Allen-Bradley

High Performance AC Drive for the Fibers and Textiles Industry

1336 SPIDER AC Drive

The 1336 AC SPIDER Drive is rated in terms of peak output amps for use with synchronous reluctance and permanent magnet synchronous motors. The drive is available in peak (synchronizing) current ratings from 21.6A to 60.0A at 200-240VAC and from 9.9A to 33.0A at 380-480VAC. Drive mounting is available as IP 20 (Open Type). There is a limited offering of factory mounted options along with several option kits for user installation. The 1336 SPIDER Drive can also be used with DriveTools32™ Suite, a family of software products that let you program, monitor and troubleshoot the drive.

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RELIANCE ELECTRIC
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Bringing Together Leading Brands in Industrial Automation

Selection

1336 SPIDER Catalog Number Explanation

The diagram below describes the 1336 SPIDER catalog numbering scheme.

1336Z – P A 022 – N – GM1

First Position
Bulletin Number

Second Position
Drive Types

Letter	Type
P	Programmable Controller Control
S	Stand-Alone Control

Third Position
Voltage

Letter	Voltages
A	200-240V AC or 310V DC
B	380-480V AC or 513-620V DC

Fourth Position
Peak Current Rating

Code	Peak Current
022	21.6A
036	36.0A
060	60.0A
010	9.9A
017	16.5A
033	33.0A

Fifth Position
Enclosure Type

Code	Type
N	IP 20 (Open Type) with Line Choke
AE	IP 20 (Open Type) with EMC Filter

Sixth Position
Options①

Code	Description

Communication Options

GM1	Single Point Remote I/O
GM2	RS-232/422/485, DF1 & DH485
GM5	DeviceNet™
GM6	Enhanced DeviceNet

Product Selection

1336 SPIDER PLC Drive

	Current Rating②		IP 20 (Open Type)	
			with Line Choke	with EMC Filter
Voltage Rating	Peak	Continuous	Code	Code
200-240V AC or 310V DC	21.6A	9.0A	PA022-N	PA022-AE
	36.0A	15.0A	PA036-N	PA036-AE
	60.0A	30.0A	PA060-N	PA060-AE
380-480V AC or 513-620V DC	9.9A	8.5A	PB010-N	PB010-AE
	16.5A	10.0A	PB017-N	PB017-AE
	33.0A	17.0A	PB033-N	PB033-AE

1336 SPIDER Stand-Alone Drive

	Current Rating②		IP 20 (Open Type)	
			with Line Choke	with EMC Filter
Voltage Rating	Peak	Continuous	Code	Code
200-240V AC or 310V DC	21.6A	9.0A	SA022-N	SA022-AE
	36.0A	15.0A	SA036-N	SA036-AE
	60.0A	30.0A	SA060-N	SA060-AE
380-480V AC or 513-620V DC	9.9A	8.5A	SB010-N	SB010-AE
	16.5A	10.0A	SB017-N	SB017-AE
	33.0A	17.0A	SB033-N	SB033-AE

① At least one HIM or Communication Board Option will be required to make the drive functional. The chosen option(s) may be ordered factory installed (if available) or as a User Installed Option.

② 50 degree C. ambient, 2kHz carrier frequency.

Specifications

Protection

	200-240V Drive	380-480V Drive
AC Input Overvoltage Trip:	285V AC	570V AC
AC Input Undervoltage Trip:	120V AC	240V AC
Bus Overvoltage Trip:	405V DC	810V DC
Bus Undervoltage Trip:	160V DC	320V DC
Nominal Bus Voltage:	324V DC	648V DC
Heat Sink Thermostat	Monitored by microprocessor overtemp trip.	
Drive Overcurrent Trip		
Software Current Limit:	20 to 240% of [Rated Amps].	
Hardware Current Limit:	125 to 270% of [Rated Amps].	
Instantaneous Current Limit:	135 to 290% of [Rated Amps].	
Line transients:	Impulse with standard voltage (1.2/50µs):4000 volts per EN 50178.	
Power Ride-Thru:	30 milliseconds at full load.	
Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical.	
Ground Fault Trip:	Phase-to-ground on drive output.	
Short Circuit Trip:	Phase-to-phase on drive output.	

Environment

Altitude:	1000 m (3300 ft) max. without derating.
Ambient Operating Temperature	
IP20, NEMA Open Type:	0 to 50 degrees C (32 to 122 degrees F).
Storage Temperature:	–40 to 70 degrees C (–40 to 158 degrees F).
Relative Humidity:	5 to 95% non-condensing, 75% average.
Shock:	15G peak for 11ms duration (±1.0ms).
Vibration:	1G continuous.
Agency Certification:	

U.L. Listed [2] CSA Certified		
Marked for all applicable directives[1]		
Product Standards	EN 61800-3	
Emissions	EN 50081-1	
	EN 50081-2	
	EN 55011 Class A	
	EN 55011 Class B	
Immunity	EN 50082-1	
	EN 50082-2	
	IEC 801-1, 2, 3, 4, 6, 8 per EN 50082-1, 2	
Low Voltage	EN 60204-1	
	EN 50178	

1 Note: Installation guidelines called out in *Appendix C of the User Manual* (publication 1336 SPIDER-5.0) must be adhered to.

2 UL/C-UL pending at time of printing.

Specifications

Electrical

Input Data	
Voltage Tolerance:	–50% of maximum (with reduced output power), +10% of maximum.
Frequency Tolerance:	47-63 Hz.
Input Phases:	Three-phase input provides full rating for all drives.
Displacement Power Factor	0.97 standard, value is application dependent.
Efficiency:	97.5% at rated amps, nominal line volts.
Max. Short Circuit Current Rating:	
Using Specified Fuses	200,000A

Control

Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives (refer to the *Derating Guidelines* on page 6).
200-240V AC Drives	2, 4, 8 kHz.
380-480V AC Drives	2, 4 kHz.
Output Voltage Range:	0 to rated voltage.
Output Frequency Range:	0 to 400 Hz.
Frequency Accuracy	
Digital Input:	Within ±0.01% of maximum output frequency.
Analog Input:	Within ±0.4% of maximum output frequency.
Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability.
Accel/Decel:	Two independently programmable accel and decel times. Each time may be programmed from 0 - 3600 seconds in 0.1 second increments[1].
Intermittent Overload:	Variable Overload (see Drive Ratings).
Current Limit Capability:	Proactive Current Limit programmable from 20 to 240% of rated output current. Independently programmable proportional and integral gain.
Inverse Time Overload Cap.	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 4/6.

[1] 0.1 second increments using a HIM or 0.01 with serial communications.

Digital Inputs and Outputs

Circuits used with 24V AC/DC inputs must be capable of operating with high = true logic.

Note: 24V DC is available at TB7 for use in local control of the drive. As an alternative, an external 24V AC/DC supply may be used, subject to the following specifications.

DC external circuits in the low state must generate a voltage of no more than 8V DC. Leakage current must be less than 1.5 mA into a 2.5k ohm load.

AC external circuits in the low state must generate a voltage of no more than 10V DC. Leakage current must be less than 2.5 mA into a 2.5k ohm load.

Both AC and DC external circuits in the high state must generate a voltage of +20 to +26 volts and source a current of approximately 10 mA for each input.

The 24V AC/DC inputs are compatible with these Allen-Bradley PLC® modules:

1771-OB	1771-OQ16	1771-OB16
1771-OBD	1771-OYL	1771-OBN
1771-OZL	1771-OQ	1771-OBB

Input/Output Ratings

Note: Drive ratings are at nominal values. See *Derating Guidelines* on next page.

Drive Catalog Number 1336Z- . . .	Synchronous Reluctance Motor *cosφ = 0.6*		
	Input Amps[1]	**Output kVA**	**Output Amps**
200-240V DRIVES			
xA022	7.6	3.7	9.0
xA036	12.5	6.2	15.0
xA060	24.6	12.5	30.0
380-480V DRIVES			
xB010	8.7	8.2	9.9
xB017	11.4	10.8	13.0
xB033	19.8	19.1	23.0

[1] Values based on line source, kVA = 10 x Drive Output kVA.

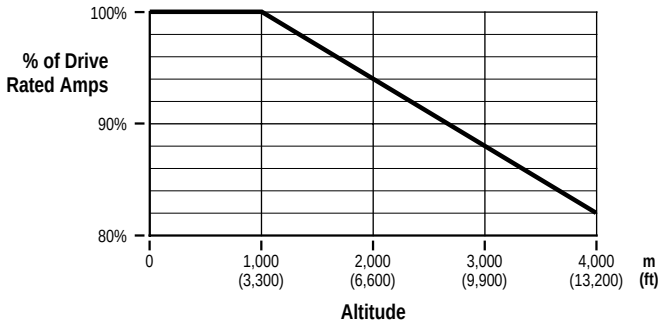
Derating Guidelines

Drive ratings can be affected by a number of factors. If more than one factor exists, derating percentages must be multiplied.

Voltage Rating	Drive Catalog Number	Carrier Frequency	F.L.A. (Synchronous/Synchronous Reluctance Motors)			Peak Current[1]	DC Brake Current[2]	Dynamic Brake Current[3, 4]
		kHz	*Ta=50˚C*	*Ta=45˚C*	*Ta=40˚C*	*Amps*	A_{rms}	A_{DC}/R_{min}
200-240V	A022	2	9A	9A	9A	21.6	12.6	15A/25 ohms
		4	9A	9A	9A			
		8	9A	9A	9A			
	A036	2	15A	15A	15A	36	21.0	15A/25 ohms
		4	14A	15A	15A			
		8	10A	12.5A	15A			
	A060	2	30A	30A	30A	60	30.0	23A/16 ohms
		4	25A	30A	30A			
		8	18A	22A	26A			
380-480V	B010	2	8.5A	9.9A	9.9A	9.9	7.0	10A/75 ohms
		4	5.5A	6.4A	7.3A			
	B017	2	10.0A	11.5A	13.0A	16.5	9.1	14A/53 ohms
		4	6.0A	7.2A	8.4A			
	B033	2	17A	20A	23A	33	16.1	17A/43 ohms
		4	10A	12A	14A			

Shading indicates Drive [Rated Amps].

Altitude – All Drive Ratings



1 For 20 seconds every 10 minutes.

2 Note that parameter 13, [DC Hold Level] must NOT be set to 150%, but maximum as follows: (A022) 140%, (A036) 140%, (A060) 100%, (B010) 70%, (B017) 70%, (B033) 70%.

3 The dynamic braking current is only defined by the external resistor. There is no internal current control nor short circuit protection. Respective measures as bimetal relay, klixon etc have to be taken externally.

4 See page 17 for dynamic brake resistor wiring information and page 33 for dimension information.

Motor Sync Loss Detection for Synchronous Motors

This function is enabled if [Sync Loss Sel] is set to “Alarm” or “Fault.”

The motor sync loss detection attempts to sense when a synchronous motor has pulled out of sync. When this happens the motor will typically draw a high current and the power flow between the motor and the drive oscillates. Based on this, the detection algorithm looks for a large oscillation of the current (relative to voltage) angle while the current is high. When loss of sync is detected, the “Sync Loss” bit in [Drive Alarm 1] is set. Additionally, the drive will add an additional voltage set by [Sync Loss Comp] to the output voltage. This will increase the pull-in torque, allowing the motor to re-synchronize.

If [Sync Loss Sel] is set to “Fault,” the time the “Sync Loss” bit is set is timed. If it exceeds the time set by [Sync Loss Time], the drive faults with a F67 “Motor Sync Loss” fault indication.

Synchronized Speed Change Function

This function is typically used in an application where multiple drives, drive different functions on one machine and the line speed must be changed.

