

HRRF Series

NTN/Delta 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

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 most 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 **SERVO CONTROLLED DAMPER ACTUATOR** system includes the Programmable Servo Motor Drive, a Servo Motor, and the Actuator. Standard power is 200 to 230V single phase or three phase voltage. The system also includes a 120 VAC control system to operate the relays and controls. Connection points exist to interface with the equipment controller or a BMS for the external control of various operating modes.

The Delta Drive PLC controls the operation of the SERVO CONTROLLED DAMPER ACTUATOR SYSTEM. The Delta Drive executes commands as specified by the PLC wired inputs and the commands received from the on-board program. LED displays on the Delta PLC shows the status of the inputs and outputs.

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:
 - a) Disconnect switch "ON", the Delta Servo Drive briefly displays AL003 (Undervoltage)
 - b) 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 SHOM (System Home Mode). The actuator slowly moves to the fully extended position. The Servo Drive temporarily displays AL015 (Forward Limit Switch Error).
 - b) After a 15 second delay, the second of two enable relays energizes and enables the operation mode selection. The AL015 (Forward Limit Switch Error) is automatically cleared.
- 4) The system automatically starts a STANDARD SEQUENCE unless an ALTERNATE SEQUENCE was selected.

SYSTEM OPERATING SEQUENCE

There are four 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 Extend (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) Cycle Retract
- 4) 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 LED display indicates the status of the PLC and the communications to the actuator including fault and Alarm Codes. System fault alarms can be reset by pressing the Alarm Reset button in the HRRF control cabinet.

ALARM FAULT DESCRIPTIONS

| DISPLAY | FAULT NAME | DESCRIPTION | FAULT REMEDY |
|---------|----------------------------|---|---|
| AL001 | Overcurrent | Main Circuit current is higher than 1.5 multiple of motor's instantaneous maximum current | |
| AL002 | Overvoltage | Main circuit voltage has exceeded its maximum allowable value. | |
| AL003 | Undervoltage | Main circuit voltage is below its minimum specified value. | Occasionally seen on first power-up of the system. Wait for the complete start sequence to finish. (Up to 20 seconds) |
| AL006 | Overload | Servo motor and drive is overloaded | |
| AL009 | Position Error | Position Control Deviation | Contact Service |
| AL013 | ESTOP Activated | Emergency stop switch is activated | |
| AL014 | Reverse limit switch error | Reverse (rear) limit switch is activated | Check adjustment of rear limit sensor and retracted position of the damper |
| AL015 | Forward limit switch error | Forward (front) limit switch is activated | Check adjustment of front limit sensor and extended position of the damper |
| AL022 | Input power phase loss | One phase of the input power is lost. | Check wiring to main contactor |
| AL023 | Pre-overload warning | This warns that the servo motor and servo drive is going to overload. | |
| AL031 | U,V,W Wiring error | The wiring connections of U,V,W (for servomotor output) and GND (for grounding) are in error. | Check wiring to main unit |

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)

| Unit Size | Bearing Size | Inspection Interval | Relubrication Interval |
|------------------------|--------------|---------------------|------------------------|
| 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).

NTN MOTOR ADJUSTMENT

Some site adjustment may be necessary to ensure the damper adequately rests against the seal, or to accommodate ducting static pressure on site that may vary from factory testing.

KEYPAD SERVO ADJUSTMENT

1. Press "MODE" to enter the parameter list.
2. Press "SHIFT" to jump between parameter groups.
3. The up "▲" and down "▼" arrows can be used to scroll through the parameter menu.
4. Press "SET" to select the parameter and display its value. (Parameters such as P7-03 and P7-21 will have two pages to display the full value)
5. Use the arrow keys to change the first digit, then press "SHIFT" to select the next digit. Repeat until all digits are set.
6. Once the full value has been changed, press "SET" to save the parameter.
7. Press "MODE" to return to the normal operating screen.

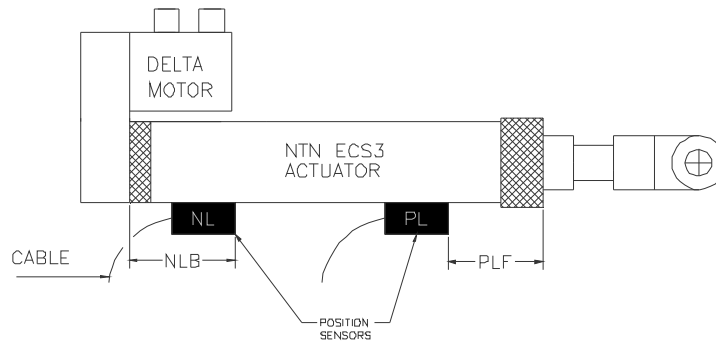
The following parameters may be adjusted:

| Parameter | Description | Default Setpoint |
|-----------|--------------------------------|------------------|
| P1-12 | Phase 1 Torque | 165 |
| P1-13 | Phase 2 Torque | 165 |
| P1-14 | Phase 3 Torque | 165 |
| | | |
| P5-05 | High Speed Homing | 200 |
| P5-06 | Low Speed Homing | 20 |
| P5-20 | Acceleration/Deceleration | 200 |
| P5-40 | Delay Time | 0 |
| P5-41 | Delay Time | 100 |
| P5-63 | Target Speed Index | 200 |
| P6-01 | Homing Definition Value | 0 |
| | | |
| P7-03 | Position 51 (Retracted) (SIGN) | 5500000 |
| P7-11 | Position 55 (Extended – Home) | 0 |
| P7-21 | Position 60 (Midpoint) (SIGN) | 2500000 |

NL AND PL SENSOR ADJUSTMENT

1. The starting point for the NL and PL sensors is as follows and can be adjusted to ensure the damper adequately rests against the seal.

| NL Limit Sensor (NLB) | PL Limit Sensor (PLF) |
|-------------------------------------|--------------------------------------|
| 3 5/8" (from back of Aluminum body) | 1 5/8" (from front of Aluminum body) |



2. Ensure that only the SHOM relay is connected and all other relayed inputs to the Delta PLC are disabled, and the damper actuator is fully retracted.
3. When the Servo Drive powers up, the actuator slowly moves to the fully extended position. Move the PL sensor towards the middle of the actuator, until the sensor LED turns "OFF", then move it back slightly until the LED turns back "ON" and tighten the sensor down in this position. In the retracted position, do the same procedure with the NL sensor.
4. Additional sensor adjustment may be necessary if Fault AL009 is occurring in either the extended or retracted position, or if the damper is bouncing off the seals.

ASDA-SOFT PROGRAM SERVO SETUP

The motor setpoints such as home position, extended position, midpoint, speed, and acceleration, can be adjusted using a laptop and the ASDA-SOFT software, which can be downloaded at <https://downloadcenter.deltaww.com/>. If the Delta PLC has been replaced, contact the Technical Service Department for the default setup program and a more detailed setup procedure.