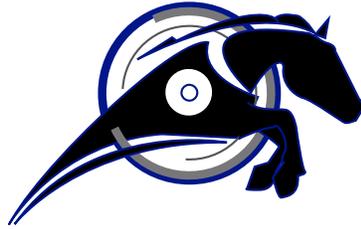


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IRONHORSE™

GSD1 SERIES DC DRIVES USER MANUAL

USER MANUAL NUMBER: IH-GSD1-USER-M



~ WARNING ~

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To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and usually change with time. It is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation is in compliance with the latest revision of these codes.

At a minimum, you should follow all applicable sections of the National Fire Code, National Electrical Code, and the codes of the National Electrical Manufacturer's Association (NEMA). There may be local regulatory or government offices that can also help determine which codes and standards are necessary for safe installation and operation.

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GSD1 DC DRIVES USER MANUAL OVERVIEW

OVERVIEW OF THIS PUBLICATION

The IronHorse GSD1 Series DC Drives User Manual describes the installation, configuration, and methods of operation of the GSD1 Series DC Drives.

All information contained in this manual is intended to be correct. However, information and data in this manual are subject to change without notice. AutomationDirect (ADC) makes no warranty of any kind with regard to this information or data. Further, ADC is not responsible for any omissions or errors or consequential damage caused by the user of the product. ADC reserves the right to make manufacturing changes which may not be included in this manual.

WHO SHOULD READ THIS USER MANUAL

This manual contains important information for those who will install, maintain, and/or operate any of the GSD1 Series DC Drives.

TECHNICAL SUPPORT

By Telephone: 770-844-4200 (Mon.–Fri., 9:00 a.m.–6:00 p.m. E.T.)

On the Web: www.automationdirect.com

Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call Technical Support at 770-844-4200. We are available weekdays from 9:00 a.m. to 6:00 p.m. Eastern Time.

We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company. Visit us at www.automationdirect.com.

SPECIAL SYMBOLS



WHEN YOU SEE THE “NOTEPAD” ICON IN THE LEFT-HAND MARGIN, THE PARAGRAPH TO ITS IMMEDIATE RIGHT WILL BE A SPECIAL NOTE.



WHEN YOU SEE THE “EXCLAMATION MARK” ICON IN THE LEFT-HAND MARGIN, THE PARAGRAPH TO ITS IMMEDIATE RIGHT WILL BE A WARNING. THIS INFORMATION COULD PREVENT INJURY, LOSS OF PROPERTY, OR EVEN DEATH (IN EXTREME CASES).

IRONHORSE GSD1 SERIES DC DRIVES GENERAL INFORMATION

STANDARD FEATURES

- Provides smooth variable speed capability for mobile equipment.
- Maintains variable speed control as batteries discharge.
- Adjustable maximum speed, minimum speed, current limit, IR compensation, and motor acceleration.
- Inhibit terminal permits optional start-stop without breaking battery lines.
- Speed potentiometer, knob, and dialplate included.
- Enclosed model (GSD1-xx-10N4X) is rated NEMA 4X.



CAREFULLY CHECK THE DC DRIVE FOR SHIPPING DAMAGE. REPORT ANY DAMAGE TO THE CARRIER IMMEDIATELY. DO NOT ATTEMPT TO OPERATE THE DRIVE IF VISIBLE DAMAGE IS EVIDENT TO EITHER THE CIRCUIT OR TO THE ELECTRONIC COMPONENTS.

