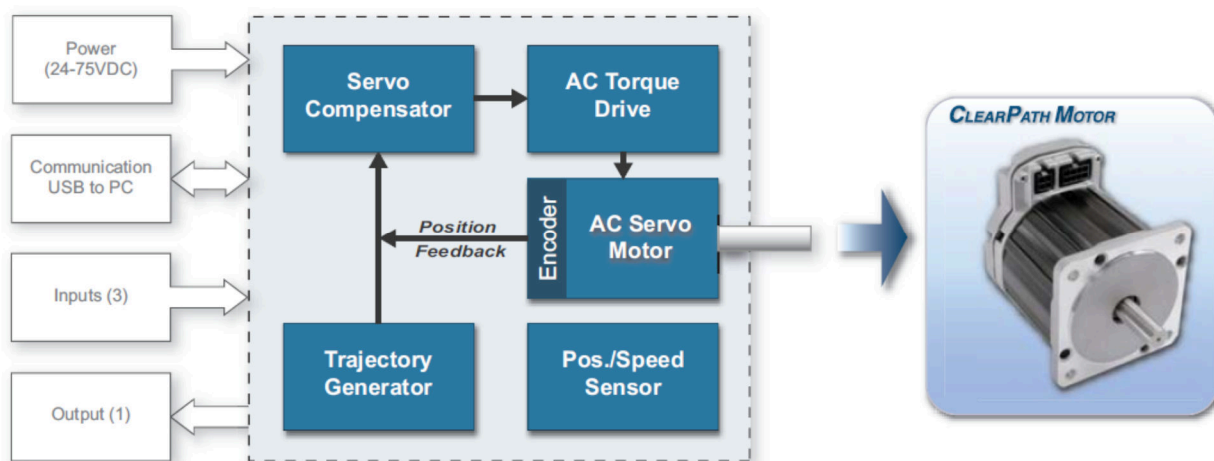
## OVERVIEW

The HRRF SERIES ELECTRIC DRIVE is an independent controller for Engineered Air HRRF style equipment designed to provide the majority of control requirements. The HRRF SERIES ELECTRIC DRIVE actuates a damper to direct airflow through the reclaim cassettes, to store the heat energy from the exhaust air stream, then on the next cycle, transfer it back to the supply air stream.

## HARDWARE INFORMATION

The CLEARPATH DAMPER ACTUATOR system includes an E-Drive model UA2-AB5 linear actuator, rated for up to 500 pounds of force, matched with a ClearPath MCPV NEMA 34 frame size motor c/w a built-in servo drive. Standard power is 120VAC single phase voltage supplying power to a 75VDC output power supply. Control Voltage for the motor is 24VDC. The system also includes a 120 VAC control system to operate the main relays and controls. Connection points exist to interface with the equipment controller or a Building Management System (BMS) for the external control of various operating modes.

Detailed instructions for the ClearPath Motor can be found in ClearPath MC/SD Manual Rev.3.22 at <https://tekninc.com/downloads/>.



## MODES OF OPERATION

### NORMAL OPERATION

Normal Operation Mode follows the standard dwell time of 70 seconds. Other dwell times of 50 and 90 seconds are also typical.

### RECIRCULATE MODE (OPTIONAL)

Activated by an external input from the equipment controller or BMS, Recirculation Mode causes the actuator to move the damper to the mid-stroke position. The damper remains stationary at the middle position until the input is de-energized.

**WARNING:**

Do NOT use Recirculate Mode as a “Lock Out” or safety. A loose connection or intermittent signal could cause the actuator to inadvertently initiate movement.

## ECONOMIZER MODE (OPTIONAL)

Activated by an external input from the equipment controller or BMS, Economizer Mode sets the dwell time between strokes of the actuator to 120 minutes. The 120-minute cycle is used to ensure the plates do not build up debris.

## DEFROST MODE (OPTIONAL)

Activated by an external input from the equipment controller or BMS, Defrost Mode sets the dwell time to 20 minutes at extend and 20 minutes at retract. After the input is de-energized, the damper cycle reverts to Normal Operation Mode.

## SEQUENCE OF OPERATIONS

On power-up with the HRRF service switch closed, the system starts an ON-delay for 15 seconds before it enters normal operating mode. Starting alternate modes through the BMS interface may suspend or alter the standard sequence.

