RELIANCE ELECTRIC

DC3E Non-Regenerative DC Drive User Guide 1/4 to 2 HP, 115/230 VAC

M/N DC3N-12D-00-010-AI
M/N DC3N-12D-4X-010-AI

Instruction Manual D2-3452-1

Rockwell Automation

The information in this manual is subject to change without notice.

Throughout this manual, the following notes are used to alert you to safety considerations:

> **ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

IMPORTANT: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Only qualified personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, and/or service this equipment. Read and understand this instruction manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The user is responsible for conforming with all applicable local and national codes. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The control circuit is at line potential when the drive is energized. Use a non-metallic screwdriver when making adjustments to the circuit board potentiometers. Exercise extreme caution as hazardous voltage exists. Failure to observe these precautions could result in severe bodily injury or loss of life.

ATTENTION: It is possible for a drive to run at full speed as a result of a component failure. Please ensure that a master switch has been placed in the AC line to stop the drive in an emergency.

ATTENTION: Reduce the chance of an electrical fire, shock, or explosion by proper grounding, over-current protection, thermal protection and enclosure. Follow sound maintenance procedures.

ATTENTION: Starting and stopping with the start/stop terminals does not disconnect AC power in the stop position. A hardwired AC power disconnection switch must be mounted between the AC source and terminals L1 and L2. This is required, as the DC drive does not have an armature loop contactor. A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

ATTENTION: This Drive contains ESD (Electric Static Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing this assembly. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

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Specifications

Model	Max. Armature Current (Amps DC)	HP Range with 115 VAC Applied	HP Range with 230 VAC Applied
DC3N-12D-00-010-AI	10A	1/4 1	1/2 2
DC3N-12D-4X-010-AI	10A	1/4 1	1/2 2

Model	Style
DC3N-12D-00-010-AI	Open chassis
DC3N-12D-4X-010-AI	NEMA 4X/12
AC Line Voltage	115 VAC or 230 V AC, 50 or 60 Hz, 1 Phase
Maximum Allowable Symmetrical AC Line Current	5000 amps
Maximum AC Line Distribution kVA	
with 115 VAC Input	2.3 kVA
with 230 VAC Input	5.0 kVA
Armature Voltage	
With 115 VAC Input	0 90 VDC
With 230 VAC Input	0 180 VDC
Field Voltage	
115 VAC Input	50 VDC (F1 to L1); 100 VDC (F1 to F2)
230 VAC Input	100 VDC (F1 to L1); 200 VDC (F1 to F2)
Maximum Field Current	1 ADC

Adjustments and Application Data

Form Factor	1.37 at base speed
Service Factor	1
Maximum Speed Trimpot Range (% of rated voltage)	0 to 90%

Minimum Speed Trimpot Range (% of rated voltage)	0 to 50%
Torque Trimpot Maximum Setting (% of maximum current)	200%
IR Drop Compensation (% of rated armature voltage)	0 to 15%
Acceleration Time Range	0.5 - 10 seconds
Deceleration Time Range	0.5 - 10 seconds
Analog Input Signal Range (S1 to S2)	0 - 10 VDC or 4 - 20 mADC
Input Impedance (S1 to S2)	> 20 KOHMS
Speed Regulation (% of base speed with 95% load change)	
With Armature Feedback	1% or better*
With Tachometer Feedback	0.1%
Speed Range	80:1*
Tachometer Feedback Voltage Range	
	7 - 50 VDC per 1000 RPM
Maximum Current Load	150% for 1 minute
Safety Certification	UL Listed Component
	cUL Listed Component
	CE Approved Component
Weight	2.1 lbs (.9x3g)

Service Conditions

Maximum Allowable Elevation	
	3300 ft (1000 m) max without derating*
Vibration	0.5G max. @ 10 Hz; 0.1 G max. @ 50 Hz
Ambient Temperature Range	
Chassis Driven	10°C - 55°C
Enclosed Drives	10°C - 40°C
Non-condensing Relative Humidity	0% to 90%

* Derate the current by 1% for every 500 ft (90m) above 3300 ft up to 10,000 ft. (3000m)

Drive Ratings

Motor HP	Rated AC Line Amps	Input KVA	DC Armature Voltage	DC Armature Current (Amps)	Motor Field Voltage	Motor Field Current (Amps)
1/4	1.5	0.5	90	2.7	50	1
	1.5	0.5	90	2.7	100	1
1/3	5.9	0.7	90	3.5	50	1
	5.9	0.7	90	3.5	100	1
1/2	7.8	0.9	90	5	50	1
	3.7	0.8	180	2.5	100	1
	3.7	0.8	180	2.5	200	1
3/4	10.5	1.2	90	7.6	50	1
	5.6	1.3	180	3.8	100	1
	5.6	1.3	180	3.8	200	1
1	13	1.5	90	10	50	1
	7	1.6	180	5	100	1
	7	1.6	180	5	200	1
1.5	--	--	--	--	--	--
	10.1	2.3	180	7	100	1
	10.1	2.3	180	7	200	1
2	--	--	--	--	--	--
	12	2.8	180	9.2	100	1
	12	2.8	180	9.2	200	1
Efficiency (at maximum horsepower output)						92%

Dimensions and Layout

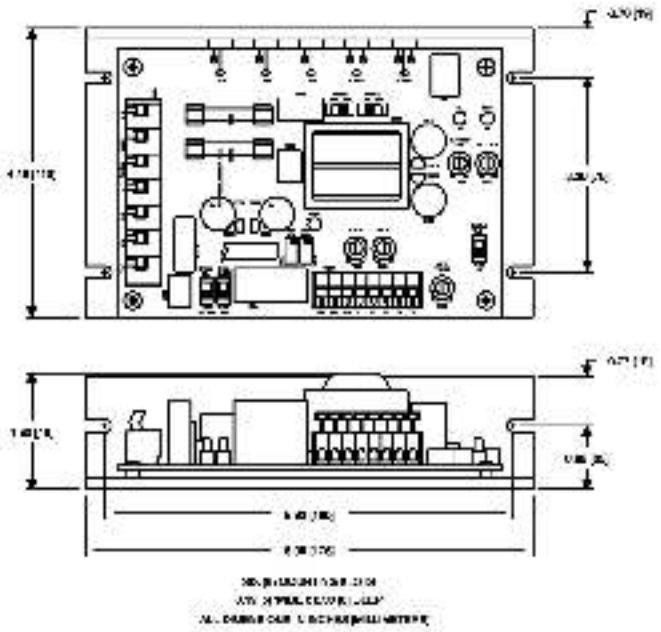
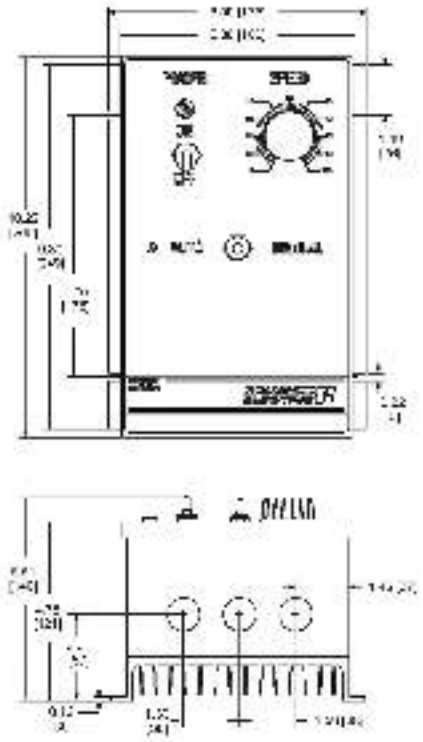


Figure 1. DC3N-12D-00-010-AI Dimensions



THREE 0.88 .22 KNOCKOUTS
ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 2. DC3N-12D-4X-010-AI Dimensions

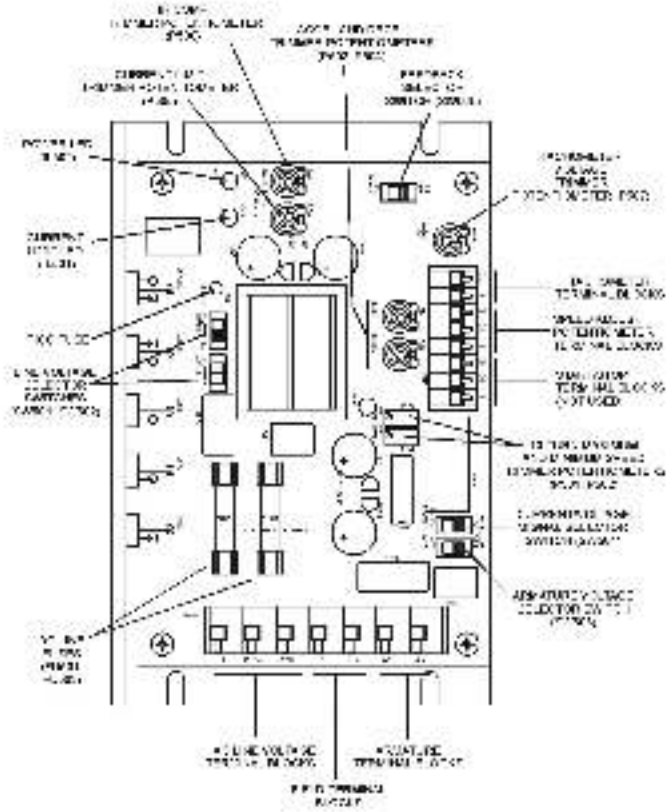


Figure 3. PC Board Layout

Installation

ATTENTION: Only qualified technical personnel, familiar with the construction and operation of this equipment and the hazards involved, should install, adjust, operate and/or service this equipment. Read and understand this instruction manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: This equipment is at line voltage when AC power is connected. Disconnect and lockout all ungrounded conductors of the AC power line before working on the unit. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The user is responsible for conforming with all applicable local and national codes. Failure to observe this precaution could result in severe bodily injury or loss of life.