SELECTION AND SPECIFICATIONS

GSD1 Series DC Drives – Selection & Specifications						
Model	GSD1-12-10C	GSD1-12-10N4X	GSD1-12-20C	GSD1-24-10C	GSD1-24-10N4X	GSD1-24-20C
Package Configuration	open frame	NEMA 4X	open frame	open frame	NEMA 4X	open frame
Power Quality Form Factor	1.05					
Input Voltage **	12 VDC ±15%			24–36 VDC ±15%		
Output Voltage	0–12 VDC			0 – (24–36) VDC		
Motor Rating (hp)	1/50 – 1/8		1/25 – 1/4	1/50 – 1/4		1/25 – 1/2
Output Current (continuous)	10A (DC)		20A (DC)	10A (DC)		20A (DC)
Current Overload Capacity	200% for 10s; 150% for 60s					
Current Limit	adjustable to 200% of motor Full Load Current (up to the Continuous Output Current rating of the drive)					
Speed Adjustment	5kΩ or 0–10 VDC input signal					
Speed Range	30:1					
Speed Regulation	1% of base speed					
Maximum Speed	adjustable from 50% to 100% of base speed					
Minimum Speed	30% of adjustable maximum speed					
Acceleration	adjustable from 0 to 10 seconds					
Deceleration	0.5s (non-adjustable)					
Dynamic Braking	no					
Plugging Capability ***	no					
Internal Operating Frequency	18 kHz		approx 1.6 kHz	18 kHz		approx 1.6 kHz
Electrical Connections	barrier terminal block; accepts 12–6 AWG					
External Fusing Required	DC-rated @ 150% motor Full Load Current (up to 150% Continuous Output Current rating of drive)					
SCCR	20A (DC)		40A (DC)	20A (DC)		40A (DC)
Operating Temperature	-10 to 45 °C [14 to 113 °F]					
Thermal Protection	not available					
Mounting Orientation	can be mounted in any orientation					
Corrosive Gases	NOT compatible with any corrosive gases					
Weight	6oz [170g]	37 oz [1049g]	10.5 oz [297g]	6oz [170g]	37 oz [1049g]	10.5 oz [297g]
Agency Approvals	RoHS					
Optional Accessories *						
Replacement Potentiometer	GSDA-5K					
Digital Potentiometer	GSDA-DP					

* For accessories details, please visit www.AutomationDirect.com.

** Input power supply must not exceed recommended voltage, or it may damage the GSD1 drive.

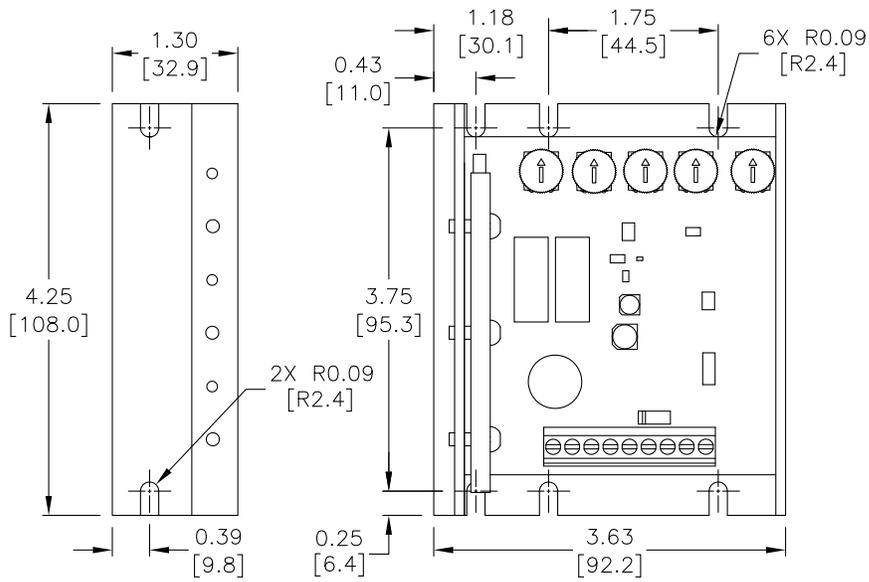
Linear power supply can be sized per drive voltage and motor full load current.

Switched power supply should be sized per drive voltage and double the motor full load current.