To initiate the speed sync function:

- The drive must be running.
- [Sync Time] must be set to a non-zero value.
- [Freq Source] must be set to “Adapter 1-6” or “Preset 1-7.”
- A SYNC input must be energized.

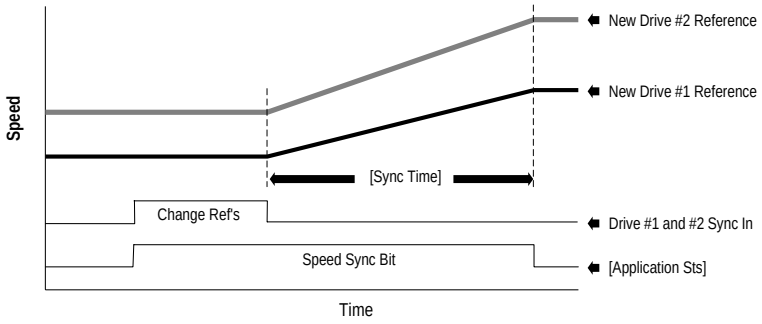
The SYNC input can come from any of the programmable input terminals (i.e. [TB5 Term 22 Sel] = “Sync”).

Important: Do not select more than one input terminal as the SYNC input.

The sync input can also come through SCANport from one of the communication options, either as a “Type 1” or “Type 2” message. For further information, refer to the instructions supplied with the option.

Typical sequence of events:

- Energize the SYNC input.
- The “Speed Sync” bit in [Application Sts] is set to “1.”
- The drive “holds” the last frequency reference value.
- The frequency command is changed and/or a different source is selected.
- De-energize the SYNC input.
- The drive will linearly ramp from the “held” reference to the new reference in a time set by [Sync Time].
- The “Speed Sync” bit in [Application Sts] is set to “0.”



Important: The accel/decel/s-curve control is active during speed sync and will limit the rate of change of frequency if set “slower.”

Power Loss Ride-Thru

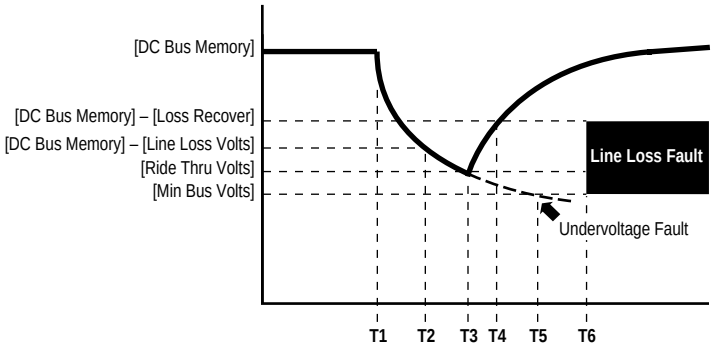
Important: The 1336 SPIDER has the ability to ride through short power interruptions. However, power loss ride-thru requires careful system design to guard against problems associated with rapid return of the AC line voltage after a line voltage dip. Consult the factory with your application details before attempting to program your drive to ride through an AC line voltage dip of more than 15% below the nominal voltage.

6 parameters are associated with the line loss functionality.

[Line Loss Mode] selects the method of detecting a power line loss and the response to a line loss.

[Line Loss Volts] adjusts the level at which a line loss is recognized when [Line Loss Mode] is set to "LoBus>Off" or "LoBus>Decel."

[Loss Recover] adjusts the level at which the drive recognizes the input power has returned when [Line Loss Mode] is set to "LoBus>Off' or "LoBus>Decel."



T1 = Loss of Power
T2 = Line Loss Recognized by Drive
T3 = Power Returned
T4 = Recovery from Line Loss Initiated by Drive
T5 = Minimum Bus Voltage Level, Undervoltage Fault Point
T6 = 500 ms Time Out, Line Loss Fault

[Ride Thru Volts] sets the bus voltage that the inertia ride thru function will attempt to regulate. If [Line Loss Mode] is set to "LoBus>Decel," a line loss condition activates the inertia ride thru function. The load is then decelerated such that the energy absorbed from the mechanical load balances the losses, and bus voltage is maintained.

[Min Bus Volts] sets the bus voltage below which the drive will disable firing of the output devices.

[Line Loss Restart] selects the timing and method of reconnecting the motor after power returns.

Operation when [Line Loss Mode] is set to "LoBus>Off."

If a power interruption occurs (T1) the drive will continue to operate from stored DC bus energy until the bus voltage drops to the level set by [DC Bus Memory] – [Line Loss Volts] (T2). At this point, the drive output is turned off and a 500 ms timer is started. One of the following conditions will then occur:

1. The bus voltage will fall below the level set by [Min Bus Volts] (T5) before the timer expires. This will generate a bus Undervoltage Fault if [Low Bus Fault] is set to "enabled."
2. The bus voltage will remain below [DC Bus Memory] – [Loss Recover], but above [Min Bus Voltage] and the timer expires (T6). If [Line Loss Fault] is set to "enabled," a Line Loss Fault will be issued.
3. The input power is restored (T3) and the bus voltage rises above [DC Bus Memory] – [Loss Recover] (T4) before the timer expires. This allows the drive to turn its output on and resume running according to the selection programmed in [Line Loss Restart].

Operation when [Line Loss Mode] is set to "LoBus>Decel."

Operation in this mode is similar to above, except that the drive will attempt to maintain the bus voltage at the level programmed in [Ride Thru Volts].

If a power interruption occurs (T1) the drive will continue to operate from stored DC bus energy until the bus voltage drops to the level set by [DC Bus Memory] – [Line Loss Volts] (T2). At this point, the drive will start a 500 ms timer and attempt to regulate the bus voltage at the level set by [Ride Thru Volts]. One of the following conditions will then occur:

1. The drive is unable to extract enough energy from the mechanical load, and the bus voltage will fall below the level set by [Min Bus Volts] (T5) before the timer expires. This will generate a bus Undervoltage Fault if [Low Bus Fault] is set to "enabled."
2. The bus voltage will be maintained at the level programmed in [Ride Thru Volts] and the timer expires. If [Line Loss Fault] is set to "enabled," a Line Loss Fault will be issued.

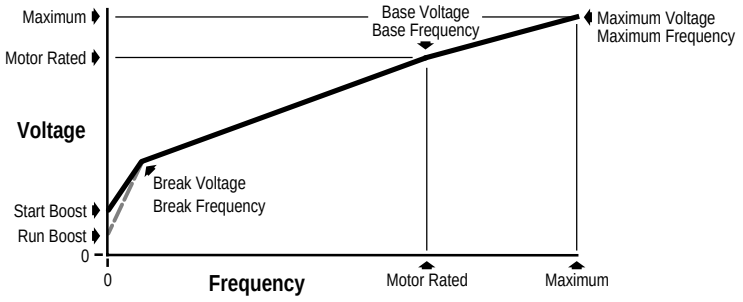
   Important: [Ride Thru Volts] should be set below the level set by [DC Bus Memory] – [Loss Recover], below the level set by [DC Bus Memory] – [Line Loss Volts], and above the level set by [Min Bus Voltage]. If [Ride Thru Volts] is set above the recovery level, the drive will oscillate in and out of line loss. If [Ride Thru Volts] is set above the line loss level, as soon as a line loss is detected, the drive will immediately decelerate as quickly as the decel setting allows until the bus voltage increases to the ride-thru level. If [Ride Thru Volts] is set below [Min Bus Voltage], the bus voltage will be allowed to drop below the minimum required and the drive output will be turned off.
3. The input power is restored (T3) and the bus voltage rises above [DC Bus Memory] – [Loss Recover] (T4) before the timer expires. The drive will then accelerate back to the commanded speed using the programmed acceleration rate.

Operation when [Line Loss Mode] is set to "Input>Off" or "Input>Decel."

When operating in either of these modes, the line loss condition is detected by an external source. The drive is then signaled through the Pulse input that a loss of power has occurred. Drive operation is the same as when [Line Loss Mode] is set to "LoBus>Off" or "LoBus>Decel," except for the following: If an inertia ride-thru is initiated, the drive attempts to regulate the bus at the value in [DC Bus Memory] rather than the value in [Ride Thru Volts].

Volts-per-Hertz

The 1336 SPIDER offers a fully programmable Volts-per-Hertz mode that allows maximum performance for applications requiring multiple motors on a common drive, particularly if the motors are not of equal size and type.

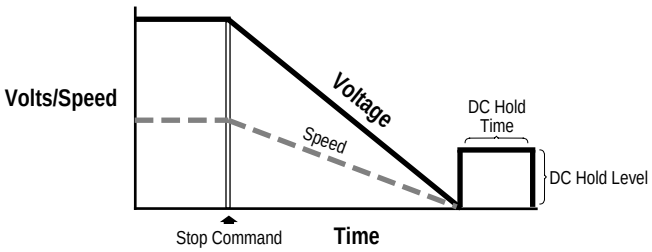


Braking

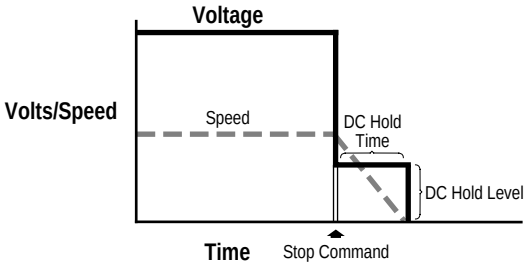
Many applications require a holding brake function to stop motor rotation between operations. The 1336 SPIDER provides a programmable DC Hold level and DC Hold time to develop holding torque in the motor after a ramp-to-stop. For applications that require a quick stopping time, the 1336 SPIDER can inject a DC voltage into the motor for a programmed time to brake the motor to a stop. While this does not take the place of an external brake for emergency stopping, it is an effective stopping method under normal operation. The drive is capable of extended or unlimited injection braking for both stopping and holding a motor. It provides:

- Injection braking at selectable levels for extended periods up to 90 seconds.
- Extended Hold Braking (up to 90 seconds).
- Continuous (event ended) Hold Braking. This is accomplished by setting the Stop mode to "Ramp to Hold." In this mode, the drive will decelerate according to the programmed decel ramp. When the drive reaches zero Hertz output, it will supply programmed current for hold braking per the DC Hold Level parameter (limited to the current listed in the *Derating Guidelines*) until; a) a Start command is issued, or b) the Enable input is opened.

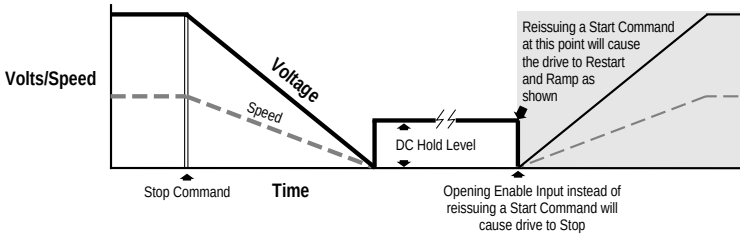
Ramp-to-Stop



Brake-to-Stop



Ramp-to-Hold



Reset/Run

The 1336 SPIDER offers the ability to automatically reset a fault (if the condition that causes the fault is no longer present) and restart. Both the number of reset attempts (0-9) and the time between reset attempts (0-30 Sec.) are programmable. If the condition causing the fault is still present when the number of "reset/run tries" is exceeded, the drive will shut down and issue a "Max Retries Exceeded" Fault. This feature will not operate for ground faults or shorted output faults.