Wiring

> **ATTENTION:** Circuit potentials are at 115 or 230 VAC above ground. To prevent the risk of injury or fatality, avoid direct contact with the printed circuit board or with circuit elements. Use a non-metallic screwdriver for the calibration trimpots.
>
> **ATTENTION:** Do not disconnect any of the motor leads from the drive unless power is removed or the drive is disabled. Opening any one motor lead may destroy the drive.

Use 18-24 AWG wire for speed adjust potentiometer wiring. Use 14–16 AWG wire for AC line (L1, L2) and motor (A1 and A2) wiring.

Shielding guidelines

> **ATTENTION:** If it is not practical to shield power conductors, Reliance Electric recommends shielding all logic-level leads. If shielding logic leads is not practical, use twisted-pair control wiring to minimize induced electrical noise.

ATTENTION: Under no circumstances should power and logic leads be bundled together. Induced voltage can cause unpredictable behavior in any electronic device, including motor controls.

As a general rule, Reliance Electric recommends shielding of all conductors if:

1) wire lengths exceed 4 inches and power and logic leads must be bundled together*; or
2) radiated and/or conducted noise must be minimized due to concerns about immunity or general compliance (CE, FCC, etc.)

It may be necessary to earth ground the shielded cable. If noise is produced by devices other than the drive, ground the shield at the drive end. If noise is generated by a device on the drive, ground the shield at the end away from the drive. Do not ground both ends of the shield.

If the device continues to pick up noise after grounding the shield, it may be necessary to add AC line filtering devices, or to mount the drive in a less noisy environment.

*Reliance Electric considers this an unfavorable condition and does not recommend bundling power and logic leads for any length.

Chassis drive

ATTENTION: This drive contains ESD (Electric Static Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing this assembly. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Mounting

Protect the drive from dirt, moisture, and accidental contact. Provide sufficient room for access to the terminal block and calibration trimpots.

Mount the drive away from other heat sources. Operate the drive within the specified ambient operating temperature range.

Prevent loose connections by avoiding excessive vibration of the drive.

Mount the drive with its board in either a horizontal or vertical plane. Four 0.19 inch (5 mm) wide slots in the chassis accept #8 pan head screws.

The chassis units do not have to be earth grounded. If you choose to ground the chassis, use a star washer beneath the head of at least one of the mounting screws to penetrate the anodized chassis surface and to reach bare metal.

Isolation transformer

> **ATTENTION:** Distribution system capacity above the maximum recommended system KVA requires the use of an isolation transformer, a line reactor, or other means of adding similar impedance to the drive power input. Failure to observe these precautions could result in damage to, or destruction of, the equipment

Input isolation transformers might be needed to help eliminate the following.

- Damaging line voltage transients from reaching the drive.
- Line noise from the drive back to the incoming power source.
- Damaging currents that could develop if a point inside the drive becomes grounded.

Observe the following guidelines when installing an isolation transformer:

- A power disconnecting device must be installed between the power line and primary of the transformer.
- If the power disconnecting device is a circuit breaker, the circuit breaker trip rating must be sized to deal with the in-rush current (10-12 times full load current) of the transformer.

Heat sinking

This DC3 drive model contains sufficient heat sinking in its original configuration. No additional heat sinking is necessary when installed in accordance with the guidelines specified in this instruction manual. The chassis plate acts as the thermal heatsink.

Fusing

> ⚠ **ATTENTION:** Most code requires that upstream branch protection be provided to protect input power wiring. Failure to observe this precaution could result in severe bodily injury or loss of life.

Install the required, user-supplied branch circuit protection fuses according to the applicable local, national, and international codes (e.g., NEC/CEC).

Line fusing

This DC3 drive model has 15-amp line fuses preinstalled on fuse holders 501 and 502 (FU501 and FU502). When replacing the line fuses, use fast acting fuses rated for 250 VAC or higher. See Figure 3, page 6, for fuse holder location, and Table 1 for recommended replacement line fuse sizes for specific application ratings.

Table 1. Recommended Line Fuse Sizes

90 VDC Motor Horsepower	180 VDC Motor Horsepower	Max. DC Armature Current (amps)	AC Line Fuse Size (amps)
1/20	1/10	0.5	3
1/13	1/8	0.8	3
1/8	1/4	1.5	5
1/6	1/2	1.7	5
1/4	1/2	2.6	8
1/3	3/4	2.5	8
1/2	1	3.0	10
3/4	1 1/2	7.6	15
1	2	10	15

Reliance Electric offers a 0.5A pico fuse (part number 050-0074) which protects the control board power supply transformer and logic.

Speed adjust potentiometer

Install the circular insulating disk between the mounting panel and the 10K ohm speed adjust potentiometer (see Figure 4). Mount the speed adjust potentiometer through a 0.38 inch (10 mm) hole with the hardware provided. Twist the speed adjust potentiometer wire to avoid picking up unwanted electrical noise. If potentiometer leads are longer than 18 inches (46 cm), use shielded cable.

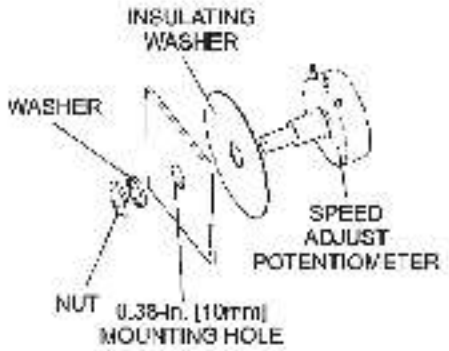


Figure 4. Speed Adjust Potentiometer

Alternate speed adjust potentiometer connections

Alternate speed adjust potentiometer connections may be found in the *Application Notes* section of this user guide.

IMPORTANT: The user may choose to install a 5K ohm speed adjust potentiometer; however, the MIN SPD and MAX SPD trimpots must be recalibrated if the 5K ohm potentiometer is used.

Cage-clamp terminals

Logic connections are made to cage-clamp terminals. To insert a wire into the cage-clamp terminal:

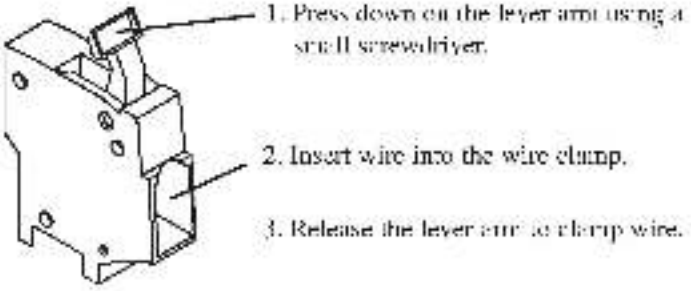


Figure 5. Cage-Clamp Terminal

Connections

ATTENTION: Do not connect this equipment with power applied. Failure to follow this directive may result in fire or serious injury.

ATTENTION: Starting and stopping with the start/stop terminals does not disconnect AC power in the stop position. A hardwired AC power disconnection switch must be mounted between the AC source and terminals L1 and L2. This is required, as the DC3 drive does not have an extreme loop protector. A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

ATTENTION: To provide the motor with overload protection, local, national, and international codes (e.g., NEC/CEC) require that a motor thermostat, internal to the motor, be installed or an electronic thermal motor overload relay, sized to protect the motor, be installed between the motor and the drives output terminals.

ATTENTION: Installation of a master power switch in the input line is required. This is the only way to disconnect power from the motor. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Motor

ATTENTION: To provide the motor with overload protection, local, national, and international codes (e.g., NEC/CEC) require that a motor thermostat, internal to the motor, be installed or an electronic thermal motor overload relay, sized to protect the motor, be installed between the motor and the drive's output terminals.