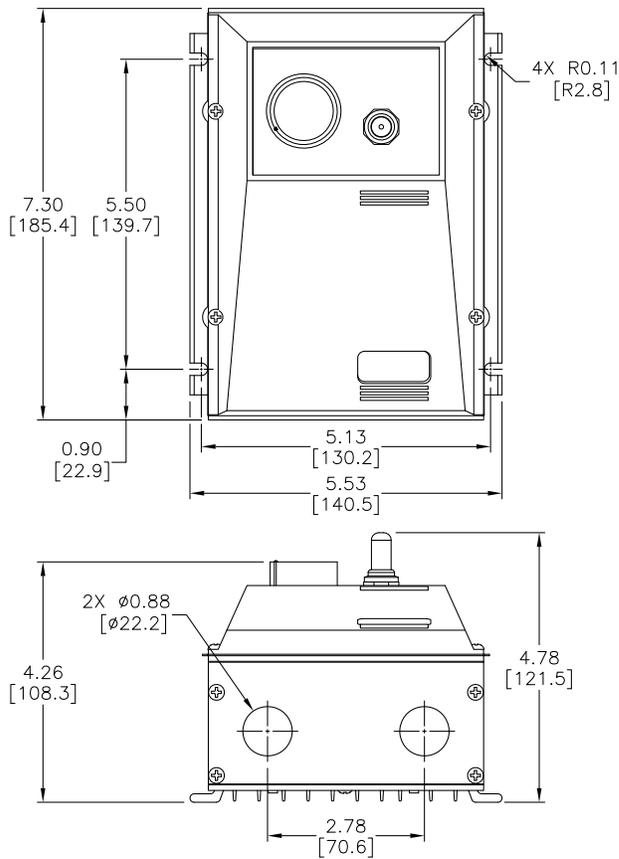
*** Plugging is a method of rapidly changing motor direction by reversing motor armature polarity, while the motor is still running.

DIMENSIONS

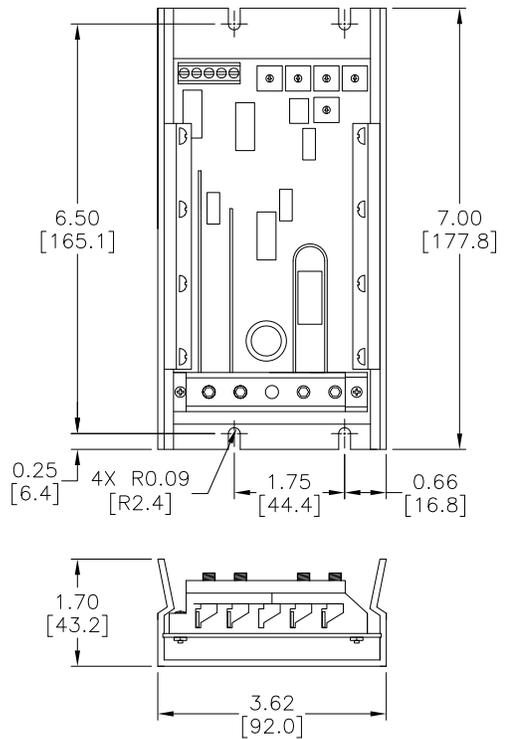
GSD1-xx-10C (DIMENSIONS = IN [MM])



GSD1-xx-10N4X (dimensions = in [mm])



GSD1-xx-20C (dimensions = in [mm])



INSTALLATION AND WIRING



INSTALL OPEN-FRAME DRIVES IN AN ENCLOSURE WITH A VOLUME AT LEAST THREE TIMES THE VOLUME OF THE OPEN-FRAME DRIVE.



DO NOT MOUNT CONTROLLER WHERE AMBIENT TEMPERATURE IS OUTSIDE THE RANGE OF -10 TO 45 °C (14 TO 113 °F).



