Application Technique

Original Instructions

Allen-Bradley
by ROCKWELL AUTOMATION

Drives in Common Bus Configurations with PowerFlex 755TM Bus Supplies

Bulletin Numbers 20G, 20J

Rockwell Automation

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added PowerFlex 755TS drive	throughout
Updated PowerFlex 755TM drive regenerative bus supply maximum external capacitance	throughout

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About This Publication

An increasing number of drive systems in a wide range of applications and power ranges are being configured today in common bus drive configurations. These system configurations provide significant advantages, such as design flexibility, higher efficiency, and cost savings.

This publication provides the necessary guidelines, considerations, and limitations for the proper application of Allen-Bradley® drives that common bus configurations use. For Allen-Bradley common bus standard products, see publication PFLEX-SG002.

There are many possible common bus drive configurations that are beyond the scope of this document. If your configurations are not covered by this manual, contact your local Allen-Bradley distributor or Rockwell Automation sales office. Rockwell Automation Systems and Solutions business can accommodate unique or more complex common bus drive configurations.

This publication is focused on common bus drive configurations that are powered from electrical power grid sources. If your application is powered by isolated power sources, such as backup or marine shipboard generators, contact your authorized Allen-Bradley distributor or Rockwell Automation sales office for assistance.

Download Firmware, AOP (Add-on Profile), EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from rok.auto/pcdc.

Definition of Common Bus Drive Configuration

This configuration contains one or more common bus drives that connect directly to the DC common bus. The common DC bus allows connected drives to share energy directly on the DC bus, which provides an efficient way to motor drives to absorb energy from regenerating inverters. You can use a PowerFlex® 755TM drive non-regenerative bus supply to supply DC power to the DC input common bus drives where it is determined that there is no regeneration to the AC power source.

If you require regeneration to the AC source, the PowerFlex 755TM drive regenerative bus supply (using the active front end [AFE] pulse-width modulated [PWM] insulated gate bipolar transistor [IGBT] converter topology) enables bidirectional power flow from and back to the incoming AC line.

In addition, you can use standard PowerFlex 755TL/TR AC drives in a shared or piggy-back common DC bus configuration, where one non-regenerative or regenerative AC drive is used to power a motor load plus other DC input inverters, which connect to the DC bus terminals.

Notes:

DC Bus Wiring Guidelines

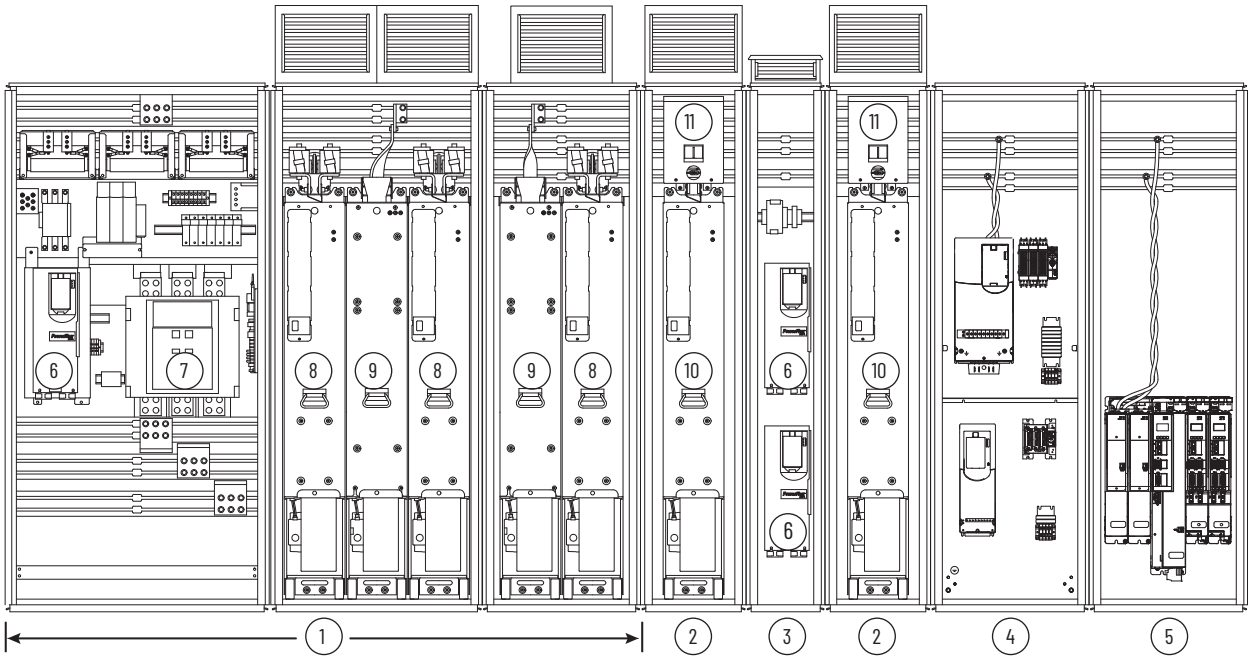
This section provides guidelines for DC bus wiring of common bus drive systems.

Drive Line-up

Generally, you want to have the drive line-up match the machine layout. However, if you use a mix of drive frame sizes in the line-up, the system layout requires you to locate the largest drives closest to the rectifier source. The rectifier source can be anywhere within the system line-up. Often, you can place the rectifier in the middle of the line-up to minimize the distance to the farthest loads. Shorter distances can minimize the energy that is stored in the parasitic inductance of the bus structure, which helps to lower peak bus voltages and mitigate voltage transients during operation.

To minimize system inductance, we recommend that the system DC bus remains uninterrupted. We do not recommend the use of cables to connect additional drive system cabinets to the system bus.

Figure 1 - Example System



Item	Description
1	PowerFlex® 755TM drive regenerative bus supply (frame 10)
2	PowerFlex 755TM common bus drive (frame 8)
3	Control bay
4	PowerFlex 750-series and PowerFlex 755TS drives (frames 2...7 only)

Item	Description
5	Kinetix® 5700 servo drive cluster
6	Control pod
7	AC precharge module
8	Line side converter

Item	Description
9	Line side converter
10	Motor side inverter
11	DC precharge module (optional)

DC Bus Connections

For optimum system operation, keep the interconnection of drives to the DC bus and the inductance levels between the drives to a minimum.

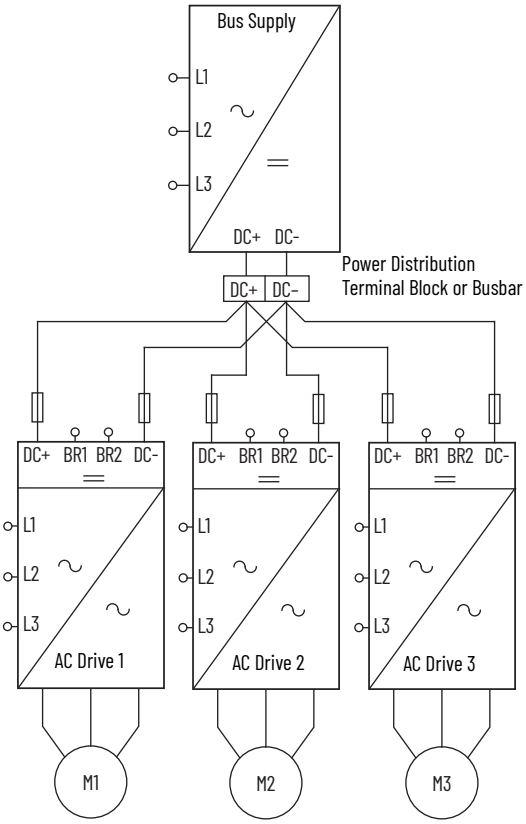
WARNING: The incorrect use or configuration of third-party assemblies can result in reduced system reliability and drive damage.

Busbar Versus Cable

Continuous busbar is required. When you use cables to connect drives to the system bus within a cabinet, adhere to the following guidelines.

- Keep the cable lengths as short as possible.
- Twist cable where possible, approximately one twist per foot.
- Use cable that is appropriately rated for the voltage class of the product.
- You cannot daisy-chain the DC bus connections. Use a star configuration of the DC bus connections as shown in Figure 2 to accommodate proper fusing.

Figure 2 - Star Configuration of Common Bus Drive Connections



Precharge

Precharge is the process through which the DC bus voltage of a drive gradually increases. During this increase in DC bus voltage, the DC bus filtering capacitors charge in a controlled manner. The precharge assembly can be part of the drive design or it can be externally provided and controlled.

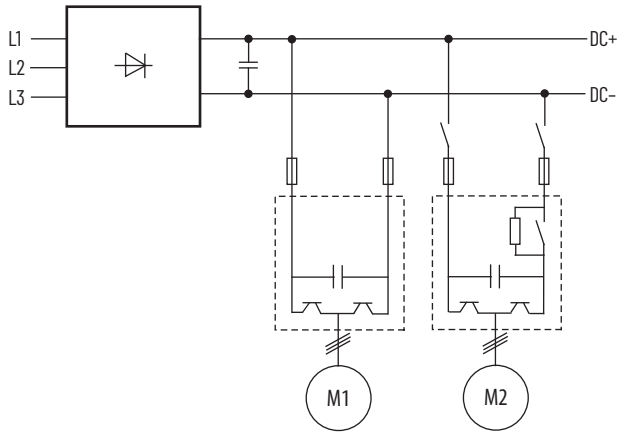
WARNING: An external source of power can be present. To avoid an electric shock hazard, verify that the AC power supply is removed before you perform any maintenance.

If you use an external voltage source to power the logic boards of the drives, take precautions to control the precharge sequence. We recommend using the Precharge Enable digital input on the drive for common bus drive operation. The logic input can be coordinated through a PLC or system-level control to sequence the precharge. The sequencing lets charge time constants for various horsepower drives settle out before the precharge is complete. Generally, a 3 second delay is acceptable after power has been applied.

IMPORTANT The Precharge Enable digital input is only available on PowerFlex 750-series, PowerFlex 755TM, and PowerFlex 755TS drives. The Kinetix 5700 servo drives do not have a Precharge Enable digital input.

When you connect multiple drives through disconnects to a common DC bus, you must provide an input to the drive that enables the precharge to finish. Often, an auxiliary contact on the drive disconnect switch controls this input.

Figure 3 - Common DC Bus Example



ATTENTION: The bus capacitors in the individual drives act as a low-impedance voltage source. Take care when you connect individual drives to an energized bus.

If you select Precharge Enable as a digital input, you must energize the input to let the initial bus precharge complete. If the input is de-energized, the input is treated as a coast-to-stop command and forces the drive to the initial bus-precharge state. Fuse failure is probable unless you coordinate the precharge circuits in individual drives.

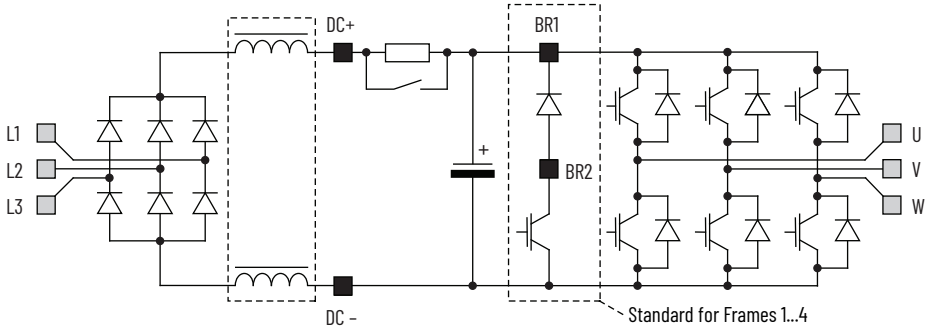
PowerFlex 750-Series and PowerFlex 755TS AC Drives (Frames 1...4)

For PowerFlex 750-series and PowerFlex 755TS AC drives (frames 1...4), the precharge hardware is on the power circuit board. The hardware comprises a resistor in series with the positive DC bus between the DC link and the bus capacitors. The resistor has a relay contact that connects in parallel, which closes to bypass the precharge resistor when the bus precharge level is attained. The precharge function operates the same way for either AC or DC input power.

Position 5 of the catalog number dictates the input type.

- 1 = Frame 5 AC input with precharge, includes DC terminals

Figure 4 - AC and DC Input Schematic (Input Type 1)

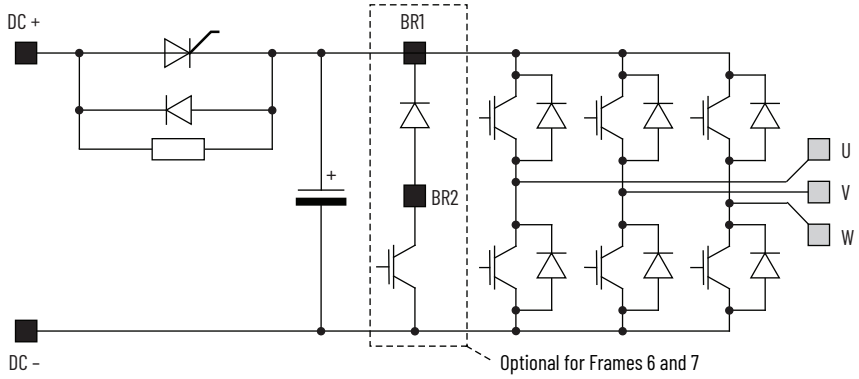


PowerFlex 750-Series and PowerFlex 755TS DC Input Common Bus Drives (Frames 5...7)

The precharge has a resistor in series with the positive DC bus, ahead of the bus capacitors. A silicon-controlled rectifier (SCR) connects in parallel. Once the SCR is gated on, the precharge resistor is bypassed.

ATTENTION: PowerFlex 750-series and PowerFlex 755TS drive input types 1 and A have no method for the user to control the DC input precharge sequence. Connection to a fully charged DC bus can result in severe drive and/or equipment damage due to uncontrolled charging of the DC bus capacitors.

Figure 5 - DC Input Schematic (Input Type 4)



PowerFlex 755TM Common Bus Drives (Frames 8...15)

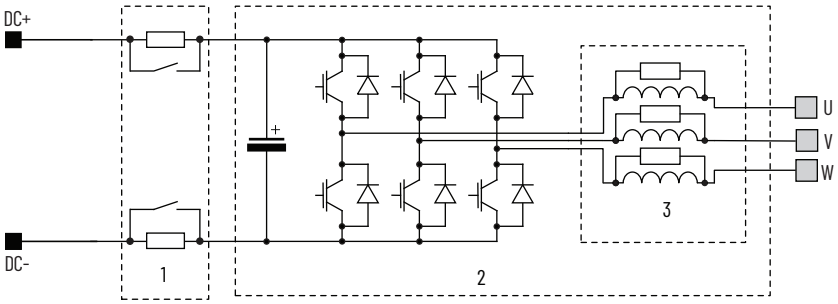
For PowerFlex 755TM common bus drive (frames 8...15), the precharge function implements with a resistor and automatic bypass in both the positive and negative DC bus between the DC input and the bus capacitors. When the DC bus reaches precharge level, the motor-operated circuit breaker (MCCB) closes, which bypasses the resistor.

Position 5 of the catalog number dictates the input type.

- D = Common bus with DC precharge
- E = Common bus without precharge, the DC fusing is contained within the DC bus connector assembly

ATTENTION: PowerFlex 755TM common bus drive input type E has no method for the user to control the DC input precharge sequence. Connection to a fully charged DC bus can result in severe drive and/or equipment damage due to uncontrolled charging of the DC bus capacitors.

Figure 6 - DC Input Schematic (Input Types D or E)



This figure represents a PowerFlex 755TM common bus drive (frame 8) with an optional DC precharge and a reflective wave filter.

1. Optional precharge, based on input type catalog number selection.
2. Power module (roll-in).
3. Optional reflective wave filtering, based on position 11, filtering, and CM cap configuration selection.

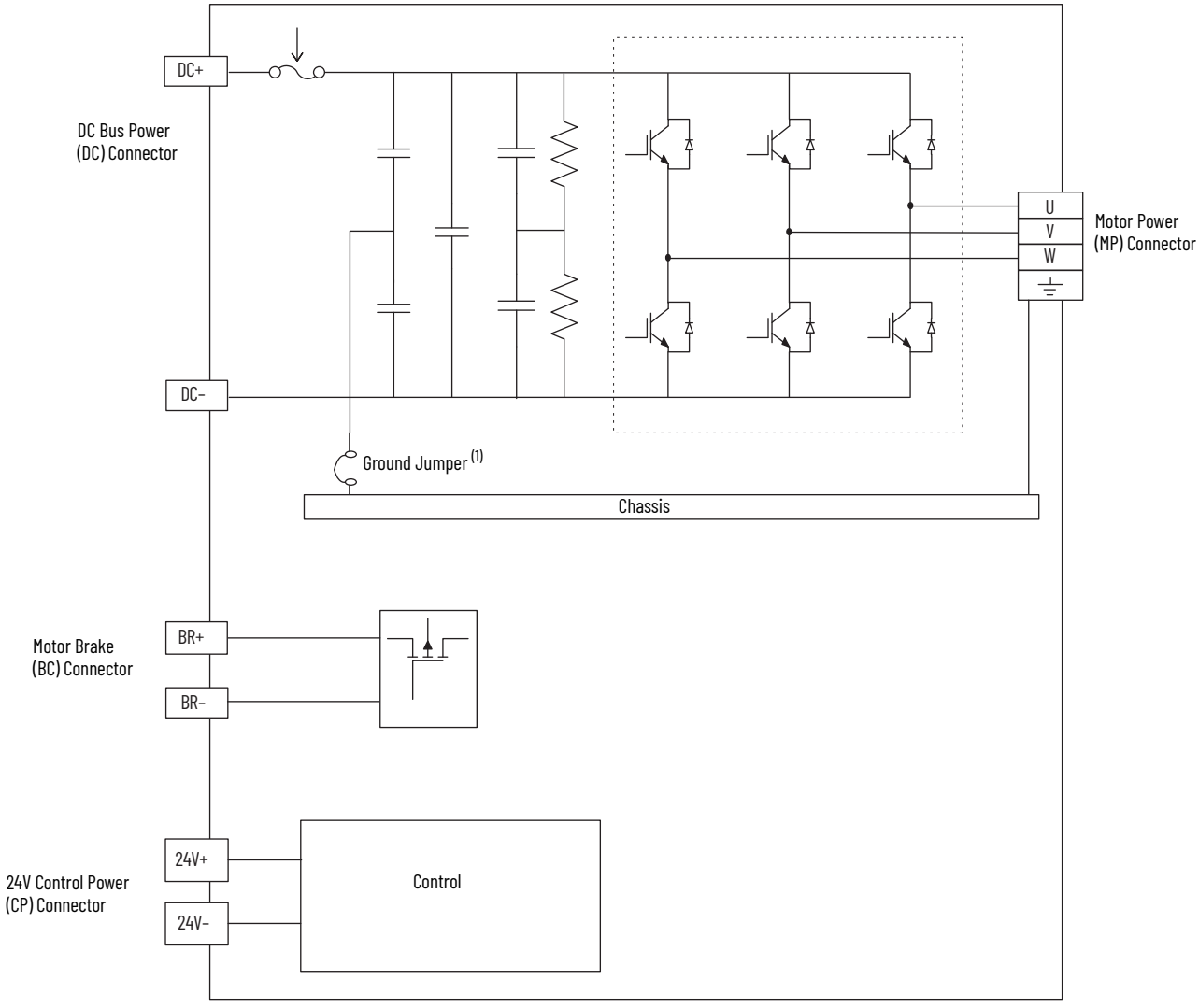
Kinetix 5700 Single-axis and Dual-axis Servo Drives

The Kinetix 5700 is a multi-axis, servo drive system with a power range of 1.6 kW...112 kW. The Kinetix 5700 drive system power supplies zero-stack and seamlessly connects with single-axis and dual-axis servo drives. However, if you use the drive system with an external non-regenerative DC-bus power supply, the 2198-CAPMOD-2240 capacitor module is required along with the 2198-CAPMODDCBUS-IO extension module to provide connections to the DC+ and DC- lug terminals. If you use the drive system with an external regenerative bus supply, the 2198-CAPMOD-2240 capacitor module is required along with the 2198-DCBUSCOND-RP312 DC-Bus Conditioner module to provide connections to the DC+ and DC-lug terminals.

ATTENTION: Kinetix servo drives have no method for the user to control the precharge sequence. Connection of Kinetix servo drives to an energized DC bus can result in severe drive and/or equipment damage due to uncontrolled charging of the DC bus capacitors.

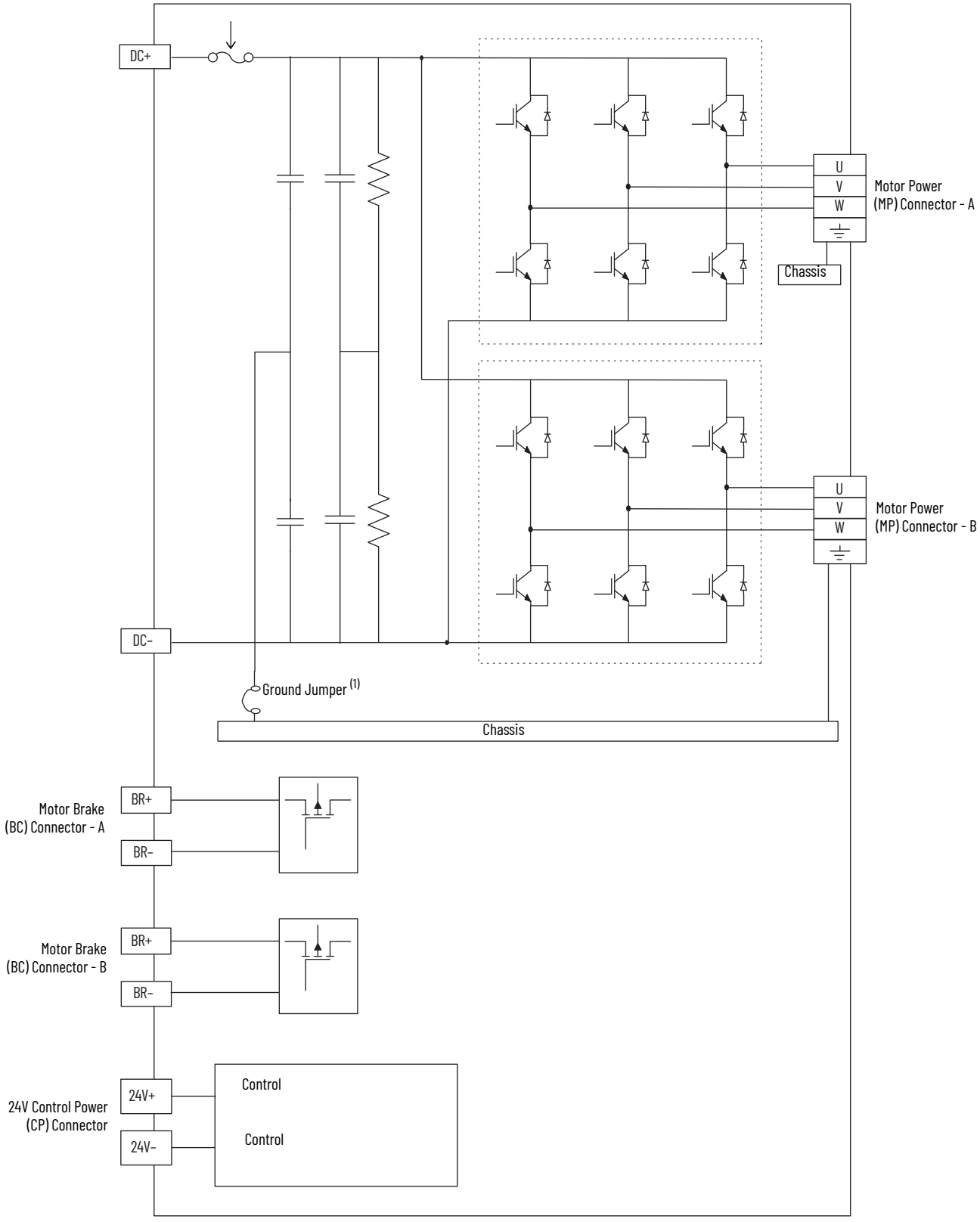
See Kinetix 5700 Servo Drives on page 106 for more information. The converter that supplies power to the bank of Kinetix drives precharge all capacitance, as the inverters themselves do not have precharge capability. See Figure 7 and Figure 8 on page 15.

Figure 7 - Single-axis Servo Block Diagram



(1) Ground jumper installed on 2198-S*xxx*-ERS3 (series A) drives.
Ground jumper removed on 2198-S*xxx*-ERS4 and 2198-S*xxx*-ERS3 (series B) drives.

Figure 8 - Dual-axis Servo Block Diagram



(1) Ground jumper installed on 2198-S*xxx*-ERS3 (series A) drives.
Ground jumper removed on 2198-S*xxx*-ERS4 and 2198-Sxxx-ERS3 (series B) drives.

Notes:

Regenerative Bus Supply Configuration

This system uses a PWM-controlled IGBT converter for full regeneration of power to the AC line. The regenerative bus supply puts energy back onto the distribution system instead of dissipates energy with resistor braking technology. This configuration provides low AC line harmonics and can be used to meet IEEE-519 when used with the appropriate filtering.

Supported Products

At the time of publication, the following products are supported.

Position 5 of the catalog number dictates the input type.

- 1 = Frames 2...4 AC input with precharge, includes DC terminals
- 4 = Frames 5...7 DC input with precharge
- 6 = Frames 6...7 regenerative and low harmonic AFE, 755TM drive bus supplies
- D = Common bus with DC precharge
- E = Common bus without DC precharge
- F = Frames 8...15 regenerative and low harmonic AFE, 755TM drive bus supplies

Table 1 - Supported Products

Drive Bus Supply Products [Cat. No. 20Jx]	Voltage Class	Supported Drives	Drive DC Bus Overvoltage Trip(1)
PowerFlex® 755TM regenerative (2) (frames 6...15) (3)	400/480V AC	400/480V AC PowerFlex 755TS (frames 2...7) (4)	815V DC
		400/480V AC PowerFlex 750-series (frames 2...7) (5)(6)	815V DC
		400/480V AC PowerFlex 755TM (frames 8...15) (7)	815V DC
		Kinetix® 5700 single-axis servo (cat. no. 2198-S*xxx*-ERSx)	810V DC
		Kinetix 5700 dual-axis servo (cat. no. 2198-D*xxx*-ERSx)	810V DC
	600/690V AC	600V AC PowerFlex 750-series (frames 3...5) (5)(8)	1013V DC
		600V AC PowerFlex 755TS (frames 3...7) (5)	1026V DC
		600/690V AC PowerFlex 750-series (frames 6...7) (5)	1162V DC
		690V AC PowerFlex 755TS (frames 6...7) (5)	1172V DC
		600/690V AC PowerFlex 755TM (frames 8...15) (7)	1172V DC

(1) DC bus voltage control methods can be required to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. See Appendix D on page 119 for more information.
(2) PowerFlex 755TM drive bus supply input type 6 or F.
(3) PowerFlex 755T regenerative bus supply (frame 6) is a panel-mounted device that requires additional external AC input power conditioning equipment. If you use frame 6 regenerative bus supplies, see publication 750-IN100, for additional installation and external device information.
(4) You can use PowerFlex 755TS drives (frame 1) with common DC systems provided certain power circuit and other conditions are met. See PowerFlex 755TS Frame 1 and common bus systems for more information and technical data.
(5) PowerFlex 750-series and PowerFlex 755TS drives input type 1 or 4.
(6) Currently, we do not recommend frame 1 drives for use with common DC bus systems.
(7) PowerFlex 755TM drive input type D or E. If DC input disconnect switches are applied to drives, you must select input type D.
(8) PowerFlex 750-series 600V AC drive (frames 3...5) cannot be used on 690V AC systems. See Appendix D on page 119 for more information.

Typical System Configurations

This section describes typical configurations for the PowerFlex 755TM drive regenerative bus supply. The common DC bus configuration includes one regenerative bus supply that powers one or more drives, which are shown in Table 1.

We recommend you use a dedicated isolation transformer that only supplies AC power to the regenerative bus supply. If other non-linear (diode/SCR rectifiers) or active front end (AFE) AC loads connect to the secondary of the isolation transformer, additional line reactors can be required. See AC Power System Resonance Conditions on page 20 for more information.

You can use the PowerFlex 755T drive regenerative bus supply with solid grounded, high-resistance grounded, and ungrounded AC power sources. We recommend solid grounded and resistance grounded power sources for typical grid powered AC sources to improve electrical safety, ease of ground fault detection, and to reduce unbalanced voltages.

Ungrounded (floating ground) AC power sources are typically used for shipboard isolated power systems that are not earth grounded.

Resistance grounded and ungrounded (floating ground) power sources can require additional user supplied circuits and optional bus conditioners (-P50 or -P51).