Function Description

Owners

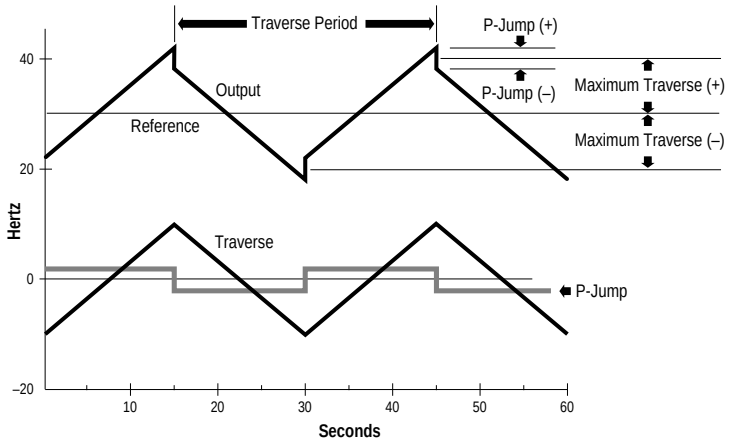
The 1336 SPIDER displays which of the available adapters currently "owns" certain control functions. To avoid conflict, some owners are exclusive (only one device can issue a direction command), while others can have multiple control (many devices can simultaneously issue a start command). Owner displays are excellent diagnostic tools, displaying precisely where drive control commands are coming from.

Masks

All external control connections to the 1336 SPIDER are made through a multi-connection communication bus called SCANport. With the possibility of many devices able to issue drive control functions (start, stop, reverse, speed reference, etc.), the 1336 SPIDER offers a mask for each control function that gives the user complete flexibility to lock out any function (except stop) from any port.

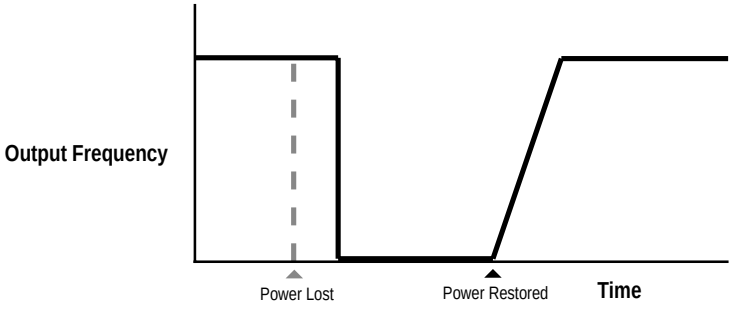
Traverse Function

The 1336 SPIDER output frequency can be programmed to modulate around a set frequency. This is accomplished by programming three parameters to develop an inertia compensated triangular waveform DD Traverse Period, Max Traverse, and P Jump. In surface driven winding applications, the waveform developed can be used by traverse drives to perform the traverse function electronically. A traverse drive will move the thread back and forth in a diamond pattern to distribute the thread evenly across a tube surface. To prevent a build up of thread at the same points on the surface, this pattern must be altered. This can be accomplished by continuously varying the speed of the traverse in a cyclical manner over a specified speed range. With the use of inertia compensation, the result is a series of distributed diamond patterns over the entire tube surface.



Run On Power Up

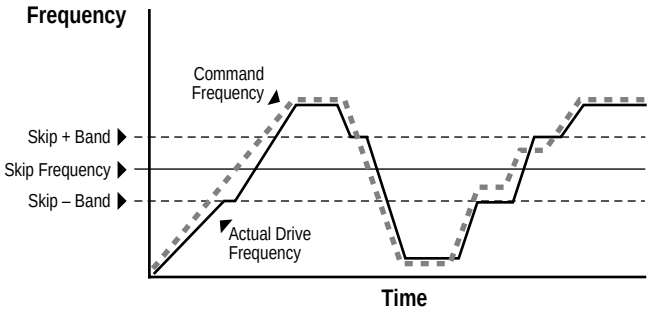
For applications that require unattended operation, the 1336 SPIDER offers the ability to resume running once power is restored after a power outage. If "Run On Power Up" is activated and input power is lost, when power is restored the drive will automatically restart and run at current command speed if all required signals are present (Enable, Auxiliary, Not-Stop and Start).



Function Description

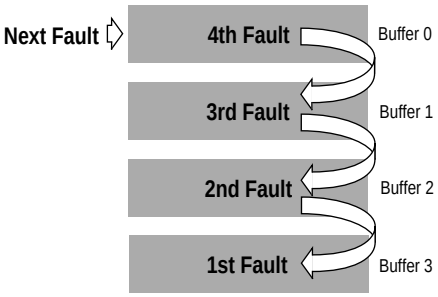
Skip Frequencies

Many mechanical systems have resonant frequencies that can cause severe vibration. If these systems are run at these speeds continuously, this vibration can cause mechanical breakdowns. The 1336 SPIDER offers three programmable Skip Frequencies that prevent the drive from running continuously at resonant speeds. An additional parameter allows a programmable Skip Bandwidth around the skip frequencies



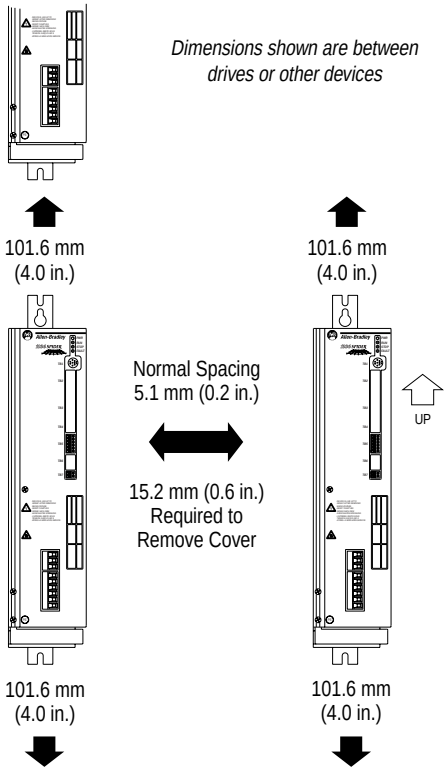
Fault Buffer

The 1336 SPIDER contains a fault buffer that records the last four faults the drive experienced. The buffer stores faults in a first-in first-out manner. Additional diagnostic parameters are listed in the Diagnostic Group.



Mounting

Minimum Mounting Requirements for Proper Heat Dissipation



Input Power Conditioning

In general, the 1336 SPIDER is suitable for direct connection to an AC line of the correct voltage. Certain conditions can exist, however, that prompt consideration of a line reactor or isolation transformer ahead of the drive.

The basic rules to aid in determining whether a line reactor or isolation transformer should be considered are as follows:

1. If the AC source experiences frequent power outages or significant voltage transients, users should calculate the source transformer VA. If the source transformer VA exceeds the VAmax (1MVA) and the drive is installed close to the source, it is an indication that there may be enough energy behind these voltage transients to cause nuisance input fuse blowing, overvoltage faults or drive power structure damage. In these cases, a line reactor or isolation transformer should be considered.
2. If the AC source does not have a neutral or one phase referenced to ground (see *Unbalanced Distribution Systems*), an isolation transformer with the neutral of the secondary grounded is required. If the line-to-ground voltages on any phase can exceed 125% of the nominal line-to-line voltage, an isolation transformer with the neutral of the secondary grounded, is **highly recommended.**
3. If the AC line supplying the drive has power factor correction capacitors that are switched in and out, an isolation transformer or 5% line reactor is recommended between the drive and capacitors. If the capacitors are permanently connected and not switched, the general rules above apply.

AC Supply Source

Unbalanced Distribution Systems

This drive is designed to operate on earthed-neutral, three-phase supply systems whose line voltages are symmetrical. 240V AC drives may be operated with one phase referenced to ground.

Ungrounded Distribution Systems

1336 SPIDER drives are not designed to operate in ungrounded systems.

Input Fuses

The 1336 SPIDER should be installed with input fuses. However, local/national electrical codes may determine additional requirements for these installations.

Installations per U.S. NEC/UL/CSA

In general, the specified fuses are suitable for branch short circuit protection and provide excellent short circuit protection for the drive. The fuses offer a high interrupting capacity and are fast acting. Refer to the North American selections in Table A.

IEC Installations

For those installations that are not required to meet the U.S. NEC/UL/CSA, the specified fuses are suitable for branch short circuit protection and provide excellent short circuit protection for the drive. The fuses offer a high interrupting capacity and are fast acting. Refer to the selections in Tables A and B.

ATTENTION: The 1336 SPIDER does not provide input power short circuit protection. Specifications for the recommended fuse to provide drive input power protection against short circuits are provided.

Table A
Maximum Recommended AC Input Line Fuse Ratings (fuses are user supplied)

European Installations	North American Installations	Drive Catalog Number	Drive Output kVA Rating	Drive Output kW Rating	Maximum Fuse Rating
The recommended fuse is Class gG, general industrial applications.	The recommended fuse is UL Class CC, T or J.	1336Z- _ A022	3.0	1.8	30A
		1336Z- _ A036	5.0	3.0	30A
		1336Z- _ A060	8.3	5.0	50A
		1336Z- _ B010	2.7	1.6	20A
		1336Z- _ B017	4.6	2.7	20A
		1336Z- _ B033	9.1	5.5	40A

Table B
Recommended Fuses for Shared DC Bus Applications
(Fuses must be mounted between the drive and the shared DC bus)

AC Line Rating	Description	Fuse Type	Maximum Fuse Rating
240V AC	with Earthed Transformer Star Point	LP-CC (Bussmann or equivalent), 300V DC rating	See Table A
		AJT (Gould or equivalent), 500V DC rating	
	with B Phase Grounded	AJT (Gould or equivalent), 500V DC rating	
480V AC	with Earthed Transformer Star Point	AJT (Gould or equivalent), 500V DC rating	

Power Cabling

Input and output power connections are performed through the power terminal blocks (see Figure 1 for location).

Important: For maintenance and setup procedures, the drive may be operated without a motor connected.

ATTENTION: The National Codes and standards (NEC, VDE, BSI etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Figure 1
Power Terminal Block Locations

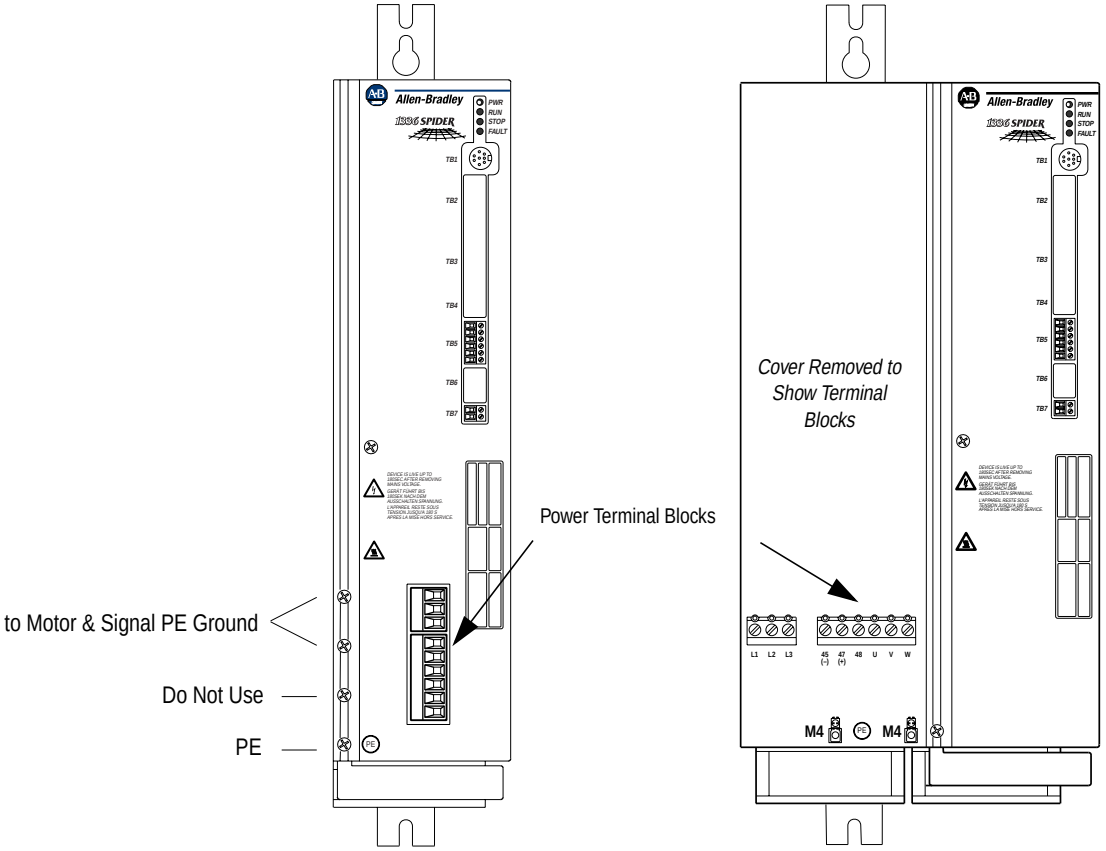


Table C
Power Terminal Block Signals

Terminal	Description
PE ⏚	Potential Earth Ground
L1 (R), L2 (S), L3 (T)	AC Line Input Terminals
(+) 47 & (–) 45	DC Bus Terminals
(+) 47 & 48	Braking Resistor
U (T1), V (T2), W (T3)	Motor Connection