IMPROPER INSTALLATION OR OPERATION OF THIS DC DRIVE MAY CAUSE INJURY TO PERSONNEL OR DRIVE FAILURE. THE DRIVE MUST BE INSTALLED IN ACCORDANCE WITH LOCAL, STATE, AND NATIONAL SAFETY CODES. MAKE CERTAIN THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY COMPONENTS!!! IF THE POWER DISCONNECT POINT IS OUT OF SIGHT, LOCK IT IN DISCONNECTED POSITION AND TAG IT TO PREVENT UNEXPECTED APPLICATION OF POWER. ONLY A QUALIFIED ELECTRICIAN OR SERVICE PERSONNEL SHOULD PERFORM ANY ELECTRICAL TROUBLESHOOTING OR MAINTENANCE. AT NO TIME SHOULD CIRCUIT CONTINUITY BE CHECKED BY SHORTING TERMINALS WITH A SCREWDRIVER OR OTHER METAL DEVICE.



BEFORE ATTEMPTING TO WIRE THE DC DRIVE, MAKE SURE ALL POWER IS DISCONNECTED. RECHECK CODE DESIGNATION TO ASSURE PROPER VOLTAGE IS PRESENT FOR THE DC DRIVE. CAUTION SHOULD BE USED IN SELECTING PROPER WIRE SIZE FOR CURRENT AND VOLTAGE DROP; MINIMUM WIRE SIZE 12 AWG.



DO NOT REVERSE POSITIVE AND NEGATIVE BATTERY LEADS, AS THIS WILL DAMAGE THE DC DRIVE. TO CHANGE MOTOR DIRECTION, INTERCHANGE THE POSITIVE AND NEGATIVE MOTOR ARMATURE LEADS.



CAUTION!! TURN POWER OFF WHILE MAKING WIRING CONNECTIONS.

FUSING

Externally fuse the +Battery input line with Littlefuse 314 series or Bussman ABC series or equivalent fuses designed for use with motors and motor control systems; rated for the lesser of:

- 1) 200% of the continuous current rating of the drive, or 2) 150% of the motor full-load current.
(Fast-blow fuses are NOT recommended) (AutomationDirect sells ABC series fuses.)

TERMINAL BLOCK

GSD1 Wiring Terminals		
Type	Wire Range	Tightening Torque
Barrier terminal block	12-6 AWG	4.4 lb-in [5.1 kg-cm]

WIRING

Refer to the following wiring diagrams for proper connection of DC Voltage, Armature, and Speed Pot wiring to the DC drive.

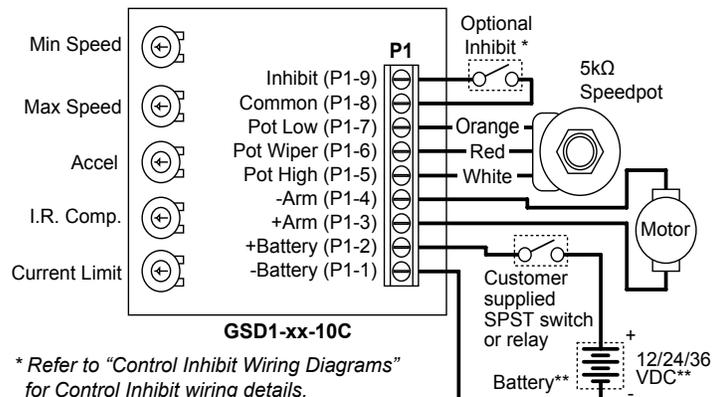
To properly adjust the CURRENT LIMIT setting, a DC ammeter should be placed in series with the armature line. This meter can be removed after the DC Drive is adjusted.

BASIC WIRING DIAGRAMS



SPEED POTS CAN BE REPLACED BY 0-10V ANALOG SIGNALS (PLC, ETC.). CONNECT SIGNAL COMMON TO POT LOW; VOLTAGE SIGNAL SOURCE TO POT WIPER; NO CONNECTION TO POT HIGH. (ANALOG SIGNAL DOES NOT HAVE TO BE ISOLATED.)