Complete the **SYSTEM STARTUP PROCEDURE** prior to operation.

## STANDARD SEQUENCE

After completing a SYSTEM STARTUP, the actuator moves to the retracted position and starts the selected mode sequence. The actuator then extends toward the end limit at a preset speed until reaching the deceleration point. Once reaching the deceleration point, the actuator slows until reaching the end limit where the damper remains at rest until the dwell time expires.

While at rest, the servo motor remains powered to prevent movement of the damper, holding it against the seal. After the dwell time expires, the actuator starts to retract. The actuator continues to retract at the preset speed until reaching the deceleration point. Once reaching the deceleration point on the retract side, the actuator slows until reaching the retract end limit.

## ALTERNATE SEQUENCES

Various modes change the dwell times or sets the damper to mid-position. System faults prevent movement of the damper.

## SYSTEM STARTUP PROCEDURE

- 1) Timer Setup: Refer to the timer manufacturers data sheet for proper on-time/off-time setup.
  - a) Set the standard dwell time on Timer #1 to 70 seconds or an alternate dwell time if specified on the Unit Function.
  - b) Set the economizer dwell timer on Timer #2 to 120 minutes (If equipped).
  - c) Set the defrost dwell time on Timer #3 to 20 minutes (If equipped).
- 2) Power up the system: Disconnect switch “ON”; HRRF Service Switch “ON”; HRRF Enable “Closed” (If equipped).
- 3) Actuator initialization:

- a) After 1 second the first of two enable relays energizes to initiate the homing sequence. The actuator slowly moves to the fully retracted position.
- b) After a 15 second delay, the second of two enable relays energizes and enables the operation mode selection.
- 4) The system automatically starts a STANDARD SEQUENCE unless an ALTERNATE SEQUENCE was selected.

## SYSTEM OPERATING SEQUENCE

There are three operational inputs to the servo drive:

- 1) Enable: Allows the actuator to either cycle or move to the mid-position.
  - a) If the Enable input is de-energized while the actuator is in the extended position, the actuator will move to the retracted position.
  - b) If the Enable is de-energized while the actuator is in the retracted position, the actuator will stay retracted.
- 2) Cycle (One of three cycle timing modes are possible):
  - a) If input A is energized, the actuator will move to the extended position.
  - b) If Input A is de-energized, the actuator will move to the retracted position.
- 3) Mid-Position (If equipped): Overrides the Cycle input to move the damper to the re-circulation mode position and stay there until the input is de-energized.

## SYSTEM FAULTS

The tri-color status LED is located on the back of the Clearpath motor, under the silicon plug. A brief fault description is shown on the following page. Refer to the ClearPath User Manual for more details. <https://teknik.com/downloads/>

CLEARPATH STATUS LED DESCRIPTION

LED Code	Except. Type	Clear Exception	Description
No LED Activity	N/A	N/A	-No (or low) Power
Yellow – on solid	N/A	N/A	-Status Disabled
Yellow - flicker	N/A	N/A	-Status: Performing Commutation Start-Up
Green - flicker	N/A	N/A	-Status: Enabled
Yellow - 2 blinks	Shutdown	Toggle Enable	-User Stop -Motor Enable Conflict
Yellow - 3 blinks	Shutdown	Toggle Enable	-Max Bus Voltage Exceeded -Power Event Detected -Bus Under Operating Voltage
Yellow – 4 blinks	Shutdown	Toggle Enable	-Command Speed Too High -Tracking Error Limit Exceeded -RMS Torque Limit Exceeded -Excessive Bus Current
Yellow – 5 blinks	Shutdown	Toggle Enable	-Excessive Motor Temp
Yellow – 6 blinks	Shutdown	Toggle Enable	-Momentary Low Bus Voltage