Table D
Power Terminal Block Specifications - *Use 75 degree C Copper wire Only*

Drive Catalog Number	Max./Min. Wire Size [1] *mm² (AWG)*	Screw Size	Torque Range *N-m (lb.-in.)*	Remove Insulation *mm (in.)*
1336Z-_ A022 1336Z-_ A036 1336Z-_ B010 1336Z-_ B017	0.2/4 (24/10)	M3	0.5-0.6 (4.4-5.3)	7 (0.28)
1336Z-_ A060 1336Z-_ B033	0.5/10 (20/6)	M4	1.2-1.5 (10.6-13.3)	10 (0.39)

[1] Wire sizes given are maximum/minimum sizes that terminal block will accept - these are not recommendations.

Motor Cables

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Use cable with the appropriate insulation class.

The cable should be 4-conductor with the ground lead being connected directly to the drive ground terminal (PE) and the motor frame ground terminal.

Shielded Cable

Shielded cable is recommended if sensitive circuits or devices are connected or mounted to the machinery driven by the motor. The shield must be connected to both the drive ground (drive end) and motor frame ground (motor end). The connection must be made at both ends to minimize interference.

If cable trays or large conduits are to be used to distribute the motor leads for multiple drives, shielded cable is recommended to reduce or capture the noise from the motor leads and minimize “cross coupling” of noise between the leads of different drives. The shield should be connected to the ground connections at both the motor and drive end.

Armored cable also provides effective shielding. Ideally it should be grounded only at the drive (PE) and motor frame. Some armored cable has a PVC coating over the armor to prevent incidental contact with grounded structure. If, due to the type of connector, the armor is grounded at the cabinet entrance, shielded cable should be used within the cabinet if power leads will be run close to control signals.

In some hazardous environments it is not permissible to ground both ends of the cable armor because of possibly high current circulating at the input frequency if the ground loop is cut by a strong magnetic field. This only applies in the proximity of powerful electrical machines. In such cases, consult factory for specific guidelines.

Conduit

If metal conduit is preferred for cable distribution, follow the guidelines below.

- Drives are normally mounted in cabinets and ground connections are made at a common ground point in the cabinet. Normal installation of conduit provides grounded connections to both the motor frame ground (junction box) and drive cabinet ground. These ground connections help minimize interference. This is a noise reduction recommendation only, and does not affect the requirements for safety grounding.
- No more than three sets of motor leads can be routed through a single conduit. This will minimize “cross talk” that could reduce the effectiveness of the noise reduction methods described. If more than three drive/motor connections per conduit are required, shielded cable as described above must be used. If practical, each conduit should contain only one set of motor leads.

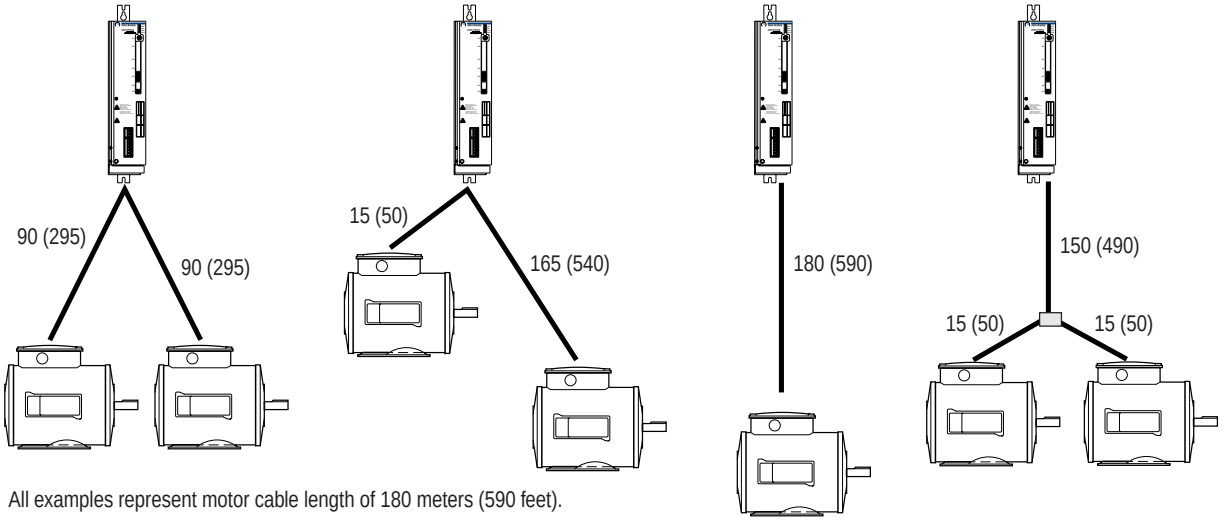
ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This will eliminate the possible shock hazard from "cross coupled" drive motor leads.

Motor Lead Lengths

Installations with long cables to the motor may require the addition of output reactors or cable terminators to limit voltage reflections at the motor. Excessive cable charging current can also reduce the amount of current available to produce rated motor torque. Refer to Table E for the maximum cable length allowed for various installation techniques. Shaded distances are restricted by cable capacitance charging current. The figure below demonstrates how total cable length is calculated. Failure to follow these guidelines can result in poor motor performance and nuisance drive overcurrent or overload tripping. For installations that exceed the recommended maximum lengths listed, contact the factory.

Note that the cable lengths shown are guidelines. Your application may be restricted to a shorter cable length due to wire type or placement, line reactor and type of motor.

How to Measure Motor Cable Lengths Limited by Capacitance



All examples represent motor cable length of 180 meters (590 feet).

Table E
Maximum Motor Cable Length Restrictions in meters (feet)

Drive Catalog Number & Input Voltage Rating	Peak Current Rating	Cable Diameter *mm² (AWG)*	No External Devices			1321-3R55-A Reactor at Drive			1321-3R25-A Reactor at Drive		
			Motor Insulation Class *not less than . . .*			Motor Insulation Class *not less than . . .*			Motor Insulation Class *not less than . . .*		
220-240V AC			**800V**	**1000V**	**1200V**	**800V**	**1000V**	**1200V**			
1336Z- _ A022	21.6A	2.5 (12)	120 (394)	120 (394)	120 (394)	180 (590)	180 (590)	180 (590)			
1336Z- _ A036	36.0A	2.5 (12)	180 (590)	180 (590)	180 (590)	180 (590)	180 (590)	180 (590)			
1336Z- _ A060	60.0A	6.0 (8)	180 (590)	180 (590)	180 (590)	180 (590)	180 (590)	180 (590)			
380-400V AC			**1000V**	**1200V**	**1400V**	**1000V**	**1200V**	**1400V**	**1000V**	**1200V**	**1400V**
1336Z- _ B010	9.9A	2.5 (12)	15 (50)	105 (344)	105 (344)	30 (98)	180 (590)	180 (590)	60 (197)		
1336Z- _ B017	16.5A	2.5 (12)	15 (50)	115 (377)	115 (377)	30 (98)	180 (590)	180 (590)	60 (197)		
1336Z- _ B033	33.0A	6.0 (8)	15 (50)	155 (509)	180 (590)	30 (98)	180 (590)	180 (590)	60 (197)		
460-480V AC			**1200V**	**1400V**	**1600V**	**1200V**	**1400V**	**1600V**	**1200V**	**1400V**	**1600V**
1336Z- _ B010	9.9A	2.5 (12)	15 (50)	105 (344)	105 (344)	30 (98)	180 (590)	180 (590)	60 (197)		
1336Z- _ B017	16.5A	2.5 (12)	15 (50)	115 (377)	115 (377)	30 (98)	180 (590)	180 (590)	60 (197)		
1336Z- _ B033	33.0A	6.0 (8)	15 (50)	120 (394)	180 (590)	30 (98)	180 (590)	180 (590)	60 (197)		

Dynamic Brake Resistor Wiring

All brake resistor wiring must be twisted wire run in conduit separate from control wiring. Maximum cable length is 2.5 meters (8.2 feet). Size wire according to the "Brake Current" provided on page 6. Brake resistor dimensions and specifications can be found on page 33.

Control & Signal Wiring

General Wiring Information

General requirements for analog and digital signal wire include: stranded copper 0.750-0.283 mm^2 (18-22 AWG), twisted-pair, 100% shield, 300V minimum insulation rating and a temperature rating suitable for the application (not less than 60 degrees C.). Refer to Table F for terminal block specifications and Figure 2 for locations.

Table F
Control and Signal Terminal Block Specifications - *Use 75 degree C Copper wire Only*

Drive Catalog Number	Max./Min. Wire Size [1] *mm^2 (AWG)*	Screw Size	Torque Range *N-m (lb.-in.)*	Remove Insulation *mm (in.)*
All	0.14-1.5 (28-16)	M2	0.22-0.25 (1.9-2.2)	9 (0.35)

[1] Wire sizes given are maximum/minimum sizes that terminal block will accept - these are not recommendations.

Signal Connections

If the drive control connections are to be linked to an electronic circuit or device, the common or 0V line should, if possible, be grounded at the device (source) end only.

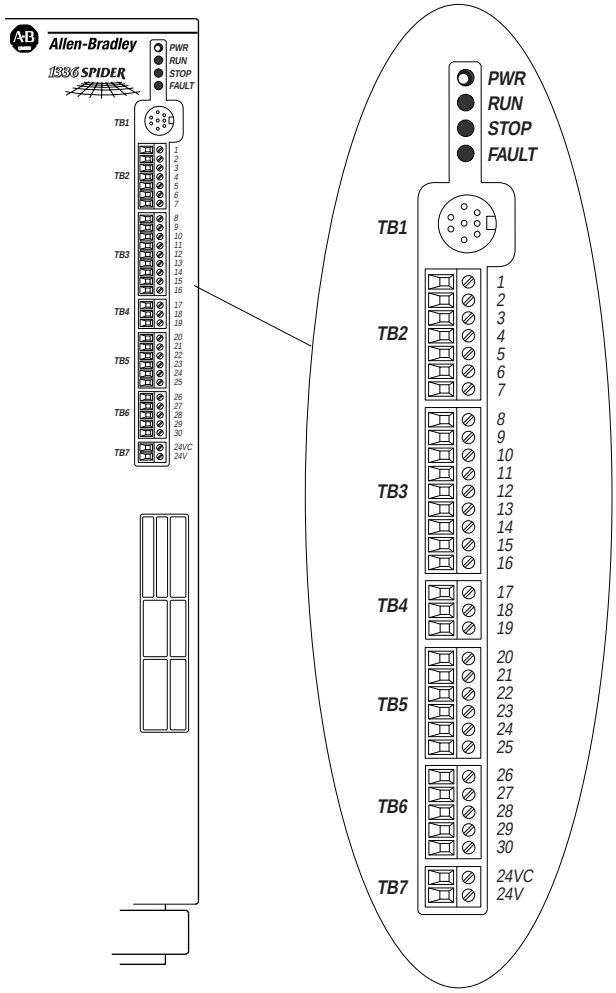
Important: The signal common (0V) of the drive is internally connected to PE. User speed reference signals are terminated to logic common at TB2, terminal 5. This puts the negative (or common) side of these signals at earth ground potential. Control schemes must be examined for possible conflicts with this type of grounding scheme.