Figure 9 - PowerFlex 755TM Drive Regenerative Bus Supply Configurations

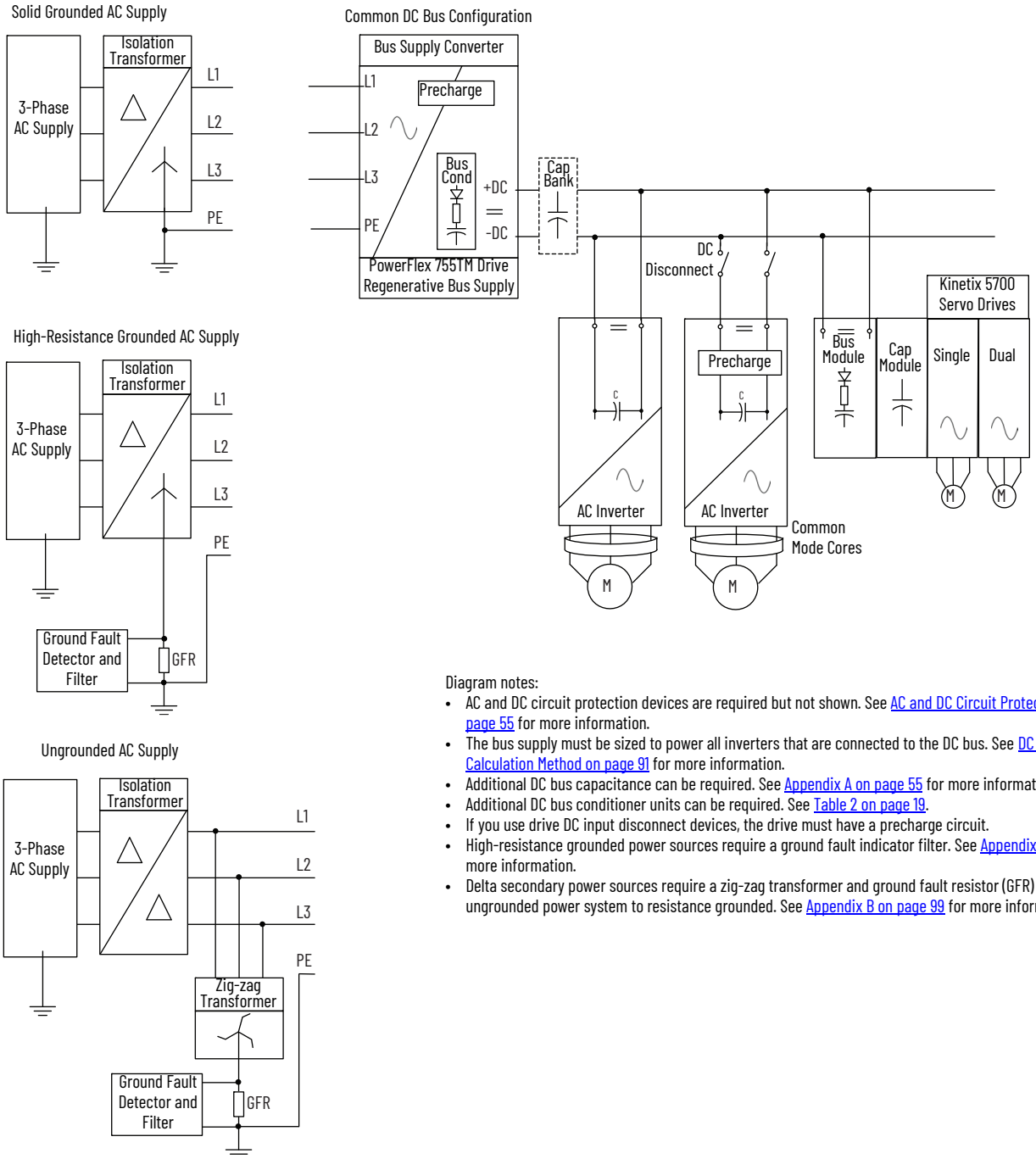


Diagram notes:

- AC and DC circuit protection devices are required but not shown. See AC and DC Circuit Protection Devices on page 55 for more information.
- The bus supply must be sized to power all inverters that are connected to the DC bus. See DC Bus Capacitance Calculation Method on page 91 for more information.
- Additional DC bus capacitance can be required. See Appendix A on page 55 for more information.
- Additional DC bus conditioner units can be required. See Table 2 on page 19.
- If you use drive DC input disconnect devices, the drive must have a precharge circuit.
- High-resistance grounded power sources require a ground fault indicator filter. See Appendix B on page 99 for more information.
- Delta secondary power sources require a zig-zag transformer and ground fault resistor (GFR) to convert the ungrounded power system to resistance grounded. See Appendix B on page 99 for more information.

Table 2 - Compatibility Table

System Voltage	Bus Supplies		Inverter		Common Mode Core	DC Bus Conditioner
	Qty.	Drive Type [Cat. No. 20Jx]	Qty.	Drive Type		
400/480V AC	1	PowerFlex 755TM regenerative (1) (frames 7...15)	n (2)	400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 2...3)	1321-M048 (3)	• Solid ground (4): -P50 option is not required (5) • High resistance grounded (4): -P50 power option is required (5)
				400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 4...6)	1321-M180 (3)	
				400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 7)	SK-Y1-CMCORE1 (3)	
				400/480V AC PowerFlex 755TM common bus (frames 8...15) (6)	Not required (7)	
				Kinetix 5700 single-axis servo (cat. no. 2198-S*xxx*-ERSx) (8)	Not required	
				Kinetix 5700 dual-axis servo (cat. no. 2198-D*xxx*-ERSx) (8)	Not required	
600/690V AC	1	PowerFlex 755TM regenerative (1) (frames 7...15)	n (2)	600/690V AC PowerFlex 755TS (frames 3...5)	Fr.3: 1321-M048 (3) Fr.4...5: 1321-M180 (3)	
				600V AC PowerFlex 750-series (frames 3...5) (9)(10)	Fr.3: 1321-M048 (3) Fr.4...5: 1321-M180 (3)	
				600/690V AC PowerFlex 750-series and PowerFlex 755TS (frames 6...7)	Fr.6: 1321-M180 (3) Fr.7: SK-Y1-CMCORE1 (3)	
				600/690V AC PowerFlex 755TM common bus (frames 8...15 (6))	Not required (7)	

(1) See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for guidance on PowerFlex 755TM drive system DC bus selection.
(2) The number of drives that can connect is limited by the precharge capability of the PowerFlex 755TM drive regenerative bus supply. See DC Bus Capacitance Calculation Method on page 91 for more information about DC bus capacitor calculations, system capacitance precharging requirements, and the maximum external DC bus capacitance that can connect.
(3) For PowerFlex 750-series and PowerFlex 755TS drives (frames 2...7), common mode cores are required on drive AC output only. See Appendix B on page 99 and product technical data manuals for more information.
(4) The appropriate number of bus conditioner units internal to the PowerFlex 755TM drive regenerative bus supply is factory-installed, depending on the frame size and -P50 option selection. Drive regenerative bus supplies (frames 6...7) have built-in bus conditioner circuits and cannot be specified with the -P50 power option. For shipboard ungrounded power sources, a marine bus conditioner, option -P51, can be required. Contact your local Allen-Bradley distributor or Rockwell Automation sales office. See Appendix B on page 99 for more information about DC Bus Conditioner modules.
(5) The catalog number determines the quantity of bus conditioners.
(6) See PowerFlex 755TM Drive Control Pod Rule on page 105 for guidance on PowerFlex 755TM drive control pod selection.
(7) For PowerFlex 755TM common bus drives, there are no provisions for AC output common mode cores. However, an optional reflective wave (dv/dt) filter is available. See catalog number position 11 - filtering and CM cap configuration, EMI solutions.
(8) To connect Kinetix 5700 servo drives to a common DC bus system, a capacitor module and other equipment is required. See Kinetix 5700 Servo Drives on page 106 for more information.
(9) When PowerFlex 750-series 600V AC drive (frames 3...5) are mixed with larger frame drives on 600V AC common DC bus systems, an external DC bus voltage control method can be required to limit the maximum routine system DC bus voltage to less than the lowest drive DC bus overvoltage trip level. See Appendix D on page 119 for more information.
(10) PowerFlex 750-series 600V AC drive (frames 3...5) cannot be used on 690V AC systems. See Appendix D on page 119 for more information.

General Considerations

- Select all system components for the same AC-line voltage.
- Use a low inductance type DC bus. See DC Bus Connections on page 10 for details.
- The common DC bus system can require feeder and branch circuit protection and disconnect devices. Provide appropriate circuit protection as required by national and local electrical safety codes and regulations.
- Depending on the product family and frame size, AC and/or DC fuses can be provided internally or you must supply fuses external to the product. See AC and DC Circuit Protection Devices on page 55 and the product technical data manuals for recommended fuse information.
- Do not use PowerFlex 755T AC drives and bus supplies on undersized or high-impedance AC supply systems. The supply system kVA must be equal to or greater than the product-related kVA, and the system impedance must be less than 10%. Operation outside these limits can cause instability and product shutdown. You must account for the kVA of all PowerFlex 755T drives and bus supplies on the distribution system and the system impedance of upstream transformers.
  - System Impedance = (PowerFlex 755T kVA ÷ Transformer kVA) x Transformer % Impedance
- The mixture of different frame size drives in this arrangement can cause high ripple current in the smaller frame drives. In this case, place the larger power drives physically closer to the bus supply. This placement helps current sharing among the various drives on the bus.

- Place the AC input power jumpers (PE-A) in the correct positions according to the power source grounding method. The PowerFlex 755T drive regenerative bus supply and all connected drives must have the DC bus jumpers (PE-B) removed or set to out, regardless of the AC power source grounding method. The Kinetix 5700 servo drives must have the ground screw/jumpers removed. The PowerFlex 755T drive regenerative bus supply is an active converter.

ATTENTION: You must set the DC bus power jumpers for the PowerFlex 755T drive bus supply (PE-B), all connected PowerFlex drives (PE-B), and all Kinetix 5700 servo drives (ground screw/jumper) to the same condition: All removed (out). There is a risk of equipment damage if the DC bus power jumpers are not all set to the same condition.

For recommended settings and instructions for modifying the position of the power jumpers, see publications:

- 750-IN100
- 750-IN101
- 750-IN001
- 750-IN119
- 2198-UM002

Precharge Interlocking

For more information about DC bus precharging and drive precharging circuit configurations, see Precharge on page 11.

- If you use a disconnect switch between the common DC bus and the drive DC input, the drive must have precharging capability. In addition, wire an auxiliary contact on the disconnect switch that opens when the disconnect is open to a drive digital input. The corresponding digital input must be assigned to the Precharge enable function.
  - PowerFlex 750-series drives - assign to parameter 0:189 **[DI Precharge]**. See publication 750-PM001.
  - PowerFlex 755TS drives and PowerFlex 755TM common bus drives - assign to parameter 0:190 **[DI Precharge]**. See publication 750-PM101.

  This configuration provides the proper precharge interlocking, which guards against possible damage to the drive when reconnecting the drive to an energized DC bus.
- The precharge status of the PowerFlex 755TM drive regenerative bus supply must interlock with the connected drives, so the drives disable (do not run) when the PowerFlex 755TM drive regenerative bus supply is in a precharge state. To create this interlock, monitor the bus supply line side converter parameter 13:225.25 **[Line Side Sts 1]**. This status bit can connect to the PowerFlex drive (Enable) and Kinetix 5700 drive (Regeneration OK) control via:
  - Hardwired bus supply I/O connection to inverter/drive local I/O
  - Logix controller I/O
  - Communication datalink within the Logix control program task

  The product can require optional I/O modules if you use hardwired interlocking methods.

ATTENTION: The Kinetix family of drives and some PowerFlex AC drives have no external means to control the precharge; therefore, do not use a DC disconnect switch without an external precharge device. See Precharge on page 11 for more information.

AC Power System Resonance Conditions

PowerFlex 755TM drive regenerative bus supplies use active front end technology that is designed to reduce AC line harmonics introduced by the product. When a dedicated isolation transformer supplies AC power, you do not typically require additional filtering devices. When other non-linear loads (such as the 6-pulse diode and thyristor converters that conventional AC drives use) share AC supply sources with PowerFlex 755T drive active front end products, there can be interaction between the various filters that can cause power system resonance. This condition causes component stress, excess heating, and can result in reduced product life. Because the interaction of each load must be considered, system resonance conditions are challenging to predict.

If other non-linear loads (6-pulse AC drives or active front end converters) share the AC source, it can be necessary to install a 3-phase line reactor between the PowerFlex 755TM drive regenerative bus supply and the AC power source. For detailed information about power system resonance conditions and mitigation techniques, see Power System Resonance Mitigation for PowerFlex 755TL/TR/TM.

PowerFlex 755T drive active front end products monitor for line-side resonance currents. Detection is a key to help prevent unexpected power system resonance failures. When system resonance is detected, the PowerFlex 755T drive active front end products continue operation and provide an early-warning of line-side resonance through alarm **14117** '**CapHighResonance**'. When power system resonance levels surpass thresholds for reliable operation, **14118** '**CapOverResonance**' provides a fault. You can configure the desired response to a system over resonance condition using parameter **0:453 [CapOvrRsncActn]**. See publication 750-PM100.

Dynamic Bus Control for Large Capacitor Bank Applications

Dynamic bus control is a mode of bus voltage control in PowerFlex 755TM drive regenerative bus supplies and 755TR regenerative drives. Dynamic bus control allows the PowerFlex 755TM drive regenerative bus supply to use the energy in an externally connected capacitor bank by not regulating the DC bus voltage at one set level. The DC bus voltage is regulated between three voltage setpoints, which depends on the state of operation.

The PowerFlex 755TM drive regenerative bus supply in Regenerating mode allows DC bus voltage at a higher level, so that the capacitor bank can absorb regenerative energy before regenerating to the AC line. As the system begins motoring, the PowerFlex 755TM drive regenerative bus supply allows a lower DC bus voltage to use the stored energy in the external capacitor bank before sourcing the AC line.

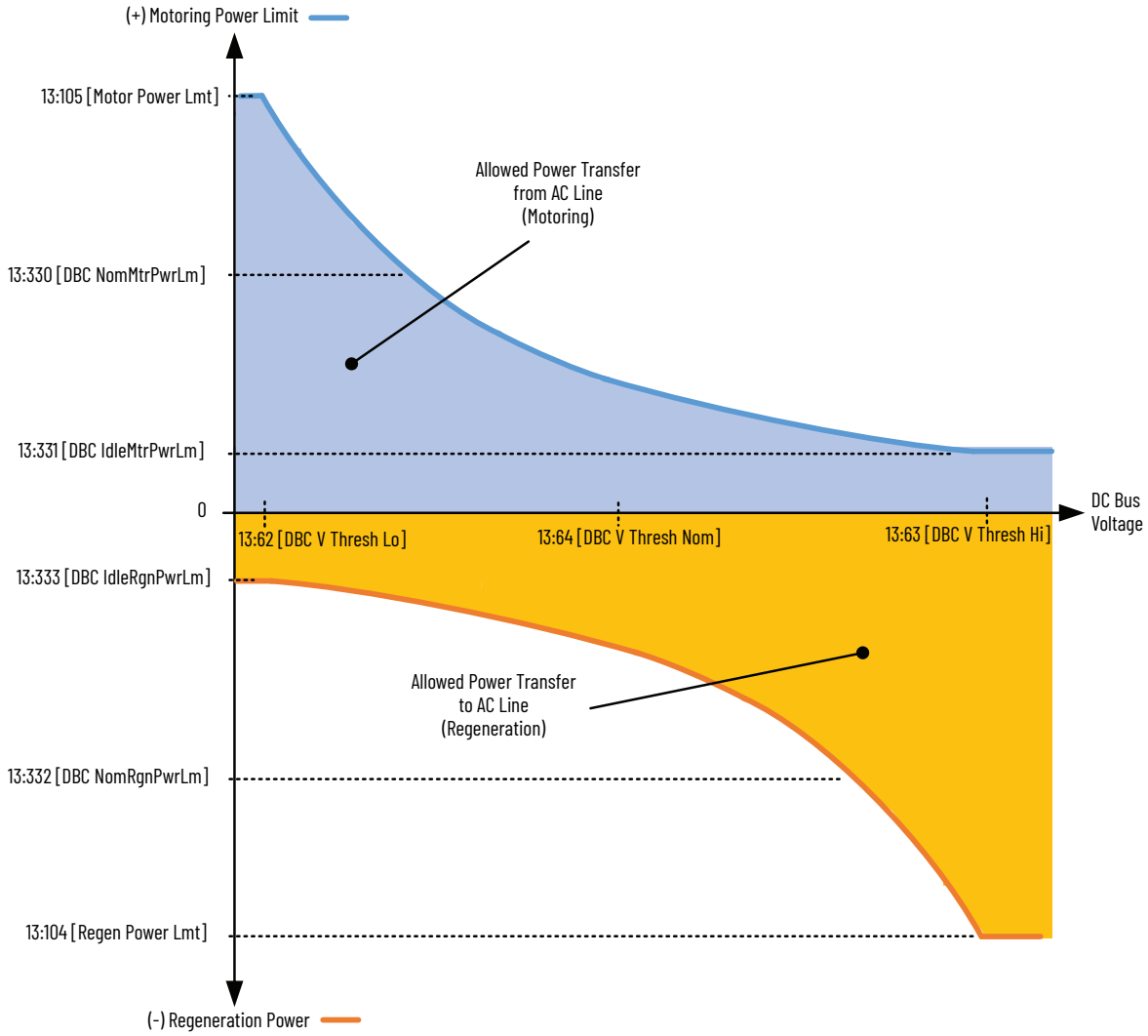
Dynamic bus control modifies the motoring and regenerating power limits constantly as the DC bus voltage increases and decreases, which allows for smooth AC line side current.

The following procedure describes how to configure dynamic bus control in the PowerFlex 755TM drive regenerative bus supply.

1. Figure 9 on page 18 shows the standard system configuration. When you use external capacitor banks, verify that the PowerFlex 755TM drive regenerative bus supply does not exceed the maximum external capacitance supported. See Appendix A on page 55.
2. PowerFlex 755TM drive regenerative bus supply parameter configuration. The following example shows the possible settings for an additional capacitor bank for a 480V AC voltage class system. Your system varies.
   a. Set **Parameter 13:45 [DC Bus Ref Sel]** = DBC
   b. Set **Parameter 13:61 [DBC Mode Sel]** = Nonlinear (Default)
   c. Set **Parameter 13:62 [DBC V Thresh Lo]** = 660V DC (Based on PowerFlex 755TM drive Voltage Class)
   d. Set **Parameter 13:63 [DBC V Thresh Hi]** = 780V DC (Based on PowerFlex 755TM drive Voltage Class)
   e. Set **Parameter 13:64 [DBC V Thresh Nom]** = 690V DC (Based on PowerFlex 755TM drive Voltage Class)
   f. Set **Parameter 13:105 [Motor Power Lmt]** = 100%
   g. Set **Parameter 13:333 [DBC IdleRgnPwrLm]** = 5%
   h. Set **Parameter 13:332 [DBC NomRgnPwrLm]** = 30%
   i. Set **Parameter 13:104 [Regen Power Lmt]** = 100%
   j. Set **Parameter 13:331 [DBC IdleMtrPwrLm]** = 5%
   k. Set **Parameter 13:330 [DBC NomMtrPwrLm]** = 30%

Figure 10 on page 22 is an example of non-linear operation of the power limits. The DC bus voltages that are shown are for a 480V AC voltage class system. The DC bus voltages are different for other AC voltage class systems. You can use the nominal motoring and regen power limits to adjust these curves.

Figure 10 - Dynamic Bus Control, Non-linear Mode



For more information on dynamic bus control and the parameters to configure this feature, see publications 750-PM101 and 750-RM100.

Kinetix 5700 Servo Drives

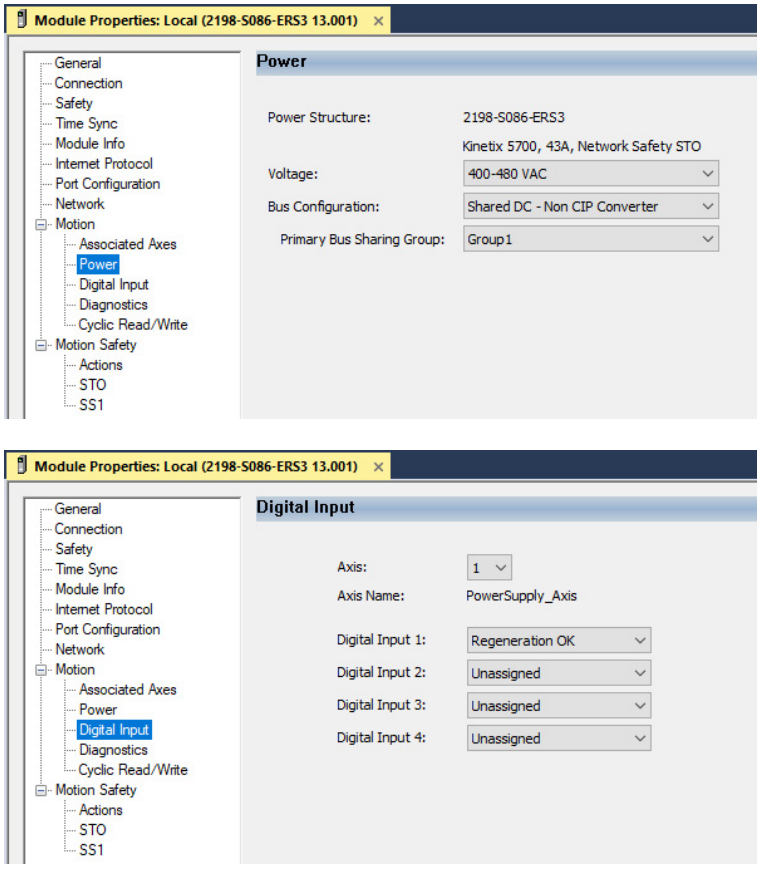
The Kinetix 5700 servo drive can connect to the 400/480V AC PowerFlex 755TM drive common DC bus systems. A capacitor module and other accessories are required. For more information about the Kinetix 5700 servo drive application to PowerFlex drive common DC bus systems, see Kinetix 5700 Servo Drives on page 106.

When a PowerFlex 755TM drive regenerative bus supplies a Kinetix 5700 servo drive bus group, you must configure one of the Kinetix 5700 servo drives in the bus group in the Studio 5000 Logix Designer® application as Shared DC - Non-CIP Converter and assign the bus supply ready status to the Kinetix 5700 drive Regeneration OK input.

The running status of the line side converter of the PowerFlex 755TM drive regenerative bus supply must link to a digital output on an I/O option board and connect/interlock with the Regeneration OK input of the Kinetix 5700 servo drive. This connection does not signal that DC bus voltage is present, but rather when the PowerFlex 755TM drive regenerative bus supply is ready to supply power, the connection allows the Kinetix 5700 servo drives to enable and pull power from the bus.

Figure 11 on page 23 shows the required settings for Shared DC - Non-CIP Converter bus configuration and Regeneration OK digital input within the Logix Designer application. For more details, see publication 2198-UM002.

Figure 11 - Required Settings in Logix Designer Application



Sizing Regenerative Bus Supply

See Basic Sizing of the Regenerative Bus Supply and Advanced Sizing of the Regenerative Bus Supply on page 25 to size the PowerFlex 755TM drive regenerative bus supply.

Basic Sizing of the Regenerative Bus Supply

To perform the basic sizing calculations, aquire the following information.

- System AC source voltage
- Product family and catalog numbers for each inverter/drive connected on the common DC bus
- Inverter/drive overload duty ratings normal duty (ND) or heavy duty (HD)

Calculation

1. Sum/total the DC input amp ratings of the respective drives, which are based on the normal duty (ND) / heavy duty (HD) ratings. See tables in Appendix A on page 55. Assume that the drives motor 100% of rating.
2. Multiply the total from step 1 by a factor of 0.9. The 0.9 multiplier is due to the regenerative bus supply, which provides a voltage boost so the common bus drive input current is less. DC bus power into the common bus drive remains the same.
3. Select the PowerFlex 755TM drive regenerative bus supply, which is based on the normal duty (ND) or heavy duty (HD) DC output current rating for the system AC voltage that meets or exceeds the worst-case calculated DC output current value from step 2. See Table 24 on page 65, Table 31 on page 72, Table 37 on page 79, and Table 43 on page 84 for continuous DC output current ratings. Verify that the system AC and DC busbars and cables are sized to support the expected current. The PowerFlex 755TM drive system standard busbars are rated for 3000 A DC and optional (-P46) 4700 A DC. All DC busbars in the common DC bus lineup must have the same amp rating. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about the DC busbar ratings and options.
4. Verify that the DC bus capacitance to output amps ratio (µF/A) meets or exceeds the target value for the system AC voltage and combination of connected inverter/drives. See DC Bus Capacitance Calculation Method on page 91.

5. Verify that the selected bus supply can precharge the connected drive DC bus capacitance. See Appendix A on page 55 for internal and maximum external DC bus capacitance. It can be necessary to increase the rating of the regenerative bus supply.

Example

This example represents a 600V AC input system with five motors and drives. The acceleration and deceleration times are assumed to be less than 1 minute so we can take advantage of the overload duty of the drives and the bus supply.

Bold text in the tables represents calculated values, which is based on Calculation on page 23.

1. Use the information summarized in Table 3.
   - All drive products are rated for 600V AC system power voltage.
   - The PowerFlex 750-series drive rated DC amps data is taken from Table 34 on page 75.
   - The PowerFlex 755TM common bus drive DC amps data is taken from Table 36 on page 78.

Table 3 - Example Calculation 1

Section Name	Drive Product	Cat. No.	Rated DC Amps (1)	Notes
Drive 1	PowerFlex 755TM	20GxE242	212	Frame 8, HD
Drive 2	PowerFlex 755	20GxE144	136.8	Frame 6, HD
Drive 3	PowerFlex 755TM	20GxE295	267	Frame 8, HD
Drive 4	PowerFlex 755	20GxE052	44.9	Frame 5, HD
Drive 5	PowerFlex 755	20GxE032	29.6	Frame 4, HD
		Total rated DC amps (2)	**690.3**	HD

(1) See Appendix A on page 55 for rated DC input current values.
(2) Excludes the 0.9 multiplier for active front end DC bus voltage boost.

2. The rated DC output current for the regenerative bus supply must be at least 690.3 A DC * 0.9 = 621.3 A DC heavy duty (HD).
3. The rated DC output current for the bus supply must be at least 621.3 A DC heavy duty (HD).
   - Use Table 37 on page 79 to select the PowerFlex 755TM drive regenerative bus supply.

   The minimum DC output current rating 600V AC PowerFlex 755TM drive regenerative bus supply is a catalog number 20JxFxE760 (frame 9) with heavy duty (HD) DC output current rating of 710 A DC.

   Verify that the system AC and DC busbars and cables are sized to support the expected current. In Table 4 on page 25, the total rated DC bus amps is 621.3 A DC. The PowerFlex 755TM drive standard DC busbars are rated 3000 A DC. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about PowerFlex 755TM DC drive bus options and ratings.
4. Verify that the DC bus capacitance to output amps ratio meets or exceeds the target µF/A ratio.
   - The PowerFlex 750-series drive internal DC bus capacitance data is taken from Table 34 on page 75.
   - The PowerFlex 755TM common bus drive internal DC bus capacitance data is taken from Table 36 on page 78.
   - The PowerFlex 755TM drive regenerative bus supply internal and maximum external capacitance data is taken from Table 36 on page 78.
   - See DC Bus Capacitance Calculation Method on page 91.

     This example is 600V AC and has a mixture of PowerFlex 750-series drives and PowerFlex 755TM common bus drives. The target DC bus capacitance to output current ratio is 28 µF/A.

     Sum the internal DC bus capacitance of the drives and the bus supply. In this example, 19,900 µF + 15,500 µF = 35400 µF.

     Sum the rated AC output current of the drives. Alternatively, use the sum of the DC bus input current and multiply this sum by 0.9 to obtain an estimate of the AC output current. In this example, the DC amps from step 2 already includes the 0.9 multiplier, so we can use 621.3 A for the equivalent total rated AC RMS output current.

   The resulting DC bus capacitance to output amp ratio of 35,400 µF / 621.3 A RMS = 57.0 µF/A exceeds the target of 28 µF/A. No additional capacitor banks are required.