IMPORTANT: Reliance Electric drives supply motor voltage from A1 and A2 terminals. It is assumed throughout this manual that, when A1 is positive with respect to A2, the motor will rotate clockwise (CW) while looking at the output shaft protruding from the front of the motor. If this is opposite of the desired rotation, simply reverse the wiring of A1 and A2 with each other.

Connect a motor to terminals A1 and A2 as shown in Figure 6 (page 23). Ensure that the motor voltage rating is consistent with the drive's output voltage.

Power input

> **ATTENTION:** Installation of a master power switch in the input line is required. This is the only way to disconnect power from the motor. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Connect the AC line power leads to terminals L1 and L2 as shown in Figure 6 (page 23). Install a master power switch in the voltage input line, as shown in Figure 6. The switch contacts should be rated at a minimum of 250 volts and 200% of maximum drive current.

Field output

ATTENTION: Do not make any connections to F1 and F2 when using a permanent magnet motor. The field output is for shunt wound motors only. See Table 2 for field output connections.

Table 2. Field Output Connections

Line Voltage (VAC)	Approximate Field Voltage (VDC)	Connect Motor Field To
115	50	F1 and L1
115	100	F1 and F2
230	100	F1 and L1
230	200	F1 and F2

START/STOP pushbuttons

> **ATTENTION:** Starting and stopping with the start/stop terminals does not disconnect AC power in the stop position. A hardwired AC power disconnection switch must be mounted between the AC source and terminals L1 and L2. This is required, as the DC3 drive does not have an armature loop contactor. A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Pushbutton operation of the DC3N drive requires that a (momentarily) normally closed STOP pushbutton be wired to terminals B2 and B3 and a (momentarily) normally open START pushbutton wired to terminals B1 and B2. These pushbuttons must be used together and are not included with the drive. The B1, B2 and B3 terminals are on terminal block 302 (TB302).

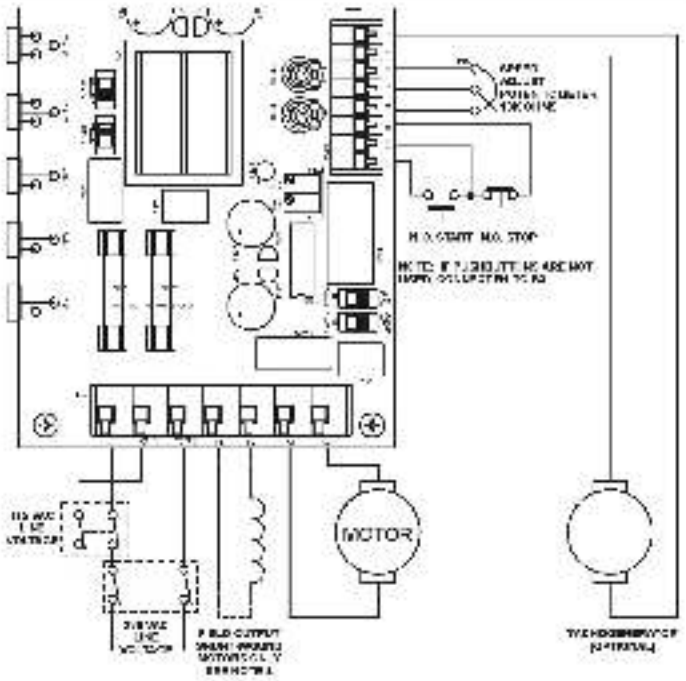
IMPORTANT: If the START/STOP pushbuttons are not used, wire a jumper between terminals B1 and B3 to bypass the latching circuit. The drive will then operate in a power up/run mode. See Figure 6 (page 23) for these switch connections.

Tachometer feedback

> **ATTENTION:** Applying the incorrect polarity to the tachometer can cause an overspeed condition. Make sure the positive (+) wire is connected to terminal T1 and the negative (–) wire is connect to terminal T2 when the motor is running in the forward direction. Failure to observe this precaution could result in bodily injury.

Using tachometer feedback improves speed regulation from approximately 1% of motor base speed to approximately 0..5% of motor base speed. Use tachometers rated from 7 VDC per 1000 RPM to 50 VDC per 1000 RPM. Connect the tachometer to terminals T1 and T2 of terminal block 502 (TB502). Place switch SW505 in the TACH position. See Figure 6 for tachometer connections.

IMPORTANT: The TACH trimpot must be adjusted prior to operating with tachometer feedback. Refer to the *Calibration* section (pg 48) for instructions on calibrating the TACH trimpot.



NOTES
1. L1 IS THE HOT TERMINAL.
2. L2/115 IS THE **NEUTRAL** TERMINAL FOR 115 VAC INPUT.
3. L2-230 IS THE **NEUTRAL** TERMINAL FOR 230 VAC INPUT.
4. TYPICAL FIELD CONNECTIONS SHOWN. REFER TO TABLE 2 (PAGE 26) FOR ALTERNATE FIELD CONNECTIONS.

Figure 8. Chassis Drive Connections

Voltage or current follower

Instead of using a speed adjust potentiometer, these DCSN model drives may be wired to follow an external input signal (see Figure 7 for connections). This input signal can be in the form of voltage (0-10 VDC) or current (4-20 mA). Because these drives have built in isolation the input signal can be either grounded or ungrounded. The signal slide switch must be set for current or voltage input, depending on the input signal type (see *Slide switches* section on pg 33).

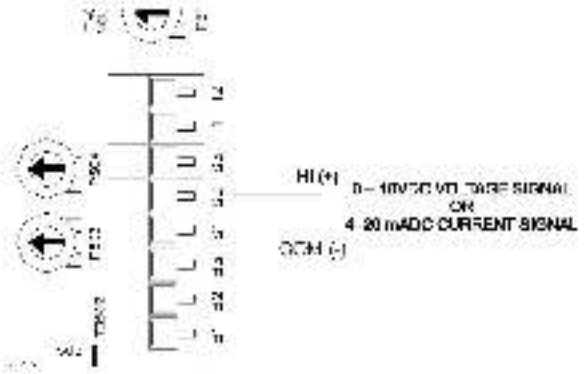


Figure 7. Chassis Drive Signal Follower Connection

Enclosed drive

Mounting

The NEMA 4X enclosed drive comes with 0.88 inch (22 mm) conduit knockout holes at the bottom of the enclosure. The units may be vertically wall mounted using the four 0.19 inch (5 mm) slotted holes on the attached heat sink. For motor loads less than 5 ADC, the drive may be bench mounted horizontally, or operated without mounting.

Mount the drive as follows:

1. Install the mounting screws.
2. For access to the terminal strip, turn the slotted screw on the front cover counterclockwise until it is free from the enclosure. The right side of the cover is hinged to the enclosure. Pull the slotted screw to open the enclosure.
3. Carefully remove the conduit knockouts by tapping them into the enclosure and twisting them off with pliers.
4. Install conduit hardware through the 0.88 inch (22 mm) knockout holes. Connect external wiring to the terminal block.
5. Grasp the slotted screw and tilt the front cover back into place. Avoid pinching any wires between the front cover and the enclosure.

6. Turn the slotted screw clockwise until tight to secure the front cover.
7. Set the POWER switch to the OFF position before applying the AC line voltage.

Heat sinking

The enclosed DCSN drive contains sufficient heat sinking in its basic configuration. No additional heat sinking is necessary when installed in accordance with the guidelines specified in this manual.

Line fusing

> **ATTENTION:** Most code requires that upstream branch protection be provided to protect input power wiring. Failure to observe this precaution could result in severe bodily injury or loss of life.

This DCSN model has 13-amp line fuses preinstalled on fuse holders 5F1 and 5F2 (FU5F1 and FU5F2). When replacing the line fuses, use fast acting fuses rated for 250 VAC or higher. See Figure 3, page 6, for fuse holder location, and Table 1, page 13, for recommended line fuse sizes.

Connections

ATTENTION: A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

ATTENTION: To provide the motor with overload protection, local, national, and international codes (e.g., NEC/CEC) require that a motor thermostat, internal to the motor, be installed or an electronic thermal motor overload relay, sized to protect the motor, be installed between the motor and the drives output terminals.

ATTENTION: Do not connect this equipment with power applied. Failure to observe this precaution may result in fire or serious injury.

Motor

> **ATTENTION:** To provide the motor with overload protection, local, national, and international codes (e.g., NEC/CEC) require that a motor thermostat, internal to the motor, be installed or an electronic thermal motor overload relay, sized to protect the motor, be installed between the motor and the drives output terminals.

IMPORTANT: Reliance Electric drives supply motor voltage from A1 and A2 terminals. It is assumed throughout this manual that, when A1 is positive with respect to A2, the motor will rotate clockwise (CW) while looking at the output shaft protruding from the front of the motor. If this is opposite of the desired rotation, simply reverse the wiring of A1 and A2 with each other.

Connect a motor to terminals A1 and A2 as shown in Figure 8 (page 3-1). Ensure that the motor voltage rating is consistent with the drive's output voltage.