Cable Routing

If unshielded cable is used, signal circuits should not run parallel to motor cables or unfiltered supply cables with a spacing less than 0.3 meters (1 foot). Cable tray metal dividers or separate conduit should be used.

Important: When user installed control and signal wiring with an insulation rating of less than 600V is used, this wiring must be routed inside the drive enclosure and separated from any other wiring and/or uninsulated live parts.

Figure 2
Control and Signal Terminal Blocks



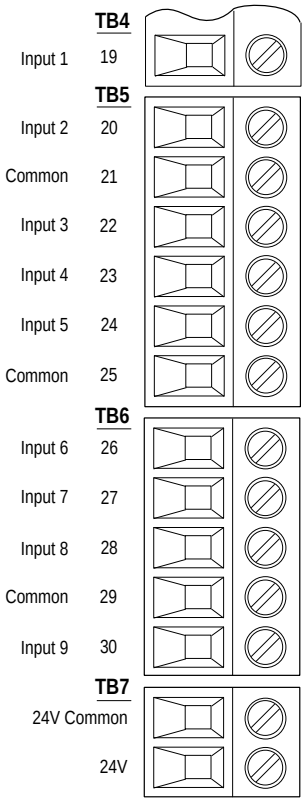
Digital Inputs

Digital inputs are connected at TB4-TB6.

Input Mode Select

A number of combinations are available by first programming [Input Mode] to the desired control scheme (i.e. 2 wire, 3 wire or Status). The remaining inputs can then be configured by programming [TB5 Term 22 Sel] through [TB6 Term 28 Sel].

Figure 3
Digital I/O Default Settings



	Input Mode (Start/Stop Functions Only)			
	Status[2] (Factory Default)	**2-Wire Control** Single-Source Control	**3-Wire Control** Single-Source Reversing	
Input 1 19	Status	Run Forward	Start	
Input 2 20	Stop/Fault Reset[3]	Stop/Fault Reset[3]	Stop/Fault Reset[3]	
Common 21	**Status Only** Default Mode shown at right is not active when [Input Mode] is set to "Status"	Common		**Factory Default Inputs**
Input 3 22		Rev/For[4]	(Programmable)	
Input 4 23		Jog	(Programmable)	
Input 5 24		Auxiliary[3]	(Programmable)	
Common 25		Common		
Input 6 26		Speed Select 3[1]	(Programmable)	
Input 7 27		Speed Select 2[1]	(Programmable)	
Input 8 28		Speed Select 1[1]	(Programmable)	
Common 29		Common		
Input 9 30	Enable[3]	Enable[3]	(Not Programmable)	

1 See *Speed Select* Table.

2 If this mode is selected, the status of all inputs can be read at the [Input Status] parameter. However, only "Stop/Fault Reset" and "Enable" will have control function.

3 These inputs must be present (reprogram if necessary) before drive will start.

4 Bit 0 of [Direction Mask] must = 1 to allow TB5 direction change/bipolar operation.

ATTENTION: A hazard of personal injury from automatic restart exists with 2-wire control. 2-wire control uses maintained Run contacts that act as both Run (closed) and Stop (open) devices. Opening the Stop contact (terminal 20) will stop the drive. If this contact is reclosed, any fault will be reset. If a valid Start command is still present, the drive will restart. Only use 2-wire control for applications outlined in NFPA79, "Under Voltage Protection."

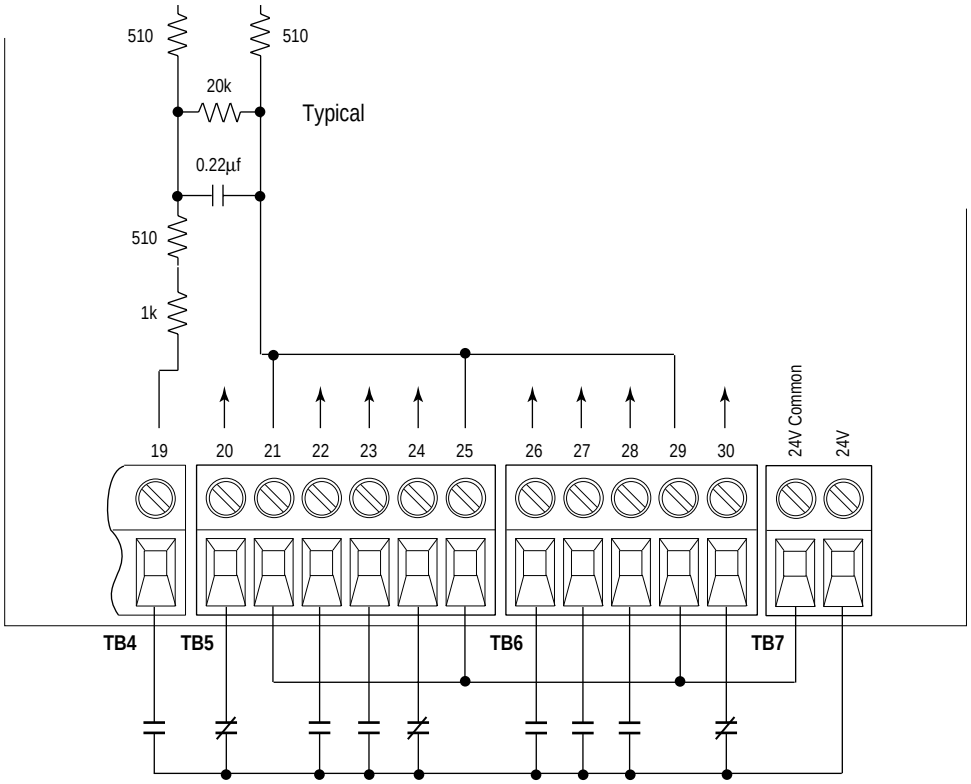
If a 3-wire device (i.e. HIM) is also used, pressing the HIM Stop key will also stop the drive. Releasing the Stop key will clear any faults that are present, but the drive will not restart without cycling the Start contact.

Circuits must be capable of operating with high = true logic.

DC external circuits in the low state must generate a voltage of no more than 8V DC. Leakage current must be less than 1.5 mA into a 2.5k ohm load.

DC external circuits in the high state must generate a voltage of +20 to +26 volts and source a current of approximately 10 mA for each input. The stand-alone version is compatible with these Allen-Bradley PLC modules:

1771-OB	1771-OQ16	1771-OB16
1771-OBD	1771-OYL	1771-OBN
1771-OZL	1771-OQ	1771-OBB



Contacts shown are general, refer to
Input Mode selection and recommended contact types.

Available Functions for Inputs 3 through 8

A variety of combinations made up of the following inputs are available.

Input	Description
"2 Acc/1 Acc" "2 Dec/1 Dec"	Closing these inputs will command the corresponding accel or decel rate. If both inputs are open or both are closed, the current rate is maintained. **Input** **1st** **2nd** No Command 0 0 Accel/Decel 1 0 1 Accel/Decel 2 1 0 Hold Time 1 1
"1st Accel" "2nd Accel" "1st Decel" "2nd Decel"	Allows selection of the accel or decel time used by the drive. 1=2nd, 0=1st
"Aux Fault"	Faults the drive via external devices (i.e. motor thermoswitch, O.L. relays, etc.). Opening this contact will fault (F02 - Aux Fault) the drive and shut the output off, ignoring the programmed stop mode.
"Clear Fault"	If drive has faulted, closing this input will clear the fault.
"Dig Pot Up" "Dig Pot Dn"	These inputs increase (up) or decrease (down) the drive commanded frequency when MOP (Motor Operated Potentiometer) is chosen as the frequency command source. The rate of increase/decrease is programmable.
"Forward"	Closing these inputs (Forward or Reverse) commands the corresponding direction. If both inputs are open or both are closed, the current direction is maintained.
"Rev/For"	Available only with three-wire control - Closing this input commands reverse direction and opening this input commands forward direction.
"Jog"	Closing this input starts the drive and causes it to run at programmed jog frequency. Opening this input stops the drive using the programmed stop mode.
"Local Ctrl"	Closing this input gives exclusive control of drive logic to the inputs at terminals 19-30. No other devices may issue logic commands (excluding Stop) to the drive.
"Reverse"	See "Forward" above.
"PI Enable"	Enables the output of the process PI loop.
"PI Reset"	Opening this input clamps the process PI *integrator* value at zero. Closing this input allows the integrator to continue to operate.
"Run Reverse"	Available Only with two-wire control - Closing this input issues both a start command and a reverse command to the drive. Opening the input issues a stop command to the drive.
"Speed Sel 1" "Speed Sel 2" "Speed Sel 3"	These inputs choose the frequency command source for the drive.
"Stop Type"	Closing this input selects the stop mode in [Stop Select 2] as the method of stopping when a stop command is issued. Opening this input selects the stop mode in [Stop Select 1] as the method of stopping.
"Sync"	Normally wired to multiple drives – When the Sync input is low, the drive operates normally. When the input is high, the speed of the drive will be held constant and the speed command will have no effect. During this period the speed input of the drive will normally be changed to a different source and/or value. Allows synchronized change of frequency command to multiple drives.
"Traverse"	Setting this input low disables the traverse function. When the input is high, the traverse function will be active. [Speed Control] must also be set to "P Jump" for the function to be active.

Important: The [Input Mode] parameter can be changed at any time, but the change will not affect drive operation until power to the drive has been removed and bus voltage has decayed completely. When changing this parameter, it is important to note that the functions of the Start and Stop inputs will change when power is reapplied to the drive.

The programming options allow you to select an input combination to meet the needs of a specific installation. The firmware will verify programming, to assure selection of an appropriate combination.

Speed Select/Frequency Reference

The drive speed command can be obtained from a number of different sources. The source is determined by drive programming and the condition of the Speed Select Inputs on TB6 (or reference select bits of command word if PLC controlled - see *Appendix A in User Manual*).

The default source for a command reference (all speed select inputs open) is the selection programmed in [Freq Select 1]. If any of the speed select inputs are closed, the drive will use other parameters as the speed command source. See Table G and the examples that follow.

Table G
Speed Select Input State vs. Frequency Source

Speed Select 3	Speed Select 2	Speed Select 1	Frequency Source
Open	Open	Open	[Freq Select 1]
Open	Open	Closed	[Freq Select 2]
Accessed through [Freq Select 2] parameter			[Preset Freq 1]
Open	Closed	Open	[Preset Freq 2]
Open	Closed	Closed	[Preset Freq 3]
Closed	Open	Open	[Preset Freq 4]
Closed	Open	Closed	[Preset Freq 5]
Closed	Closed	Open	[Preset Freq 6]
Closed	Closed	Closed	[Preset Freq 7]

Important: The final speed command may be affected by the type of modulation selected with [Speed Control], parameter 77.