Table 4 - Example Calculation 2

Section Name	Drive Product	Cat. No.	DC Bus Capacitance [µF] (1)	Notes
Drive 1	Powerflex 755TM	20GxE242	4650	Frame 8, HD
Drive 2	Powerflex 755	20GxE144	5200	Frame 6, HD
Drive 3	Powerflex 755TM	20GxE295	4650	Frame 8, HD
Drive 4	Powerflex 755	20GxE052	3600	Frame 5, HD
Drive 5	Powerflex 755	20GxE032	1800	Frame 4, HD
Bus supply	Powerflex 755TM regen	20JxFxE760	15500	Frame 9, HD
	Max external capacitance		73002	
	Additional capacitance		0	µF
	Total external capacitance (2)		**19900**	µF
	Total DC bus capacitance		**35400**	µF
			Precharge OK	

(1) See DC Bus Capacitance Calculation Method on page 91 for internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TM drive bus supply internal bus capacitance.

Equivalent total rated AC output amps (1)	**621.3**	A RMS
This system target µF/A ratio	28	µF/A
This system calculated µF/A ratio	**57.0**	µF/A
µF/A ratio OK	**0**	µF additional required

(1) The equivalent total AC output amps is calculated by multiplying the total rated DC amps * 0.9

5. Verify that the chosen PowerFlex 755TM drive regenerative bus supply can precharge the connected drive DC bus capacitance.
   - The PowerFlex 755TM drive regenerative bus supply maximum external capacitance data is taken from Table 36 on page 78.

     The total external capacitance (19,900 µF) is less the PowerFlex 755TM drive regenerative bus supply maximum external capacitance (73,002 µF).

     The chosen PowerFlex 755TM drive regenerative bus supply can precharge the connected DC bus capacitance.

The chosen PowerFlex 755TM drive regenerative bus supply is an acceptable solution for this common DC bus application example.

Advanced Sizing of the Regenerative Bus Supply

To perform the advanced sizing calculations, acquire the following system information.

- System AC source voltage
- Motor nameplate power rating
- Motor nameplate efficiency
- Product family and catalog numbers for each inverter/drive connected on the common DC bus
- Inverter/drive overload duty ratings normal duty (ND) or heavy duty (HD)
- Application power requirements and polarity for each motor during the acceleration, steady running, and deceleration phases of operation

Calculation

1. Convert all motor powers to kW (kW = HP x 0.746).
2. In step 3...step 10, PMotor is the motor power that is required for the application, not the nameplate power of the motor (unless the application power is unknown). If the application absorbs power, use positive values. If the application regenerates power, use negative values.

3. Determine the total DC bus power that is required during acceleration.

   For motoring loads: PDrive = PMotor / Motor Efficiency / Inverter Efficiency (0.97)

   For regenerating loads: PDrive = PMotor * Motor Efficiency * Inverter Efficiency (0.97)

   Calculate the DC bus power that is required during acceleration times less than 1 minute; take advantage of the normal duty 110% for 1 minute (OL=1.1) or heavy duty 150% for 1 minute (OL=1.5) overload rating of the bus supply. If acceleration time is greater than 1 minute, use an overload rating of OL=1.0.

   PAccel = (PDrive1 + PDrive2 + ...) / OL

4. Determine the total DC bus power that is required during steady-state run operation.

   For motoring loads: PDrive = PMotor / Motor Efficiency / Inverter Efficiency (0.97)

   For regenerating loads: PDrive = PMotor * Motor Efficiency * Inverter Efficiency (0.97)

   Calculate the steady-state DC bus power that is required.

   PRun = PDrive1 + PDrive2 + ...

5. Determine the total DC bus power that is required during deceleration.

   For motoring loads: PDrive = PMotor / Motor Efficiency / Inverter Efficiency (0.97)

   For regenerating loads: PDrive = PMotor * Motor Efficiency * Inverter Efficiency (0.97)

   Calculate the DC bus power that is required during deceleration times less than 1 minute; take advantage of the normal duty 110% for 1 minute (OL=1.1) or heavy duty 150% for 1 minute (OL=1.5) overload rating of the bus supply. If acceleration time is greater than 1 minute, use an overload rating of OL=1.0.

   PDecel = (PDrive1 + PDrive2 + ...) / OL

6. Compare the absolute values of the normal duty (ND) or heavy duty (HD) DC bus power that is required during acceleration, deceleration, and steady state run (step 3...step 5). Use the highest numerical value to select the bus supply in step 7.
7. Select a PowerFlex 755TM drive regenerative bus supply for the system AC voltage based on the normal duty (ND) or heavy duty (HD) DC output power rating that meets or exceeds the highest calculated DC bus power from step 6. See Table 24 on page 65, Table 31 on page 72, Table 37 on page 79, and Table 43 on page 84 for DC output power ratings.
8. The DC bus capacitance per output amp ratio must meet or exceed the target µF/A ratio. Additional DC bus capacitor modules can be required. See DC Bus Capacitance Calculation Method on page 91 for more information about DC bus capacitor µF/A ratio calculations.
9. The bus supply that is selected in step 7 must be able to precharge the total system DC bus capacitance. Sum the internal DC bus capacitance values for all connected AC inverters/drives and additional capacitor modules. Exclude the internal capacitance of the PowerFlex 755TM drive regenerative bus supply in this calculation.

   See Appendix A on page 55 for internal DC bus capacitance values used in PowerFlex 750-series drives, PowerFlex 755TS, and PowerFlex 755TM common bus drives, and Kinetix 5700 servo drives. The tables in Appendix A on page 55 also show the maximum external DC bus capacitance values for the PowerFlex 755TM drive regenerative bus supply.

   If the total external capacitance is less than the PowerFlex 755TM drive regenerative bus supply maximum external capacitance rating, then the PowerFlex 755TM drive regenerative bus supply can precharge the external AC drives; otherwise, select a higher rated PowerFlex 755TM drive regenerative bus supply and repeat step 8 and step 9.
10. Verify that the system AC and DC busbars and cables are sized to support the expected current. The total rated DC bus current is the sum of all inverter/drive rated AC output currents that are calculated in step 8 divided by 0.9.

    The PowerFlex 755TM drive system standard busbars are rated for 3000 A DC and optional (-P46) 4700 A DC. All DC busbars in the common DC bus lineup must have the same amp rating. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about the DC busbar ratings and options. If the calculated total DC rated amps exceed these ratings, special design considerations are required to make sure that the AC and DC busbar systems are sized to handle the expected AC and DC currents. Back-to-back or center-fed enclosure lineups can be used to satisfy these requirements. See the associated PowerFlex 755T manuals in Additional Resources on page 122 for more information. You can also employ third-party enclosures with suitably rated AC and DC busbars to meet the AC and DC current requirements of this example system.

Example

This example represents a 600V AC input system with five motors and drives.

The acceleration and deceleration times are assumed to be less than 1 minute so we can take advantage of the overload duty of the inverter drives and the bus supply.

Bold text in the table represents calculated values that are based on the calculation methods that are described in Basic Sizing of the Regenerative Bus Supply on page 23 and Advanced Sizing of the Regenerative Bus Supply on page 25.

Table 5 summarizes step 1...step 5.

- All drive products are rated for 600V AC system power voltage
- PMaccel, PMrun, and PMdecel are the motor shaft power requirements of the application
- PAccel, PRun, and PDecel are the calculated DC input power requirements of the inverter drives

Table 5 - Example Calculation 3

Section Name	Motor Nameplate		Accel DC Bus Power		Run DC Bus Power [kW]		Decel DC Bus Power [kW]	
	Power [kW]	Efficiency	PMaccel	PAccel	PMrun	PRun (1)	PMdecel	PDecel (2)
Drive 1	112	0.95	20.0	**21.70**	-90.0	**-82.94**	-120.0	**-110.58**
Drive 2	75	0.8	97.0	**125.0**	68.0	**87.63**	-80.0	**-62.08**
Drive 3	150	0.96	210.0	**225.52**	130.0	**139.60**	-210.0	**-195.55**
Drive 4	30	0.87	35.0	**41.47**	24.0	**28.44**	-35.0	**-29.54**
Drive 5	18	0.87	20.0	**23.70**	15.0	**17.77**	-20.0	**-16.88**
Bus supply OL duty None = 1 ND = 1.1 HD = 1.5	1.5	**DC bus input power totals**		**291.6**		**190.5**		**-276.4**
	Bus supply min DC output power rating			**291.6**	**kW HD**			

(1) Drive output power calculations include factors for polarity of power, motor efficiency, and drive efficiency.
(2) Output power total calculations include the overload duty of the bus supply.

6. The highest output absolute value power total is 291.6 kW heavy duty (HD). Use this value to select the minimum DC output power for the PowerFlex 755TM drive regenerative bus supply.
7. Use Table 37 on page 79 to select the output power rating 600V AC PowerFlex 755TM drive regenerative bus supply that supports the value in step 6. A catalog number 20Jx6xE395 (frame 7) or 20JxFxE395 (frame 8) with an HD DC output power rating of 317 kW and 365 A DC meets the requirements. For this example, the frame 8 product is chosen.
8. Perform the DC bus capacitance calculations in DC Bus Capacitance Calculation Method on page 91.
   - The PowerFlex 750-series drive internal DC bus capacitance data is taken from Table 34 on page 75.
   - The PowerFlex 755TM common bus drive internal DC bus capacitance data is taken from Table 36 on page 78.
   - The PowerFlex 755TM drive regenerative bus supply internal and maximum external capacitance data is taken from Table 36 on page 78. The PowerFlex 755TM drive regenerative bus supply internal bus capacitance value is not included in the total external capacitance calculation.

   Verify that the µF/A ratio meets or exceeds the target of 28 µF/A ratio for this 600V AC system with mixed inverter types. Table 6 on page 28 summarizes the DC bus capacitance data and calculations.

   Sum the internal DC bus capacitance of the inverter/drives and regenerative bus supply. In this example,

   19,900 µF + 4650 µF = 24550 µF

   Sum the AC output currents of the inverter/drives. In this example, 629.0 A RMS.

   The calculated system µF/A ratio of 24,550 µF / 629 A RMS = 39.0 µF/A exceeds the design target of 28 µF/A. This common DC bus system does not require additional bus capacitance.

Table 6 - Example Calculation 4

Section Name	Drive Product	Cat. No.	DC Bus Capacitance [µF] (1)	Rated Output Amps	Notes
Drive 1	Powerflex 755TM	20GxE242	4650	192	Frame 8, HD
Drive 2	Powerflex 755	20GxE144	5200	125	Frame 6, HD
Drive 3	Powerflex 755TM	20GxE295	4650	242	Frame 8, HD
Drive 4	Powerflex 755	20GxE052	3600	42	Frame 5, HD
Drive 5	Powerflex755	20GxE032	1800	28	Frame 4, HD
Bus supply	Powerflex 755TM regen	20JxFxE395	4650	365	Frame 8, HD
		Max external capacitance	44540		
		Additional capacitance	0	µF	
		Total external capacitance (2)	**19900**	µF	
		Total DC bus capacitance	**24550**	µF	
		Total rated AC output amps (3)		**629.0**	A RMS

(1) See Appendix A on page 55 for rated output amps, internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TM drive bus supply internal bus capacitance.
(3) The total rated AC output amps is the sum of the inverter/drive rated AC output current and excludes the DC output current of the bus supply.

This system target µF/A ratio	28	µF/A
This system calculated µF/A ratio	**39.0**	µF/A
µF/A ratio OK	**0**	µF additional required

9. Verify that the PowerFlex 755TM drive regenerative bus supply can precharge the external DC bus capacitance.
   - The PowerFlex 750-series drive internal DC bus capacitance data is taken from Table 34 on page 75.
   - The PowerFlex 755TM common bus drive internal DC bus capacitance data is taken from Table 36 on page 78.
   - The PowerFlex 755TM drive regenerative bus supply internal and maximum external capacitance data is taken from Table 37 on page 79.

     The total external capacitance (19,900 µF) is less the PowerFlex 755TM drive regenerative bus supply maximum external capacitance (44,540 µF).

     The chosen PowerFlex 755TM drive regenerative bus supply can precharge the connected DC bus capacitance.

Table 7 - Example Calculation 5

Section Name	Drive Product	Cat. No.	DC Bus Capacitance [µF] (1)	Notes
Drive 1	Powerflex 755TM	20GxE242	4650	Frame 8, HD
Drive 2	Powerflex 755	20GxE144	5200	Frame 6, HD
Drive 3	Powerflex 755TM	20GxE295	4650	Frame 8, HD
Drive 4	Powerflex 755	20GxE052	3600	Frame 5, HD
Drive 5	Powerflex 755	20GxE032	1800	Frame 4, HD
Bus supply	Powerflex 755TM nonregent	20JxFxE395	4650	Frame 8, HD
		Max external capacitance	44540	
		Additional capacitance	0	
		Total external capacitance (2)	**19900**	
			Precharge OK	

(1) See Appendix A on page 55 for rated output amps, internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TM drive bus supply internal bus capacitance.

10. Verify that the DC bus cable/bus bars are adequately sized for the total rated DC bus current.

    Calculate the approximate total rated DC bus current by dividing the total AC output current from step 8 (629 A RMS) by 0.9.

    Minimum DC busbar rating = 629 A RMS / 0.9 = 699 A DC

    The standard PowerFlex 755TM DC drive busbar is capable of 3000 A DC. All DC busbars in the common DC bus lineup must have the same amp rating. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about the DC busbar ratings and options.

The chosen PowerFlex 755TM drive regenerative bus supply is an acceptable solution for this common DC bus application example. Verify that the system AC and DC busbars and cables are sized to support the expected current.

Notes:

Shared DC Bus Configuration (Piggyback)

This system features one standalone PowerFlex® 755TL or PowerFlex 755TR drive, as the converter and additional common DC bus drives are used in a shared DC bus configuration.

Supported Products

At the time of publication, the following products are supported.

Position 5 of the catalog number dictates the input type.

- 1 = Frames 2...4 AC input with precharge, includes DC terminals
- 4 = Frames 5...7 DC input with precharge
- 6 = Frames 5...6 regenerative and low harmonic AFE, 755TR drives
- 7 = Frames 5...6 low harmonic AFE, 755TL drives
- F = Frames 8...15 regenerative and low harmonic AFE, 755TR drives
- G = Frames 8...10 low harmonic AFE, 755TL drives

Table 8 - Supported Products

Bus Supply Products [Cat. No. 20Gx]	Voltage Class	Supported Drives	Drive DC Bus Overvoltage Trip (1)
• PowerFlex 755TL (2) (frames 5...6 (3), 8...10 (4)) or • PowerFlex 755TR (5) (frames 5...6 (3), 8...15 (4))	400/480V AC	400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 2...7) (6)(7) (8)	815V DC
	600/690V AC	600V AC PowerFlex 750-series (frames 3...5) (6)(9)	1013V DC
		600V AC PowerFlex 755TS (frames 3...7) (6)	1026V DC
		600/690V AC PowerFlex 750-series (frames 6...7) (6)	1162V DC
		690V AC PowerFlex 755TS (frames 6...7) (6)	1172V DC

(1) DC bus voltage control methods can be required to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. See Appendix D on page 119 for more information.
(2) PowerFlex 755TL drive input type 7 or G. Frame 7 drive shared DC bus configurations are not supported currently.
(3) PowerFlex 755TL/TR drives (frames 5...6) are panel-mounted devices that require additional external AC input power conditioning equipment. If you use frames 5...6, see publication 750-IN100 for additional installation and external device information.
(4) PowerFlex 755TL/TR AC drives (frames 8...15) require an extension of the DC busbars and other modifications. See DC Bus Termination on page 34 for more information.
(5) PowerFlex 755TR drive input type 6 or F. Frames 7 drive shared DC bus configurations are not currently supported.
(6) PowerFlex 750-series and PowerFlex 755TS drives input type 1 or, 4.
(7) Currently, we do not recommend frame 1 drives for use with common DC bus systems.
(8) You can use PowerFlex 755TS drives (frame 1) with common DC systems, provided certain power circuit and other conditions are met. See PowerFlex 755TS Frame 1 and common bus systems for more information and technical data.
(9) You cannot use the PowerFlex 750-series 600V AC drive (frames 3...5) on 690V AC systems. See Appendix D on page 119 for more information.

Typical System Configuration

This section describes typical configurations for the PowerFlex 755TL/TR drive that is used as a shared DC bus supply. The shared DC bus configuration includes one AC drive that powers one or more inverters that are shown in Table 8.

We recommend you use a dedicated isolation transformer that only supplies AC power to the PowerFlex 755TL/TR AC drive. If other non-linear (diode/SCR rectifiers) or active front end (AFE) AC loads connect to the secondary of the isolation transformer, additional line reactors can be required. See AC Power System Resonance Conditions on page 34 for more information.

You can use the PowerFlex 755TL/TR drive with solid grounded, high-resistance grounded, and ungrounded AC power sources. We recommend solid grounded and resistance grounded power sources for typical grid powered AC sources to improve electrical safety, ease of ground fault detection, and to reduce unbalanced voltages.

Ungrounded (floating ground) AC power sources are typical for use in shipboard isolated power systems that are not earth grounded.

Resistance grounded and ungrounded (floating ground) power sources can require additional user supplied circuits and optional bus conditioners (-P50 or -P51).

Figure 12 - PowerFlex 755TL/TR Drive Shared DC Bus Configuration

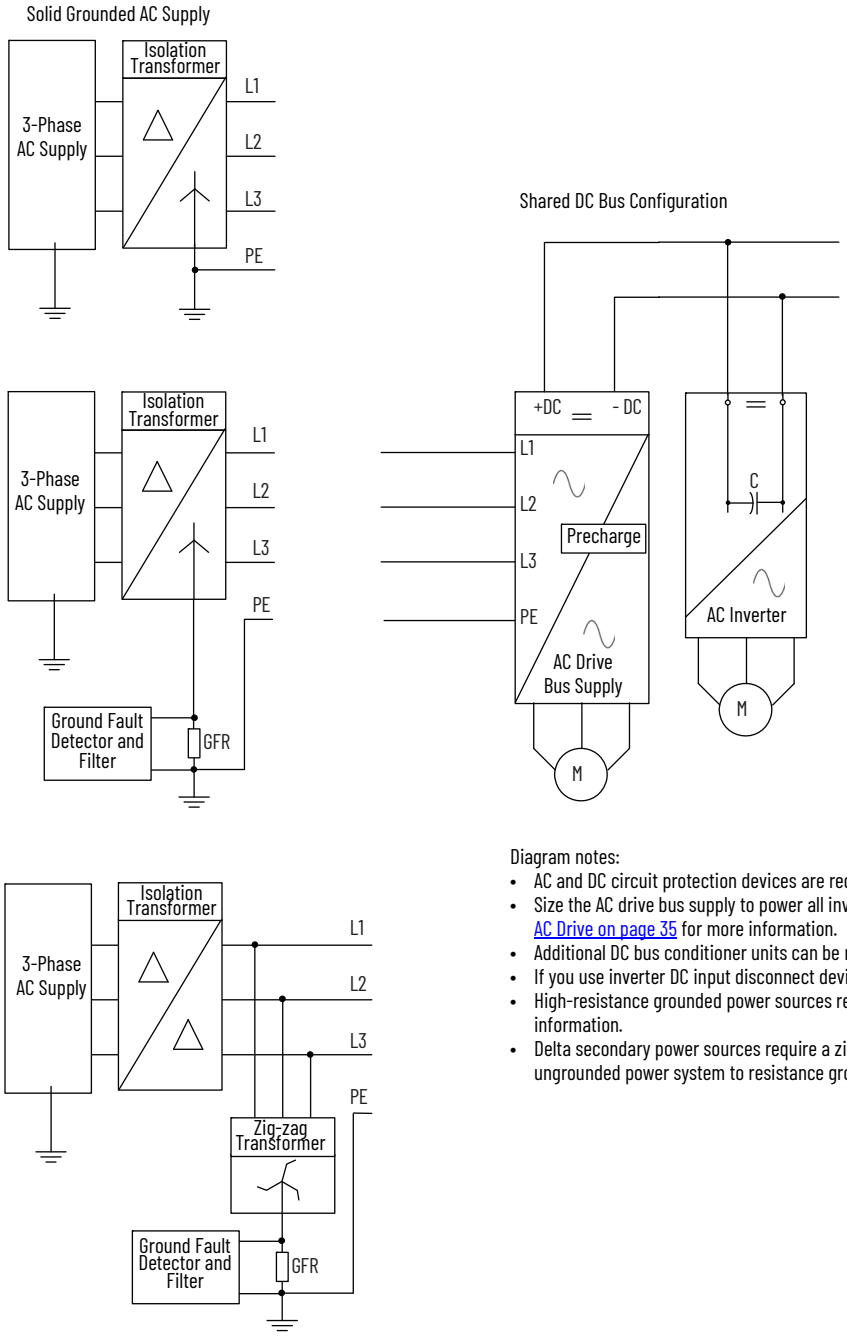


Diagram notes:

- AC and DC circuit protection devices are required but not shown. See Appendix A on page 55 for more information.
- Size the AC drive bus supply to power all inverters that are connected to the DC bus. See See Sizing Shared Bus Supply AC Drive on page 35 for more information.
- Additional DC bus conditioner units can be required. See Table 9 on page 33.
- If you use inverter DC input disconnect devices, the inverter must have a precharge circuit.
- High-resistance grounded power sources require a ground fault indicator filter. See Appendix B on page 99 for more information.
- Delta secondary power sources require a zig-zag transformer and ground fault resistor (GFR) to convert the ungrounded power system to resistance grounded. See Appendix B on page 99 for more information.

Table 9 - Product Compatibility

System Voltage	Bus Supplies		Inverter		Common Mode Core	DC Bus Conditioner
	Qty.	Drive Type [Cat. No. 20Gx]	Qty.	Drive Type		
400/480V AC	1	• PowerFlex 755TL (frames 5...6, 8...10) or • PowerFlex 755TR (frames 5...6, 8...15)	n (1)	400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 2...3)	1321-M048 (2)	• Solid ground (3): -P50 option not required, quantity of bus conditioners determined by the catalog number • High resistance grounded (3): -P50 power option is required, quantity of bus conditioners determined by the catalog number
				400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 4...6)	1321-M180 (2)	
				400/480V AC PowerFlex 750-series and PowerFlex 755TS (frame 7)	SK-Y1-CMCORE1 (2)	
600/690V AC	1	• PowerFlex 755TL (frames 5...6, 8...10) or • PowerFlex 755TR (frames 5...6, 8...15)	n (1)	600V AC PowerFlex 750-series, (frames 3...5) (4) (5)	Fr.3: 1321-M048 (2) Fr.4...5: 1321-M180 (2)	
				600/690V AC PowerFlex 755TS, (frames 3...5)	Fr.3: 1321-M048 (2) Fr.4...5: 1321-M180 (2)	
				600/690V AC PowerFlex 750-series and PowerFlex 755TS (frames 6...7)	Fr.6: 1321-M180 (2) Fr.7: SK-Y1-CMCORE1 (2)	

(1) the precharge capability of the PowerFlex 755TL/TR AC drive can limit the number of inverters that you can connect. See DC Bus Capacitance Calculation Method on page 91 for more information about DC bus capacitor calculations and system capacitance precharging requirements. See Appendix C on page 109 for the maximum external DC bus capacitance that you can connect.

(2) For PowerFlex 750-series and PowerFlex 755TS drives (frames 2...7), common mode cores are required on inverter AC output only. See Appendix B on page 99 and product technical data manuals for more information.

(3) The appropriate number of bus conditioner units, internal to the PowerFlex 755TL/TR AC drive, are factory-installed depending on the frame size and -P50 option selection. Frames 5...6 AC drives have built in bus conditioner circuits and cannot be specified with the -P50 power option. For shipboard ungrounded power sources, a marine bus conditioner, option -P51, can be required (contact your local Allen-Bradley distributor or Rockwell Automation sales office). See Appendix B on page 99 for more information about DC Bus Conditioner modules.

(4) When you use PowerFlex 750-series 600V AC drives (frames 3...5) with a PowerFlex 755TL drive on 600V AC shared DC bus systems, an external DC bus voltage control method can be required to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. When you use PowerFlex 750-series 600V AC drives (frames 3...5) with a PowerFlex 755TR drive on 600V AC shared DC bus systems, the drive must be configured to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. See Appendix D on page 119 for more information.

(5) You cannot use PowerFlex 750-series 600V AC drives (frames 3...5) on 690V AC systems. See Appendix D on page 119 for more information.

General Considerations

- Select all system components for the same AC-line voltage.
- Use a low inductance type DC bus. See DC Bus Connections on page 10 for details.
- The common DC bus system can require feeder and branch circuit protection and disconnect devices. Provide appropriate circuit protection as required by national and local electrical safety codes and regulations.
- Depending on the product family and frame size, AC and/or DC fuses can be provided internally or must be supplied external to the product. See Appendix A on page 55 and the product technical data manuals for recommended fuse information.
- Do not use PowerFlex 755T AC drives and bus supplies on undersized or high-impedance AC supply systems. The supply system kVA must be equal to or greater than the product-related kVA, and the system impedance must be less than 10%. Operation outside these limits can cause instability and product shutdown. You must account for the kVA of all PowerFlex 755T drives and bus supplies on the distribution system and the system impedance of upstream transformers.
  - System Impedance = (PowerFlex 755T kVA ÷ Transformer kVA) x Transformer % Impedance
- The mixture of different frame size drives in this arrangement can cause high ripple current in the smaller frame drives. In this case, place the larger power drives physically closer to the bus supply. This placement helps current sharing among the various drives on the bus.
- Place the AC input power jumpers (PE-A) in the correct positions according to the power source grounding method. The PowerFlex 755TL/TR drive and all connected PowerFlex inverters must have the DC bus jumpers (PE-B) removed or set to out, regardless of the AC power source grounding method. The PowerFlex 755TL/TR drives have active converters.

ATTENTION: Set all DC bus jumpers for the PowerFlex 755TL/TR drive (PE-B), and all connected PowerFlex inverters (PE-B), to the same condition: All removed (out). There is a risk of equipment damage if the DC bus power jumpers are not all set to the same condition.

For recommended settings and instructions for modifying the position of the power jumpers, see publications:

- 750-IN100
- 750-IN101
- 750-IN001
- 750-IN119

Precharge Interlocking

For more information about DC bus precharging and inverter precharging circuit configurations, see Precharge on page 11.

- If you use a disconnect switch between the common DC bus and the inverter DC input, the inverter must have precharging capability. In addition, wire an auxiliary contact on the disconnect switch that opens when the disconnect is open, to an inverter digital input. Assign the corresponding digital input to the Precharge enable function.
  - PowerFlex 750-series - assign to parameter 0:189 **[DI Precharge]**. See publication 750-PM101.
  - PowerFlex 755TS - assign to parameter 0:190 [DI Precharge]. See publication 750-PM101.

  This configuration provides the proper precharge interlocking, which guards against possible damage to the drive when you reconnect the drive to an energized DC bus.

ATTENTION: Some PowerFlex AC drives have no external means of controlling the precharge; therefore, do not use a DC disconnect switch. See Precharge on page 11 for more information.

- The precharge status of the PowerFlex 755TL/TR AC drive must interlock with the connected AC drives, such that the drives disable (do not run) when the PowerFlex 755TL/TR AC drive is in a precharge state. Monitor the bus supply line side converter parameter 13:225.25 **[Line Side Sts 1]** to accomplish the interlock. This status bit can connect to the PowerFlex (Enable) control via:
  - Hardwired bus supply I/O connection to inverter/drive local I/O
  - Logix controller I/O
  - Communication datalink within the Logix control program task

  The product can require optional I/O modules if you use hardwired interlocking methods.

AC Power System Resonance Conditions

PowerFlex 755TL/TR AC drives use active front end technology that is designed to reduce the AC line harmonics that the product introduces. When a dedicated isolation transformer supplies AC power, additional filtering devices are typically not required. When other non-linear loads, such as 6-pulse diode and thyristor converters that are used by conventional AC drives, share AC supply sources with PowerFlex 755T active front end products, there can be interaction between the various filters that can cause power system resonance. This condition causes component stress, excess heating, and can result in reduced product life. Because you must consider the interaction of each load, system resonance conditions are challenging to predict.

If other non-linear loads, 6-pulse AC drives, or active front end converters share the AC source, install a 3-phase line reactor between the PowerFlex 755TL/TR AC drive input and the AC power source. For detailed information about power system resonance conditions and mitigation techniques, see Power System Resonance Mitigation for PowerFlex 755TL/TR/TM.

PowerFlex 755T active front end products monitor for line-side resonance currents. Detection is the key to help prevent unexpected power system resonance failures. When system resonance is detected, the PowerFlex 755T active front end products continue operation and provide an early-warning of line-side resonance through alarm 14117 **CapHighResonance**. When power system resonance levels surpass thresholds for reliable operation, 14118 **CapOverResonance** provides a fault. You can configure the desired response to a system over resonance condition using parameter 0:453 **[CapOvrRsncActn]**. See publication 750-PM100.

DC Bus Termination

The frame size of the PowerFlex 755TL or PowerFlex 755TR drive determines how the secondary inverter connects to the DC bus of the drive.

PowerFlex TL/TR Drives (Frames 5 and 6)

Frames 5 and 6 come preinstalled with DC+/- terminals that give access to the DC Bus.