Power input

Connect the AC line power leads to terminals L1 and L2 as shown in Figure 8 (page 31). Ensure that earth ground is connected to the green screw inside the case.

Field output

ATTENTION: Do not make any connections to F1 and F2 when using a permanent magnet motor.The field output is for shunt wound motors only. See Table 3 for field output connections.

Table 3. Field Output Connections

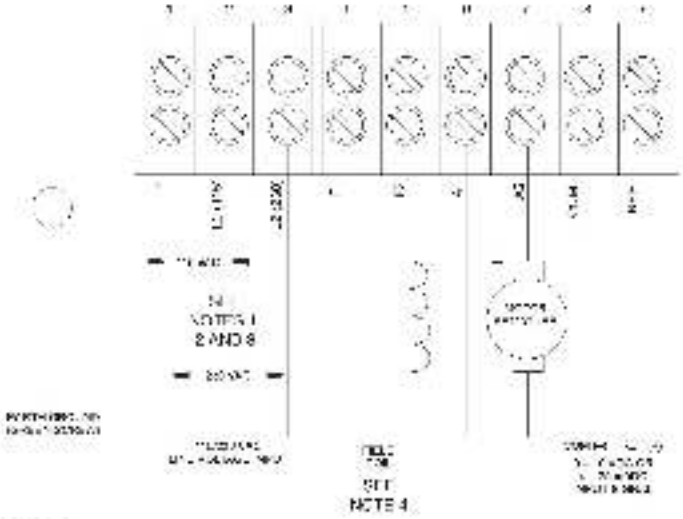
Line Voltage (VAC)	Approximate Field Voltage (VDC)	Connect Motor Field To	Terminal Numbers
115	50	F1 and L*	4 and 1
115	100	F1 and F2	4 and 5
230	100	F1 and L*	4 and 1
230	200	F1 and F2	4 and 5

Tachometer feedback

> **ATTENTION:** Applying the incorrect polarity to the tachometer can cause an overspeed condition. Make sure the positive (+) wire is connected to terminal T1 and the negative (–) wire is connect to terminal T2 when the motor is running in the forward direction. Failure to observe this precaution could result in bodily injury.

Using tachometer feedback improves speed regulation from approximately 1% of motor base speed to approximately 0..% of motor base speed. Use tachometers rated from 7 VDC per 1000 RPM to 50 VDC per 1000 RPM. Connect the tachometer to terminals T1 and T2 of terminal block 502 (TB502). Place switch SW505 in the TACH position. See Figure 6 (page 25) for tachometer connections.

IMPORTANT: The TACH trimpot must be adjusted prior to operating with tachometer feedback. Refer to the *Calibration* section (page 48) for instructions on calibrating the TACH trimpot.



NOTES:
1. L1 IS THE HOT TERMINAL.
2. L2/115 IS THE NEUTRAL TERMINAL FOR 115 VAC INPUT.
3. L2/230 IS THE NEUTRAL TERMINAL FOR 230 VAC INPUT.
4. TYPICAL FIELD CONNECTIONS SHOWN. REFER TO CABLE 21 (AGL 29) FOR ALTERNATE FIELD CONNECTIONS.

Figure 8. Enclosed Drive Connections

Voltage or current follower

Instead of using a speed adjust potentiometer, these DC3N series drives may be wired to follow an external input signal (see Figure 8 on page 31 for connections). This input signal can be in the form of voltage (0-10 VDC) or current (4-20 mA). Because these drives have built-in isolation, the input signal can be either grounded or ungrounded. The signal slide switch SW504 must be set for current or voltage input, depending on the input signal type (see *Slide switches* section on page 33).

Slide switches

ATTENTION: Change slide switch settings only when the drive is disconnected from the AC line voltage. Make sure both line voltage and motor switches are set to their correct position. If the switches are improperly set to a lower voltage position, the motor will not run at full voltage and may cause transformer damage. If the switches are improperly set to a higher voltage position, the motor will overspeed, which may cause motor damage or result in bodily injury or loss of life.

See Figure 9 on page 35 for all slide switch locations.

LINE VOLTAGE (SW501 and SW502)

Select the appropriate line voltage: 115 for 115 VAC line voltage, or 230 for 230 VAC line voltage.

MOTOR (SW503)

Select the maximum armature voltage: 90V for 90 VDC motors, or 180V for 180 VDC motors. If the AC line voltage is 115 VAC, the typical maximum output voltage is 90 VDC. If the AC line voltage is 230 VAC, the typical maximum output voltage is 180 VDC.

SIGNAL (SW504)

Select the input signal being used: CURR for 4-20 mADC current input signal, or VOLT for 0-10 VDC voltage input signal or speed adjust potentiometer input.

FEEDBACK (SW505)

> **ATTENTION:** The DC33N does not have tachometer loss or a field loss protection. Loss of field or tachometer will cause the motor to run at maximum uncontrolled speed. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Select the appropriate feedback option: ARMATURE for armature feedback, or TACH for tachometer feedback.

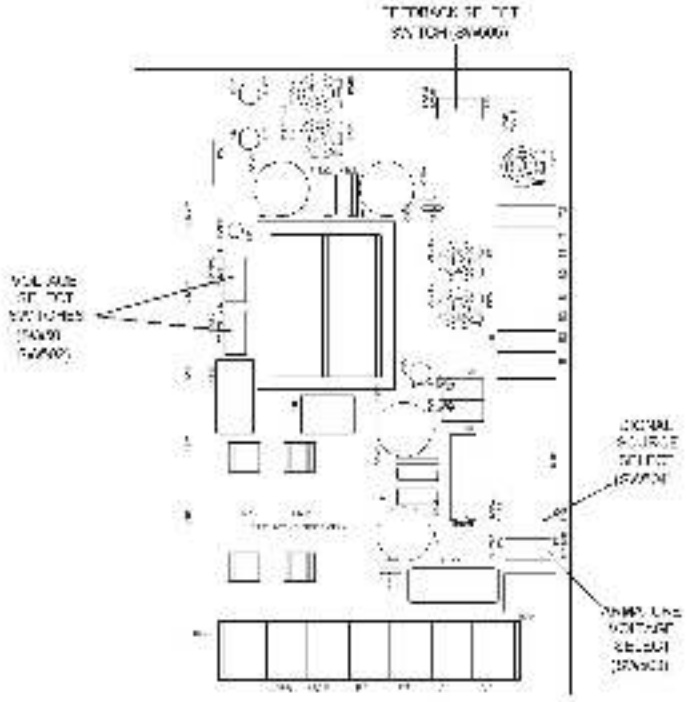


Figure 9. Slide Switches

Operation

ATTENTION: Change voltage switch settings only when the drive is disconnected from AC line voltage. Make sure both switches are set to their correct position. If the switches are improperly set to a lower voltage position, the motor will not run at full voltage and may cause damage to the transformer. If the switches are improperly set to a higher voltage position, the motor will overspeed, which may cause motor damage, or result in bodily injury or loss of life.

ATTENTION: Only qualified technical personnel, familiar with the construction and operation of this equipment and the hazards involved, should install, adjust, operate and/or service this equipment. Read and understand this instruction manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: All adjustments to these components should be made with power removed. Failure to observe this precaution could result in severe bodily injury or loss of life.

Before applying power (all models)

> **ATTENTION:** If the motor or drive does not perform as described, disconnect the AC line voltage immediately. Refer to the ***Troubleshooting*** section, page 61, for further assistance.

- Set LINE VOLTAGE SELECT switches SW501 and SW502 to either 115V or 230V to match the AC line voltage.
- Set ARMATURE VOLTAGE SELECT switch SW503 to either 90V or 180V to match the maximum armature voltage.
- Set SIGNAL SELECT switch SW504 to CURR if using a 4-20 mADC current signal; set it to VOLT if using a 0-10 VDC voltage signal or the speed adjust potentiometer.
- Verify that no conductive material is present on the printed circuit board.
- If using a 90 VDC or 130 VDC motor with 230 VAC line voltage, derate the nameplate motor speed and torque by at least 30%. The form factor will increase beyond the typical value, causing increased motor heating. Contact the factory for details.

Drive operation

Chassis drive operation

POWER ON start

SPEED REFERENCE: External signal or potentiometer
START/STOP control: POWER ON/OFF

IMPORTANT: It is necessary to wire a jumper between B1 and B3 if no START/STOP switches are to be used.

IMPORTANT: Line starting and line stopping (applying and removing AC line voltage) is recommended for infrequent starting and stopping of a drive only. When AC line voltage is applied to the drive, the motor accelerates to the speed set by the speed adjust potentiometer or analog input signal. When AC line voltage is removed, the motor coasts to a stop.

1. Turn the speed adjust potentiometer full counterclockwise (CCW), or set the external reference signal so that it is at its lowest level (0V or 4 mA).
2. Apply AC line voltage.