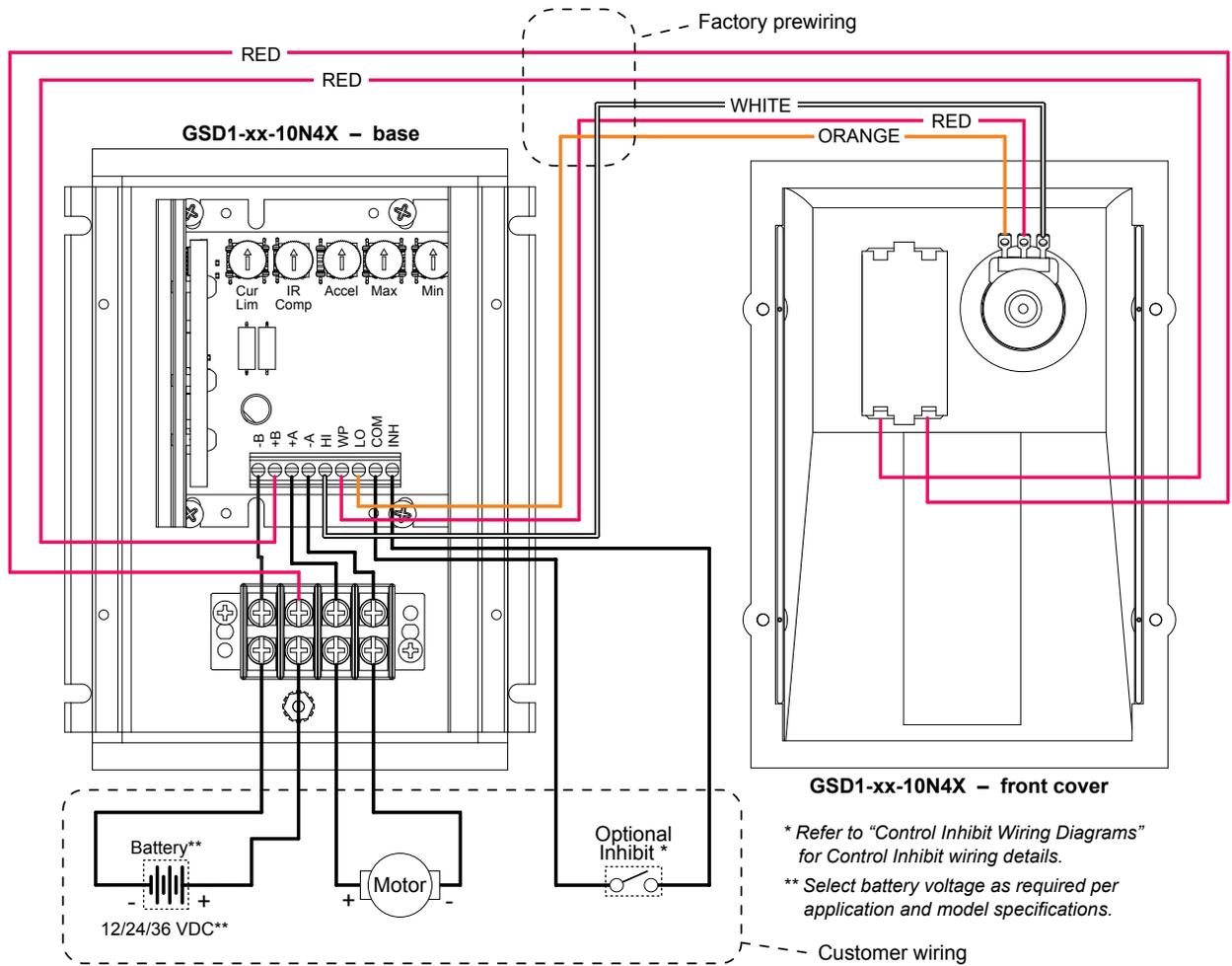
GSD1-xx-10C BASIC WIRING DIAGRAM



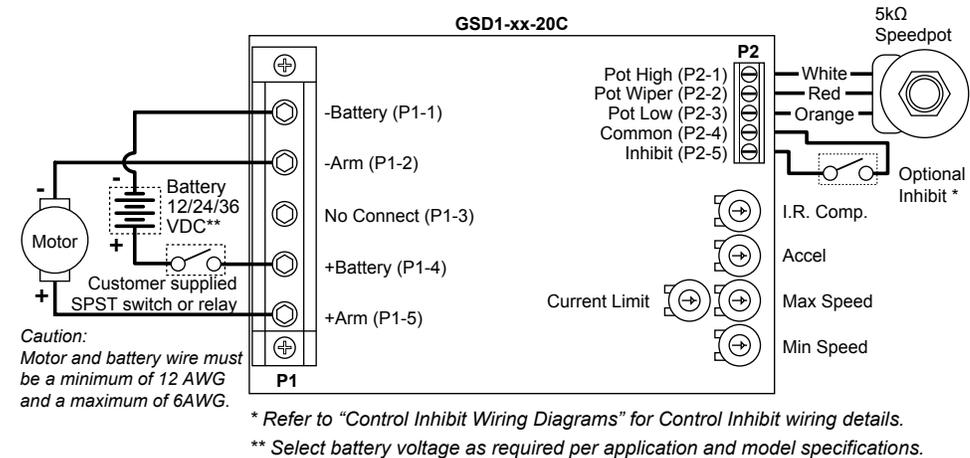
* Refer to "Control Inhibit Wiring Diagrams" for Control Inhibit wiring details.

** Select battery voltage as required per application and model specifications.

GSD1-xx-10N4X BASIC WIRING DIAGRAM



GSD1-xx-20C BASIC WIRING DIAGRAM



REVERSING WIRING DIAGRAMS