PowerFlex TL/TR Drives (Frame 7)

Frame 7 is not supported currently.

PowerFlex TL/TR Drives (Frame 8)

Consult technical support when you create piggyback configurations with a PowerFlex 755TL/TR drive (frame 8).

PowerFlex TL/TR Drives (Frames 9...15)

PowerFlex 755TL/TR drive (frames 9...15) requires an extension of the DC busbar to connect additional inverters in a piggyback configuration. Specify additional cabinet space with the necessary DC busbar and DC busbar splices. For more information on the DC busbar and DC busbar splice kits available, see publication 750-TD101.

Sizing Shared Bus Supply AC Drive

Use the following methods to size the PowerFlex 755TL/TR AC drive. The highest power AC motor must connect to the PowerFlex 755TL/TR AC drive.

Basic Sizing of the PowerFlex 755TL/TR AC Drive

To perform the basic sizing calculations, acquire the following information.

- Motor nameplate power rating
- Motor nameplate efficiency
- Product family and catalog numbers for each inverter/drive that connects on the common DC bus
- Application overload duty normal duty (ND) or heavy duty (HD)

Calculation

1. Convert all motor powers to kW (kW = HP x 0.746).
2. Calculate the required drive AC output power. Divide each motor nameplate power by the motor efficiency. Assume that the motors are motoring at 100% of the rating.
3. Sum the calculated AC output power of all inverters/drives. Choose the application overload duty rating. All motors must be the same overload duty rating, either normal duty (ND) or heavy duty (HD).
4. Select the PowerFlex 755TL/TR AC drive that meets or exceeds the calculated AC output power value and overload duty rating from step 3. See the PowerFlex 755TL/TR AC drive fuse tables in Appendix C on page 109 for continuous AC output power ratings.
5. Verify that the selected PowerFlex 755TL/TR AC drive can precharge the connected inverter/drive DC bus capacitance. See the tables in Appendix A on page 55 and Appendix C on page 109 for internal and maximum external DC bus capacitance values. It can be necessary to increase the rating of the PowerFlex 755TL/TR AC drive.
6. Verify that the interconnecting DC bus cables or busbars are adequate for the expected DC bus current to each inverter/drive. Use the tables in Appendix A on page 55 to determine the inverter/drive rated DC input currents.

Example Basic Sizing of the PowerFlex 755TL/TR AC Drive

This example represents a 480V AC input system with three motors and drives. The acceleration and deceleration times are assumed to be less than 1 minute so we can take advantage of the overload duty of the inverter drives and the bus supply.

Bold text in Table 10 represents calculated values based on the Calculation.

Table 10 summarizes step 1...step 3.

Table 10 - Calculation Summary

Section Name	Motor Nameplate Power [kW]	Motor Nameplate Efficiency	Drive Output Power [kW]	Notes
Motor 1	11	0.9	**12.2**	Heavy duty (HD)
Motor 2	45	0.85	**52.9**	Heavy duty (HD)
Motor 3	5	0.92	**5.4**	Heavy duty (HD)
		Minimum Rated Output Power	**70.6**	**Heavy duty (HD)**

4. The minimum rated AC output power for the PowerFlex 755TL/TR AC drive must be at least 70.6 kW heavy duty (HD).
   - If your application requires regeneration, select a PowerFlex 755TR regenerative AC drive. If regeneration is not required, consider a PowerFlex 755TL low harmonic non-regenerative AC drive. If you are uncertain, select a PowerFlex 755TR regenerative AC drive.
   - Use Table 70 on page 111 to select the PowerFlex 755TL/TR AC drive.

   The minimum AC output power rating 480V AC PowerFlex 755TL/TR AC drive is a catalog number 20GxD156 (frame 6) with heavy duty (HD) AC output power rating of 100 HP (75 kW).
5. Verify that the chosen PowerFlex 755TL/TR AC drive can precharge the connected inverter/drive DC bus capacitance.
   - The PowerFlex 750-series internal DC bus capacitance data is taken from Table 20 on page 61.
   - The PowerFlex 755TL/TR AC drive internal and maximum external capacitance data is taken from Table 70 on page 111.

   The PowerFlex 755TL/TR AC drive must apply to the highest power AC motor. In this example, motor 2 (45 kW) would connect to the PowerFlex 755TL/TR AC drive.

   The total external capacitance (1905 µF) is greater than the PowerFlex 755TL/TR AC drive maximum external capacitance (880 µF).

   The chosen PowerFlex 755TL/TR AC drive cannot precharge the connected DC bus capacitance. Choose a higher rated PowerFlex 755TL/TR AC drive and repeat the sizing process.

Section Name	Drive Product	Cat. No.	Drive Rated Output Power [kW]	DC Bus Capacitance [µF] (1)	Rated DC Input Amps	Notes
Motor 1	PowerFlex 755	20GxD027	11.0	1200	23.3	Frame 3, HD
Motor 2	PowerFlex 755TL/TR	20GxD156	75.0	9200	–	Frame 6, HD shared bus supply
Motor 3	PowerFlex 755	20GxD011	5.6	705	8.1	Fame 2, HD
			PowerFlex 755TL/TR drive max external capacitance	880	µF	
			Total external capacitance (2)	**1905**	µF	
			Total DC bus capacitance	**11105**	µF	
			Total DC rated amps	**31.4**	A DC	
				Precharge not OK		

(1) See Appendix A on page 55 and Appendix C on page 109 for internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TL/TR AC drive internal bus capacitance.

6. Use the tables in Appendix A on page 55 to determine the rated DC input currents for each external connected inverter/drive. Size the DC power cables/busbars the feed each external inverter/drive for the rated DC input current.

   In this example, the total rated DC amps for the external connected inverter/drives is 23.3 A DC + 8.1 A DC = 31.4 A DC.

The chosen PowerFlex 755TL/TR AC drive is not an acceptable shared DC bus solution for this example. Select another rating and repeat the sizing process.

Advanced Sizing of the PowerFlex 755TL/TR AC Drive

The sizing calculations require the following system information.

- Motor nameplate power rating
- Motor nameplate efficiency
- Product family and catalog numbers for each inverter/drive connected on the common DC bus
- Inverter/drive overload duty ratings normal duty (ND) or heavy duty (HD)
- Application power requirements and polarity for each motor during the acceleration, steady running, and deceleration phases of operation

Calculation

1. Convert all motor powers to kW (kW = HP x 0.746).
2. In step 3...step 11, the PMotor is the motor power that is required for the application, not the nameplate power of the motor (unless the application power is unknown). If the application is absorbing power, use positive values. If the application is regenerating power, use negative values.
3. Determine the total AC output power that is required during acceleration.
   - For motoring loads: PDrive = PMotor / Motor Efficiency
   - For regenerating loads: PDrive = PMotor * Motor Efficiency

Calculate the AC output power that is required during acceleration time less than 1 minute, taking advantage of the normal duty 110% for 1 minute (OL=1.1) or heavy duty 150% for 1 minute (OL=1.5) overload rating of the AC drive. If acceleration time is greater than 1 minute, use an overload rating of OL=1.0.

PAccel = (PDrive1 + PDrive2 + ...) / OL

4. Determine the total AC output power that is required during steady-state run operation.
   - For motoring loads: PDrive = PMotor / Motor Efficiency
   - For regenerating loads: PDrive = PMotor * Motor Efficiency

   Calculate the steady-state running AC output power that is required.

   PRun = PDrive1 + PDrive2 + ...
5. Determine the total AC output power that is required during deceleration.
   - For motoring loads: PDrive = PMotor / Motor Efficiency
   - For regenerating loads: PDrive = PMotor * Motor Efficiency

   Calculate the AC output power that is required during deceleration time less than 1 minute, taking advantage of the normal duty 110% for 1 minute (OL=1.1) or heavy duty 150% for 1 minute (OL=1.5) overload rating of the AC drive. If the deceleration time is greater than 1 minute, use an overload rating of OL=1.0.

   PDecel = (PDrive1 + PDrive2 + ...) / OL
6. If any of the power levels calculated in step 3...step 5 have a negative value, line regeneration is required. Select a PowerFlex 755TR regenerative AC drive, otherwise consider a PowerFlex 755TL low harmonic (non-regenerative) AC drive.
7. Compare the absolute values of the normal duty (ND) or heavy duty (HD) AC output power that is required during acceleration, deceleration, and steady state (step 3...step 5). Step 8 uses the highest numerical output power value to select the PowerFlex 755TL/TR drive.
8. Select a PowerFlex 755TL/TR AC drive for the system AC voltage based on the normal duty (ND) or heavy duty (HD) AC output power rating that meets or exceeds the highest calculated AC output power from step 7. See the tables in Appendix A on page 55 for AC output power ratings.
9. If the AC drive is rated more than two times the connected motor, you can change the system design to a separate bus supply solution as described in Chapter 2 on page 17, Chapter 4 on page 39, and Chapter 5 on page 51. Otherwise proceed to step 10. We recommend you rate PowerFlex AC drives no more than two times the connected motor power rating.
10. The bus supply that is selected in step 7 must be able to precharge the total system DC bus capacitance. Sum the internal DC bus capacitance values for all external connected PowerFlex 750-series and PowerFlex 755TS AC drives. Exclude the internal capacitance of the PowerFlex 755TL/TR AC drive in this calculation. See Appendix A on page 55 for PowerFlex 750-series and PowerFlex 755TS internal DC bus capacitance and Appendix C on page 109 for PowerFlex 755TL/TR drive maximum external DC bus capacitance values. If the total external capacitance is less than the PowerFlex 755TL/TR drive maximum external capacitance rating, then the PowerFlex 755TL/TR AC drive can precharge the external AC drives; otherwise, select a higher rated PowerFlex 755TL/TR AC drive and repeat step 8...step 10. In some cases, a better solution is to chose a separate bus supply converter, as described in chapters Chapter 2 on page 17, Chapter 4 on page 39, and Chapter 5 on page 51.
11. Verify that the interconnecting DC bus cables or busbars are adequate for the expected DC bus current to each externally connected inverter/drive. Use the tables in Appendix A on page 55 to determine the inverter/drive rated DC input currents.

Example PowerFlex 755TL/TR Drive Shared DC Bus Advanced Calculation

This example represents a 480V AC input system with three motors and drives. Bold text in Table 11 on page 38 represents calculated values that are based on the method described earlier.

Drive 2, the 45 kW AC motor, is the highest power and must connect to the PowerFlex 755TL/TR AC drive.

Table 11 on page 38 summarizes step 1...step 5.

- PMaccel, PMrun, and PMdecel are the motor shaft power requirements of the application.
- PAccel, PRun, and PDecel are the calculated AC output power requirements of the drives.

Table 11 - Calculation Summary

Section Name	Motor Nameplate		Accel Drive Output Power [kW]		Run Drive Output Power [kW]		Decel Drive Output Power [kW]	
	Power [kW]	Efficiency	PMaccel	PAccel	PMrun	PRun	PMdecel	PDecel
Motor 1	11	0.9	14.00	**15.56**	9.00	**10.00**	-15.00	**-13.50**
Motor 2	45	0.85	50.00	**58.82**	35.00	**41.18**	-20.00	**-17.00**
Motor 3	5	0.92	6.70	**7.28**	3.50	**3.80**	-6.00	**-5.52**
Bus supply OL duty None = 1.0 ND = 1.1 HD = 1.5	1.5	**Output Power Totals**		**54.4**		**55.0**		**-24.0**
	Bus Supply Min Output Power Rating			**55.0**	**kW HD**			

6. The calculated total deceleration output power, PDecel, is a negative value, which indicates line regeneration is required. Select a PowerFlex 755TR regenerative AC drive.
7. The highest AC output absolute value power total is 55.0 kW heavy duty (HD). Use this value to select the minimum AC output power for the PowerFlex 755TR AC drive.
8. From Table 70 on page 111, the minimum AC output power rating 480V AC PowerFlex 755TR drive is a catalog number 20GxD125 (frame 6) with an AC output HD power rating of 75 HP (56 kW). The catalog number 20GxD125 AC drive can only support a maximum external capacitance of 880 uF. Select the catalog number 20GxD186 AC drive that can support a maximum external capacitance of 2184 uF.
9. Motor 2, the 45 kW AC motor that connects to the 125 HP (93 kW) HD PowerFlex 755TR AC drive, has a power ratio of 93 kW/45 kW= 2.07:1. This ration is very close to the recommended 2:1 ratio.
10. Verify that the PowerFlex 755TR AC drive can precharge the external DC bus capacitance.
    - All drive products are rated for 480V AC system power voltage.
    - The PowerFlex 750-series internal DC bus capacitance data is taken from Table 20 on page 61.
    - The PowerFlex 755TL/TR drive maximum external DC bus capacitance data is taken from Table 70 on page 111.

    The total external capacitance (1905 µF) is less the PowerFlex 755TL/TR drive maximum external capacitance (2184 µF).

    The chosen PowerFlex 755TR AC drive can precharge the shared DC bus capacitance.

Section Name	Drive Product	Cat. No.	Internal DC Bus Capacitance [µF] (1)	Rated DC Input Amps	Notes
Motor 1	PowerFlex 755	20GxD027	1200	23.3	Frame 3, HD
Motor 2	PowerFlex 755TR	20GxD186	13800	–	Frame 6, HD bus supply
Motor 3	PowerFlex 755	20GxD011	705	8.1	Frame 2, HD
PF755TL/TR drive max external capacitance			2184	µF	
Total external capacitance (2)			**1905**	µF	
Total DC bus capacitance			**15705**	µF	
Total DC rated amps			**31.4**	A DC	
Precharge OK					

(1) See Appendix A on page 55 and Appendix C on page 109 for internal and maximum capacitance values.
(2) The total external capacitance calculation excludes the PF755TR drive internal DC bus capacitance.

11. Use the tables in Appendix A on page 55 to determine the rated DC input currents for each external connected inverter/drive. Size the DC power cables/busbars that feed each external inverter/drive for the rated DC input current.

    In this example, the total rated DC amps for the external connected inverter/drives is 23.3 A DC + 8.1 A DC = 31.4 A DC. The chosen PowerFlex 755TL/TR AC drive is an acceptable solution for this shared DC bus application example.

Non-regenerative Bus Supply Configuration

This system features a PowerFlex® 755TM drive non-regenerative bus supply that converts the 3-phase AC line voltage into a non-filtered DC bus voltage. No provisions exist for line regeneration or power dissipation of any recovered energy from the motor/load system.

Supported Products

At the time of publication, the products that are shown in Table 12 are supported.

In Table 12, position 5 of the catalog number dictates the input type.

- 1 = Frames 2...4 AC input with precharge, includes DC terminals
- 4 = Frames 5...7 DC input with precharge
- D = Common bus with DC precharge
- E = Common bus without DC precharge
- H = Non-regenerative bus supply

Table 12 - Supported Non-regenerative Bus Supply Products

Non-regenerative Bus Supply [Cat. No. 20JEHx] (1)	Voltage Class	Supported Drives	Inverter DC Bus Overvoltage Trip (2)
PowerFlex 755TM • Single-density • Dual-density	400/480V AC	400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 2...7) (3) (4) (5)	815V DC
		400/480V AC PowerFlex 755TM (frames 8...15) (6)	815V DC
		Kinetix® 5700 single-axis servo (cat. no. 2198-S*xxx*-ERSx)	810V DC
		Kinetix 5700 dual-axis servo (cat. no. 2198-D*xxx*-ERSx)	810V DC
	600/690V AC	600V AC PowerFlex 750-series (frames 3...5) (3) (7)	1013V DC
		600V AC PowerFlex 755TS (frames 3...7) (3)	1026V DC
		600/690V AC PowerFlex 750-series (frames 6...7) (3)	1162V DC
		600/690V AC PowerFlex 755TM (frames 8...15) (6)	1172V DC
		690V AC PowerFlex 755TS (frames 6...7) (3)	1172V DC

(1) PowerFlex 750TM non-regenerative supply input type H.
(2) You can require DC bus voltage control methods to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. See Appendix D on page 119 for more information.
(3) PowerFlex 750-series and PowerFlex 755TS drive input type 1 or 4.
(4) Currently, we do not recommend you use frame 1 drives with common DC bus systems.
(5) You can use PowerFlex 755TS drives (frame 1) with common DC systems, if certain power circuit and other conditions are met. See PowerFlex 755TS Frame 1 and common bus systems for more information and technical data.
(6) PowerFlex 755TM drive input type D or E. If you apply DC input disconnect switches to drives, you must select code D.
(7) You cannot use the PowerFlex 750-series 600V AC drive (frames 3...5) on 690V AC systems. See Appendix D on page 119 for more information.

Typical System Configurations

This section describes typical configurations for the PowerFlex 755TM drive non-regenerative bus supply. The common DC bus configuration includes a non-regenerative bus supply that powers one or more inverters, shown in Table 12.

For information about legacy PowerFlex SCR front-end systems, see publication DRIVES-AT002.

You can use the PowerFlex 755T non-regenerative supply with solid grounded, high-resistance grounded, and ungrounded AC power sources. We recommend solid grounded and resistance grounded power sources for typical grid powered AC sources to improve electrical safety, ease of ground fault detection, and to reduce unbalanced voltages.

Ungrounded (floating ground) AC power sources are typically for use with shipboard isolated power systems that are not earth grounded.

Resistance grounded and ungrounded (floating ground) power sources can require additional user supplied circuits and optional bus conditioners (-P50 or -P51).

Figure 13 - PowerFlex 755TM Drive Non-regenerative Supply Configurations

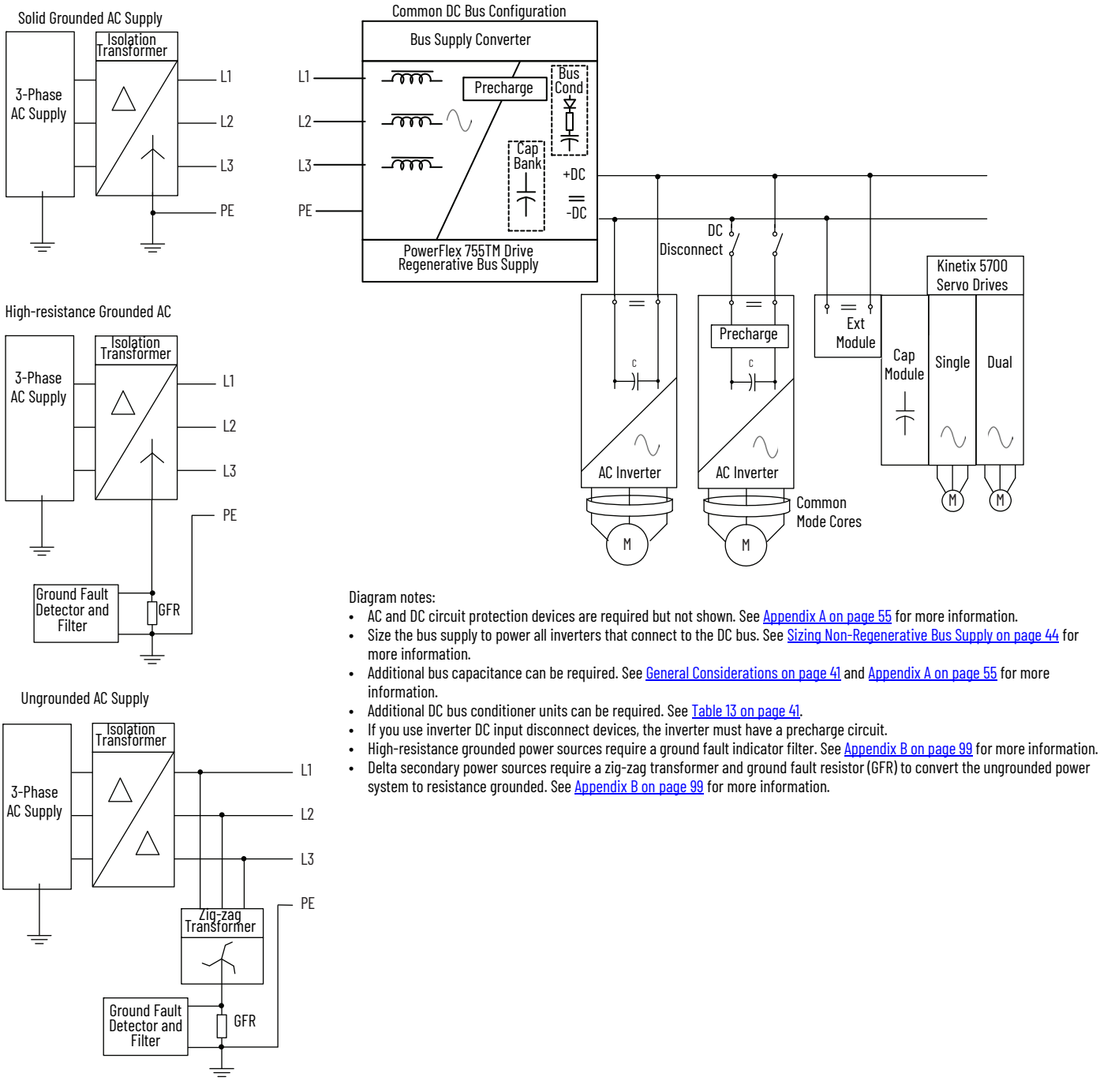


Diagram notes:

- AC and DC circuit protection devices are required but not shown. See Appendix A on page 55 for more information.
- Size the bus supply to power all inverters that connect to the DC bus. See Sizing Non-Regenerative Bus Supply on page 44 for more information.
- Additional bus capacitance can be required. See General Considerations on page 41 and Appendix A on page 55 for more information.
- Additional DC bus conditioner units can be required. See Table 13 on page 41.
- If you use inverter DC input disconnect devices, the inverter must have a precharge circuit.
- High-resistance grounded power sources require a ground fault indicator filter. See Appendix B on page 99 for more information.
- Delta secondary power sources require a zig-zag transformer and ground fault resistor (GFR) to convert the ungrounded power system to resistance grounded. See Appendix B on page 99 for more information.

Table 13 - Compatibility Table

System Voltage	Bus Supply		Inverter		Common Mode Core	DC Bus Conditioner
	Qty.	Non-regenerative Supply Drive Type [Cat. No. 20JEHx]	Qty.	Drive Type		
400/480V AC	1...6 (1)	PowerFlex 755TM (2): • Single-density • Dual-density	n (3)	400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 2...3)	1321-M048 (4)	• Solid grounded (5): -P50 power option NOT required, quantity of bus conditioners determined by the catalog number • High resistance grounded (5): -P50 power option is required, quantity of bus conditioners determined by the catalog number
				400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 4...6)	1321-M180 (4)	
				400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 7)	SK-Y1-CMCORE1 (4)	
				400/480V AC PowerFlex 755TM Common Bus (frames 8...15) (6)	Not Required (7)	
				Kinetix 5700 single-axis servo (cat. no. 2198-S*xxx*-ERSx) (8)	Not Required	
				Kinetix 5700 dual-axis servo (cat. no. 2198-D*xxx*-ERSx) (8)	Not Required	
600/690V AC	1...6 (1)	PowerFlex 755TM (2): • Single-density • Dual-density	n (3)	600V AC PowerFlex 750-series (frames 3...5) (9) (10)	Fr.3: 1321-M048 (4) Fr.4...5: 1321-M180 (4)	
				600/690V AC PowerFlex 755TS (frames 3...5)	Fr.3: 1321-M048 (4) Fr.4...5: 1321-M180 (4)	
				600/690V AC PowerFlex 750-series and PowerFlex 755TS (frames 6...7)	Fr.6: 1321-M180 (4) Fr.7: SK-Y1-CMCORE1 (4)	
				600/690V AC PowerFlex 755TM common bus (frames 8...15) (6)	Not Required (7)	

(1) When paralleling non-regenerative supplies, derating factors are applied. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
(2) See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for guidance on PowerFlex 755TM drive system DC bus selection.
(3) the precharge capability of the PowerFlex 755TM drive non-regenerative supply can limit the number of inverters that can connect. See DC Bus Capacitance Calculation Method on page 91 for more information about DC bus capacitor calculations and system capacitance precharging requirements and the maximum external DC bus capacitance that can be connected.
(4) For PowerFlex 750-series and PowerFlex 755TS drives (frames 2...7), cores are required on inverter AC output only. See Appendix B on page 99 and product technical data manuals for more information.
(5) The appropriate number of bus conditioner units internal to the PowerFlex 755TM drive non-regenerative supply are factory-installed, depending on the frame size and -P50 option selection. Shipboard ungrounded power sources can require a marine bus conditioner, option -P51 (contact your local Allen-Bradley distributor or Rockwell Automation sales office). See Appendix B on page 99 for more information about DC bus conditioner modules.
(6) See Appendix B for guidance on PowerFlex 755TM drive control pod selection.
(7) For PowerFlex 755TM common bus drives, there are no provisions for AC output common mode cores; however, an optional reflective wave (dv/dt) filter is available. See catalog number position 11 - filtering and CM cap configuration, EMI solutions.
(8) To connect Kinetix 5700 servo drives to a common DC bus system, a capacitor module and other equipment are required. See Kinetix 5700 Servo Drives on page 106 for more information.
(9) When PowerFlex 750-series 600V AC drives (frame 3...5) are mixed with larger frame inverters on 600V AC common DC bus systems, an external DC bus voltage control method can be required to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. See Appendix D on page 119 for more information.
(10) You cannot use PowerFlex 750-series 600V AC drives (frames 3...5) on 690V AC systems. See Appendix D on page 119 for more information.

General Considerations

- Select all system components for the same AC-line voltage.
- Use a low inductance type DC bus. See DC Bus Connections on page 10 for details.
- A minimum DC bus capacitance greater than 110 uF is required to enable the bus supply to power up if there is no other connected DC bus capacitance. Typically, this situation only occurs during commissioning when all inverters can disconnect from the DC bus. The PowerFlex 755TM drive non-regenerative supply excludes any internal DC bus capacitance as standard. If necessary, confirm that the minimum connected capacitance is provided by optional internal capacitor modules or an external capacitor module of at least 110 uF. See Appendix B on page 99 for more information about external capacitor modules.
- The common DC bus system can require feeder and branch circuit protection and disconnect devices. Provide appropriate circuit protection as required by national and local electrical safety codes and regulations.

ATTENTION: The PowerFlex 755T non-regenerative supply does not employ overload protection devices or current limitation controls. Overload protection devices can be required to protect the non-regenerative supply and system DC busbars. You are responsible for installing appropriate fuses and/or circuit breakers as recommended in publication 750-UM100, and as required by national and local electrical safety codes and regulations.

- Depending on the product family and frame size, AC and/or DC fuses can be provided internally or you must supply fuses external to the product. See Appendix A on page 55 and the product technical data manuals for recommended fuse information.

- Do not use PowerFlex 755T AC drives and bus supplies on undersized or high-impedance AC supply systems. The supply system kVA must be equal to or greater than the product-related kVA, and the system impedance must be less than 10%. You must account for the kVA of all PowerFlex 755T drives and bus supplies on the distribution system and the system impedance of upstream transformers.
  - System Impedance = (PowerFlex 755T kVA ÷ Transformer kVA) x Transformer % Impedance
- The mixture of different frame size drives in this arrangement can cause high ripple current in the smaller frame drives. In this case, place the larger power drives physically closer to the bus supply. This arrangement helps current sharing among the various drives on the bus.
- Place the AC input power jumpers (PE-A) and DC bus jumpers (PE-B) in the correct positions according to the power source grounding method. The PowerFlex 755T non-regenerative supply is a passive rectifier.

ATTENTION: Set all DC bus jumpers for the PowerFlex 755T drive bus supplies (PE-B), all connected PowerFlex drives (PE-B), and all Kinetix 5700 servo drives (ground screw/jumper) to the same condition: Either all connected (in) or all removed (out). Risk of equipment damage exists if the DC bus power jumpers are not all set to the same condition.

- For recommended settings and instructions for modifying the position of the power jumpers, see publications:
  - 750-UM100
  - 750-IN100
  - 750-IN101
  - 750-IN001
  - 2198-UM002
  - 750-IN119

Precharge Interlocking

For more information about DC bus precharging and inverter precharging circuit configurations, see Precharge on page 11.

- If you use a disconnect switch between the common DC bus and the inverter DC input, the inverter must have precharging capability. In addition, you must wire an auxiliary contact on the disconnect switch that opens when the disconnect is open, to an inverter digital input. Assign the corresponding digital input the Precharge enable function.
  - PowerFlex 750-series - assign to parameter 0:189 **[DI Precharge]**. See publication 750-PM001.
  - PowerFlex 755TM and PowerFlex 755TS drive - assign to parameter 0:190 **[DI Precharge]**. See publication 750-PM101.

  This configuration provides the proper precharge interlocking, which guards against possible damage to the drive when you reconnect the drive to an energized DC bus.