3. Slowly increase the speed reference signal. The motor slowly accelerates as the potentiometer is turned CW or the external speed reference is increased. Continue until the desired speed is reached.
4. Remove AC line voltage to coast the motor to a stop.

Pushbutton start/stop

SPEED REFERENCE: External signal or potentiometer
START/STOP control: PUSHBUTTON

> **ATTENTION:** Starting and stopping with the start/stop terminals does not disconnect AC power in the stop position. A hardwired AC power disconnection switch must be mounted between the AC source and terminals L1 and L2. This is required, as the DC3 drive does not have an armature loop contactor. A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

1. Turn the speed adjust potentiometer full counterclockwise (CCW), or set the external reference signal so that it is at its lowest level (0 VDC or 4 mA).

2. Apply AC line voltage.
3. Slowly increase the speed reference signal and press the START pushbutton. The motor accelerates as the potentiometer is turned CW or the external speed reference is increased. Continue until the desired speed is reached.
4. Press STOP pushbutton to coast motor to a stop.

Alternate Starting and Stopping Methods

ATTENTION: The DC5 Drive is intended to operate at a predetermined minimum speed. If the application requires zero speed operation, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

ATTENTION: For frequent starts and stops, use coasting to a stop with a STOP pushbutton, decelerating to minimum speed (shorting S2 and S1 to each other), or dynamic braking. Do not use any of these methods for emergency stopping. They may not stop a drive that is malfunctioning. Removing AC line power (both L1 and L2) is the only acceptable method for emergency stopping.

ATTENTION: Frequent starts and stops, coasting to a stop, decelerating to minimum speed, and dynamic braking produce high current. This may cause damage to motors, especially gearmotors, that are not properly sized for the application.

Minimum speed

The circuit shown in Figure 10 may be used to decelerate a motor to a minimum speed. Closing the switch between S1 and S2 decelerates the motor from set speed to a minimum speed determined by the MIN SPD trimpot setting. If the MIN SPD trimpot is set full CCW, the motor decelerates to zero speed when the switch between S1 and S2 is closed. The DECEL trimpot setting determines the rate at which the drive decelerates. By opening the switch the motor accelerates to set speed at a rate determined by the ACCEL trimpot setting.

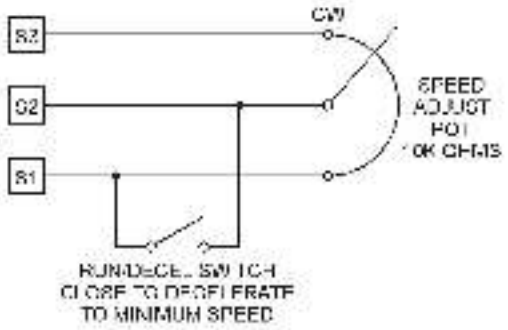


Figure 10. Run/Decelerate to Minimum Speed Switch

Dynamic braking

> **ATTENTION:** Wait for the motor to completely stop before switching it back to RUN. This will prevent high armature currents from damaging the motor.
>
> **ATTENTION:** Armature output can drift full ON with the switch in the BRAKE position and will be driven full ON if the minimum speed option is selected with the inhibit circuit. Failure to observe this precaution could result in severe bodily injury or loss of life.

Dynamic braking may be used to rapidly stop the motor (Figure 11, page 44). For the RUN/BRAKE switch, use a two-pole, two-position switch rated for at least 250 VDC and 150% of motor nameplate current. For the dynamic brake resistor, use a 40-watt minimum, high power, wirewound resistor, or refer to Table 4 on page 44.

Dynamic brake resistor value

Sizing the dynamic brake resistor depends on load inertia, motor voltage, and braking time. Use a lower-value, higher-wattage dynamic brake resistor to stop the motor more rapidly. Refer to Table 4 (page 44) for recommended dynamic brake resistor sizes.

Table 4. Minimum Recommended Dynamic Brake Resistor Values

Motor Armature Current Rating Wattage	Minimum Dynamic Brake Resistor Value	Minimum Dynamic Brake Resistor
Less than 2 ADC	1 ohm	1W
2–5 ADC	5 ohm	5W
5–5 ADC	10 ohm	20W
5–10 ADC	20 ohm	40W

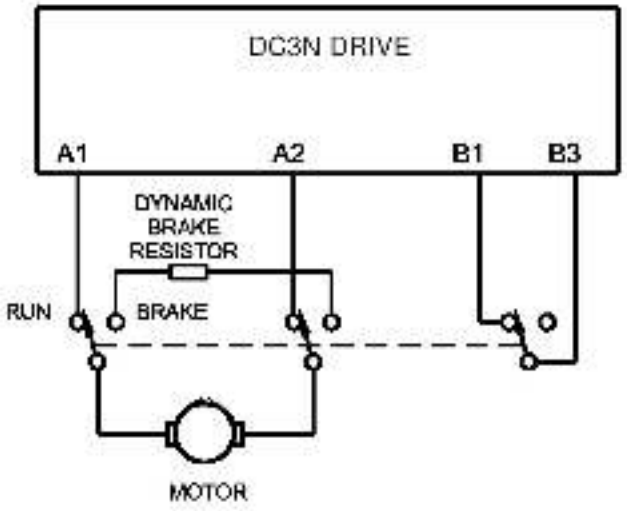


Figure 11. Dynamic Brake Connection

Enclosed drive operating modes

> **ATTENTION:** If you run the drive in AUTO mode, you must recalibrate the MIN SPD trimpot to offset any motor drift caused by the input signal. Refer to the *Calibration* section (page 48) for more information.

The mode selector switch on the drive, mounted on its cover, provides the option of operating in either MANUAL (mounted speed potentiometer) or AUTO (external signal source) mode.

Manual mode

Set the mode selector switch to MANUAL if you wish to control the motor speed using the speed adjust potentiometer mounted on the drive cover. In MANUAL mode, the motor speed is controlled by the speed adjust knob located on the drive cover. Setting the speed adjust knob to zero causes the motor to run at the minimum speed dictated by the MIN SPD trimpot setting. Refer to the *Calibration* section (page 48) for information on calibrating the MIN SPD trimpot. Set SIGNAL SELECT switch SW504 to VOLT when in manual mode.

Auto mode

IMPORTANT: If you run the drive in AUTO mode using an external current signal, you must recalibrate the MIN SPD trimpot to offset any motor drift caused by the input signal.

IMPORTANT: When switching between MANUAL and AUTO (0-10 VDC) modes, you must balance the MIN SPD trimpot setting for both operating modes.

Set the mode selector switch to AUTO if you wish to follow an external signal, independent of the speed adjust knob setting. In AUTO mode, the drive will control motor speed in proportion to either a 0 – 10 VDC analog voltage or a 4 – 20 mADC current signal. You must set select switch SW504, SIGNAL SOURCE SELECT, to either VOLTAGE or CURRENT, depending on your signal input.

Enclosed drive operation

ATTENTION: For frequent starts and stops, short the inhibit terminals, decelerate to a minimum speed, or apply a dynamic brake to the motor. Do not use any of these methods for emergency stopping. They may not stop a drive that is malfunctioning. Removing AC line power (both L1 and L2) is the only acceptable method for emergency stopping.

ATTENTION: Frequent starting and stopping can produce high torque. This may cause damage to motors, especially gearmotors that are not properly sized for the application.

To run the motor:

1. Set the speed adjust potentiometer to "0" (full CCW).
2. Apply AC line voltage.
3. Set the POWER switch to the ON position.
4. Slowly advance the speed adjust potentiometer clockwise (CW), or increase the external reference signal. The motor will slowly accelerate to follow the speed adjust potentiometer or external reference signal. Continue until the desired speed is reached.

To stop the motor:

1. Rotate the speed adjust potentiometer to zero (full CCW), or set the external reference signal to zero. The motor will slowly decelerate until minimum speed is reached.
2. Set the POWER switch on the front panel to OFF.

Calibration

ATTENTION: Dangerous voltages exist on the drive when it is powered, and up to 30 seconds after power is removed and the motor stops. When possible, disconnect the voltage input from the drive before adjusting the trimpots. If the trimpots must be adjusted with power applied, use insulated tools and the appropriate personal protection equipment. BE ALERT. High voltages can cause serious or fatal injury.

ATTENTION: The control circuit is at line potential when the drive is energized. Exercise extreme caution as hazardous voltage exists.

These DC3N drives have seven user adjustable trimpots. Each drive is factory calibrated to its maximum horsepower rating. **Readjust the calibration trimpot settings to accommodate lower horsepower motors.**

All adjustments increase with CW rotation, and decrease with CCW rotation. Use a non-metallic screwdriver for calibration. Each trimpot is identified on the printed circuit board. Refer to Figure 12 for trimpot locations.