CAUTION: WHEN REVERSING A SPINNING PERMANENT MAGNET DC MOTOR, CAUTION MUST BE TAKEN THAT THE RESULTING CURRENT THROUGH THE ARMATURE OF THE MOTOR DOES NOT EXCEED THE OVERLOAD RATINGS OF THE DC DRIVE, OR THE DEMAGNETIZE RATING OF THE MOTOR BEING REVERSED.

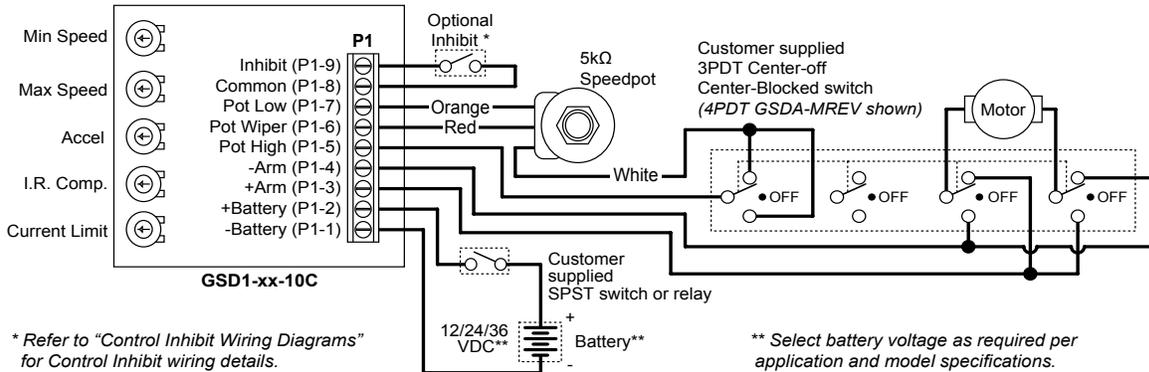


CAUTION: ENSURE THAT MOTOR ROTATION HAS STOPPED BEFORE REVERSING THE APPLIED VOLTAGE.