ATTENTION: The Kinetix family of drives and some PowerFlex AC drives have no external means of controlling DC bus capacitor precharge; therefore, do not use a DC disconnect switch without the use of an external precharge device. See Precharge on page 11 for more information.

- The precharge status of the PowerFlex 755TM drive non-regenerative supply must interlock with the connected drives, so the drives disable (do not run) when the PowerFlex 755TM drive non-regenerative bus supply is in a precharge state. You can accomplish interlocking with a hardwired I/O connection to the Precharge Complete relay output from the bus supply to the drive enable control via drive local I/O, or to the Logix controller I/O and software control of drive enable via communication.

Kinetix 5700 Servo Drives

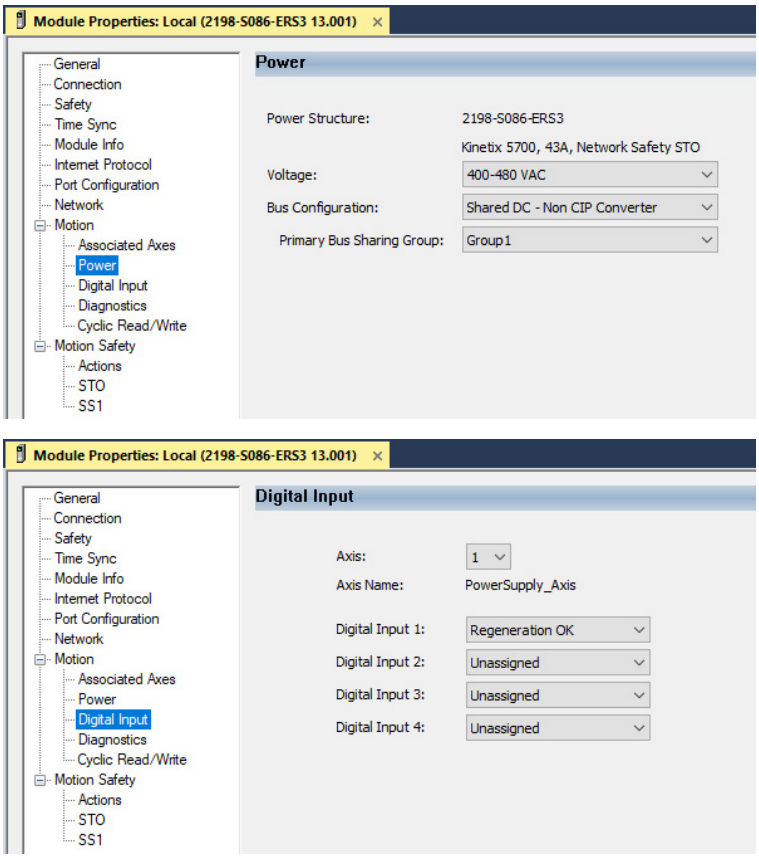
The Kinetix 5700 servo drive can connect to 400/480V AC PowerFlex 755TM DC drive common bus systems. You require a capacitor module and other accessories. For more information about the application of the Kinetix 5700 to PowerFlex DC drive common bus systems, see Kinetix 5700 Servo Drives on page 106.

When a PowerFlex 755TM drive bus supplies a Kinetix 5700 servo drive bus group, you must configure one of the Kinetix 5700 drives in the bus group in the Studio 5000 Logix Designer® application as Shared DC - Non-CIP Converter, and the bus supply ready status that is assigned to the Kinetix 5700 drive Regeneration OK input.

The Precharge Complete relay output of the PowerFlex 755TM drive non-regenerative bus supply must connect/interlock with the Regeneration OK input of the Kinetix 5700 drive. This connection does not signal that the DC bus voltage is present, but rather when the PowerFlex 755TM drive non-regenerative bus supply is ready to supply power, the connection allows the Kinetix 5700 drives to enable and pull power from the bus.

The following screen captures show the settings that are required for Shared DC - non-CIP Converter bus configuration and Regeneration OK digital input within the Logix Designer application. See publication 2198-UM002.

Figure 14 - Required Settings in Logix Designer Application



Paralleling PowerFlex 755TM Drive Non-regenerative Modules

- The PowerFlex 755TM drive non-regenerative supply is available in two rating sizes: Single-density (1X) and dual-density (2X). You can parallel additional single-density and/or dual-density modules to increase the rating of the overall non-regenerative bus supply.
- Parallel configurations comprise separate enclosures and catalog number 20-750-MN*x* single-density (1X) and dual-density (2X) roll-in modules. See publication 750-TD101.
- There are many possible combinations of paralleling single- and dual-density roll-in modules into a complete non-regenerative bus supply converter. The ratings and specifications for single modules and various parallel configurations are shown in Appendix A on page 55. Use the tables to obtain the derated overall ratings for parallel combinations.
- Parallel up to six single- and/or dual-density modules to configure a fully coordinated bus supply system for power ratings up to 4000 kW and 6000 Hp. The coordinated module operation requires that each parallel module interconnects with the signal interconnection harness. See publication 750-IN101 for more information on parallel configurations.
- There are practical limitations to the current carrying capacity of the system busbars and other components. Perform calculations for the total bus supply rated DC current to confirm that the system requirements do not exceed the PowerFlex 755TM common DC bus drive system busbar rating (standard = 3000 A DC, option -P46 = 4700 A DC). See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about PowerFlex 755TM drive DC busbar ratings. If the calculated total DC rated amps exceed these ratings, special design considerations are required to make sure that the AC and DC busbar systems are sized to handle the expected AC and DC currents. Use back-to-back or center-fed enclosure lineups to satisfy these requirements. See the associated PowerFlex 755T technical data and installation manuals from Additional Resources on page 122 for more information. You can also use third-party enclosures with suitably rated AC and DC busbars to meet the AC and DC current requirements of this example system.

- If you have an application that requires paralleling of more than six PowerFlex 755TM drive non-regenerative bus supply modules, contact your local Allen-Bradley distributor or Rockwell Automation sales office.

Sizing Non-Regenerative Bus Supply

Use one of the following methods to size the PowerFlex 755TM drive non-regenerative bus supply.

Basic Sizing of the Non-Regenerative Supply

To perform the basic sizing calculations, acquire the following information.

- System AC source voltage.
- Inverter/drive product family and catalog numbers.
- Inverter overload duty ratings normal duty (ND) or heavy duty (HD) and the catalog numbers for each inverter/drive connected on the common DC bus.

Calculation

1. Sum/total the DC input amp ratings of the respective inverters, which are based on the application normal duty (ND) / heavy duty (HD) ratings. See the tables in Appendix A on page 55. Assume that the drives are motoring 100% of rating.
2. Select a single- or dual-density PowerFlex 755TM drive non-regenerative supply, which is based on the normal duty (ND) or heavy duty (HD) DC output current rating for the system AC voltage that meets or exceeds the worst case calculated normal duty DC output current value from step 1. To achieve the required rating, it can be necessary to configure a parallel combination of single- and/or dual-density modules. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information. The basic sizing method assumes that there is no requirement for regeneration. If the application requires regeneration, perform calculations from Advanced Sizing of the Non-Regenerative Supply on page 47.
3. Verify that the system AC and DC busbars and cables are sized to support the expected current. The PowerFlex 755TM drive system standard busbars are rated for 3000 A DC and optional (-P46) 4700 A DC. All DC busbars in the common DC bus lineup must have the same amp rating. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about the DC busbar ratings and options. Confirm that you have adequate AC and DC overload and overcurrent devices capable of protecting the non-regenerative busbars.
4. Verify that the DC bus capacitance to output amps ratio (µF/A) meets or exceeds the target value for the system AC voltage and combination of connected inverter/drives. See DC Bus Capacitance Calculation Method on page 91.
5. Verify that the selected bus supply can precharge the total connected DC bus capacitance. Sum the internal DC bus capacitance values for all connected AC inverters/drives and additional capacitor modules. Include the internal capacitance of the PowerFlex 755TM drive non-regenerative bus supply in this calculation.
6. See the tables in Appendix A on page 55 for internal DC bus capacitance values used in PowerFlex 750-series drives, PowerFlex 755TM and PowerFlex 755TS common bus drives, Kinetix 5700 servo drives, and PowerFlex 755TM drive non-regenerative supply optional internal DC bus capacitor banks. The tables in Appendix A on page 55 show the maximum external DC bus capacitance values and corresponding precharge delay times for the PowerFlex 755TM drive non-regenerative bus supply. If bus supply modules are paralleled, sum the maximum external bus capacitance values for each module to determine the total maximum DC bus capacitance. Set the PowerFlex 755TM drive non-regenerative supply precharge delay times so the non-regenerative supply can precharge the total DC bus capacitance.

Example Basic Sizing of the Non-Regenerative Bus Supply

This example represents a 480V AC input system with five motors and mixed product family drives. The acceleration and deceleration times are assumed to be less than 1 minute so we can take advantage of the overload duty of the inverter drives and the bus supply.

Bold text in Table 14 represents calculated values that are based on Calculation on page 44.

Table 14 summarizes step 1.

- All drive products are rated for 480V AC system power voltage.
- The PowerFlex 750-series rated DC amps data is taken from Table 20 on page 61.
- The PowerFlex 755TM common bus drive rated DC amps data is taken from Table 22 on page 64.
- The Kinetix 5700 servo drive DC amps data is taken from Table 23 on page 65.

Table 14 - Calculation Summary

Section Name	Drive Product	Cat. No.	Rated DC Amps	Notes
Drive 1	PowerFlex F755TM	20GxD1K6	**1568**	Frame 10, HD
Drive 2	PowerFlex 755	20GxD096	**84.5**	Frame 5, HD
Drive 3	PowerFlex 755TM	20GxD960	**883**	Frame 9, HD
Drive 4	PowerFlex 755	20GxD022	**14.7**	Frame 2, HD
Drive 5	Kinetix 5700	2198-S086	**45.7**	ND
		Total Rated DC Amps	**2595.9**	**HD**

The rated DC output current for the bus supply must be at least 2595.9 A DC heavy duty (HD).

2. Use Table 25 on page 67 to select the PowerFlex 755TM drive non-regenerative bus supply.

   Because the DC bus current exceeds the rating of a single-density non-regenerative module, you must parallel non-regenerative supply single-density (1X) and dual-density (2X) power modules. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information about paralleling modules.

   For this example, two dual-density (2X) modules and one single-density (1X) module are paralleled.

   The parallel PowerFlex 755TM drive non-regenerative supply total heavy duty (HD) continuous DC output current is 3290 A DC.

3. Verify that the system AC and DC busbars and cables are sized to support the expected current. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for ratings of PowerFlex 755TM drive power bus systems. For this example, the total rated DC amps (2595.9 A DC) is less than the PowerFlex 755TM drive standard 3000 A DC busbar.

IMPORTANT The PowerFlex 755TM drive non-regenerative bus supply does not contain overload protective devices. Provide AC overload protective devices that protect the non-regenerative supply, associated AC and DC conductors, and busbars.

4. Verify that the DC bus capacitance to output amps ratio meets or exceeds the target µF/A ratio. See DC Bus Capacitance Calculation Method on page 91.

- The PowerFlex 750-series internal DC bus capacitance data is taken from in Table 20 on page 61.
- The PowerFlex 755TM common bus drive internal DC bus capacitance data is taken from Table 22 on page 64.
- The Kinetix 5700 servo drive internal DC bus capacitance is taken from Table 23 on page 65.
- The PowerFlex 755TM drive non-regenerative bus supply internal capacitance data is taken from Table 25 on page 67.

This example is 480V AC and has a mixture of PowerFlex 750-series drives, PowerFlex 755TM common bus drives, and Kinetix 5700 servo drives. The target DC bus capacitance to output current ratio is 40 µF/A.

To meet the target µF/A ratio, you must include one 30,000 µF (2X) capacitor bank and one 15,000 µF (1X) capacitor bank in the PowerFlex 755TM drive non-regenerative supply modules.

Sum the internal DC bus capacitance of the inverter/drives and non-regenerative supply. In this example, 71,420 µF + 30,000 µF = 101420 µF.

Sum the rated AC output current of the inverter/drives. Alternatively, sum the rated DC input amps of the inverter/drives and multiply this value by 0.9 to obtain the approximate AC RMS output current. In this example, 3000 AA DC * 0.9 = 2336.3 A RMS.

The resulting DC bus capacitance to output amps ratio is 101,420 µF / 2336.3 A RMS = 43.4 µF/A, which exceeds the target of 40 µF/A.

Section Name	Drive Product	Cat. No.	DC Bus Capacitance [µF] (1)	Notes
Drive 1	PF755TM	20GxD1K6	45000	Frame 8, HD
Drive 2	PF755	20GxD096	4600	Frame 6, HD
Drive 3	PF755TM	20GxD960	18000	Frame 8, HD
Drive 4	PF755	20GxD022	1020	Frame 5, HD
Drive 5	Kinetix 5700	2198-S086 2198-CAPMOD	560 2240	ND, Cluster capacitor module
Bus Supply	PF755TM Non-regenerative	20JEHxD1K3 20JEHxD1K3 20JEHxD740	30000	Quantity of 2 (2X) modules Quantity of 1 (1X) module Quantity of 1 (2X) cap bank
		Max external capacitance	383100	0.2 sec precharge
		Additional capacitance	0	µF
		Total external DC bus capacitance (2)	**71420**	µF
		Total DC bus capacitance	**101420**	µF
		Equivalent total AC output amps (3)	**2336.4**	A RMS
			Precharge OK	
		This system target µF/A ratio	40 µF/A	
		This system calculated µF/A ratio	**43.4** µF/A	
		µF/A ratio OK	**0** µF additional required	

(1) See Appendix A on page 55 for internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TM drive bus supply internal bus capacitance.
(3) Equivalent total AC output amps are calculated by multiplying the total rated DC amps by 0.9

5. Verify that the chosen PowerFlex 755TM drive non-regenerative bus supply can precharge the total connected DC bus capacitance.

- The PowerFlex 755TM drive non-regenerative bus supply maximum DC bus capacitance data and precharge delay settings are taken from Table 25 on page 67.

  The total connected DC bus capacitance is 101,420 µF. Sum the PowerFlex 755TM drive non-regenerative module maximum DC bus capacitance values for one (1X) module and two (2X) modules. With a 0.2 second precharge ramp time, the total maximum DC bus capacitance is 81,700 µF + 150,700 µF + 150,700 µF = 383100 µF. This total exceeds the total connected capacitance of 101,420 µF; the PowerFlex 755TM drive non-regenerative bus supply precharge delay time can be set to 0.2 seconds or higher.

  The chosen PowerFlex 755TM drive non-regenerative bus supply can precharge the total connected DC bus capacitance.

The chosen 480V AC PowerFlex 755TM drive non-regenerative supply, which comprises two dual-density (2X) modules and one single-density (1X) module, meet the required heavy duty (HD) continuous DC amps required for this example. Additional non-regenerative supply DC bus capacitor banks are required to the meet the target 40 µF/A ratio requirements for this example.

Advanced Sizing of the Non-Regenerative Supply

To perform the advanced sizing calculations, acquire the following system information.

- System AC source voltage
- Motor nameplate power rating
- Motor nameplate efficiency
- Product family and catalog numbers for each inverter/drive connected on the common DC bus
- Inverter/drive overload duty ratings normal duty (ND) or heavy duty (HD).
- Application power requirements and polarity for each motor during the acceleration, steady running, and deceleration phases of operation

Calculation

1. Convert all motor powers to kW (kW = HP x 0.746).
2. In step 3...step 10, PMotor is the motor power that is required for the application, not the nameplate power of the motor (unless the application power is unknown). If the application absorbs power, use positive values. If the application regenerates power, use negative values.
3. Determine the total DC bus power that is required during acceleration.
   - For motoring loads: Pdrive = Pmotor / Motor Efficiency / Inverter Efficiency (0.97)
   - For regenerating loads: Pdrive = Pmotor * Motor Efficiency * Inverter Efficiency (0.97)

   Calculate the DC bus power that is required during acceleration, taking advantage of the normal duty 110% for 1 minute (OL=1.1) or heavy duty 150% 1 minute (OL=1.5) overload rating of the non-regenerative supply. If acceleration time is greater than 1 minute, use an overload rating of OL=1.0.

   Paccel = (Pdrive1 + Pdrive2 + ...) / OL
4. Determine the total DC bus power that is required during steady-state run operation.
   - For motoring loads: Pdrive = Pmotor / Motor Efficiency
   - For regenerating loads: Pdrive = Pmotor * Motor Efficiency

   Calculate the steady-state DC bus power that is required.

   Prun = Pdrive1 + Pdrive2 + ...
5. Determine the total DC bus power that is required during deceleration.
   - For motoring loads: Pdrive = Pmotor / Motor Efficiency / Inverter Efficiency (0.97)
   - For regenerating loads: Pdrive = Pmotor * Motor Efficiency * Inverter Efficiency (0.97)

   Calculate the DC bus power that is required during deceleration, taking advantage of the normal duty 110% for 1 minute (OL=1.1) or heavy duty 150% for 1 minute (OL=1.5) overload rating of the non-regenerative supply. If the deceleration time is greater than 1 minute, use an overload rating of OL=1.0.

   PDecel = (Pdrive1 + Pdrive2 + ...) / OL

ATTENTION: If Paccel, Prun, or PDecel is a negative value, the application can require a method of regeneration. Consider a PowerFlex 755TM drive regenerative bus supply (discussed in Regenerative Bus Supply Configuration on page 17 or Paralleling Two PowerFlex 755TM Drive Regenerative Bus Supplies on page 51), or an external brake chopper and DB resistor sized for the application regeneration requirements.

6. Compare the absolute values of the DC bus power that is required during acceleration, deceleration, and steady state (step 3...step 5). Use the highest numerical value to select the bus supply in step 7.
7. Select a single- or dual-density PowerFlex 755TM drive non-regenerative supply for the system AC voltage based on the normal duty (ND) or heavy duty (HD) DC output power rating that meets or exceeds the highest calculated DC bus power from step 6. To achieve the required rating, it can be necessary to configure a parallel combination of single- and/or dual-density modules. Calculate the total motoring DC bus power available by summing and derating paralleled single- and dual-density modules. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
8. The DC bus capacitance per output amp ratio must meet or exceed the target µF/A ratio. Additional DC bus capacitor modules can be required. See DC Bus Capacitance Calculation Method on page 91 for more information about DC bus capacitor µF/A ratio calculations.
9. The bus supply that is selected in step 7 must be able to precharge the total system DC bus capacitance. Sum the internal DC bus capacitance values for all connected AC inverters/drives and additional capacitor modules. Include the internal capacitance of the PowerFlex 755TM drive non-regenerative bus supply in this calculation.

See the tables in Appendix A on page 55 for internal DC bus capacitance values used in PowerFlex 750-series drives, PowerFlex 755TM and PowerFlex 755TS common bus drives, Kinetix 5700 servo drives, and PowerFlex 755TM drive non-regenerative supply optional internal DC bus capacitor banks. Tables in Appendix A on page 55 show the maximum external DC bus capacitance values and corresponding precharge delay times for the PowerFlex 755TM drive non-regenerative bus supply. If bus supply modules are paralleled, sum the maximum external bus capacitance values for each module to determine the total maximum DC bus capacitance. Set the PowerFlex 755TM drive non-regenerative supply precharge delay times so the non-regenerative supply can precharge the total DC bus capacitance.

10. Verify that the system AC and DC busbars and cables are sized to support the expected current. The total rated DC bus current is the sum of all inverter/drive rated DC input currents as described in PowerFlex 755TM Drive System DC Bus Ratings on page 103. Alternatively, calculate the rated DC bus current by dividing the total rated AC output current in step 8 by 0.9.

    The PowerFlex 755TM drive system standard busbars are rated for 3000 A DC and optional (-P46) 4700 A DC. All DC busbars in the common DC bus lineup must have the same amp rating. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about the DC busbar ratings and options. If the calculated total DC rated amps exceed these ratings, special design considerations are required to confirm that the AC and DC busbar systems are sized to handle the expected AC and DC currents. Use back-to-back or center-fed enclosure lineups to satisfy these requirements. See the associated PowerFlex 755T technical data and installation manuals in Additional Resources on page 122 for more information. You can also employ third-party enclosures with suitably rated AC and DC busbars to meet the AC and DC current requirements of this example system.

    Confirm that you have adequate AC and DC overload and overcurrent devices capable of protecting the PowerFlex 755TM drive non-regenerative bus supply and associated AC and DC circuit conductors and busbars.

IMPORTANT The PowerFlex 755TM drive non-regenerative bus supply does not contain overload protective devices. Provide AC overload protective devices that protect the non-regenerative supply and associated AC and DC conductors and busbars.

Example Advanced Sizing PowerFlex 755TM Drive Non-regenerative Bus Supply Calculation

This example represents a 480V AC input system with five motors and mixed product family drives. The acceleration and deceleration times are assumed to be less than 1 minute so we can take advantage of the overload duty of the inverter drives and the bus supply.

Bold text in Table 15 represents calculated values that are based on the calculation methods that are described earlier.

Table 15 summarizes step 1...step 5.

- All drive products are rated for 480V AC system power voltage.
- Pmaccel, Pmrun, and Pmdecel are the motor shaft power requirements of the application.
- Paccel, Prun, and PDecel are the calculated DC input power requirements of the inverter drives.

Table 15 - Calculation Summary

Section Name	Motor Nameplate		Accel DC Bus Power [kW]		Run DC Bus Power [kW]		Decel DC Bus Power [kW]	
	Power [kW]	Efficiency	Pmaccel	Paccel (1)	Pmrun	Prun (1)	Pmdecel	PDecel (1)
Drive 1	933	0.95	1120.0	**1215.41**	900.0	**976.67**	-40.0	**-36.86**
Drive 2	45	0.9	56.0	**64.15**	-50.0	**-43.65**	-10.0	**-8.73**
Drive 3	522	0.94	705.0	**773.20**	480.0	**526.43**	70.0	**76.77**
Drive 4	7.5	0.87	11.0	**13.03**	6.5	**7.70**	-10.0	**-8.44**
Drive 5	22	0.9	20.0	**22.91**	14.0	**16.04**	-15.0	**-13.10**
Bus supply OL duty None=1.0 ND=1.1 HD=1.5	1.5	**DC bus power totals (2)**		**1392.5**		**1483.2**		**19.9**
		Bus supply DC bus output power		**1483.2**	**kW HD**			

(1) Drive output power calculations include factors for polarity of power, motor efficiency, and inverter efficiency
(2) Output power total calculations include overload duty of the bus supply

6. The highest output absolute value power total is 1483.2 kW heavy duty (HD). Use this value to select the minimum DC output power for the PowerFlex 755TM drive non-regenerative bus supply.
7. Use Table 25 on page 67, to select the DC bus output power rating 480V AC PowerFlex 755TM drive non-regenerative bus supply that supports the value in step 6.

    Because the DC bus power exceeds the rating of a single- (1X) or a dual-density (2X) non-regenerative module, you must parallel non-regenerative dual-density (2X) power modules. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information about paralleling modules.

For this example, two dual-density (2X) modules are paralleled.

The PowerFlex 755TM drive non-regenerative supply total heavy duty (HD) continuous DC output power rating for this example is 1633 kW DC.

8. Perform the DC bus capacitance calculations in DC Bus Capacitance Calculation Method on page 91.
   - The PowerFlex 750-series internal DC bus capacitance data is taken from Table 20 on page 61.
   - The PowerFlex 755TM common bus drive internal DC bus capacitance data is taken from Table 22 on page 64.
   - The Kinetix 5700 servo drive internal DC bus capacitance data is taken from Table 23 on page 65.
   - The PowerFlex 755TM drive non-regenerative bus supply internal capacitance data is taken from Table 25 on page 67.

   Verify that the µF/A ratio meets or exceeds the target of 40 µF/A ratio for this 480V AC system with mixed inverter types. Table 16 summarizes the DC bus capacitance data and calculations.

   To meet the target µF/A ratio, it is necessary to include one 30,000 µF (2X) capacitor bank within one of the PowerFlex 755TM drive non-regenerative supply modules.

   Sum the DC bus capacitance of the inverter/drives and non-regenerative supply. In this example, 71,320 µF + 30,000 µF = 101320 µF.

   Sum the rated AC output current of the inverter/drives. In this example, 2354.0 A RMS.

   The resulting DC bus capacitance to output amps ratio of 101,320 µF / 2354.0 A RMS = 43.0 µF/A is greater than the target of 40 µF/A.

Table 16 - Calculation Summary

Section Name	Drive Product	Cat. No.	DC Bus Capacitance [µF] (1)	Rated Output Amps	Notes
Drive 1	PowerFlex F755TM	20GxD1K6	45000	1420	Frame 10, HD
Drive 2	PowerFlex PF755	20GxD096	4500	77	Frame 5, HD
Drive 3	PowerFlex 755TM	20GxD960	18000	800	Frame 9, HD
Drive 4	PowerFlex 755	20GxD022	1020	14	Frame 2, HD
Drive 5	Kinetix 5700	2198-SO86 2198-CAPMOD	560 2240	43	ND, cluster capacitor module
Bus supply	PowerFlex 755TM non-regenerative	20JEHxD1K3 20JEHxD1K3	30000	2520	Quantity of 2 (2X) modules Quantity of 1 (2X) cap bank
		Max external capacitance	301400		
		Additional capacitance	0	µF	
		Total external capacitance (2)	**71320**	µF	
		Total DC bus capacitance	**101320**	µF	
		Total rated AC output amps(3)		**2354.0**	A RMS

(1) See Appendix A on page 55 for internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TM drive bus supply internal bus capacitance.
(3) The total rated output amps include the external connected inverter/drive rated AC output amps. The bus supply rated amps are not included in this total sum.

This system target µF/A ratio	40	µF/A
This system calculated µF/A ratio	**43.0**	µF/A
µF/A ratio OK	**0**	µF additional required

9. Verify that the PowerFlex 755TM drive non-regenerative bus supply can precharge the total connected DC bus capacitance.
   - The PowerFlex 750-series internal DC bus capacitance data is taken from Table 20 on page 61.
   - The PowerFlex 755TM common bus drive internal DC bus capacitance data is taken from Table 22 on page 64.
   - The Kinetix 5700 servo drive internal DC bus capacitance data is taken from Table 23 on page 65.
   - The PowerFlex 755TM drive non-regenerative bus supply maximum DC bus capacitance data is taken from Table 25 on page 67.

   The total connected DC bus capacitance is 101,320 µF. Sum the PowerFlex 755TM drive non-regenerative module maximum DC bus capacitance values for two (2X) modules. With a 0.2 second precharge ramp time, the total maximum DC bus capacitance is 150,700 µF + 150,700 µF = 301400 µF. This total exceeds the total connected capacitance of 101,320 µF; the PowerFlex 755TM drive non-regenerative bus supply precharge delay time can be set to 0.2 seconds or higher.

   The chosen PowerFlex 755TM drive non-regenerative bus supply can precharge the total connected DC bus capacitance.

Section Name	Drive Product	Cat. No.	DC Bus Capacitance [µF] (1)	Notes
Drive 1	PF755TM	20GxD1K6	45000	Frame 10, HD
Drive 2	PF755	20GxD096	4500	Frame 5, HD
Drive 3	PF755TM	20GxD960	18000	Frame 9, HD
Drive 4	PF755	20GxD022	1020	Frame 2, HD
Drive 5	Kinetix 5700	2198-S086 2198-CAPMOD-DCBUS-IO	560 2240	Drive capacitor module
Bus Supply	PF755TM non-regenerative	20JEHxD1K3 20JEHxD1K3	30000	Quantity of 2 (2)X modules Quantity of 1 (2X) cap bank
		Max DC bus capacitance	301400	0.2 sec precharge ramp time
		Additional capacitance	0	µF
		Total external capacitance (2)	**71320**	µF
		Total DC bus capacitance	**101320**	µF
			Precharge OK	

(1) See Appendix A on page 55 for internal and maximum capacitance values.
(2) The calculated total external DC bus capacitance excludes the PowerFlex 755TM drive bus supply internal bus capacitance.

10. Verify that the DC bus cable/bus bars are adequately sized for the total rated DC bus current.

    The total rated DC bus current is calculated by dividing the total rated AC output current from step 8 by 0.9. In this example, 2354.0 A RMS / 0.9 = 2616 A DC.

    The standard PowerFlex 755TM drive DC busbar is capable of 3000 A DC. All DC busbars in the common DC bus lineup must have the same amp rating. See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about the DC busbar ratings and options.

IMPORTANT The PowerFlex 755TM drive non-regenerative bus supply does not contain overload protective devices. Confirm that you provide AC overload protective devices that protect the non-regenerative supply and associated AC and DC conductors and busbars.

The chosen PowerFlex 755TM drive non-regenerative supply, which is composed of two dual-density (2X) modules, meets the required heavy duty (HD) continuous DC amps required for this example. Additional non-regenerative supply DC bus capacitor banks are required to the meet the target 40 µF/A ratio requirements for this example.