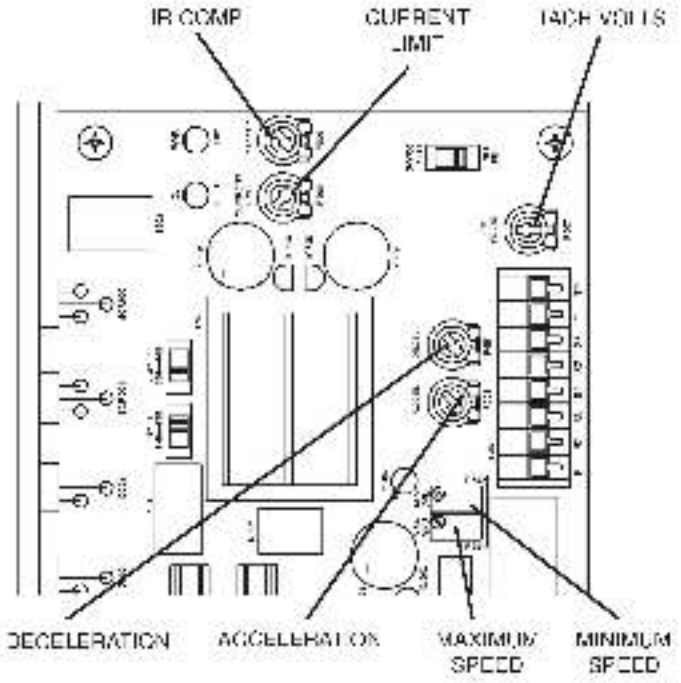


Figure 12. Calibration Trimpot Layout

Drive Calibration Procedure

Prepare the DC3N drive for calibration as follows. This procedure applies to both chassis and enclosed drives.

1. Ensure that no power is applied to the drive.
2. If you use an enclosed drive, you must open the drive cover to gain access to the trimpots. Turn the slotted screw on the front cover counterclockwise until it is free from the enclosure. The right side of the cover is hinged to the enclosure. Pull the slotted screw to open the enclosure.
3. Set all trimpots except CURRENT LIMIT and TACH VOLTS full counterclockwise (CCW).
4. Set the CURRENT LIMIT trimpot full clockwise (CW).
5. Make no adjustment to the TACH VOLTS trimpot, unless tachometer feedback is used. If you use tachometer feedback, set the TACH VOLTS trimpot to the center of travel (12 o'clock position).
6. Adjust the trimpots in the following order:
   - MIN SPD
   - MAX SPD
   - CURRENT LIMIT
   - IR COMP
   - ACCEL
   - DECEL
   - TACH VOLTS (if used)

MIN SPD

> **ATTENTION:** The DC3N Drive is intended to operate at a predetermined minimum speed. If the application requires zero speed operation, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

IMPORTANT: If you run the drive in AUTO mode, you must recalibrate the MIN SPD trimpot to offset any motor drift caused by the input signal.

The MIN SPD setting determines the motor speed when the speed adjust potentiometer or input signal is set for minimum speed. It is factory set to zero speed.

To calibrate MIN SPD:

1. Turn the speed adjust potentiometer full CCW or set the external reference signal for minimum voltage or current.
2. Adjust the MIN SPD trimpot until the motor has stopped, or is running at the desired minimum speed.

MAX SPD

The MAX SPD setting determines the motor speed when the speed adjust potentiometer or external reference signal is set for maximum speed. It is factory set for maximum rated motor speed.

To calibrate MAX SPD:

1. Set the MAX SPD trimpot full CCW.
2. Turn the speed adjust potentiometer full CW or set the external reference signal for maximum speed.
3. Adjust the MAX SPD trimpot until the desired maximum motor speed is reached.

IMPORTANT: Check the MIN SPD and MAX SPD settings after recalibrating to verify that the motor runs at the desired minimum and maximum speeds.

IMPORTANT: If operation requires switching between AUTO and MANUAL modes, the user should verify calibration for both modes if required.

CURRENT LIMIT

> **ATTENTION:** Although the CURRENT LIMIT trimpot is set to 120% of the maximum drive current rating, continuous operation at that rating may damage the drive or motor.

The CURRENT LIMIT setting determines the maximum armature current output of the drive. It is factory set at 120% of maximum drive current. If you use a lower horsepower motor, CURRENT LIMIT must be recalibrated for the motor.

To calibrate CURRENT LIMIT, refer to Figure 13 on page 59, or use the following procedure:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the CURRENT LIMIT trimpot to minimum (full CCW).
3. Lock the motor armature shaft. Be sure that the motor is firmly mounted in order to withstand torque generated by the motor.
4. Connect power to the drive. The motor should remain stopped.
5. Set the speed adjust potentiometer or external reference signal for maximum speed.

6. Adjust the CURRENT LIMIT trimpot slowly CW until the armature current is 150% of motor rated current.
7. Set the speed adjust potentiometer or external reference signal for zero speed and remove power.
8. Remove the lock on the motor armature shaft.

IR COMP

The IR COMP setting determines the degree to which motor speed is held constant as the motor load changes. It is factory set at optimum motor regulation for the highest motor horsepower.

To calibrate IR COMP, refer to Figure 13 on page 59, or use the following procedure:

1. Turn the IR COMP trimpot full CCW.
2. Set the speed adjust potentiometer or external reference signal until the motor runs at midspeed without load (for example, 900 RPM for an 1800 RPM motor). A hand held tachometer may be used to measure motor speed.
3. Load the motor armature to its full load armature current rating. The motor should slow down.
4. While keeping the load on the motor, rotate the IR COMP trimpot until the motor runs at the speed measured in step 2.

Approximate IR COMP calibration:
If the motor does not maintain set speed as the load changes, gradually rotate the IR COMP trimpot CW. If the motor oscillates (overcompensation), the IR COMP trimpot may be set too high (CW). Turn the IR COMP trimpot CCW to stabilize the motor speed.

ACCEL

The ACCEL setting determines the time the motor takes to ramp to a higher speed, within the limits of available torque. The ACCEL setting is factory set for its fastest acceleration time (full CCW).

To calibrate ACCEL:

1. Set the speed adjust potentiometer or external reference signal for minimum speed. The motor should run at minimum speed.
2. Set the speed adjust potentiometer or external reference signal to maximum speed, and measure the time it takes the motor to go from minimum to maximum speed.
3. If the time measured in step 2 is not the desired acceleration time, turn the ACCEL trimpot CW for a slower acceleration time, or CCW for a faster acceleration time. Repeat steps 1 through 3 until the acceleration time is correct.

DECEL

The DECEL setting determines the time the motor takes to ramp to lower speed, within the limits of available torque. The DECEL setting is factory set for its fastest deceleration time (full CCW).

To calibrate DECEL:

1. Set the speed adjust potentiometer or external reference signal for maximum speed. The motor should run at maximum speed.
2. Set the speed adjust potentiometer or external reference signal for minimum speed and measure the time it takes the motor to go from maximum to minimum speed.
3. If the time measured in step 2 is not the desired deceleration time, turn the DECEL trimpot CW for a slower deceleration time, or CCW for a faster deceleration time.

Repeat steps 1 through 3 until the deceleration time is correct.

TACH VOLTS

ATTENTION: Applying the incorrect polarity to the tachometer can cause an overspeed condition. Make sure the positive (+) wire is connected to terminal T1 and the negative (-) wire is connect to terminal T2 when the motor is running in the forward direction. Failure to observe this precaution could result in bodily injury.

ATTENTION: The control circuit is at line potential when the drive is energized. Use a non-metallic screwdriver when making adjustments to the circuit board potentiometers. Exercise extreme caution as hazardous voltage exists. Failure to observe these precautions could result in severe bodily injury or loss of life.

IMPORTANT: Calibrate the TACH VOLTS setting only when a tachometer is used. The TACH VOLTS setting, like the IR COMP setting, determines the degree to which the motor speed is held constant as the motor load changes.

To calibrate the TACH VOLTS trimpot:

1. Disconnect power from drive.
2. Connect the tachometer to T1 and T2. The polarity is (+) for T1 and (-) for T2 when the motor is running in the forward direction.

3. Set switch S05 (SWS05) to ARM for armature feedback.
4. Apply power to drive.
5. Set the speed adjust potentiometer or external reference signal to maximum speed.
6. Measure the armature voltage across A1 and A2 using a voltmeter.
7. Disconnect power from drive.
8. Set the speed adjust potentiometer or external reference signal to minimum speed.
9. Set SWS05 to TACH for tachometer feedback.
10. Set the IR COMP trimpot full CCW.
11. Set the TACH VOLTS trimpot full CW.
12. Apply power to drive.
13. Set the speed adjust potentiometer or external reference signal to maximum speed.
14. Adjust the TACH VOLTS trimpot until the armature voltage is the same value as the voltage measured in step 6.

Check that the TACH VOLTS trimpot is properly calibrated. The motor should run at the same set speed when SWS05 is set to either armature or tachometer feedback.