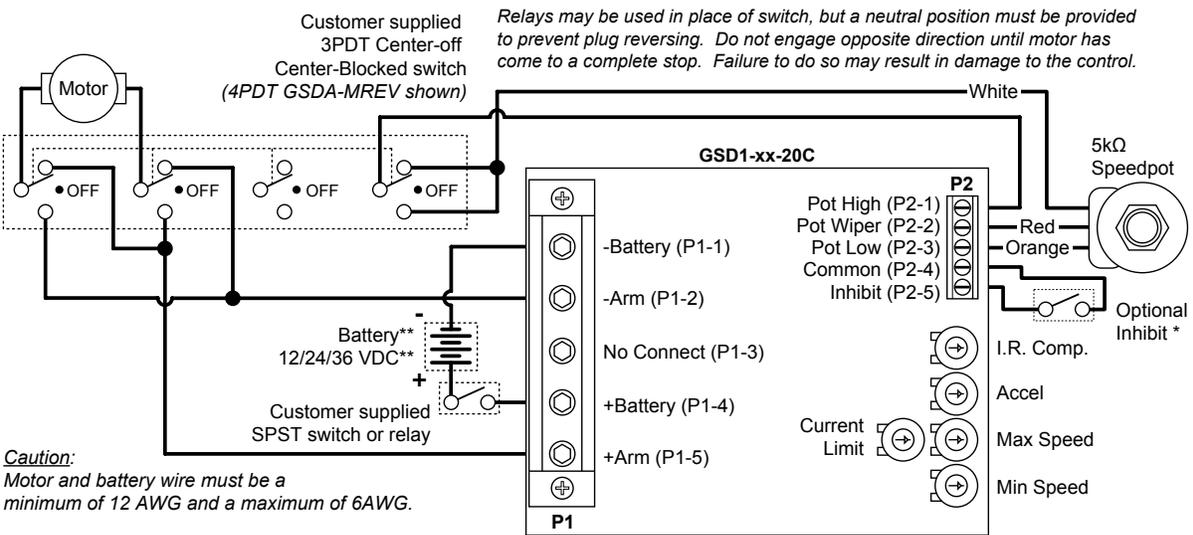


SPEED POTS CAN BE REPLACED BY 0-10V ANALOG SIGNALS (PLC, ETC.). CONNECT SIGNAL COMMON TO POT LOW; VOLTAGE SIGNAL SOURCE TO POT WIPER; NO CONNECTION TO POT HIGH. (ANALOG SIGNAL DOES NOT HAVE TO BE ISOLATED.)

GSD1-xx-10C REVERSING WIRING DIAGRAM



GSD1-xx-20C REVERSING WIRING DIAGRAM



* Refer to "Control Inhibit Wiring Diagrams" for Control Inhibit wiring details.

CONTROL INHIBIT WIRING DIAGRAMS



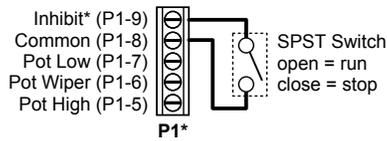
ALWAYS USE A SHIELDED CABLE WHEN CONNECTING TO THE INHIBIT TERMINAL. THE SHIELD OF THE CABLE SHOULD CONNECT TO THE COMMON TERMINAL OF THE DC DRIVE.



SPEED POTS CAN BE REPLACED BY 0-10V ANALOG SIGNALS (PLC, ETC.). CONNECT SIGNAL COMMON TO POT LOW; VOLTAGE SIGNAL SOURCE TO POT WIPER; NO CONNECTION TO POT HIGH. (ANALOG SIGNAL DOES NOT HAVE TO BE ISOLATED.)

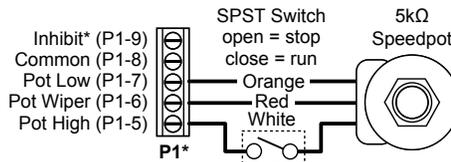
GSD1-xxx-10xxx CONTROL INHIBIT WIRING DIAGRAMS

Control Inhibit by using Inhibit Input:
Provides fast Start-Stop
by bypassing accel/decel circuit



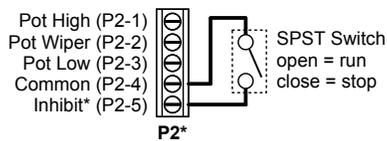
* Use shielded cable when connecting to the Inhibit terminal.
Connect the cable shield to the Common terminal of P1.