Paralleling Two PowerFlex 755TM Drive Regenerative Bus Supplies

System Characteristics

One PowerFlex® 755TM drive regenerative bus supply can be paralleled with another PowerFlex 755TM drive regenerative bus supply to increase the total DC bus power rating and for applications that require system redundancy. Configure this option with the Voltage Droop feature of the PowerFlex 755TM drive regenerative bus supply. For more information on the Voltage Droop feature, see publication 750-RM100.

In this configuration, both PowerFlex 755TM drive regenerative bus supplies modulate and share the load of the inverters that connect to the common DC bus. For redundancy applications, you must size the PowerFlex 755TM drive regenerative bus supplies appropriately, such that if one bus supply goes down, the system can operate at full capacity on one PowerFlex 755TM drive regenerative bus supply.

Supported Products

At the time of publication, the products that are shown in Table 17 are supported.

In Table 17, position 5 of the catalog number dictates the input type.

- 1 = Frames 2...4 AC input with precharge, includes DC terminals
- 4 = Frames 5...7 DC input with precharge
- 6 = Frames 6...7 regenerative and low harmonic AFE, 755TM drive bus supplies
- D = Common bus with DC precharge
- E = Common bus without DC precharge
- F = Frames 8...15 regenerative and low harmonic AFE, 755TM drive bus supplies

Table 17 - Regenerative Bus Supply Products

Regenerative Bus Supply [Cat. No. 20Jx]	Voltage Class	Supported Drives	Inverter DC Bus Overvoltage Trip (1)
PowerFlex 755TM (2) (frames 6...15) (3) (4)	400/480V AC	400/480V AC PowerFlex 750-series and PowerFlex 755TS (frames 2...7) (5) (6) (7)	815V DC
		400/480V AC PowerFlex 755TM (frames 8...15) (8)	815V DC
		Kinetix® 5700 single-axis servo (cat. no. 2198-S*xxx*-ERS*x*)	810V DC
		Kinetix 5700 dual-axis servo (cat. no. 2198-D*xxx*-ERS*x*)	810V DC
	600/690V AC	600V AC PowerFlex 750-series (frames 3...5) (6) (9)	1013V DC
		600V AC PowerFlex 755TS (frames 3...7) (6)	1026V DC
		600/690V AC PowerFlex 750-series (frames 6...7) (6)	1162V DC
		690V AC PowerFlex 755TS (frames 6...7) (6)	1172V DC
		600/690V AC PowerFlex 755TM (frames 8...15) (8)	1172V DC

(1) You can require DC bus voltage control methods to limit the maximum routine system DC bus voltage to less than the lowest inverter DC bus overvoltage trip level. See Appendix D on page 119 for more information.
(2) PowerFlex 755TM drive regenerative bus supply input type 6 or F.
(3) Only two regenerative bus supplies of the same frame size can be paralleled.
(4) PowerFlex 755T drive regenerative bus supply (frame 6) is a panel-mounted device that requires additional external AC input power conditioning equipment. If frame 6 regenerative bus supplies are used, see publication 750-IN100 for additional installation and external device information.
(5) Currently, we do not recommend frame 1 drives for use with common DC bus systems.
(6) PowerFlex 750-seriesand PowerFlex 755TS drives input type 1 or 4.
(7) You can use PowerFlex 755TS drives (frame 1) with common DC systems provided certain power circuit and other conditions are met. See PowerFlex 755TS Frame 1 and common bus systems for more information and technical data.
(8) PowerFlex 755TM drive input type D or E. If you apply DC input disconnect switches to inverters, you must select code D common bus with DC precharge.
(9) You cannot use PowerFlex 750-series 600V AC drives (frames 3...5) on 690V AC systems. See Appendix D on page 119 for more information.

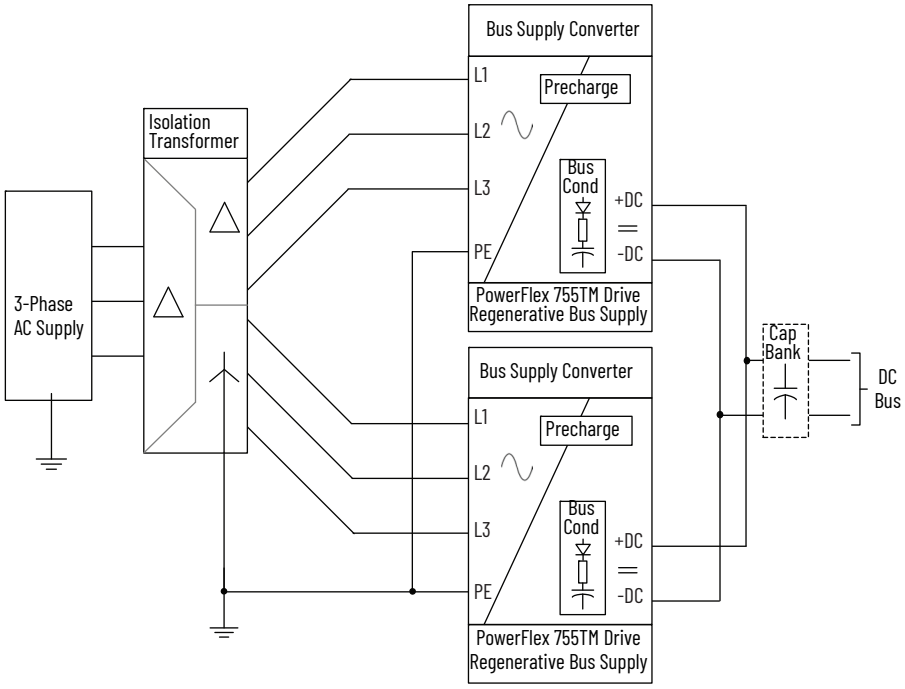
Typical System Configuration

This section describes typical configurations for parallel PowerFlex 755TM drive regenerative bus supplies. The common DC bus configuration includes two parallel connected regenerative bus supplies as shown in Figure 15. In this configuration, both regenerative bus supplies modulate and share the load of the inverters that connect to the common DC bus.

Use a dedicated isolation transformer that only supplies AC power to the regenerative bus supplies. Do not connect other AC loads to the secondary of the isolation transformer.

You can use the PowerFlex 755T drive regenerative bus supply with solid-grounded, high-resistance grounded, and ungrounded AC power sources. We recommend solid-grounded and resistance-grounded power sources for typical grid-powered AC sources to improve electrical safety, ease of ground fault detection, and to reduce unbalanced voltages. Ungrounded (floating ground) AC power sources are typically for use with shipboard isolated power systems that are not earth grounded. Resistance-grounded and ungrounded (floating ground) power sources can require additional user-supplied circuits and optional bus conditioners (-P50 or -P51).

Figure 15 - PowerFlex 755TM Drive Regenerative Bus Supply with Parallel PowerFlex 755TM Drive Regenerative Bus Supply



- AC and DC circuit protection devices are required but not shown. See Appendix A on page 55 for more information.
- Size the bus supplies to power all inverters that connect to the DC bus. See Sizing Regenerative Bus Supply on page 23 for more information.
- Additional DC bus capacitance can be required. See DC Bus Capacitance Calculation Method on page 91 for more information.
- Additional DC bus conditioner units can be required. See Table 2 on page 19.
- Inverter units are not shown in this diagram. See Table 2 on page 19 for more information.
- Several methods are acceptable for isolation of the two regenerative bus supplies. This diagram shows a dual secondary transformer with delta and wye secondary windings. You can also use two separate isolation transformers. Secondary windings can be either delta or wye.
- One of the regenerative bus supply AC sources can be solid grounded (as shown) or high resistance grounded. High-resistance grounded power sources require a ground fault indicator filter. See Appendix B on page 99 for more information.
- Delta secondary power sources require a zig-zag transformer and ground fault resistor (GFR) to convert the ungrounded power system to resistance grounded. See Appendix B on page 99 for more information.
- See Regenerative Bus Supply Configuration on page 17 for more information about regenerative bus AC source grounding methods and recommendations.
- One of the regenerative bus supply AC sources must be ungrounded to help prevent circulating common mode currents between the two converters.

General Considerations

- See Table 2 on page 19 for compatibility.
- Select all system components for the same AC-line voltage.
- Use a low inductance type DC bus. See DC Bus Connections on page 10 for details.
- The common DC bus system can require feeder and branch circuit protection and disconnect devices. Provide appropriate circuit protection as required by national and local electrical safety codes and regulations.
- Depending on product family and frame size, AC and/or DC fuses can be provided internally, or you must supply external to the product. See Appendix A on page 55 and the product technical data manuals in Additional Resources on page 122 for recommended fuse information.
- Do not use PowerFlex 755T AC drives and bus supplies on undersized or high-impedance AC supply systems. The supply system kVA must be equal to or greater than the product-related kW, and the system impedance must be less than 10%. Operation outside these limits can cause instability and product shutdown. You must account for the kVA of all PowerFlex 755T drives and bus supplies on the distribution system and the system impedance of upstream transformers.
  - System Impedance = (PowerFlex 755T kVA ÷ Transformer kVA) x Transformer % Impedance

- Wiring of inverters that connect to the DC bus must go to a common point on the DC busbars to confirm the system is symmetrical between the two PowerFlex 755TM drive regenerative bus supplies.
- The mixture of different frame size drives in this arrangement can cause high ripple current in the smaller frame drives. In this case, place the larger power drives physically closer to the bus supply. This arrangement helps current sharing among the various drives on the bus.
- Place the AC input power jumpers (PE-A) in the correct positions according to the power source grounding method. The PowerFlex 755T drive regenerative bus supply and all connected inverters must have the DC bus jumpers (PE-B) removed or set to out, regardless of the AC power source grounding method. The Kinetix 5700 servo drives must have the ground screw/jumpers removed. The PowerFlex 755T drive regenerative bus supply is an active converter.

ATTENTION: Set all DC bus power jumpers for PowerFlex 755T drive bus supplies (PE-B), all connected PowerFlex inverters (PE-B), and all Kinetix 5700 servo drives (ground screw/jumper) to the same condition: All removed (out). Risk of equipment damage exists if the DC bus power jumpers are not all set to the same condition.

For recommended settings and instructions for modifying the position of the power jumpers, see the following publications.

- 750-IN100
- 750-IN101
- 750-IN001
- 2198-UM002
- 750-IN119

Precharge Interlocking

For more information about DC bus precharging and inverter precharging circuit configurations, see Precharge on page 11.

- If you use a disconnect switch between the common DC bus and the inverter DC input, the inverter must have precharging capability. In addition, an auxiliary contact on the disconnect switch that opens when the disconnect is open, must be wired to an inverter digital input. The corresponding digital input must be assigned to the Precharge enable function.
  - PowerFlex 750-series - assign to parameter 0:189 **[DI Precharge]**. See publication 750-PM001.
  - PowerFlex 755TM and PowerFlex 755TS drive - assign to parameter 0:190 **[DI Precharge]**. See publication 750-PM101.

This configuration provides the proper precharge interlocking, which guards against possible damage to the drive when reconnecting the drive to an energized DC bus.

- The precharge status of the PowerFlex 755TM drive regenerative bus supply must interlock with the connected drives, so the drives disable (do not run) when the PowerFlex 755TM drive regenerative bus supply is in a precharge state. You can accomplish interlocking by monitoring bus supply line side converter parameter 13:225.25 **[Line Side Sts 1]**. This status bit can connect to the PowerFlex drive (Enable) and Kinetix 5700 drive (Regeneration OK) control via:
  - Hardwired bus supply I/O connection to inverter/drive local I/O
  - Logix controller I/O
  - Communication datalink within the Logix control program task

  Product can require optional I/O modules if hardwired interlocking methods are used.

ATTENTION: The Kinetix family of drives and some PowerFlex AC drives have no external means to control the precharge; therefore, do not use a DC disconnect switch without the use of an external precharge device. See Precharge on page 11.

Parallel Operation of Two PowerFlex 755TM Drive Regenerative Bus Supplies

When bus supplies are paralleled, dedicated isolation transformers must power the two units.

- One of the regenerative bus supply AC sources must be ungrounded to help prevent circulating common mode currents between the two bus supplies.
- There are several acceptable methods for isolation of the two regenerative bus supplies:
  - Dual secondary transformer with delta and wye secondary windings
  - Two separate isolation transformers can also be used. Secondary windings can be either delta or wye

- One of the regenerative bus supply AC sources can be solid grounded (this diagram), high resistance grounded or ungrounded with zig-zag transformer, neutral ground resistor (NGR), and ground indicator filter. See Regenerative Bus Supply Configuration on page 17 for more information about regenerative bus AC source grounding methods and recommendations.
- AC source and DC busbar configuration must be symmetrical when installing a parallel PowerFlex 755TM drive regenerative bus supply system.
- Parameter 13:45 **[DC Bus Ref Sel]** must be set to 2 Droop Ctrl on each of the PowerFlex 755TM drive regenerative bus supplies.
- There are practical limitations to the current carrying capacity of the system busbars and other components. When considering paralleling modules, perform calculations for the total bus supply DC current and confirm that the system requirements do not exceed the PowerFlex 755TM common DC bus drive system busbar rating (standard = 3000 A DC, option -P46 = 4700 busbar). See PowerFlex 755TM Drive System DC Bus Ratings on page 103 for more information about PowerFlex 755TM drive DC busbar ratings.

Load Sharing Two PowerFlex 755TM Drive Regenerative Bus Supplies

- An isolation transformer is required to isolate the two PowerFlex 755TM drive regenerative bus supplies. The transformer kVA must be equal to or greater than the PowerFlex 755TM drive regenerative bus supply's input kVA.
- The system impedance must be less than 10%.
- AC source and DC Bus configuration must be symmetrical when installing a parallel PowerFlex 755TM drive regenerative bus supply system.

ATTENTION: The DC Bus configuration must be symmetrical to maintain that there are no impedance differences that are seen by the two PowerFlex 755TM drive regenerative bus supplies.

- Parameter 13:45 **[DC Bus Ref Sel]** must be set to 2 Droop Ctrl on each of the PowerFlex 755TM drive regenerative bus supplies.
- Verify that the PE-B jumpers are configured properly. See publications 750-IN100 and 750-IN119.

Additional Information

See the following sections.

- AC Power System Resonance Conditions on page 20
- Kinetix 5700 Servo Drives on page 22
- Basic Sizing of the Regenerative Bus Supply on page 23
- Dynamic Bus Control for Large Capacitor Bank Applications on page 21

Electrical Ratings, Recommended Protective Devices, and DC Bus Capacitance

This appendix includes product information that is required to configure the common DC bus systems described in this publication.

AC and DC Circuit Protection Devices

The common DC bus system can require additional feeder and branch circuit protection and disconnect devices. You are responsible for providing appropriate circuit protection as required by national and local electrical safety codes and regulations.

See manuals in Additional Resources on page 122 for more information about branch circuit protection recommendations.

Depending on product family and frame size, AC and/or DC fuses can be provided internally or you must supply fuses external to the product. Internal and recommended external fuses are non-time delay, high-speed semiconductor overcurrent protection devices that are not suitable for branch circuit overload protection.

Table 18 - AC and DC Circuit Protection Devices

Drives	Frame Size	AC Input Fuses	DC Output Fuses	DC Input Fuses
PowerFlex® 755TM non-regenerative supply (1)	• Single-density • Dual-density	Internal	Internal	-
PowerFlex 755TM regenerative bus supply	6	External user supplied	External user supplied	-
	7...15	Internal	Internal	-
PowerFlex 755TL/TR AC (shared bus)	5...6	External user supplied	External user supplied	-
	8...15 (2)	Internal	External user supplied	
PowerFlex 750-series AC	2...7	External user supplied	External user supplied	External user supplied
PowerFlex 755TS AC	1...7	External user supplied	External user supplied	External user supplied
PowerFlex 755TM common bus	8...15	-	-	Internal
Kinetix® 5700 servo	• Single axis • Dual axis	-	-	External user supplied (one set per cluster of common bus drives)

(1) The PowerFlex 755TM drive non-regenerative supply does not employ overload or current limiting functions. Select external overload protective devices that protect the AC and DC power conductors and the PowerFlex 755TM drive non-regenerative supply. See the PowerFlex 755T manuals in Additional Resources on page 122 for more information.
(2) PowerFlex 755TL AC drives are only available up to frame 10.

Circuit Protection Configurations

Figure 16...Figure 24 on page 60 illustrate the AC and DC circuit protection configurations for the products that are listed in Table 18 on page 55.

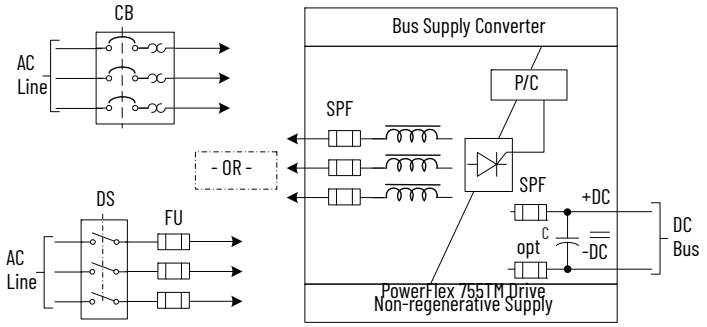
Table 19 - Diagram Abbreviations

Term	Description
CB	Circuit breaker - For branch circuit overload and overcurrent protection and disconnection of AC power. See publication 750-TD100 fuse and circuit breaker data tables for fuse specifications.
ST	Shunt trip - Part of the CB, applied power trips the circuit breaker.
N	AC contactor - Three pole AC contactor for disconnecting AC power.
DS	Disconnect switch - For use to disconnect of AC or DC power.
FU	AC fuse - Dual element time delay or non-time delay fuse. Optional for branch circuit overload and overcurrent protection. See publication 750-TD100 for fuse specifications.
SPF	Semiconductor protection fast acting-fuse - Required for protection of power electronics. These fuses are typically within the PowerFlex product, except for the PowerFlex 755TL/TR AC drive (frames 5...6) and the PowerFlex 755TM drive regenerative bus supply (frame 6).
P/C	Pre-charger - Resistive or SCR phase-controlled circuits for precharging DC bus capacitors.
C	DC bus capacitors.

PowerFlex 755TM Drive Non-regenerative Supply, All Configurations

See publication 750-UM100 for recommended external AC input overload/over-current protective devices.

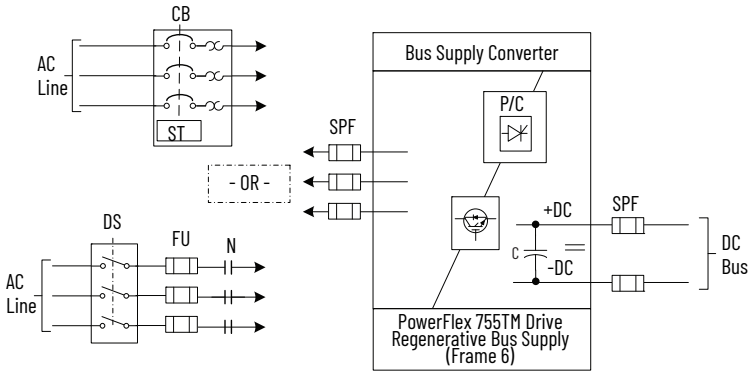
Figure 16 - PowerFlex 755TM Drive Non-regenerative Supply, All Configurations



PowerFlex 755TM Drive Regenerative Bus Supply (Frame 6)

- Requires user-supplied AC input and DC output semiconductor protection fuses (SPF). See publication 750-TD100 for fuse specifications.
- Requires user-supplied AC input circuit breaker (CB) with shunt trip (ST) or AC input contactor (N). The bus supply converter onboard digital outputs and the user-supplied 24V DC power supply control these devices. See publication 750-IN100.

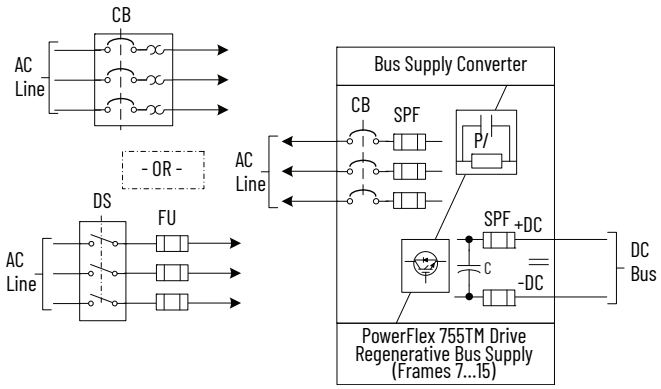
Figure 17 - PowerFlex 755TM Drive Regenerative Bus Supply (Frame 6)



PowerFlex 755TM Drive Regenerative Bus Supply (Frames 7...15)

- CB or DS, FU disconnect means and branch circuit protection, if necessary.
- See publication 750-TD100 for user-supplied AC input branch circuit protection recommendations.

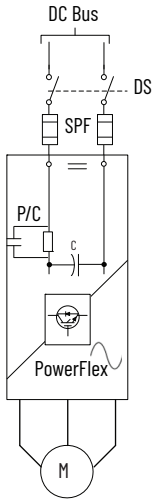
Figure 18 - PowerFlex 755TM Drive Regenerative Bus Supply (Frames 7...15)



PowerFlex 750-Series AC Drive (Frames 2...7)

- Requires user-supplied DC input fuses. See publication 750-TD001 for recommended external non-time delay fast-acting semiconductor protection fuses (SPF). See Fuse Certification and Test Data on page 87 for fuse self-certification and test data for Bussmann 170M and JKS fuses, and Mersen HSJ fuses that are recommended for the DC bus fusing.
- Disconnect switch (DS) - Inverter DC disconnect switch, if necessary. If you use the DC disconnect switch, the inverter must have precharging circuits.

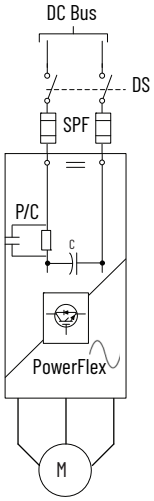
Figure 19 - PowerFlex 750-Series AC Drive (Frames 2...7)



PowerFlex 755TS AC Drive (Frames 1...7)

- Requires user-supplied DC input fuses. See publication 750-TD104 for recommended external non-time delay fast-acting semiconductor protection fuses (SPF). See publication 750-IN121 for catalog number 20-750-DCFUSE and 20-750-DCFH fuse installation. See Fuse Certification and Test Data on page 87 for fuse self-certification and test data for Bussmann 170M and JKS fuses, and Mersen HSJ fuses.
- Disconnect switch (DS) - Inverter DC disconnect switch, if necessary. If you use the DC disconnect switch, the inverter must have precharging circuits.

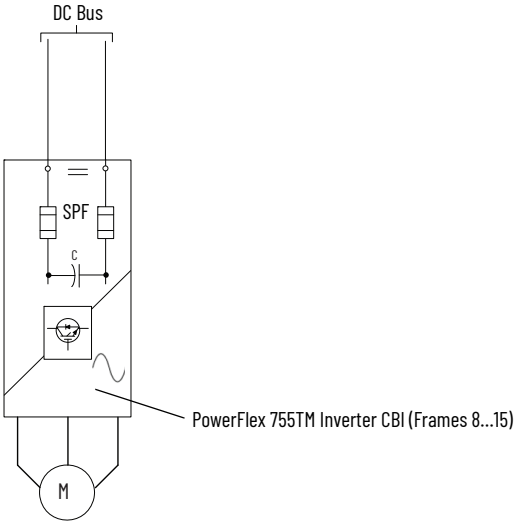
Figure 20 - PowerFlex 755TS AC Drive (Frames 1...7)



PowerFlex 755TM Common Bus Inverter (Frames 8...15)

See publication 750-TD100, for ratings of internal semiconductor protection fuses (SPF).

Figure 21 - PowerFlex 755TM Common Bus Inverter (Frames 8...15)



Kinetix 5700 Servo Drive, All Configurations

- Do not exceed 208 A DC continuous input current (DC busbar current rating).
- Each cluster of common bus drives requires only one set of semiconductor protection (SPF) DC input fuses. Do not exceed 315 A fuse rating (20-750-DCFUSE3S-315A, Bussmann 170M3696 or equivalent). See publication 750-IN121 for catalog number 20-750-DCFUSE and 20-750-DCFH fuse installation.
- Choose the fuse sizes based on the DC current rating of the drive cluster. We recommend Rockwell Automation® catalog number 20-750-DCFUSE series and Eaton/Cooper Bussmann 170M or FWP series DC rated fuses.

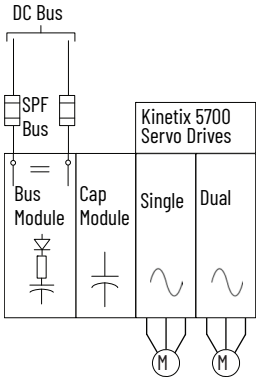
  Fuse selection guidelines:

  - Sum the rated DC input current of each drive that connects to the drive cluster. See Table 23 on page 65 (400V AC) or Table 30 on page 72 (480V AC) for rated DC input currents.
  - Multiply this sum by x 1.5…2. Choose the next higher rating semiconductor fast-acting DC fuse rating.

  Example: A 480V AC system with one single-axis catalog number 2198-S086-ERSx, 45.7 A DC input amps, one dual-axis catalog number 2198-D020-ERSx, 8.5 A DC input amps. DC input current data is in Table 30 on page 72.

  - (45.7ADC + 8.5ADC) x 1.75 = 94.9 ADC
  - Choose 100 A semiconductor protection high-speed fuses. Bussmann FWP-100B, 100 A, 700V, or equivalent.

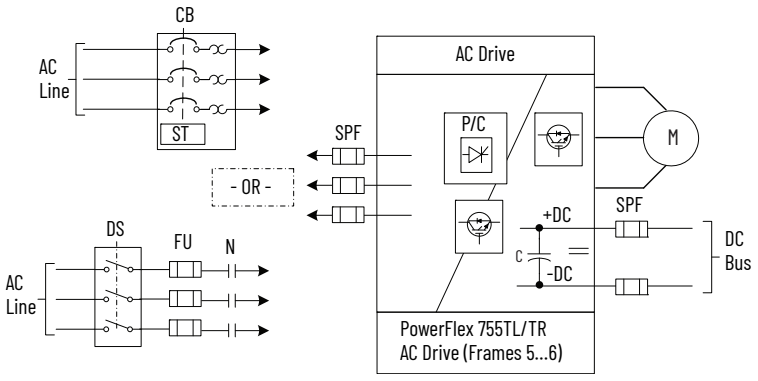
Figure 22 - Kinetix 5700 Servo Drive, All Configurations



PowerFlex 755TL/TR AC Drives (Frames 5…6)

- Requires user-supplied AC input and DC output semiconductor protection fuses (SPF). See publication 750-TD100 fuse and circuit breaker data tables for fuse specifications.
- Requires user-supplied AC input circuit breaker (CB) with shunt trip (ST), or AC input contactor (N). The bus supply converter onboard digital outputs and the user-supplied 24V DC power supply connect these devices. See publication 750-IN100.

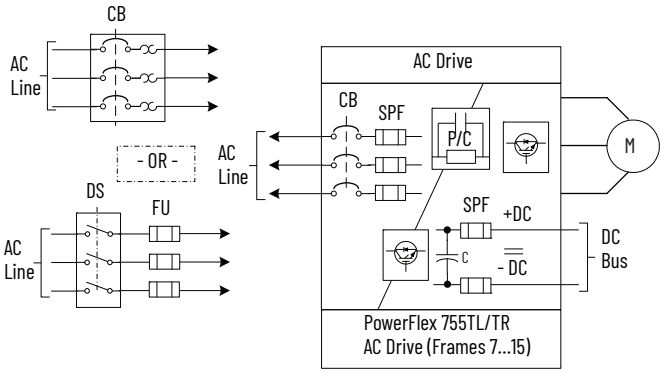
Figure 23 -



PowerFlex 755TL/TR AC Drives (Frames 7...15)

- CB or DS, FU disconnect means and branch circuit protection, if necessary.
- See publication 750-TD100 for user-supplied AC input branch circuit protection recommendations.
- PowerFlex 755TL drives only available up to frame 10.