Important: If a bi-polar input option (LA6 or LA7) is installed, the signal is designated "Analog Input 0." Note the following:

3 Wire Control – If [Input Mode] is set to "3 Wire" and the bi-polar input is selected as the active frequency reference [Freq Select 1 or 2], it is assumed that direction control is desired via analog polarity. If another source has control of direction, a "Bipolar Direction" fault (F16) will occur. If direction control via polarity is not required, bit 7 of [Direction Mask] should be set to "0." This causes the input to be treated as a 0-10V frequency reference only. Negative analog signals are treated as zero and direction control must come from another source.

2 Wire Control – If [Input Mode] is set to "2 Wire," it is assumed that direction control is provided via the 2 wire inputs (Run Forward and Run Reverse). Bit 7 of [Direction Mask] must be set to "0." This causes the input to be treated as a 0-10V frequency reference only. Negative analog signals are treated as zero. Failure to set the Mask will generate a "Bipolar Direction" (F16) fault.

Pulse Input/Output Option

Pulse Input

ATTENTION: If input voltages are maintained at levels above ±15V DC, signals may be degraded and component damage may result.

The pulse input signal must be an externally powered square-wave pulse at a 5V TTL logic level. As measured at the terminal block, circuits in the high state must generate a voltage between 3.6 and 5.5V DC at 8 mA. Circuits in the low state must generate a voltage between 0.0 and 0.8V DC. Maximum input frequency is 250kHz. Scale factor [Pulse/Enc Scale] must be set.

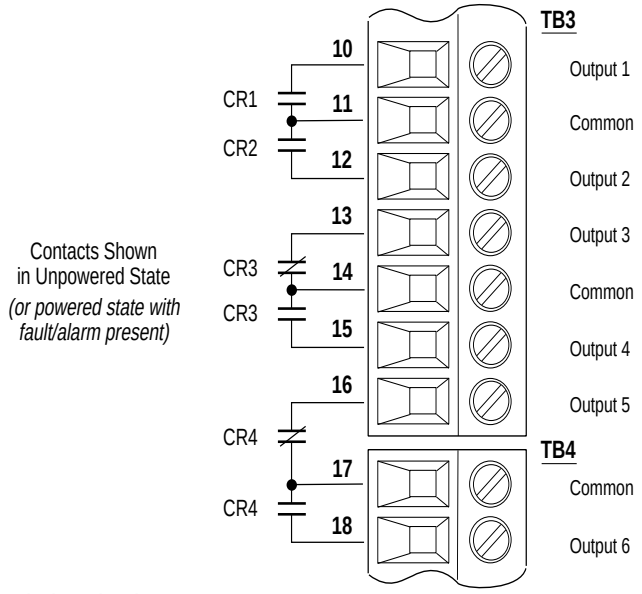
Pulse Output

Provides a TTL pulse train suitable for driving up to three 1336 SPIDER pulse inputs or a separate 125 ohm load at TTL levels (4V at 32 mA source, 0.8V at 3.2 mA sink).

Digital Outputs

The digital outputs are at terminals 10 through 18 of TB3-TB4.

Figure 4
Digital Outputs



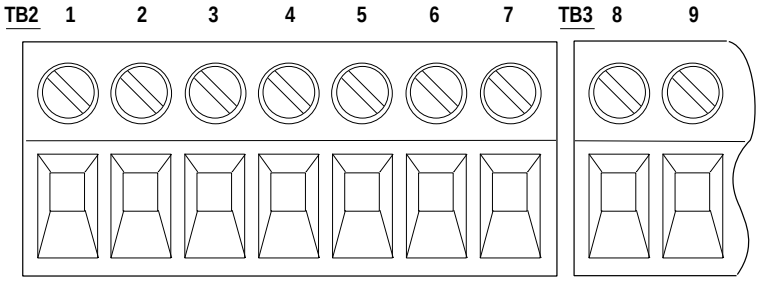
Terminal	Signal	
10, 11	CR1 Programmable Contact	Resistive Rating = 115V AC/30V DC, 5.0A Inductive Rating = 115V AC/30V DC, 2.0A
11, 12	CR2 Programmable Contact	
13, 14 14, 15	CR3 Programmable Contact	
16, 17 17, 18	CR4 Programmable Contact	

Important: The power supply used for relay contact outputs requires a field installation of transient voltage surge suppression with maximum clamping voltage of 2.5 kV on all control boards.

Analog I/O

The 1336 SPIDER analog I/O configuration provides a standard set of inputs and outputs with the capability to install up to 2 option boards, thus replacing the standard I/O with a variety of options. All connections are performed at TB2 and TB3. Installing an option board in the slot A or B location will change the function of those terminals on TB2-TB3 from standard. Only one option board can be installed in each slot. Figure 5 shows the standard and optional I/O configurations.

Figure 5
Analog I/O – TB2 and TB3



Analog I/O Option Slot A

Std.	Pot. Reference +5V [1]	Single-Ended Input 0 Pot., 10V or 20mA	Single-Ended Input 1 Pot., 10V or 20mA	Signal Common
	or (select 1)			
LA2	Isolated Input 0 (+) 10V or 20mA	Isolated Input 0 (–) 10V or 20mA	Isolated Input 1 (+) 10V or 20mA	Isolated Input 1 (–) 10V or 20mA
LA6	Isolated Input 0 (+) ±10V, ±20mA	Isolated Input 0 (–) ±10V, ±20mA	Thermistor Isolated Input (+)	Thermistor Isolated Input (–)
LA7	Isolated Input 0 (+) ±10V, ±20mA	Isolated Input 0 (–) ±10V, ±20mA	Isolated Input 1 (+) 10V or 20mA	Isolated Input 1 (–) 10V or 20mA

[1] If an Option Board is installed in Slot A, the +5V pot. reference will not be available. If a 5V source is required, it must be user supplied.

[2] Standard Analog Input 2 is maintained at this terminal – configure with J11.

Signal Common

Analog I/O Option Slot B

Std.	Single-Ended Input 2 Pot., 10V or 20mA	Single Ended Output 0 0-10V Only	Single Ended Output 1 0-10V Only	Signal Common
	or (select 1)			
LA1	Single-Ended Input 2 [2] Pot., 10V or 20mA	Single-Ended Output 0 10V or 20mA	Single-Ended Output 1 20mA Only	0-20mA Output Return
LA3	Isolated Output 0 (+) 10V or 20mA	Isolated Output 0 (–) 10V or 20mA	Isolated Output 1 (+) 10V or 20mA	Isolated Output 1 (–) 10V or 20mA
LA4	Isolated Input 2 (+) 10V or 20mA	Isolated Input 2 (–) 10V or 20mA	Isolated Output 1 (+) 10V or 20mA	Isolated Output 1 (–) 10V or 20mA
LA5	Single-Ended Output 0 10V or 20mA	Non-Isolated 250 kHz Pulse Output	Isolated 250 kHz Pulse In (+)	Isolated 250 kHz Pulse In (–)

All isolated I/O is designed with full galvanic (greater than 10 meg ohms, less than 50 pf) isolation. This results in an insulation withstand capability of 200VAC from each channel to PE ground and between channels. The Analog I/O Option Boards are summarized below.

Option	Board Type	Slot	Description
LA1	Dual Analog Output	B	This option replaces both standard analog outputs with two single-ended high resolution analog outputs. Analog Output 0 is configurable to 0-10V or 0-20 mA operation while Analog Output 1 is for 0-20 mA operation only. This option maintains access to the standard (non-isolated) Analog Input 2 through TB2-6 – Configuration remains with jumper J11.
LA2	Dual Isolated Input	A	This option replaces the two standard analog inputs with two galvanically isolated analog inputs. Both analog input channels are configurable for 0-10V or 0-20 mA operation.
LA3	Dual Isolated Output	B	Replaces Analog Input 2 and both standard analog outputs with two galvanically isolated high resolution analog outputs. Both analog output channels are configurable for 0-10V or 0-20 mA operation.
LA4	Isolated Input/ Isolated Output	B	This option replaces Analog Input 2 and both standard analog outputs with a galvanically isolated analog input and a galvanically isolated high resolution analog output. Both analog channels are configurable for 0-10V or 0-20 mA operation.
LA5	Analog Output/Pulse Output/Pulse Input	B	This option replaces Analog Input 2 and both standard analog outputs with a single-ended high resolution analog output, a single-ended 5V pulse output, and galvanically isolated 5V pulse input. The analog output channel is configurable for 0-10V or 0-20 mA operation.
LA6[1]	Isolated Bipolar/ Isolated Thermistor Input	A	This option replaces the two standard analog inputs with a galvanically isolated analog input and a galvanically isolated thermistor input. Analog Input 0 is configurable for ±10V or ±20 mA operation, with polarity determining forward or reverse operation Analog Input 0 is suitable for use with PTC sensor chains with a maximum total resistance at normal operating temperature of 1.8k ohms. An indication occurs in short circuit or over-temperature conditions. A short circuit condition is when the total resistance of the sensor chain is less than 60 ohms with reset from the short circuit condition occurring when the resistance exceeds 70 ohms. An over-temperature condition is when the total resistance of the sensor chain exceeds 3.3k ohms with reset from the over-temperature condition occurring when the resistance is less than 2.2k ohms.
LA7[1]	Isolated Bipolar Input/Isolated Input	A	This option replaces the two standard analog inputs with two galvanically isolated analog inputs. Analog Input 0 is configurable for ±10V or ±20mA operation, with polarity determining forward or reverse operation, while Analog Input 1 is configurable for 0-10V or 0-20 mA operation.

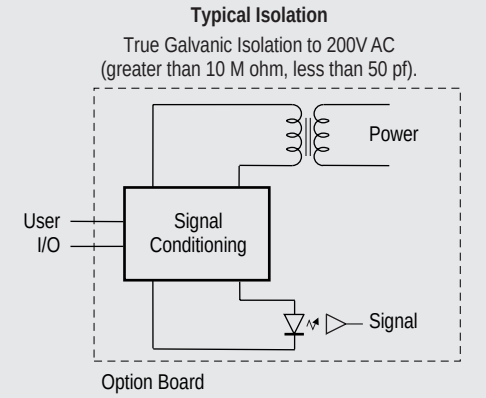
[1] Refer to the **Important** statement on page 22 concerning "bi-polar input option."

Specifications for the various inputs and outputs are provided below.