Figure 19. Typical CURRENT LIMIT and IR COMP Settings for DC3N drive (actual settings may vary with each application)

Application Notes

ATTENTION: The equipment is at line voltage when AC power is connected. Disconnect and lockout all ungrounded conductors of the AC power line. Failure to observe this precaution could result in severe bodily injury or loss of life.

This section shows typical chassis drive connections.

Multiple fixed speeds

Replace the speed adjust potentiometer with series resistors with a total series resistance of 10K ohms (Figure 14). Add a single pole, multi-position switch with the correct number of positions for the desired number of fixed speeds.

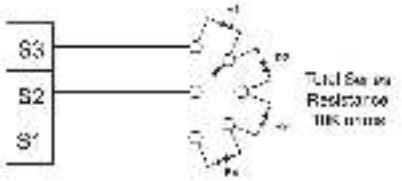


Figure 14. Multiple Fixed Speeds

Adjustable speeds using potentiometers in series

Replace the speed adjust potentiometer with a single pole, multi-position switch, and two or more potentiometers in series, with a total series resistance of 10K ohms. Figure 15 shows a connection for fixed high and low speed adjust potentiometers.

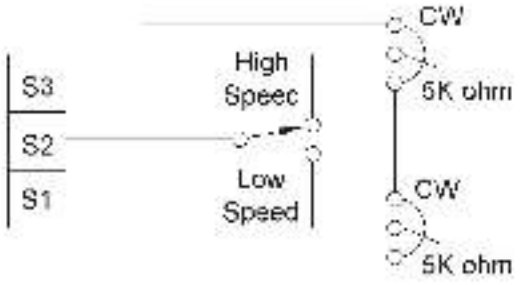


Figure 15. Adjustable Fixed Speeds Using Potentiometers in Series

Independent adjustable speeds

Replace the speed adjust potentiometer with a single pole, multi-position switch, and two or more potentiometers in parallel, with a total parallel resistance of 10K ohms. Figure 16 shows the connection of two independent speed adjust potentiometers that can be mounted at two separate operating stations.

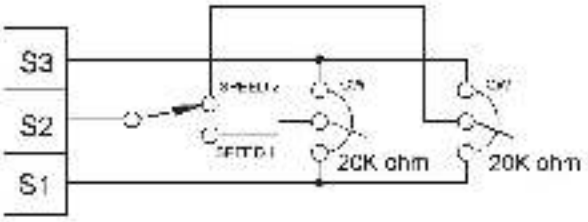


Figure 16. Independent Adjustable Speeds

Reversing

> **ATTENTION:** The DC3 Drive is intended to operate at a predetermined minimum speed. If the application requires zero speed operation, the user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audible or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

A dynamic brake may be used when reversing the motor direction (Figure 17, page 64). Use a three-pole, three-position switch rated for at least the maximum DC armature voltage and maximum braking current. Wait for the motor to stop completely before switching it to either the forward or reverse direction. See the *Dynamic Braking* section on page 43 for sizing the dynamic brake resistor.

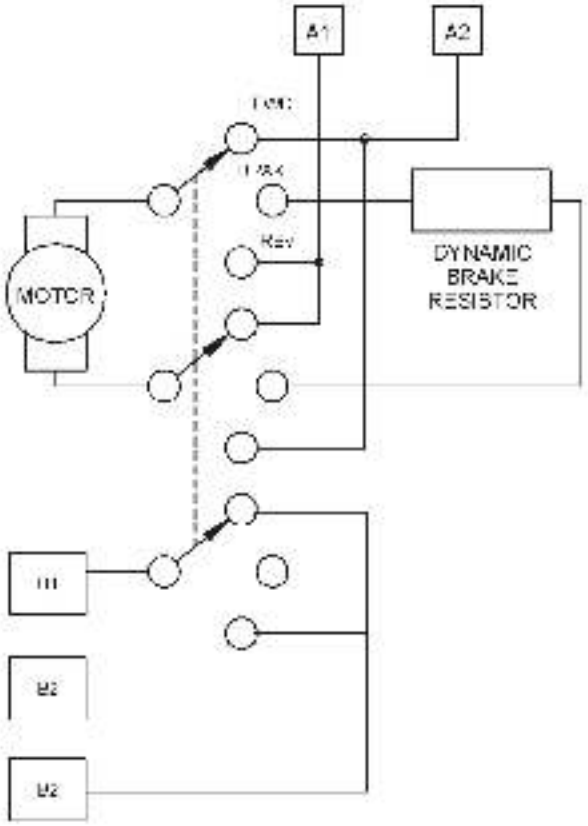


Figure 17. Reversing Circuit Connection

RUN/JOG switch

> **ATTENTION:** Starting and stopping with the start/stop terminals does not disconnect AC power in the stop position. A hardwired AC power disconnection switch must be mounted between the AC source and terminals L1 and L2. This is required, as the DC3 drive does not have an armature loop contactor. A single fault like a power device short may cause motor rotation when in the stop mode. The user is responsible for assuring safe conditions for operating personnel by providing suitable guards, audio or visual alarms, or other devices. Failure to observe these precautions could result in bodily injury.

Using a RUN/JOG switch is recommended in applications where quick stopping is not needed and frequent jogging is required. Use a single pole, two position switch for the RUN/JOG switch, and a single pole, normally closed, momentary operated pushbutton for the JOG pushbutton.

Connect the RUN/JOG switch and the JOG pushbutton as shown in Figure 16, page 66. When the RUN/JOG switch is set to JOG, the motor decelerates at minimum speed (minimum speed is determined by the minimum speed trimpot setting). Press the JOG pushbutton to jog the motor. Return the RUN/JOG switch to RUN for normal operation.

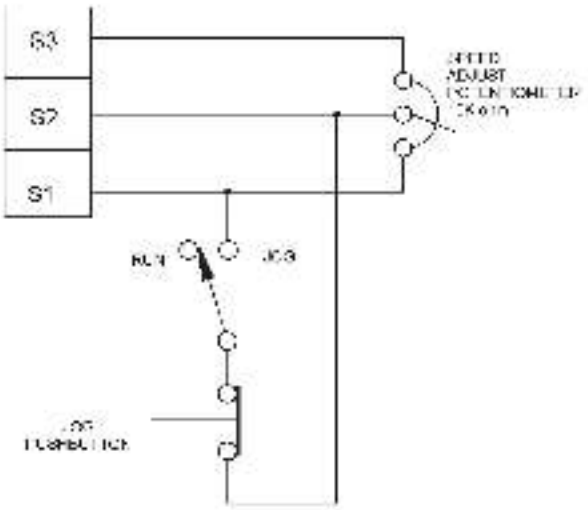


Figure 16. RUN/JOG Switch Connection to Speed Adjust Potentiometer

Troubleshooting

> **ATTENTION:** This equipment is at line voltage when AC power is connected. Disconnect and lockout all ungrounded conductors of the AC power line before working on the unit. Failure to observe this precaution could result in severe bodily injury or loss of life.

Before troubleshooting

Perform the following steps before starting any procedure in this section:

- Disconnect AC line voltage from the drive.
- Check the drive closely for damaged components.
- Check that no conductive or other foreign material has become lodged on the printed circuit board.
- Verify that every connection is correct and in good condition.
- Verify that there are no short circuits or grounded connections.
- Check that the voltage selection switch settings match the AC line and output voltages.
- Check that the drive's rated armature and field outputs are consistent with the motor ratings.
- Check that the line fuses are properly sized and not blown.

Diagnostic LEDs

DC3N Series drives are equipped with two diagnostic LEDs (see Figure 19 for LED location). The red CURRENT LIMIT LED turns on whenever the drives reaches current limit and stays off whenever the drive is not in current limit (normal operation). The green POWER LED turns on whenever AC line voltage is applied to the drive and stays off whenever there is no AC line voltage applied to the drive.

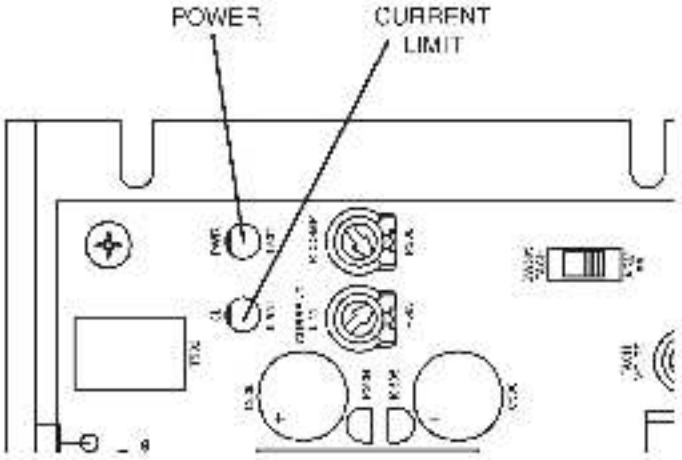


Figure 19. Diagnostic LED Locations

Problem	Possible Causes	Suggested Solutions
Line fuse blows	1. Line fuses are the wrong size.	1. Check that line fuses are correct for motor size (page 13).
	2. Motor cable or armature is shorted to ground.	2. Check motor cable and armature for shorts.
	3. Nuisance tripping caused by a combination of ambient conditions and high-current spikes (i.e. reversing).	3. Add a blower to cool the drive components, or decrease the duty cycle of the system.
	4. Field circuit is open (shunt wound motors only).	4. Send drive to Reliance Electric repair department.