Figure 24 - PowerFlex 755TL/TR AC Drives (Frames 7...15)



400V AC Rating Tables

Table 20 - PowerFlex 750-Series Drives (Frames 2...7), 400V AC

Cat. No. 20Fx/20Gx [1]	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
C2P1	2	0.75	–	2.1		2.1	1.1	705
		–	0.75	–	2.1	2.1	1.1	
C3P5	2	1.5	–	3.5	–	3.7	2	705
		–	1.5	–	3.5	3.7	2	
C5P0	2	2.2	–	5	–	5.3	2.9	705
		–	2.2	–	5	5.3	2.9	
C8P7	2	4	–	8.7	–	9.3	5	705
		–	4	–	8.7	9.3	5	
C011	2	5.5	–	11.5	–	12.6	6.8	705
		–	5.5	–	11.5	12.6	6.8	
C015	2	7.5	–	15.4	–	17	9.2	705
		–	5.5	–	11.5	12.6	6.8	
C022	2	11	–	22	–	24.6	13.3	1020
		–	7.5	–	15.4	17	9.2	
C030	3	15	–	30	–	33.6	18.1	1200
		–	11	–	22	24.6	13.3	
C037	3	18.5	–	37	–	41.4	22.3	1500
		–	15	–	30	33.6	18.1	
C043	3	22	–	43	–	48.1	26	1800
		–	18.5	–	37	41.4	22.3	
C060	4	30	–	60	–	67.1	36.2	2400
		–	22	–	43	48.1	26	
C072	4	37	–	72	–	82.4	44.5	3000
		–	30	–	60	67.1	36.2	
C072	5	37	–	72	–	82.4	44.5	3600
		–	30	–	60	67.1	36.2	
C085	5	45	–	85	–	97.3	52.5	3600
		–	37	–	72	82.4	44.5	
C104	5	55	–	104	–	120.2	64.9	4500
		–	45	–	85	97.3	52.5	
C104	6	55	–	104	–	120.2	64.9	4600
		–	45	–	85	97.3	52.5	
C140	6	75	–	140	–	160.3	86.5	4600
		–	55	–	104	120.2	64.9	
C170	6	90	–	170	–	194.6	105.1	9200
		–	75	–	140	160.3	86.5	
C205	6	110	–	205	–	234.7	126.7	9200
		–	90	–	170	194.6	105.1	
C260	6	132	–	260	–	297.7	160.7	9200
		–	110	–	205	234.7	126.7	
C260	7	132	–	260	–	297.7	160.8	13,800
		–	110	–	205	234.7	126.7	

Table 20 - PowerFlex 750-Series Drives (Frames 2...7), 400V AC (Continued)

Cat. No. 20Fx/20Gx (1)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
C302	7	160	–	302	–	345.7	186.7	13,800
		–	132	–	260	297.7	160.7	
C367	7	200	–	367	–	420.2	226.9	13,800
		–	160	–	302	345.7	186.7	
C456	7	250	–	456	–	522	281.9	18,400
		–	200	–	367	420.2	226.9	
C477	7	270		477	–	546	294.8	18,400
			200	–	367	420.2	226.9	

(1) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 21 - PF755TS Drive (Frames 2...7) (1), 400V AC

Cat. No. 20Gx (2)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
C2P1	2	0.75	–	2.1		2.2	1.2	820
		–	0.75	–	2.1	2.2	1.2	
C3P5	2	1.5	–	3.5	–	3.7	2.0	820
		–	1.5	–	3.5	3.7	2.0	
C5P0	2	2.2	–	5	–	5.3	2.9	820
		–	2.2	–	5	5.3	2.9	
C8P7	2	4	–	8.7	–	9.2	5.0	820
		–	4	–	8.7	9.2	5.0	
C011	2	5.5	–	11.5	–	12.2	6.6	820
		–	5.5	–	11.5	12.2	6.6	
C015	2	7.5	–	15.4	–	16.3	8.8	820
		–	5.5	–	11.5	12.2	6.6	
C022	2	11	–	22	–	23.2	12.5	820
		–	7.5	–	15.4	16.3	8.8	
C030	3	15	–	30	–	31.7	17.1	1500
		–	11	–	22	23.2	12.5	
C037	3	18.5	–	37	–	39.1	21.1	1500
		–	15	–	30	31.7	17.1	
C043	3	22	–	43	–	45.4	24.5	1800
		–	18.5	–	37	39.1	21.1	
C060	4	30	–	60	–	63.4	34.2	3450
		–	22	–	43	45.4	24.5	
C061	3	30	–	61	–	64.5	34.8	1800
		–	22	–	43	45.4	24.5	
C072	4	37	–	72	–	76.1	41.1	3450
		–	30	–	60	63.4	34.2	
C072	5	37	–	72	–	76.1	41.1	4000
		–	30	–	60	63.4	34.2	
C073	4	37	–	73	–	77.1	41.6	3450
		–	30	–	60	63.4	34.2	
C085	5	45	–	85	–	89.8	48.5	4000
		–	37	–	72	76.1	41.1	

Table 21 - PF755TS Drive (Frames 2...7) (1), 400V AC (Continued)

Cat. No. 20Gx (2)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
C086	4	45	–	86	–	90.9	49.1	3450
		–	37	–	72	76.1	41.1	
C104	5	55	–	104	–	109.9	59.3	4400
		–	45	–	85	89.8	48.5	
C104	6	55	–	104	–	109.9	59.3	4600
		–	45	–	85	89.8	48.5	
C140	6	75	–	140	–	151.4	81.8	4600
		–	55	–	104	109.9	59.3	
C170	6	90	–	170	–	183.9	99.3	9200
		–	75	–	140	151.4	81.8	
C205	6	110	–	205	–	221.7	119.7	9200
		–	90	–	170	183.9	99.3	
C260	6	132	–	260	–	281.2	151.8	9200
		–	110	–	205	221.7	119.7	
C260	7	132	–	260	–	281.2	151.8	13,800
		–	110	–	205	221.7	119.7	
C302	7	160	–	302	–	326.7	176.4	13,800
		–	132	–	260	281.2	151.8	
C367	7	200	–	367	–	397	214.4	13,800
		–	160	–	302	326.7	176.4	
C456	7	250	–	456	–	493.2	266.3	18,400
		–	200	–	367	397	214.4	
C477	7	270		477	–	516	278.6	18,400
			200	–	367	397	214.4	

(1) You can use PowerFlex 755TS drives (frame 1) with common DC systems, provided certain power circuit and other conditions are met. See PowerFlex 755TS Frame 1 and common bus systems for more information and technical data.
(2) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 22 - PowerFlex 755TM Common Bus Inverters (Frames 8...15), 400V AC

Cat. No. 20Gx (1)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
C302	8	160	–	302	–	348	187.9	9000
		–	132	–	260	300	162	
C367	8	200	–	367	–	423	228.4	9000
		–	160	–	302	348	187.9	
C460	8	250	–	460	–	530	286.2	9000
		–	200	–	367	423	228.4	
C540	8	315	–	540	–	622	335.9	9000
		–	250	–	460	530	286.2	
C585	8	315	–	585	–	674	364	15,000
		–	250	–	472	530	286.2	
C650	8	355	–	650	–	749	404.5	15,000
		–	315	–	540	622	335.9	
C750	8	400	–	750	–	864	466.6	15,000
		–	315	–	585	674	364	
C770	8	400	–	770	–	887	479	15,000
		–	355	–	650	740	399.6	
C920	9	500	–	920	–	1060	572.4	18,000
		–	400	–	770	887	479	
C1K0	9	560	–	1040	–	1198	646.9	18,000
		–	500	–	920	1060	572.4	
C1K1	9	630	–	1112	–	1281	691.7	30,000
		–	500	–	1040	1198	646.9	
C1K2	9	710	–	1175	–	1354	731.2	30,000
		–	560	–	1090	1256	678.2	
C1K4	9	800	–	1463	–	1685	909.9	30,000
		–	630	–	1175	1354	731.2	
C1K6	10	850	–	1590	–	1821	983.3	45,000
		–	710	–	1465	1688	911.5	
C1K7	10	1000	–	1715	–	1976	1067	45,000
		–	800	–	1480	1705	920.7	
C2K1	10	1250	–	2156	–	2484	1341.4	45,000
		–	1000	–	1715	1976	1067	
C2K8	11	1650	–	2849	–	3282	1772.3	60,000
		–	1400	–	2330	2684	1449.4	
C3K5	12	2000	–	3542	–	4081	2203.7	75,000
		–	1650	–	3032	3493	1886.2	
C4K2	13	2200	–	4235	–	4879	2634.7	90,000
		–	1953	–	3575	4070	2197.8	
C5K6	14	2920	–	5621	–	6475	3496.5	120,000
		–	2592	–	4745	5402	2917.1	
C7K0	15	3640	–	7007	–	8072	4358.9	15,0000
		–	3231	–	5915	6734	3636.4	

(1) Drive input type (position 5 of catalog number) = D (common bus with DC precharge) or E (common bus without DC precharge).

Table 23 - Kinetix 5700 Drive Modules, 400V AC (1)

Module Cat. No.	Frame Width [mm]	AC Output ND Continuous (2)		DC Input ND Continuous		Module DC Bus Capacitance [µF]
		kW	Amps RMS	Amps	kW	
2198-D006-ERSx	55	1.7	2.5	2.7	1.5	165
2198-D012-ERSx	55	3.4	5	5.3	2.9	165
2198-D020-ERSx	55	5.5	8	8.5	4.7	330
2198-D032-ERSx	55	8.9	13	13.7	7.6	390
2198-D057-ERSx	85	15.9	23	24.5	13.5	705
2198-S086-ERSx	85	29.7	43	45.7	25.3	560
2198-S130-ERSx	85	44.9	65	69	38.2	840
2198-S160-ERSx	100	60.1	85	92.3	51.2	1120
2198-S263-ERSx	220	90	150	164	78.4	2050
2198-S312-ERSx	220	112	192	207	97.3	2050
2198-CAPMOD-2240	55	—	—	—	—	2240
2198-DCBUSCOND-RP312	55	—	—	—	—	0
2198-CAPMOD-DCBUS-IO	55	—	—	—	—	0

(1) For the Kinetix 5700 single- and dual-axis servo drives, the fuse is internal to the product and is not field replaceable.
(2) These attributes apply to each of the axes in the dual-axis inverter modules (catalog number 2198-D*xxx*).

Table 24 - PowerFlex 755TM Drive Regenerative Bus Supplies (Frames 6...15), 400V AC (580V DC)

Cat. No. 20Jx (1)	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	External DC Bus Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
C140	6	87	—	150	9200	25,792
		—	65	112		
C176	6	106	—	182	9200	25,792
		—	87	150		
C205	6	128	—	220	13,800	21,192
		—	106	182		
C260	6	162	—	279	13,800	21,192
		—	128	220		
C302	7	188	—	324	9000	94,680
		—	162	279		
C367	7	228	—	394	9000	94,680
		—	188	324		
C460	7	286	—	494	9000	94,680
		—	228	394		
C540	7	336	—	579	9000	94,680
		—	286	494		
C585	7	373	—	644	9000	71,784
		—	311	537		
C302	8	188	—	324	9000	63,720
		—	162	279		
C367	8	228	—	394	9000	63,720
		—	188	324		
C460	8	286	—	494	9000	63,720
		—	228	394		

Table 24 - PowerFlex 755TM Drive Regenerative Bus Supplies (Frames 6...15), 400V AC (580V DC) (Continued)

Cat. No. 20Jx (1)	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	External DC Bus Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
C540	8	336	–	579	9000	63,720
		–	286	494		
C585	8	364	–	628	15,000	88,680
		–	286	494		
C650	8	405	–	698	15,000	88,680
		–	336	579		
C750	8	467	–	805	15,000	88,680
		–	364	628		
C770	8	479	–	826	15,000	88,680
		–	405	698		
C920	9	572	–	987	18,000	178,992
		–	479	826		
C1K0	9	647	–	1116	18,000	178,992
		–	572	987		
C1K1	9	692	–	1193	30,000	166,992
		–	647	1116		
C1K2	9	731	–	1261	30,000	166,992
		–	678	1170		
C1K4	9	910	–	1570	30,000	166,992
		–	731	1261		
C1K6	10	984	–	1697	45,000	245,304
		–	911	1572		
C1K7	10	1067	–	1840	45,000	245,304
		–	921	1588		
C2K1	10	1342	–	2314	45,000	245,304
		–	1067	1840		
C2K8	11	1772	–	3057	60,000	323,616
		–	1449	2500		
C3K5	12	2204	–	3801	75,000	401,928
		–	1886	3254		
C4K2	13	2634	–	4546	90,000	480,240
		–	2226	3839		
C5K6	14	3496	–	6030	120,000	636,864
		–	2954	5095		
C7K0	15	4358	–	7517	15,0000	793,488
		–	3684	6352		

(1) Drive input type (position 5 of catalog number) = F (regenerative and low harmonic AFE).

Table 25 - PowerFlex 755TM Drive Non-regenerative Supply – Single- and Dual-density, 400V AC (540V DC Output)

Cat. No. 20JEHx	Module Size [1]	DC Output Rating[1]			Internal Optional DC Bus Capacitance [µF][2]
		Power [kW]		Continuous Amps	
		ND	HD		
C770	1X	479	-	887	15,000
		-	400	740	
C1K4	2X	910	-	1685	30,000
		-	731	1354	
20-750-MNx [3]	1X/2X	1341	-	2484	Total internal µF values calculated based on module size and quantity of parallel modules
		-	1119	2072	
	2X/2X	1771	-	3282	
		-	1479	2738	
	1X/2X/2X	2203	-	4080	
		-	1886	3493	
	2X/2X/2X	2634	-	4879	
		-	2198	4070	
	1X/1X/	2634	-	4879	
	2X/x2X	-	2198	4070	
	2X/2X/	3497	-	6475	
	2X/2X	-	2917	5402	
	1X/1X/	4359	-	8072	
	2X/2X/2X/2X	-	3636	6734	
	2X/2X/2X/2X/2X/2X [4]	5221	-	9668	
		-	4356	8066	

(1) Modules are available in single-density and dual-density. Modules can be paralleled to increase the rating. In this table, 1X means one single-density module, 2X means one dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
(2) For paralleled modules, sum the corresponding 1X and 2X internal optional capacitance values to obtain the overall bus supply internal/optional DC bus capacitance value.
(3) Parallel configurations are built-up from separate enclosures and catalog number 20-750-MNx single-density (1X) and dual-density (2X) roll-in modules. See publication 750-TD101.
(4) You can only achieve the configuration ratings in these rows with user-supplied busbars.

Table 26 - Maximum DC Bus Capacitance

Cat. No. 20JEHx	Module Size [1]	Precharge Ramp [µF] [1][2]							
		0.2 s	1.3 s	2.0 s	5.0 s	10 s	20 s	30 s	60 s
C770	1X	81,700	408,500	817,000	2,042,500	4,085,000	8,170,000	12,255,000	24,510,000
C1K4	2X	150,700	753,500	1,507,000	3,767,500	7,535,000	15,070,000	22,605,000	45,210,000

(1) For paralleled modules, sum the corresponding 1X and 2X maximum external capacitance values to obtain the overall bus supply system maximum external DC bus capacitance value.
(2) Select the fastest precharge ramp time that supports the total connected DC bus capacitance. Perform calculations to determine the required DC bus capacitance and the system total DC bus capacitance. See DC Bus Capacitance Calculation Method on page 91.

480V AC Rating Tables

Table 27 - PowerFlex 750-Series Drives (Frames 2...7), 480V AC

Cat. No. 20Fx/20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
D2P1	2	1.0	–	2.1	–	1.9	1.2	705
		–	1.0	–	2.1	1.9	1.2	
D3P4	2	2.0	–	3.4	–	3	2	705
		–	2.0	–	3.4	3	2	
D5P0	2	3.0	–	5.0	–	4.5	2.9	705
		–	3.0	–	5.0	4.5	2.9	
D8P0	2	5.0	–	8.0	–	8.1	5.3	705
		–	5.0	–	8.0	4.5	2.9	
D011	2	7.5	–	11	–	11.1	7.2	705
		–	7.5	–	11	11.1	7.2	
D014	2	10	–	14	–	14.7	9.5	705
		–	7.5	–	11	11.1	7.2	
D022	2	15	–	22	–	23.3	15.1	1020
		–	10	–	14	14.7	9.5	
D027	3	20	–	27	–	28.9	18.8	1200
		–	15	–	22	23.3	15.1	
D034	3	25	–	34	–	36.4	23.6	1500
		–	20	–	27	28.9	18.8	
D040	3	30	–	40	–	42.9	27.8	1800
		–	25	–	34	36.4	23.6	
D052	4	40	–	52	–	55.7	36.1	2400
		–	30	–	40	42.9	27.8	
D065	4	50	–	65	–	69.7	45.1	3000
		–	40	–	52	55.7	36.1	
D065	5	50	–	65	–	69.7	45.3	3600
		–	40	–	52	55.7	36.2	
D077	5	60	–	77	–	84.5	54.7	3600
		–	50	–	65	69.7	45.1	
D096	5	75	–	96	–	105.3	68.3	4500
		–	60	–	77	84.5	54.7	
D096	6	75	–	96	–	105.3	68.4	4600
		–	60	–	77	84.5	54.9	
D125	6	100	–	125	–	137.1	88.9	4600
		–	75	–	96	105.3	68.3	
D156	6	125	–	156	–	171.2	110.9	9200
		–	100	–	125	137.1	88.9	
D186	6	150	–	186	–	204.1	132.2	9200
		–	125	–	156	171.2	110.9	
D248	6	200	–	248	–	272.1	176.3	9200
		–	150	–	186	204.1	132.2	
D248	7	200	–	248	–	272.1	176.9	13,800
		–	150	–	186	204.1	132.7	

Table 27 - PowerFlex 750-Series Drives (Frames 2...7), 480V AC (Continued)

Cat. No. 20Fx/20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
D302	7	250	–	302	–	331.3	214.7	13,800
		–	200	–	248	272.1	176.3	
D361	7	300	–	361	–	396.1	256.6	13,800
		–	250	–	302	331.3	214.7	
D415	7	350	–	415	–	455.3	295	18,400
		–	300	–	361	396.1	256.6	
D477	7	400	–	477	–	523.3	340.1	18,400
		–	300	–	361	396.1	257.5	

(1) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 28 - PF755TS Drives (Frames 2...7) (1), 480V AC

Cat. No. 20Gx (2)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
D2P1	2	1.0	–	2.1	–	2.2	1.4	820
		–	1.0	–	2.1	2.2	1.4	
D3P4	2	2.0	–	3.4	–	3.6	2.3	820
		–	2.0	–	3.4	3.6	2.3	
D5P0	2	3.0	–	5.0	–	5.3	3.4	820
		–	3.0	–	5.0	5.3	3.4	
D8P0	2	5.0	–	8.0	–	8.5	5.5	820
		–	5.0	–	8.0	8.5	5.5	
D011	2	7.5	–	11	–	11.7	7.6	820
		–	7.5	–	11	11.7	7.6	
D014	2	10	–	14	–	14.9	9.7	820
		–	7.5	–	11	11.7	7.6	
D022	2	15	–	22	–	23.5	15.3	820
		–	10	–	14	14.9	9.7	
D027	3	20	–	27	–	28.8	18.7	1500
		–	15	–	22	23.5	15.3	
D034	3	25	–	34	–	36.2	23.5	1500
		–	20	–	27	28.8	18.7	
D040	3	30	–	40	–	42.6	27.7	1800
		–	25	–	34	36.2	23.5	
D052	4	40	–	52	–	55.4	36.0	3450
		–	30	–	40	42.6	27.7	
D053	3	40	–	53	–	55.4	36.0	2000
		–	30	–	40	42.6	27.7	
D065	4	50	–	65	–	69.3	45.0	3450
		–	40	–	52	55.4	36.0	
D065	5	50	–	66	–	69.3	45.0	4000
		–	40	–	52	55.4	36.0	
D066	4	50	–	66	–	70.4	45.8	3450
		–	40	–	52	55.4	36.0	
D077	5	60	–	77	–	82.1	53.4	4000
		–	50	–	65	69.3	45.0	

Table 28 - PF755TS Drives (Frames 2...7) (1), 480V AC (Continued)

Cat. No. 20Gx (2)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
D078	4	60	–	77	–	83.2	54.1	3450
		–	50	–	65	69.3	45.0	
D096	5	75	–	96	–	102.3	66.5	4400
		–	60	–	77	82.1	53.4	
D096	6	75	–	96	–	102.3	66.5	4600
		–	60	–	77	82.1	53.4	
D125	6	100	–	125	–	136.4	88.7	4600
		–	75	–	96	102.3	66.5	
D156	6	125	–	156	–	170.2	110.6	9200
		–	100	–	125	136.4	88.7	
D186	6	150	–	186	–	203	132.0	9200
		–	125	–	156	170.2	110.6	
D248	7	200	–	248	–	270.6	175.9	9200
		–	150	–	186	203.0	132.0	
D248	7	200	–	248	–	270.6	175.9	13,800
		–	150	–	186	203.0	132.0	
D302	7	250	–	302	–	329.5	214.2	13,800
		–	200	–	248	270.6	175.9	
D361	7	300	–	361	–	393.9	256.0	13,800
		–	250	–	302	329.5	214.2	
D415	7	350	–	415	–	452.8	294.3	18,400
		–	300	–	361	393.9	256.0	
D477	7	400	–	477	–	520.5	338.3	18,400
		–	300	–	361	393.9	256.0	

(1) You can use PowerFlex 755TS drives (frame 1) with common DC systems, provided certain power circuit and other conditions are met. See PowerFlex 755TS Frame 1 and common bus systems for more information and technical data.
(2) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 29 - PowerFlex 755TM Common Bus Inverters (Frames 8...15), 480V AC

Cat. No. 20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
D302	8	250	–	302	–	333	216.5	9000
		–	200	–	248	274	178.1	
D361	8	300	–	361	–	399	259.4	9000
		–	250	–	302	333	216.5	
D430	8	350	–	430	–	475	308.8	9000
		–	300	–	361	399	259.4	
D505	8	400	–	505	–	558	362.7	9000
		–	350	–	430	475	308.8	
D545	8	450	–	545	–	602	391.3	15,000
		–	350	–	454	475	308.8	
D617	8	500	–	617	–	681	442.7	15,000
		–	400	–	485	535	347.8	
D710	8	600	–	710	–	784	509.6	15,000
		–	450	–	545	602	391.3	
D740	8	650	–	740	–	817	531.1	15,000
		–	500	–	617	681	442.7	
D800	9	700	–	800	–	883	574	18,000
		–	600	–	740	817	531.1	
D960	9	800	–	960	–	1060	689	18,000
		–	700	–	800	883	574	
D1K0	9	900	–	1045	–	1154	750.1	30,000
		–	750	–	960	1060	689	
D1K1	9	1000	–	1135	–	1253	814.5	30,000
		–	800	–	1045	1154	750.1	
D1K3	9	1100	–	1365	–	1507	979.6	30,000
		–	900	–	1135	1253	814.5	
D1K4	10	1250	–	1420	–	1568	1019.2	45,000
		–	1000	–	1365	1507	979.6	
D1K6	10	1500	–	1655	–	1827	1187.6	45,000
		–	1100	–	1420	1568	1019.2	
D2K0	10	1800	–	2072	–	2288	1487.2	45,000
		–	1500	–	1655	1827	1187.6	
D2K6	11	2400	–	2738	–	3023	1965	60,000
		–	2000	–	2240	2473	1607.5	
D3K4	12	3000	–	3404	–	3758	2442.7	75,000
		–	2400	–	2980	3290	2138.5	
D4K0	13	3600	–	4070	–	4494	2921.1	90,000
		–	2800	–	3394	3746	2434.9	
D5K4	14	4800	–	5402	–	5964	3876.6	120,000
		–	3700	–	4504	4971	3231.2	
D6K7	15	6000	–	6734	–	7435	4832.8	15,0000
		–	4600	–	5615	6197	4028.1	

(1) Drive input type (position 5 of catalog number) = D (common bus with DC precharge) or E (common bus without DC precharge).

Table 30 - Kinetix 5700 Drive Modules, 480V AC (1)

Module Cat. No.	Frame Width [mm]	AC Output ND Continuous (2)		DC Input ND Continuous		Module DC Bus Capacitance [µF]
		kW	Amp RMS	Amps	kW	
2198-D006-ERS*x*	55	1.7	2.5	2.7	1.8	165
2198-D012-ERS*x*	55	3.4	5	5.3	2.9	165
2198-D020-ERS*x*	55	5.5	8	8.5	4.7	330
2198-D032-ERS*x*	55	8.9	13	13.7	7.6	390
2198-D057-ERS*x*	85	15.9	26	24.5	13.5	705
2198-S086-ERS*x*	85	29.7	43	45.7	25.3	560
2198-S130-ERS*x*	85	44.9	65	69	38.2	840
2198-S160-ERS*x*	100	60.1	85	92.3	51.2	1120
2198-S263-ERS*x*	220	90	150	164	78.4	2050
2198-S312-ERS*x*	220	112	192	207	97.3	2050
2198-CAPMOD-2240	55	—	—	—	—	2240
2198-DCBUSCOND-RP312	55	—	—	—	—	0
2198-CAPMOD-DCBUS-IO	55	—	—	—	—	0

(1) For the Kinetix 5700 single-axis and dual-axis servo drives, the fuse is internal to the product and is not field replaceable.
(2) These attributes apply to each of the axes in the dual-axis inverter modules (2198-D*xxx*).

Table 31 - PowerFlex 755TM Drive Regenerative Bus Supplies (Frames 6...15), 480V AC (696V DC Output)

Cat. No. 20J*x* (1)	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	Max External DC Bus Capacitance [µF]
		kW		Continuous Amps		
		ND	HD			
D125	6	90	—	129	9200	22,768
		—	69	99		
D156	6	111	—	160	9200	22,768
		—	90	129		
D186	6	133	—	191	13,800	18,168
		—	111	160		
D248	6	177	—	255	13,800	18,168
		—	133	191		
D302	7	216	—	311	9000	86,472
		—	177	255		
D361	7	258	—	371	9000	86,472
		—	216	311		
D430	7	307	—	442	9000	86,472
		—	258	371		
D505	7	361	—	519	9000	86,472
		—	307	442		
D617	7	426	—	617	9000	68,472
		—	355	514		
D302	8	216	—	311	9000	86,472
		—	177	255		
D361	8	258	—	371	9000	86,472
		—	216	311		
D430	8	307	—	442	9000	86,472
		—	258	371		

Table 31 - PowerFlex 755TM Drive Regenerative Bus Supplies (Frames 6...15), 480V AC (696V DC Output)

Cat. No. 20Jx (1)	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	Max External DC Bus Capacitance [µF]
		kW		Continuous Amps		
		ND	HD			
D505	8	361	—	519	9000	86,472
		—	307	442		
D545	8	390	—	560	15,000	80,472
		—	307	442		
D617	8	442	—	635	15,000	80,472
		—	347	499		
D710	8	508	—	730	15,000	80,472
		—	390	560		
D740	8	529	—	761	15,000	80,472
		—	442	635		
D800	9	573	—	823	18,000	158,112
		—	529	761		
D960	9	687	—	987	18,000	158,112
		—	573	823		
D1K0	9	748	—	1075	30,000	146,112
		—	687	987		
D1K1	9	812	—	1167	30,000	146,112
		—	748	1075		
D1K3	9	977	—	1404	30,000	146,112
		—	812	1167		
D1K4	10	1016	—	1460	45,000	222,408
		—	977	1404		
D1K6	10	1184	—	1702	45,000	222,408
		—	1016	1460		
D2K0	10	1483	—	2131	45,000	222,408
		—	1184	1702		
D2K6	11	1959	—	2816	60,000	293,232
		—	1603	2304		
D3K4	12	2436	—	3501	75,000	364,200
		—	2132	3065		
D4K0	13	2912	—	4186	90,000	435,168
		—	355	3493		
D5K4	14	3865	—	5555	120,000	576,960
		—	2430	4636		
D6K7	15	4818	—	6925	15,0000	718,752
		—	4020	5779		

(1) Drive input type (position 5 of catalog number) = F (regenerative and low harmonic AFE).

Table 32 - PowerFlex 755TM Drive Non-regenerative Supplies – Single- and Dual-density, 480V AC (650V DC Output)

Cat.No. 20JEHx	Module Size(1)	DC Output Rating (1)			Internal Optional DC Bus Cap [µF] (2)
		kW		Continuous Amps	
		ND	HD		
D740	1X	529	-	817	15,000
		-	441	681	
D1K3	2X	977	-	1507	30,000
		-	812	1253	
20-750-MNx(3)	1X/2X	1482	-	2288	Total internal µF values calculated based on module size and quantity of parallel modules
		-	1236	1907	
	2X/2X	1959	-	3023	
		-	1633	2520	
	1X/2X/2X	2435	-	3758	
		-	2132	3290	
	2X/2X/2X	2912	-	4494	
		-	2427	3746	
	1X/1X/	2912	-	4494	
	2X/x2X	-	2427	3746	
	2X/2X/	3865	-	5964	
	2X/2X	-	3221	4871	
	1X/1X/	4818	-	7435	
	2X/2X/2X/2X	-	4016	6197	
	2X/2X/2X/2X/2X/2X (4)	5171	-	8905	
		-	4810	7423	

(1) Modules are available in single-density and dual-density. Modules can be paralleled to increase the rating. In this table, 1X means one single-density module, 2X means one dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
(2) For paralleled modules, sum the corresponding 1X and 2X internal optional capacitance values to obtain the overall bus supply internal/optional DC bus capacitance value.
(3) Parallel configurations are built-up from separate enclosures and catalog number 20-750-MN*x* single-density (1X) and dual-density (2X) roll-in modules. See publication 750-TD101.
(4) You can only achieve the configuration ratings in these rows with user-supplied busbars.