I/O Type	Configuration	Specification	Ref.
Standard	0-10V Input	100k ohm input impedance.	TB2-2[1]
	0-10V Output	Can drive a 10k ohm load (60 mA short circuit current limit).	TB2-7[1]
	0-20 mA Input	200 ohm input impedance.	TB2-2[1]
	10k Ohm Pot. Input	760k ohm input impedance. Pot. source = 5V through 2.67k ohms to TB2-1.	TB2-2[1]
Option Board[2]	0-10V Input	100k ohm input impedance.	TB2-1, 2
	0-10V Output	Can drive 3.3k ohms (3 - parallel 10k ohm loads).	TB2-7
	0-20 mA Input	100 ohm input impedance.	TB2-1, 2
	0-20 mA Output	Can drive 400 ohms (3 - series 0-20 mA inputs).	TB2-7
	Pulse Input	250 ohms in series with an opto LED. Pulse high is greater than 8 mA or 3.6V, while pulse low is less than 0.8V or 0.2 mA. Absolute maximum continuous input level is 12V or 50 mA.	TB3-8, 9
	Pulse Output	Provides a current limited 4.5V square wave. This output can drive one SPIDER or three SPIDER pulse inputs.	TB2-7
	Thermistor Input	5V across 3.3k ohms in series with the thermistor. This arrangement limits the measuring voltage to less than 2.5V (no self-heating).	TB2-3, 4

1 Use TB2-5 for shield connection.

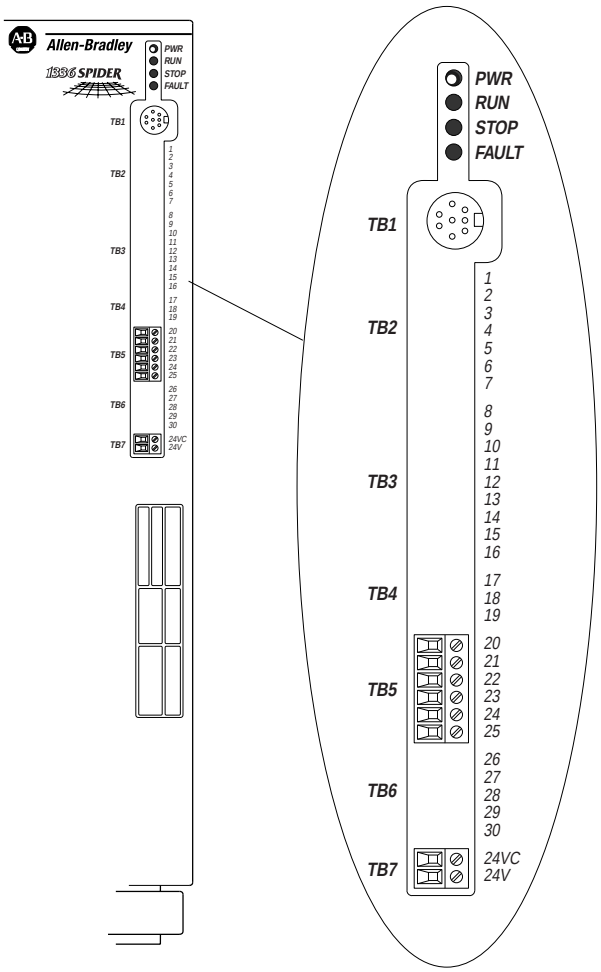
2 Refer to Typical Isolation diagram below.



ATTENTION: Configuring an analog input for 0-20mA operation and driving it from a voltage source could cause component damage. Verify proper configuration prior to applying input signals.

Control & Signal Wiring

Figure 6
Control and Signal Terminal Blocks



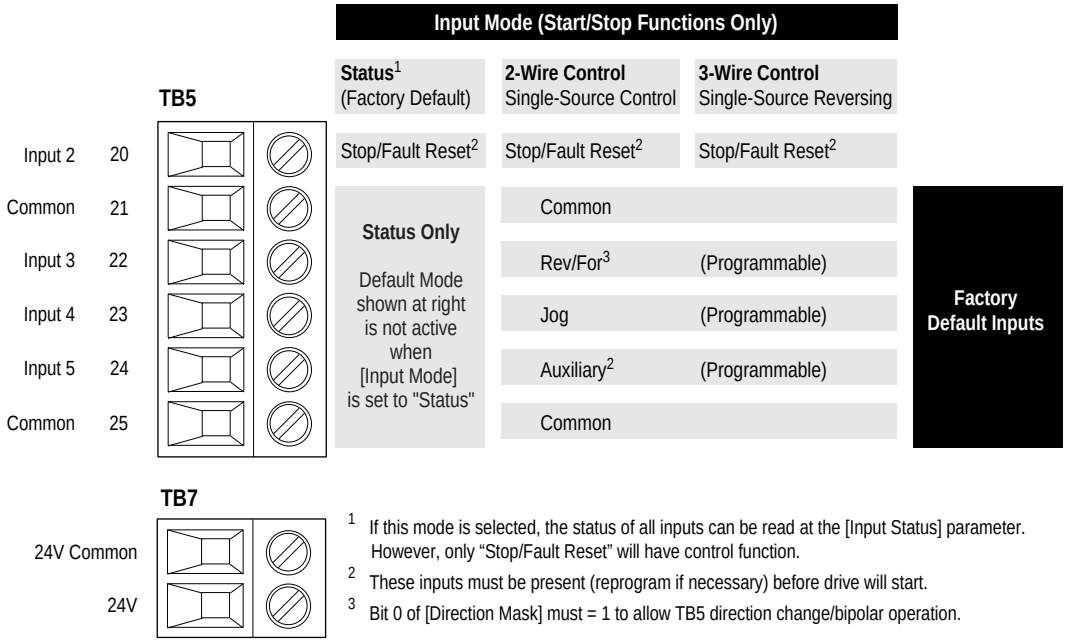
Digital Inputs

Digital inputs are connected at TB5.

Input Mode Select

A number of combinations are available by first programming [Input Mode] to the desired control scheme (i.e. 2 wire, 3 wire or Status). The remaining inputs can then be configured by programming [TB5 Term 23 Sel].

Figure 7
Digital I/O Default Settings



1 If this mode is selected, the status of all inputs can be read at the [Input Status] parameter. However, only "Stop/Fault Reset" will have control function.

2 These inputs must be present (reprogram if necessary) before drive will start.

3 Bit 0 of [Direction Mask] must = 1 to allow TB5 direction change/bipolar operation.

ATTENTION: A hazard of personal injury from automatic restart exists with 2-wire control. 2-wire control uses maintained Run contacts that act as both Run (closed) and Stop (open) devices. Opening the Stop contact (terminal 20) will stop the drive. If this contact is reclosed, any fault will be reset. If a valid Start command is still present, the drive will restart. Only use 2-wire control for applications outlined in NFPA79, "Under Voltage Protection."

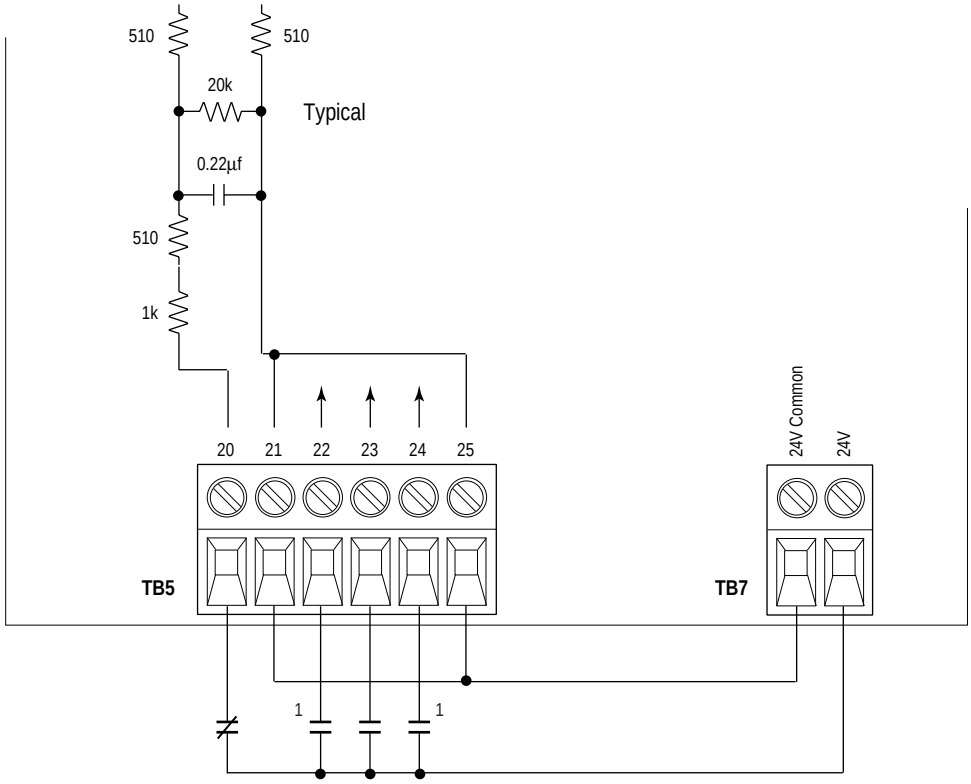
If a 3-wire device (i.e. HIM) is also used, pressing the HIM Stop key will also stop the drive. Releasing the Stop key will clear any faults that are present, but the drive will not restart without cycling the Start contact.

Circuits must be capable of operating with high = true logic.

DC external circuits in the low state must generate a voltage of no more than 8V DC. Leakage current must be less than 1.5 mA into a 2.5k ohm load.

DC external circuits in the high state must generate a voltage of +20 to +26 volts and source a current of approximately 10 mA for each input. The communication version is compatible with these Allen-Bradley PLC modules:

1771-OB	1771-OQ16	1771-OB16
1771-OBD	1771-OYL	1771-OBN
1771-OZL	1771-OQ	1771-OBB



Contacts shown are general, refer to
Input Mode selection and recommended contact types.

[1] Only used if 3-Wire Input Mode selected

Available Functions for Inputs 3 through 5

A variety of combinations made up of the following inputs are available.