Control Inhibit by using Speedpot:
Provides Start-Stop
using accel/decel settings



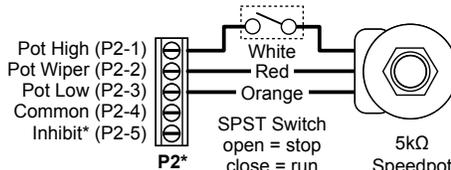
GSD1-xxx-20C CONTROL INHIBIT WIRING DIAGRAMS

Control Inhibit by using Inhibit Input:
Provides fast Start-Stop
by bypassing accel/decel circuit



* Use shielded cable when connecting to the Inhibit terminal.
Connect the cable shield to the Common terminal of P2.

Control Inhibit by using Speedpot:
Provides Start-Stop
using accel/decel settings



TRIM POT ADJUSTMENTS

Before the power is applied, the speed potentiometer and trim pots should be preset as follows:

TRIM POT PRESET

- 1) Preset Speed pot fully CCW.
- 2) Preset MAX trim pot CW 1/2 way.
- 3) Preset CURRENT LIMIT trim pot fully CW.
- 4) Preset MIN trim pot fully CCW.
- 5) Preset ACCEL trim pot CW 1/2 way.
- 6) Preset IR trim pot fully CCW.

DC power can now be applied to the system and the DC Drive adjusted as follows:

TRIM POT ADJUSTMENT

- 7) Increase the MIN trim pot CW until just before reaching an output voltage (deadband), or until the desired minimum speed is reached.
- 8) Turn the Speed pot fully CW and adjust the MAX trim pot until the desired maximum speed is reached.
- 9) Adjust the ACCEL trim pot to achieve the desired soft start time.
(CW rotation will increase accel time.)
- 10) Rotate the CURRENT LIMIT trim pot fully CCW. Apply a full load to the motor. While motor is stalled, adjust the CURRENT LIMIT trim pot CW until a desired current setting is obtained.
(Approximately 125% of rated motor current is recommended.)
- 11) For 10A models GSD1-xx-10xxx:
Set the Speed pot to approximately 50%, and note the motor RPM. Load the motor to normal load condition and adjust the IR trim pot CW until motor RPM is equal to the unloaded speed.
For 20A models GSD1-xx-20C:
Adjust the IR trim pot CW 1/2 way. If the motor speed is inconsistent (jumpy), rotate the IR trim pot CCW until the motor rotation becomes stable.

TROUBLESHOOTING

If a newly installed DC Drive will not operate, it is likely that a terminal connection is loose. Check the terminal connections and ensure that they are secure and correct. If the drive is still inoperative, refer to the Troubleshooting Table.

Troubleshooting		
<i>Problem</i>	<i>Possible Cause(s)</i>	<i>Corrective Action</i>
<i>Motor doesn't run</i>	<ol style="list-style-type: none"> 1) Incorrect or no power 2) Speed pot set at zero 3) Worn motor brushes 4) Current Limit set too low 	<ol style="list-style-type: none"> 1) Install proper power service 2) Rotate Speed pot fully CW 3) Replace motor brushes 4) Adjust Current Limit trim pot CW
<i>Motor "hunts"</i>	<ol style="list-style-type: none"> 1) Max trim pot set too high 2) IR Comp trim pot set too high 	<ol style="list-style-type: none"> 1) Refer to "Trim Pot Adjustment" 2) Refer to "Trim Pot Adjustment"
<i>Motor runs uncontrollably at "full speed"</i>	<ol style="list-style-type: none"> 1) Loose Speed pot connections 2) Min or Max trim pots improperly adjusted 3) Possible drive failure 	<ol style="list-style-type: none"> 1) Secure all connections 2) Refer to "Trim Pot Adjustment" 3) Contact ADC Technical Support
<i>Motor rotates in wrong direction</i>	Motor armature hooked up backwards	Reverse armature + and - leads
<i>Motor stalls under a light load</i>	Current Limit trim pot improperly adjusted	Refer to "Trim Pot Adjustment"

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Literature Number: LT136

Drawing Number: A-5-3900A