LED Code	Except. Type	Clear Exception	Description
Yellow – 7 blinks	Shutdown	Toggle Enable	-Old Config File Version -Motor Phase Overload -Hard Stop Gave Way -Excessive Bus Current -Communication Startup Error
Yellow – strobe	Shutdown	Toggle Enable	-Velocity Set Too High -RES Change Rejected -Step Input Timing Error -Speed too High for RES -MagAlign Distance Error -MagAlign Direction Error -DSP Watchdog Restart
Green/Yellow alternating	Lockdown	Toggle Enable Input	-Travel Limits Violated (Lockdown) -Motor Enable Conflict
Green – 2 blinks	Warning	Auto-clears at start of next move if cause is no longer present	-Travel Limits Violated (Warning) -Move Buffer Underrun
Green – 3 blinks	Alert	Auto-clears when cause is no longer present	-Torque Saturation -Voltage Saturation -Over-speed -Over-Temp
Red Toggle	Motor Has Failed	Not Clearable	-Motor Has Failed

## CLEANING & MAINTENANCE

### DAMPER SECTION

The damper section has been engineered to reduce the amount of maintenance or service required. Damper controls are factory pre-set and tested before shipping.

### DAMPER SHAFT

The damper shaft(s) are supported by ball bearings that require a minimum amount of maintenance. All damper bearings are 2-bolt flange style, re-greaseable, general duty ball bearings. The loading and speed of rotation are well below the design limits of the ball bearings. An overall damper housing cleaning schedule should be developed and is directly dependent upon the environment in which the damper is operating.

A regular inspection and lubrication program should be established per the recommendations below. However, if the operating conditions are exceptionally dirty or dusty, lubrication intervals can be adjusted based on the condition of the purged grease.



## DAMPER SHAFT LUBRICATION SCHEDULE (MONTHS)

<b>Unit Size</b>	<b>Bearing Size</b>	<b>Inspection Interval</b>	<b>Relubrication Interval</b>
EB-500 thru EB-10000	1 in.	3	6
EB-10500 thru EB-20000	1 ½ in.	2	4

Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some examples of grease having these properties are:

Shell	Alvania No. 2
Mobil	Mobilith AW2 Mobilith SHC100
Texaco	Premium RB2
American	Rykon Premium 2

Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

## ELECTRIC ACTUATOR MAINTENANCE

The actuator electric cylinder is pre-lubricated and requires minimal servicing.

ELECTRIC ACTUATOR MAINTENANCE SCHEDULE

Dwell Time (seconds)	Duty Cycle (%)	Inspection Interval (months)	Relubrication Interval (months)
50	100	17	35
50	90	19	39
50	80	22	43
50	70	25	50
70	100	24	49
70	90	27	54
70	80	30	61
70	70	35	69
90	100	31	63
90	90	35	69
90	80	39	78
90	70	45	89

Refill with 2.5cc of grease per each re-lubrication interval. Generally, any ball-bearing grease can be used. NLGI consistency class 2 grease is recommended, as it's in compliance with DIN 51825 K2K and KP2K.

**NOTICE:**



Do not use greases with solid lubricant components (e.g. graphite or MoS2).

## CLEARPATH MOTOR ADJUSTMENT

The motor setpoints such as home (retracted) position, extended position, midpoint, speed, and acceleration can be adjusted using a laptop and the ClearPath-MC and -SD Series Motor Setup software, which can be downloaded at <https://teknik.com/downloads>.

## CLEARPATH ACTUATOR SETUP

The ClearPath software has an Auto-Tuning feature that allows easy setup of the damper actuator.

1. Disable all control input relays and timers, except the Enable contact and connect the laptop to the ClearPath motor.
2. Turn on the power and HRRF Service Switch and follow the Auto-Tune prompts on the ClearPath software by adding the following parameters:
  - a. Torque: Start with 80% and increase if required.
  - b. Max. Velocity: 1,030 RPM
  - c. Limited Rotation
  - d. I want to use power to move the mechanics
  - e. Run the Auto Tune Control and wait for it to complete.
  - f. Press “Disable” then “Next” on the Turn Servo Off screen.
  - g. When the Motor Main Configuration screen appears, Auto-Tune is complete.
3. Cycle power off, then back on to restart the ClearPath Drive.
  - a. Now on the ClearPath software, select “I have already run auto-tune”.
  - b. The parameters shown on the Normal Run screen can be adjusted if required, but will look similar to the following.

**NOTICE:**



**If the torque limit is exceeded and the motor goes into a warning mode, it is easiest to power it down and restart to clear the fault**