Problem	Possible Causes	Suggested Solutions
Line fuse does not blow, but motor does not run	1. Speed adjust potentiometer, voltage external reference signal, or current external reference signal set to zero speed.	1. Increase the speed adjust potentiometer, voltage, or current setting.
	2. Speed adjust potentiometer, voltage or current external reference signal not connected to drive input properly; connections are open.	2. Check connections to input. Verify that connections are not open.
	3. S2 is shorted to S1.	3. Remove short.
	4. Drive is in current limit mode.	4. Verify that motor is not jammed. Increase CURRENT LIMIT setting if it is set too low.

Problem	Possible Causes	Suggested Solutions
Line fuse does not blow, but motor does not run (cont.)	5. Drive is not receiving AC line voltage.	5. Apply AC line voltage to L1 and L2.
	6. Motor is not connected.	6. Connect motor to A1 and A2.
	7. B1 not connected to B3 (if START/STOP pushbuttons are not used).	7. Connect B1 to B3.
	8. Motor is stalled because of incorrect field connections (shunt wound motors only).	8. Verify proper field connections.

Problem	Possible Causes	Suggested Solutions
Motor runs too fast at set speed	1. MIN SPD and MAX SPD settings are too high.	1. Recalibrate MIN SPD and MAX SPD.
	2. Motor field connections are loose (shunt wound motors only).	2. Check motor field connections.
	3. Motor is demagnetized.	3. Check for proper braking technique and method by which power is cycled.
	4. Tachometer leads are reversed.	4. Check tachometer connections.

Problem	Possible Causes	Suggested Solutions
Motor runs too slow or too fast.	1. Switches are set incorrectly.	1. Verify all switch settings.
	2. MIN SPD and MAX SPD not calibrated.	2. Calibrate MIN SPD and MAX SPD.
	3. Motor field not properly connected (shunt wound motors only).	3. Verify motor field connections.
	4. TACH VOLTS trimpot not calibrated properly.	4. Recalibrate TACH VOLTS trimpot.
	5. Motor is demagnetized.	5. Check for proper braking technique and method by which power is cycled.

Problem	Possible Causes	Suggested Solutions
Motor will not reach the desired speed	1. MAX SPD setting is too low.	1. Increase MAX SPD setting.
	2. IR COMP setting is too low.	2. Increase the IR COMP setting.
	3. Motor is overloaded.	3. Check motor load. Resize the motor if necessary.
Motor pulsates or surges under load	1. IR COMP is set too high.	1. Adjust the IR COMP setting slightly CCW until the motor speed stabilizes.
	2. Motor "bounding" in and out of torque limit.	2. Make sure motor is not undersized for load; adjust CURRENT LIMIT trimpot.

Block Diagram

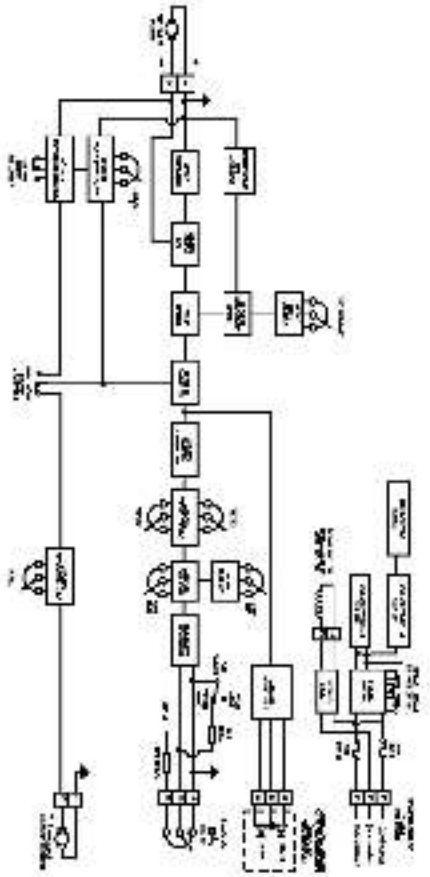


Figure 20. DC3N Block Diagram

Terminal descriptions

Chassis drive terminals

L1 (TB501)
Hot terminal for AC line voltage.

L2/115 (TB501)
Neutral terminal for 115 VAC line voltage.

L2/230 (TB501)
Neutral terminal for 230 VAC line voltage.

F1, F2 (TB501)
Field coil connections (shunt wound motors only). Field voltage is 100/200 VDC.

A1, A2 (TB501)
Connections to motor.

B1, B2, B3 (TB502)
Connections for START/STOP pushbuttons.

S1, S2, S3 (TB502)
Connections for speed adjust potentiometer or external reference signal.

T1, T2 (TB502)
Connections to optional external tachometer.

Enclosed drive terminals

L1 (terminal 1)
Hot terminal for AC line voltage.

L2/115 (terminal 2)
Neutral terminal for 115 VAC line voltage.

L2/230 (terminal 3)
Neutral terminal for 230 VAC line voltage.

F1, F2 (terminals 4 and 5)
Field coil connections (shunt wound motors only). Field voltage is 100/200 VDC.

A1, A2 (terminals 6 and 7)
Connections to motor.

COM (terminal 8)
Circuit common (-) for external reference signal.

REF (terminal 9)
Signal (+) lead for external reference signal.

CE Compliance

Reliance Electric Corporation hereby certifies that its DC3N series drives have been approved to bear the "CE" mark provided the conditions of approval listed in Exhibit "A" have been met by the end user.

The DC3N series has been tested to the following test specifications:

EN55011:1991 (emissions);
EN50082-1:1992 (immunity)

Compliance allows Reliance Electric's DC3N series to bear the CE mark.

The end user, as described herein, falls into one of two categories:

1. The Consumer will deploy a stand-alone unit as an integral, yet external, portion of the machine he/she is operating.

2. The Original Equipment Manufacturer (OEM) will implement the product as a component of the machine being manufactured.

Exhibit "A"

In addition to EMI/RFI safeguards inherent in the DC3N series' design, external filtering is required.

Reliance Electric requires the Corcom®9 filters listed in Table 5. If the exact filter is not available, the specifications are as follows:

L = (1.73 + 0.03) milliHenries.
C = (0.27 – 0.24) microFarads (X); (0.0055 microFarads (Y).
R = 330Kohms.
Rated current: 1.4 times maximum DC motor current.
Filter type: Balanced 2 section.

Table 5. Corcom® Fillers

Nameplate Current of Motor Wired to the Drive	Corcom® Filter Part Number
0 to 4 amps	6VV1
4.1 to 13 amps	20VV1

The filters in Table 5 must be wired to the AC output of the drive, as close to the drive as possible. The ground connection from the filter must be wired to solid earth ground (resistance less than 500 ohms); not machine ground. This is very important!

If the end-user is using a CE approved motor, the correct filter from Table 5 is all that is necessary to meet the EMC directives listed herein.

Armature Filters

If the end-user is not using a CE-approved motor, a Reliance Electric CEXXMM filter must be deployed on the output. XX is the rated current on the filter.

The CE20MM is a Real-Pole Balanced-Pi 3-pole filter. If the exact filter is not available, the specifications are as follows:

L & L1 = 2 * (0.8) milliHenries.
C & C1 = 2 * (0.1) microFarads @ 400W VDC.
Rin = 0.1 ohm; Rout = 1.2 ohm.

Table 6. Armature Filters

Nameplate Current of Motor Wired to the Drive	Reliance Electric® Filter Part Number
0 to 4 amps	CE04MM
4.1 to 13 amps	CE20MM

The filters in Table 6 must be wired to the DC output of the drive, as close to the drive as possible. The ground connection from the filter must be wired to solid earth ground (resistance less than 500 ohms); not machine ground. This is very important!

The end user must use the filtering listed in Exhibit A to comply with CE. The OEM may choose to provide alternative filtering that encompasses the Reliance Electric drive and other electronics within the same panel.

The OEM has this liberty because CE is a machinery directive. Whether or not every component in the OEM's machinery meets CE, the OEM must still submit his machine for CE approval. Thus, no component must necessarily meet CE within the machine, as long as the OEM takes the necessary steps to guarantee the machine does meet CE. By the same token, even if every component in the OEM's machine does meet CE, the machine will not necessarily meet CE as a machine.

Use of CE approved wiring practices, such as proper shielding, and the filters listed in Exhibit A guarantee the drive will meet EN55011 (1991 emissions standard) and EN50082-1 (1992 immunity standard).

Notes

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