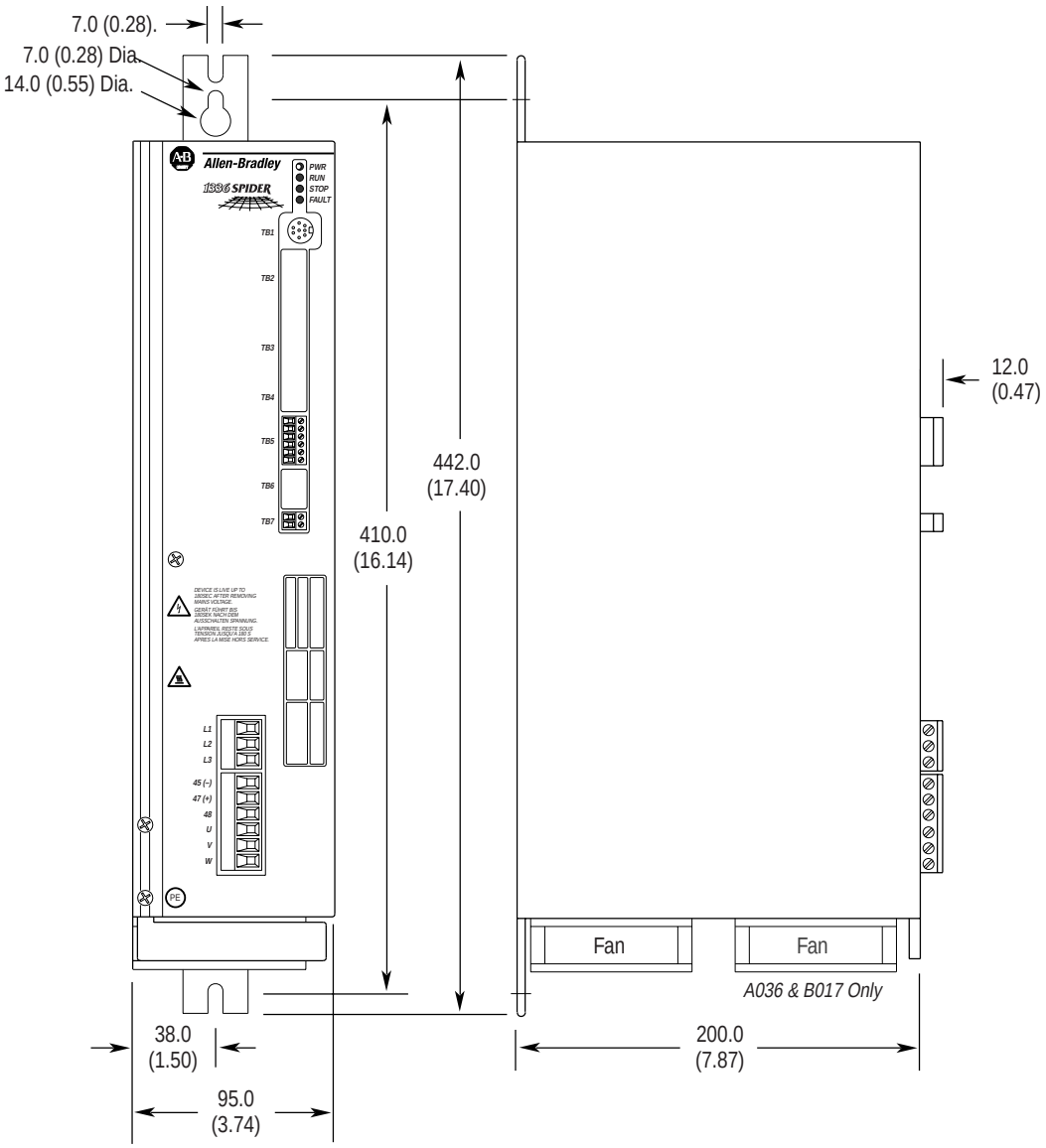
Input	Description
"2 Acc/1 Acc" "2 Dec/1 Dec"	Closing these inputs will command the corresponding accel or decel rate. If both inputs are open or both are closed, the current rate is maintained. **Input** **1st** **2nd** No Command 0 0 Accel/Decel 1 0 1 Accel/Decel 2 1 0 Hold Time 1 1
"1st Accel" "2nd Accel" "1st Decel" "2nd Decel"	Allows selection of the accel or decel time used by the drive. 1=2nd, 0=1st
"Aux Fault"	Faults the drive via external devices (i.e. motor thermoswitch, O.L. relays, etc.). Opening this contact will fault (F02 - Aux Fault) the drive and shut the output off, ignoring the programmed stop mode.
"Clear Fault"	If drive has faulted, closing this input will clear the fault.
"Dig Pot Up" "Dig Pot Dn"	These inputs increase (up) or decrease (down) the drive commanded frequency when MOP (Motor Operated Potentiometer) is chosen as the frequency command source. The rate of increase/decrease is programmable.
"Forward"	Closing these inputs (Forward or Reverse) commands the corresponding direction. If both inputs are open or both are closed, the current direction is maintained.
"Rev/For"	Available only with three-wire control - Closing this input commands reverse direction and opening this input commands forward direction.
"Jog"	Closing this input starts the drive and causes it to run at programmed jog frequency. Opening this input stops the drive using the programmed stop mode.
"Local Ctrl"	Closing this input gives exclusive control of drive logic to the inputs at terminals 20-25. No other devices may issue logic commands (excluding Stop) to the drive.
"Reverse"	See "Forward" above.
"PI Enable"	Enables the output of the process PI loop.
"PI Reset"	Opening this input clamps the process PI *integrator* value at zero. Closing this input allows the integrator to continue to operate.
"Run Reverse"	Available Only with two-wire control - Closing this input issues both a start command and a reverse command to the drive. Opening the input issues a stop command to the drive.
"Speed Sel 1" "Speed Sel 2" "Speed Sel 3"	These inputs choose the frequency command source for the drive.
"Stop Type"	Closing this input selects the stop mode in [Stop Select 2] as the method of stopping when a stop command is issued. Opening this input selects the stop mode in [Stop Select 1] as the method of stopping.
"Sync"	Normally wired to multiple drives – When the Sync input is low, the drive operates normally. When the input is high, the speed of the drive will be held constant and the speed command will have no effect. During this period the speed input of the drive will normally be changed to a different source and/or value. Allows synchronized change of frequency command to multiple drives.
"Traverse"	Setting this input low disables the traverse function. When the input is high, the traverse function will be active. [Speed Control] must also be set to "P Jump" for the function to be active.

Important: The [Input Mode] parameter can be changed at any time, but the change will not affect drive operation until power to the drive has been removed and bus voltage has decayed completely. When changing this parameter, it is important to note that the functions of the Start and Stop inputs will change when power is reapplied to the drive.

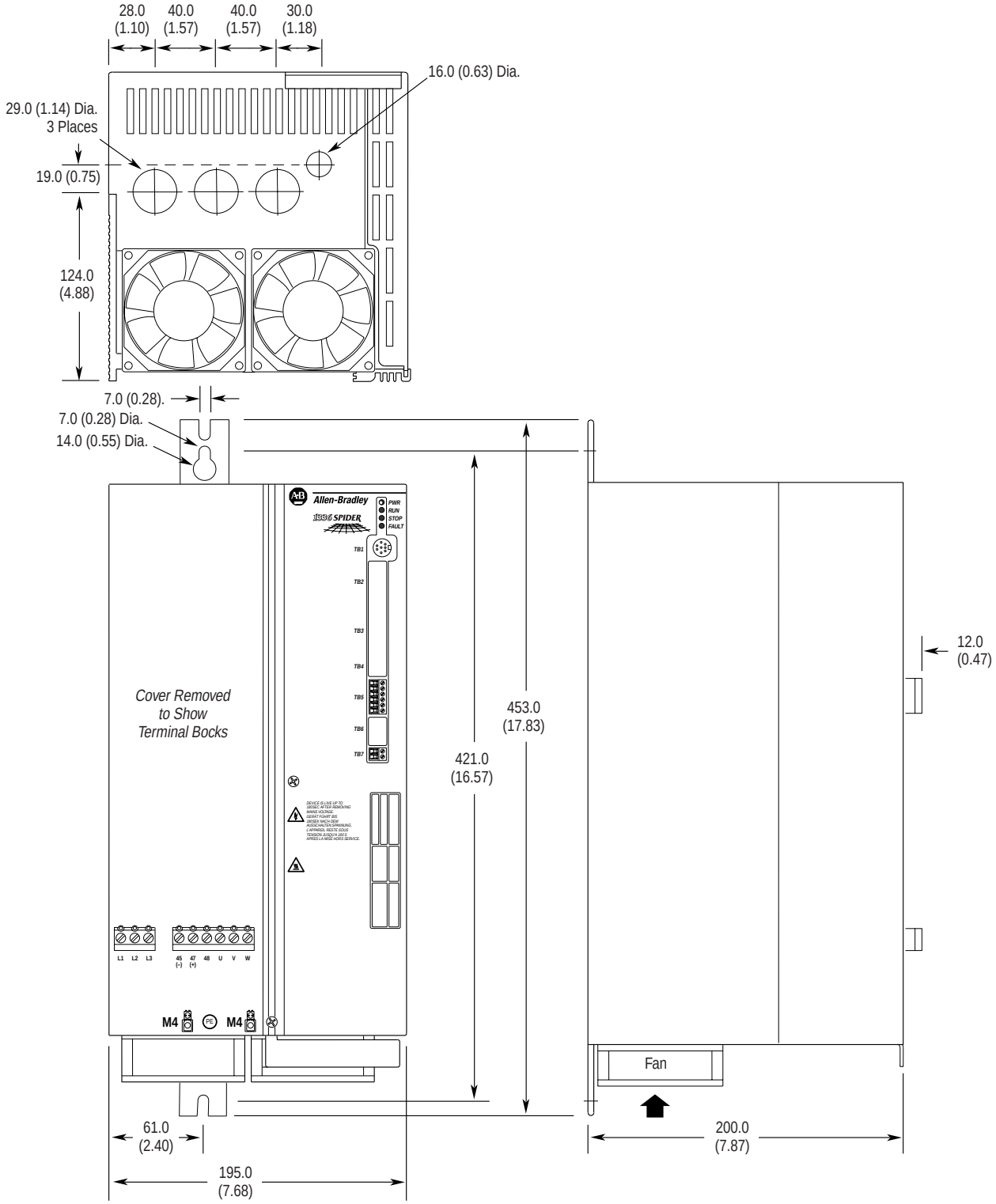
The programming options allow the user to select an input combination to meet the needs of a specific installation. The firmware will verify programming, to assure an appropriate combination has been selected.

IP 20 (Open Type) Dimensions – A022, A036, B010, B017

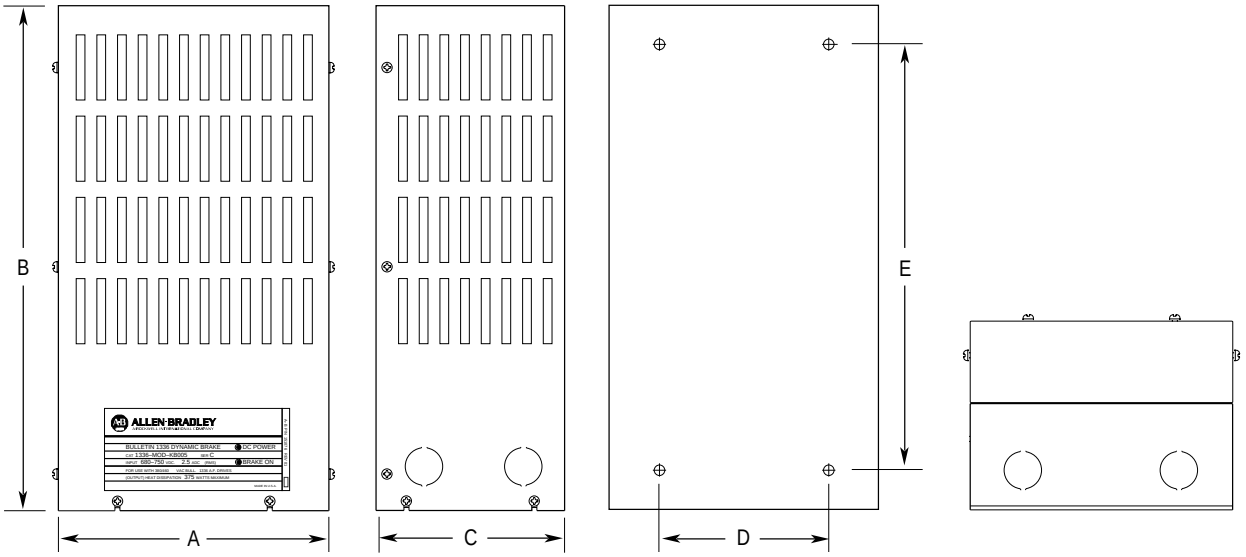
Important: The following dimensions are for estimating purposes only. Contact your Allen-Bradley Sales Office if certified drawings are required.



IP 20 (Open Type) Dimensions – A060, B033



Dynamic Brake Resistor Dimensions



(Front) (Side) (Bottom View - Mounting Holes) (Bottom)

IPC Catalog Number[1]	Brake Resistor		Dimensions				
	Resistance	Power	A	B	C	D	E
556-1	25 Ohms	1850 Watts	330.2 (13.00)	355.6 (14.00)	127.0 (5.00)	279.4 (11.00)	304.8 (12.00)
556-2	16 Ohms	2790 Watts	254.0 (10.00)	533.4 (21.00)	127.0 (5.00)	203.2 (8.00)	482.6 (19.00)
556-3	75 Ohms	2475 Watts	254.0 (10.00)	533.4 (21.00)	127.0 (5.00)	203.2 (8.00)	482.6 (19.00)
556-4	53 Ohms	3428 Watts	330.2 (13.00)	533.4 (21.00)	127.0 (5.00)	279.4 (11.00)	482.6 (19.00)
556-5	43 Ohms	4100 Watts	330.2 (13.00)	711.2 (28.00)	127.0 (5.00)	279.4 (11.00)	660.4 (26.00)

1 100% braking torque at 20% duty cycle.

Resistor assemblies listed are manufactured by IPC Power Resistors Int'l, Inc. and have been tested with the 1336 SPIDER Drive. Equivalent resistor packages may be used if they conform to the ratings shown.

Available resistor assembly options include an overtemperature switch, auxiliary terminal blocks and custom enclosures.

For further information contact:

IPC Power Resistors Int'l, Inc.
7453 Empire Dr.
Unit #105
Florence, Kentucky 41042-7453
Tel. (606) 282-2900 Fax. (606) 282-2904

Notes

Notes

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