Table 33 - Maximum DC Bus Capacitance

Cat. No. 20JEHx	Module Size (1)	Precharge Ramp [µF] (2) (3)							
		0.2 s	1.3 s	2.0 s	5.0 s	10 s	20 s	30 s	60 s
D740	1X	81,700	408,500	817,000	2,042,500	4,085,000	8,170,000	12,255,000	24,510,000
D1K3	2X	150,700	753,500	1,507,000	3,767,500	7,535,000	15,070,000	22,605,000	45,210,000

(1) Modules are available in single-density and dual-density. Modules can be paralleled to increase the rating. In this table 1X means one single-density module, 2X means one dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
(2) For paralleled modules, sum the corresponding 1X and 2X maximum external capacitance values to obtain the overall bus supply system maximum external DC bus capacitance value.
(3) Select the fastest precharge ramp time that supports the total connected DC bus capacitance. Perform calculations to determine the required DC bus capacitance and the system total DC bus capacitance. See DC Bus Capacitance Calculation Method on page 91.

600V AC Rating Tables

Table 34 - PowerFlex 750-Series Drives (Frames 3...7), 600V AC

Cat. No. 20Fx/20Gx [1]	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
E1P7	3	1	–	1.7	–	1.9	1.5	1500
		–	0.5	–	0.9	1	0.8	
E2P7	3	2	–	2.7	–	3	2.4	1500
		–	1	–	1.7	1.9	1.5	
E3P9	3	3	–	3.9	–	4.3	3.5	1500
		–	2	–	2.7	3	2.4	
E6P1	3	5	–	6.1	–	6.7	5.4	1500
		–	3	–	3.9	4.3	3.5	
E9P0	3	7.5	–	9	–	9.9	8	1500
		–	5	–	6.1	6.7	5.4	
E011	3	10	–	11	–	12	9.7	1500
		–	7.5	–	9	9.9	8	
E012	6	10	–	12	–	13.1	10.6	2600
		–	7.5	–	9.1	10	8.1	
E017	3	15	–	17	–	18.6	15.1	1500
		–	10	–	11	12	9.7	
E018	6	15	–	18	–	19.7	16	2600
		–	10	–	12	13.1	10.6	
E022	3	20	–	22	–	24.1	19.5	1500
		–	15	–	17	18.6	15.1	
E023	6	20	–	23	–	25.2	20.4	2600
		–	15	–	18	19.7	16	
E024	6	20	–	24	–	26.3	21.3	2600
		–	20	–	22	24.1	19.5	
E027	4	25	–	27	–	29.6	24	1800
		–	20	–	22	24.1	19.5	
E028	6	25	–	28	–	30.7	24.9	2600
		–	20	–	23	25.2	20.4	
E032	4	30	–	32	–	35	28.4	1800
		–	25	–	27	29.6	24	
E033	6	30	–	33	–	36.1	29.2	2600
		–	25	–	28	30.7	24.9	
E041	5	40	–	41	–	44.9	36.4	3600
		–	30	–	32	35	28.4	
E042	6	40	–	42	–	46	37.3	2600
		–	30	–	33	36.1	29.2	
E052	5	50	–	52	–	56.9	46.1	3600
		–	40	–	41	44.9	36.4	
E053	6	50	–	53	–	58	47	2600
		–	40	–	42	46	37.3	
E063	6	60	–	63	–	69	55.9	5200
		–	50	–	52	58	47	

Table 34 - PowerFlex 750-Series Drives (Frames 3...7), 600V AC

Cat. No. 20Fx/20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
E077	6	75	–	77	–	84.3	68.3	5200
		–	60	–	63	69	55.9	
E099	6	100	–	99	–	108.4	87.8	5200
		–	75	–	77	84.3	68.3	
E125	6	125	–	125	–	136.8	110.8	5200
		–	100	–	99	108.4	87.8	
E144	6	150	–	144	–	157.6	127.7	5200
		–	125	–	125	136.8	110.8	
E192	7	200	–	192	–	210.2	170.3	11,700
		–	150	–	144	157.6	127.7	
E242	7	250	–	242	–	264.9	214.6	11,700
		–	200	–	192	210.2	170.3	
E289	7	300	–	289	–	316.4	256.3	11,700
		–	250	–	242	264.9	214.6	

(1) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 35 - PowerFlex 755TS Drives — Frames 3...7, 600V AC

Cat. No. 20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
E1P7	3	1	–	1.7	–	1.9	1.5	1200
		–	0.5	–	0.9	1	0.8	
E2P7	3	2	–	2.7	–	3	2.4	1200
		–	1	–	1.7	1.9	1.5	
E3P9	3	3	–	3.9	–	4.3	3.5	1200
		–	2	–	2.7	3	2.4	
E6P1	3	5	–	6.1	–	6.7	5.4	1200
		–	3	–	3.9	4.3	3.5	
E9P0	3	7.5	–	9	–	9.9	8	1200
		–	5	–	6.1	6.7	5.4	
E011	3	10	–	11	–	12	9.7	1200
		–	7.5	–	9	9.9	8	
E012	6	10	–	12	–	13.1	10.6	2050
		–	7.5	–	9.1	10	8.1	
E017	3	15	–	17	–	18.6	15.1	1200
		–	10	–	11	12	9.7	
E018	6	15	–	18	–	19.7	16	2050
		–	10	–	12	13.1	10.6	
E022	3	20	–	22	–	24.1	19.5	1200
		–	15	–	17	18.6	15.1	
E023	6	20	–	23	–	25.2	20.4	2050
		–	15	–	18	19.7	16	
E024	6	20	–	24	–	26.3	21.3	2050
		–	20	–	22	24.1	19.5	
E027	4	25	–	27	–	29.6	24	1800
		–	20	–	22	24.1	19.5	

Table 35 - PowerFlex 755TS Drives — Frames 3...7, 600V AC (Continued)

Cat. No. 20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
E028	6	25	–	28	–	30.7	24.9	2050
		–	20	–	23	25.2	20.4	
E032	4	30	–	32	–	35	28.4	1800
		–	25	–	27	29.6	24	
E033	6	30	–	33	–	36.1	29.2	2050
		–	25	–	28	30.7	24.9	
E041	5	40	–	41	–	44.9	36.4	3600
		–	30	–	32	35	28.4	
E042	6	40	–	42	–	46	37.3	2050
		–	30	–	33	36.1	29.2	
E052	5	50	–	52	–	56.9	46.1	3600
		–	40	–	41	44.9	36.4	
E053	6	50	–	53	–	58	47	2050
		–	40	–	42	46	37.3	
E063	6	60	–	63	–	69	55.9	4100
		–	50	–	52	58	47	
E077	6	75	–	77	–	84.3	68.3	4100
		–	60	–	63	69	55.9	
E099	6	100	–	99	–	108.4	87.8	4100
		–	75	–	77	84.3	68.3	
E125	6	125	–	125	–	136.8	110.8	4100
		–	100	–	99	108.4	87.8	
E144	6	150	–	144	–	157.6	127.7	4100
		–	125	–	125	136.8	110.8	
E192	7	200	–	192	–	210.2	170.3	8200
		–	150	–	144	157.6	127.7	
E242	7	250	–	242	–	264.9	214.6	8200
		–	200	–	192	210.2	170.3	
E289	7	300	–	289	–	316.4	256.3	8200
		–	250	–	242	264.9	214.6	

(1) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 36 - PowerFlex 755TM Common Bus Inverters (Frames 8...15), 600V AC

Cat. No. 20Gx (1)	Frame Size	AC Output Rating [HP]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
E242	8	250	–	242	–	267	216.3	4650
		–	200	–	192	212	171.7	
E295	8	300	–	295	–	326	264.1	4650
		–	250	–	242	267	216.3	
E355	8	350	–	355	–	392	317.5	4650
		–	300	–	295	326	264.1	
E395	8	400	–	395	–	436	353.2	4650
		–	350	–	355	392	317.5	
E435	8	450	–	435	–	480	388.8	7750
		–	400	–	395	436	353.2	
E545	8	550	–	545	–	602	487.6	7750
		–	450	–	450	497	402.6	
E595	9	600	–	580	–	640	518.4	9300
		–	550	–	545	602	487.6	
E690	9	700	–	690	–	762	617.2	9300
		–	600	–	595	640	518.4	
E760	9	800	–	760	–	839	679.6	15,500
		–	700	–	690	762	617.2	
E825	9	900	–	825	–	911	737.9	15,500
		–	800	–	760	839	679.6	
E980	9	1000	–	980	–	1082	876.4	15,500
		–	900	–	825	911	737.9	
E1K1	10	1100	–	1045	–	1154	934.7	23,250
		–	1000	–	980	1082	876.4	
E1K2	10	1250	–	1220	–	1347	1091.1	23,250
		–	1100	–	1045	1154	934.7	
E1K5	10	1500	–	1430	–	1579	1279	23,250
		–	1250	–	1220	1347	1091.1	
E2K0	11	2000	–	1946	–	2148	1739.9	31,000
		–	1800	–	1700	1877	1520.4	
E2K4	12	2500	–	2420	–	2672	2164.3	38,750
		–	2100	–	2070	2285	1850.9	
E2K9	13	3100	–	2998	–	3311	2681.9	46,500
		–	2500	–	2475	2734	2214.5	
E3K9	14	4100	–	3979	–	4393	3560	62,000
		–	3300	–	3285	3628	2938.7	
E4K9	15	5100	–	4960	–	5178	4437.2	77,500
		–	4100	–	4095	4523	3663.6	

(1) Drive input type (position 5 of catalog number) = D (common bus with DC precharge) or E (common bus without DC precharge).

Table 37 - PowerFlex 755TM Regenerative Bus Supplies (Frames 6...15), 600V AC (870V DC Output)

Cat. No. 20Jx [1]	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	Max External DC Bus Capacitance [µF]
		kW		Continuous Amps		
		ND	HD			
E077	6	69	—	79	3100	9903
		—	56	64		
E099	6	89	—	102	3100	9903
		—	69	79		
E125	6	112	—	129	4650	8353
		—	89	102		
E144	6	129	—	148	4650	8353
		—	112	129		
E192	7	171	—	197	4650	31,033
		—	129	148		
E242	7	217	—	249	4650	31,033
		—	171	197		
E295	7	263	—	303	4650	31,033
		—	217	249		
E355	7	317	—	365	4650	31,033
		—	263	303		
E395	7	353	—	406	4650	31,033
		—	317	365		
E242	8	217	-	249	4650	44,540
		-	171	197		
E295	8	263	-	303	4650	44,540
		-	217	249		
E355	8	317	-	365	4650	44,540
		-	263	303		
E395	8	353	-	406	4650	44,540
		-	317	365		
E435	8	389	-	447	7750	41,440
		-	353	406		
E545	8	487	-	560	7750	41,440
		-	403	463		
E595	9	518	-	596	9300	79,202
		-	487	560		
E690	9	617	-	710	9300	79,202
		-	532	612		
E760	9	680	-	782	15,500	73,002
		-	617	710		
E825	9	737	-	848	15,500	73,002
		-	680	782		
E980	9	877	-	1008	15,500	73,002
		-	737	848		
E1K1	10	935	-	1075	23,250	105,875
		-	877	1008		
E1K2	10	1091	-	1255	23,250	105,875
		-	935	1075		

Table 37 - PowerFlex 755TM Regenerative Bus Supplies (Frames 6...15), 600V AC (870V DC Output) (Continued)

Cat. No. 20Jx (1)	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	Max External DC Bus Capacitance [µF]
		kW		Continuous Amps		
		ND	HD			
E1K5	10	1279	-	1471	23,250	105,875
		-	1091	1255		
E2K0	11	1740	-	2001	31,000	144,795
		-	1520	1748		
E2K4	12	2164	-	2489	38,750	179,784
		-	1851	2129		
E2K9	13	2678	—	3080	46,500	224,047
		—	2215	2547		
E3K9	14	3555	—	4088	62,000	297,050
		—	2939	3380		
E4K9	15	4432	—	5096	77,500	370,153
		—	3664	4213		

(1) Drive input type (position 5 of catalog number) = F (regenerative and low harmonic AFE).

Table 38 - PowerFlex 755TM Drive Non-regenerative Supplies – Single and Dual-density, 600V AC (810V DC Output)

Cat. No. 20JEHx	Module Size (1)	DC Output Rating (1)			Internal Optional DC Bus Capacitance [µF] (2)
		kW		Continuous Amps	
		ND	HD		
E545	1X	488	-	602	7000
		-	403	497	
E980	2X	876		1082	14,000
		-	738	911	
20-750-MNx (3)	1X/2X	1365	-	1686	Total internal µF values calculated based on the module size and quantity of parallel modules,
		-	1127	1392	
	2X/2X	1804	-	2227	
		-	1490	1839	
	1X/2X/2X	2243	-	2769	
		-	1852	2286	
	2X/2X/2X	2682	-	3311	
		-	2214	2734	
	1X/1X/	2682	-	3311	
	2X/x2X	-	2214	2734	
	2X/2X/	3560	-	4395	
	2X/2X	-	2939	3628	
	1X/1X/	4437	-	5478	
	2X/2X/2X/2X	-	3663	4523	
	2X/2X/2X/2X/2X/2X	5315	-	6562	
		-	4388	5417	

(1) Modules are available in single-density (S) and dual-density (D). Modules can be paralleled to increase the rating. In this table, 1X means a single-density module, 2X means a dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43.
(2) For paralleled modules sum the corresponding 1X and 2X maximum internal optional capacitance values to obtain the overall bus supply internal/optional DC bus capacitance value.
(3) Parallel configurations are built-up from separate enclosures and catalog number 20-750-MNx single-density (1X) and dual-density (2X) roll-in modules. See publication 750-TD101.

Table 39 - Maximum DC Bus Capacitance

Cat. No. 20JEHx	Module Size (1)	Precharge Ramp [µF] (2)(3)							
		0.2 s	1.3 s	2.0 s	5.0 s	10 s	20 s	30 s	60 s
E545	1X	27,800	139,000	278,000	695,000	1,390,000	2,780,000	4,170,000	8,340,000
E980	2X	50,700	253,500	507,000	1,267,500	2,535,000	5,070,000	7,605,000	15,210,000

(1) Modules are available in single-density and dual-density. Modules can be paralleled to increase the rating. In this table 1X means one single-density module, 2X means one dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
(2) For paralleled modules, sum the corresponding 1X and 2X maximum external capacitance values to obtain the overall bus supply system maximum external DC bus capacitance value.
(3) Select the fastest precharge ramp time that supports the total connected DC bus capacitance. Perform calculations to determine the required DC bus capacitance and the system total DC bus capacitance. See DC Bus Capacitance Calculation Method on page 91.

690V AC Rating Tables

Table 40 - PowerFlex 750-Series Drives (Frames 6 and 7), 690V AC

Cat. No. 20Fx/20Gx (1)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
F012	6	7.5	–	12	–	13.2	12.3	2600
		–	5.5	–	9	9.9	9.2	
F015	6	11	–	15	–	16.5	15.4	2600
		–	7.5	–	12	13.2	12.3	
F020	6	15	–	20	–	21.9	20.4	2600
		–	11	–	15	16.5	15.4	
F023	6	18.5	–	23	–	25.2	23.5	2600
		–	15	–	20	21.9	20.4	
F030	6	22	–	30	–	32.9	30.7	2600
		–	18.5	–	23	25.2	23.5	
F034	6	30	–	34	–	37.3	34.8	2600
		–	22	–	30	32.9	30.7	
F046	6	37	–	46	–	50.5	47.1	2600
		–	30	–	34	37.5	34.8	
F050	6	45	–	50	–	54.8	51.1	2600
		–	37	–	46	50.5	47.1	
F061	6	55	–	61	–	66.9	62.4	5200
		–	45	–	50	54.8	51.1	
F082	6	75	–	82	–	89.9	83.8	5200
		–	55	–	61	66.9	62.4	
F098	6	90	–	98	–	107.5	100.2	5200
		–	75	–	82	89.9	83.8	
F119	6	110	–	119	–	130.5	121.6	5200
		–	90	–	98	107.5	100.2	
F142	6	132	–	142	–	155.7	145.1	5200
		–	110	–	119	130.5	121.6	
F171	7	160	–	171	–	187.5	174.8	11,700
		–	132	–	142	155.7	145.1	
F212	7	200	–	212	–	232.5	216.7	11,700
		–	160	–	171	187.5	174.8	
F263	7	250	–	263	–	288.4	268.8	11,700
		–	200	–	212	232.5	216.7	

(1) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 41 - PowerFlex 755TS Drives (Frames 6 and 7), 690V AC

Cat. No. 20Fx/20Gx (1)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
F012	6	7.5	–	12	–	13.2	12.3	2050
		–	5.5	–	9	9.9	9.2	
F015	6	11	–	15	–	16.5	15.4	2050
		–	7.5	–	12	13.2	12.3	
F020	6	15	–	20	–	21.9	20.4	2050
		–	11	–	15	16.5	15.4	
F023	6	18.5	–	23	–	25.2	23.5	2050
		–	15	–	20	21.9	20.4	
F030	6	22	–	30	–	32.9	30.7	2050
		–	18.5	–	23	25.2	23.5	
F034	6	30	–	34	–	37.3	34.8	2050
		–	22	–	30	32.9	30.7	
F046	6	37	–	46	–	50.5	47.1	2050
		–	30	–	34	37.5	34.8	
F050	6	45	–	50	–	54.8	51.1	2050
		–	37	–	46	50.5	47.1	
F061	6	55	–	61	–	66.9	62.4	4100
		–	45	–	50	54.8	51.1	
F082	6	75	–	82	–	89.9	83.8	4100
		–	55	–	61	66.9	62.4	
F098	6	90	–	98	–	107.5	100.2	4100
		–	75	–	82	89.9	83.8	
F119	6	110	–	119	–	130.5	121.6	4100
		–	90	–	98	107.5	100.2	
F142	6	132	–	142	–	155.7	145.1	4100
		–	110	–	119	130.5	121.6	
F171	7	160	–	171	–	187.5	174.8	8200
		–	132	–	142	155.7	145.1	
F212	7	200	–	212	–	232.5	216.7	8200
		–	160	–	171	187.5	174.8	
F263	7	250	–	263	–	288.4	268.8	8200
		–	200	–	212	232.5	216.7	

(1) Drive input type (position 5 of catalog number) = 1 (AC input with precharge, includes DC terminals) or 4 (DC input with precharge).

Table 42 - PowerFlex 755TM Common Bus Inverters (Frames 8...12), 690V AC

Cat. No. 20Gx (1)	Frame Size	AC Output Rating [kW]		AC Output Rating [Amp RMS]		DC Input Rating		Internal DC Bus Capacitance [µF]
		ND	HD	ND	HD	Amps	kW	
F215	8	200	–	215	–	237	220.9	4650
		–	160	–	171	188	175.2	
F265	8	250	–	265	–	292	272.1	4650
		–	200	–	215	237	220.9	
F330	8	315	–	330	–	364	339.2	4650
		–	250	–	265	292	272.1	
F370	8	355	–	370	–	408	380.3	4650
		–	315	–	330	364	339.2	
F415	8	400	–	415	–	457	425.9	7750
		–	355	–	370	408	380.3	
F505	8	500	–	505	–	556	518.2	7750
		–	400	–	415	457	425.9	
F565	9	560	–	565	–	623	580.6	9300
		–	500	–	505	556	518.2	
F650	9	630	–	650	–	716	667.3	9300
		–	560	–	565	623	580.6	
F735	9	710	–	735	–	810	754.9	15,500
		–	630	–	650	716	667.3	
F820	9	800	–	820	–	904	842.5	15,500
		–	710	–	735	810	754.9	
F920	9	900	–	920	–	1014	945	15,500
		–	800	–	820	904	842.5	
F1K0	10	1000	–	1030	–	1135	1057.8	23,250
		–	900	–	920	1014	945	
F1K1	10	1100	–	1150	–	1267	1180.8	23,250
		–	1000	–	1030	1135	1057.8	
F1K4	10	1400	–	1419	–	1564	1457.6	23,250
		–	1100	–	1162	1280	1193	
F1K8	11	1800	–	1865	–	2055	1915.3	31,000
		–	1500	–	1535	1692	1576.9	
F2K3	12	2300	–	2318	–	2554	2380.3	38,750
		–	2000	–	2020	2226	2074.6	
F2K7	13	2750	–	2778	–	3058	2850.1	46,500
		–	200	–	2283	2514	2343	
F3K6	14	3650	–	3687	–	4059	3783	62,000
		–	2920	–	3030	3336	3109.2	
F4K5	15	4550	–	4596	–	5060	4715.9	77,500
		–	3640	–	3777	4159	3876.2	

(1) Drive input type (position 5 of catalog number) = D (common bus with DC precharge) or E (common bus without DC precharge).

Table 43 - PowerFlex 755TM Drive Regenerative Bus Supplies (Frames 6...15), 690V AC (1000V DC Output)

Cat. No. 20Jx	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	Max External DC Bus Capacitance [µF]
		kW		Continuous Amps		
		ND	HD			
F082	6	84	–	84	3100	9702
		–	63	63		
F098	6	101	–	101	3100	9702
		–	84	84		
F119	6	122	–	122	4650	8152
		–	101	101		
F142	6	146	–	146	4650	8152
		–	122	122		
F171	7	176	–	176	4650	28,715
		–	146	146		
F215	7	221	–	221	4650	28,715
		–	176	176		
F265	7	272	–	272	4650	28,715
		–	221	221		
F330	7	339	–	339	4650	28,715
		–	272	272		
F370	7	380	–	380	4650	28,715
		–	339	339		
F215	8	221	–	221	4650	40,912
		–	176	176		
F265	8	272	–	272	4650	40,912
		–	221	221		
F330	8	339	–	339	4650	40,912
		–	272	272		
F370	8	380	–	380	4650	40,912
		–	339	339		
F415	8	426	–	426	7750	37,812
		–	380	380		
F505	8	518	–	518	7750	37,812
		–	426	426		
F565	9	580	–	580	9300	73,658
		–	518	518		
F650	9	667	–	667	9300	73,658
		–	580	580		
F735	9	754	–	754	15,500	67,458
		–	667	667		
F820	9	842	–	842	15,500	67,458
		–	754	754		
F920	9	944	–	944	15,500	67,458
		–	842	842		
F1K0	10	1057	–	1057	23,250	104,665
		–	944	944		
F1K1	10	1180	–	1180	23,250	104,665
		–	1057	1057		

Table 43 - PowerFlex 755TM Drive Regenerative Bus Supplies (Frames 6...15), 690V AC (1000V DC Output) (Continued)

Cat. No. 20Jx	Frame Size	DC Output Rating			Internal DC Bus Capacitance [µF]	Max External DC Bus Capacitance [µF]
		kW		Continuous Amps		
		ND	HD			
F1K4	10	1456	—	1456	23,250	104,665
		—	1193	1193		
F1K8	11	1914	—	1914	31,000	137,134
		—	1576	1576		
F2K3	12	2379	—	2379	38,750	170,208
		—	2073	2073		
F2K7	13	2849	—	2849	46,500	204,089
		—	2343	2343		
F3K6	14	3781	—	3781	62,000	270,640
		—	3110	3110		
F4K5	15	4714	—	4714	77,500	337,090
		—	3877	3877		

Table 44 - PowerFlex 755TM Drive Non-regenerative Supply – Single- and Dual-density, 690V AC (932V DC Output)

Cat. No, 20JEHx	Frame Size (1)	DC Output Rating (1)			Internal Optional DC Bus Capacitance [µF] (2)
		kW		Continuous Amps	
		ND	HD		
F505	1X	561	-	602	7000
		-	463	497	
F920	2X	1008		1082	14,000
		-	849	911	
20-750-MNx(3)	1X/2X	1570	-	1686	Total internal µF values calculated based on module size and quantity of parallel modules
		-	1296	1392	
	2X/2X	2075	-	2227	
		-	1713	1839	
	1X/2X/2X	2580	-	2769	
		-	2130	2286	
	2X/2X/2X	3084	-	3311	
		-	2546	2734	
	1X/1X/	3084	-	3311	
	2X/x2X	-	2546	2734	
	2X/2X/	4094	-	4395	
	2X/2X	-	3380	3628	
	1X/1X/	5103	-	5478	
	2X/2X/2X/2X	-	4213	4523	
	2X/2X/2X/2X/2X/2X	6112	-	6562	
		-	5046	5417	

(1) Modules are available in single-density and dual-density. Modules can be paralleled to increase the rating. In this table, 1X means a single-density module, 2X means a dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43.
(2) For paralleled modules sum the corresponding 1X and 2X internal optional capacitance values to obtain the overall bus supply internal/optional DC bus capacitance value.
(3) Parallel configurations are built-up from separate enclosures and catalog number 20-750-MN*x* single-density (1X) and dual-density (2X) roll-in modules. See publication 750-TD101.

Table 45 - Maximum DC Bus Capacitance

Cat. No. 20JEHx	Module Size (1)	Precharge Ramp [µF] (2) (3)							
		0.2 s	1.3 s	2.0 s	5.0 s	10 s	20 s	30 s	60 s
F505	1X	27,800	139,000	278,000	695,000	1,390,000	2,780,000	4,170,000	8,340,000
F920	2X	50,700	253,500	507,000	1,267,500	2,535,000	5,070,000	7,605,000	15,210,000

(1) Modules are available in single-density and dual-density. Modules can be paralleled to increase the rating. In this table, 1X means a single-density module, 2X means a dual-density module. See Paralleling PowerFlex 755TM Drive Non-regenerative Modules on page 43 for more information.
(2) For paralleled modules, sum the corresponding 1X and 2X maximum external capacitance values to obtain the overall bus supply system maximum external DC bus capacitance value.
(3) Select the fastest precharge ramp time that supports the total connected DC bus capacitance. Perform calculations to determine the required DC bus capacitance and the system total DC bus capacitance. See DC Bus Capacitance Calculation Method on page 91.

Fuse Certification and Test Data

The following are copies of self-certification letters and test data for JKS and 170M fuses that are recommended in the data from publication 750-TD001.

Configuration A indicates one fuse in the (+) leg and one fuse in the (-) leg of the DC bus.

Bussmann JKS Fuses
Cooper Bussmann
P. O. Box 14460
St. Louis, MO 63178-4460

January 25, 2002

Sr. Project Engineer

Rockwell Automation
6400 West Enterprise Drive
P.O. Box 760
Mequon, WI 53092

Subject: DC Testing for JKS Fuses

Dear *X*

At the request of Rockwell Automation, Bussmann has completed the DC testing for the JKS fuses and is pleased to present the attached information indicating successful 'Self-Certification DC Rating' on all subject fuses.

Bussmann tested fuses to the following parameters specified by Rockwell Automation:

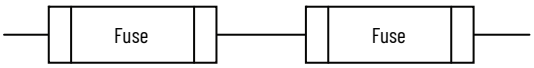
Short Circuit Current = 65 kA
Voltage = 810V DC
Time Constant ≥ 0.4 ms

Additional tests were performed for acceptability.

Short Circuit Current ≅ 30 times fuse amperage
Voltage = 810V DC
Time Constant ≥ 0.4 ms

The attached table identifies the fuses tested, the actual circuit parameters, and the circuit configuration. In the attached table, the Interrupting Amps column specifies the fuses minimum and maximum amps the fuse will safely clear at 810V DC.

Circuit Configuration A



By way of this correspondence, Cooper Bussmann self-certifies the preceding fuses in end-user applications to the preceding parameters and the attached data sheet.

Should you have any questions regarding this correspondence, please contact me at the listed address and numbers.

Regards,

Strategic OEM Accounts Manager
Cooper Bussmann

Table 46 - Cooper Bussmann JKS, DC Fuse Test for Rockwell Automation

Fuse	Results	Circuit Parameters				
		Interrupting Amps		Volts DC	Time Constant	Circuit Configuration
		Min	Max			
JKS-(3A...15A)	Acceptable	–	69.6 kA	810	2.78 ms	Configuration A
JKS-(3A...15A)	Acceptable	375 A	–	810	0.55 ms	Configuration A
JKS-(20A...30A)	Acceptable	–	69.6 kA	816	2.78 ms	Configuration A
JKS-(20A...30A)	Acceptable	920 A	–	812	0.4 ms	Configuration A
JKS-(35A...60A)	Acceptable	–	69.6 kA	816	2.78 ms	Configuration A
JKS-(35A...60A)	Acceptable	1820 A	–	812	0.5 ms	Configuration A
JKS-(70A...100A)	Acceptable	–	69.6 kA	816	2.78 ms	Configuration A
JKS-(70A...100A)	Acceptable	2950 A	–	812	0.86 ms	Configuration A
JKS-(110A...200A)	Acceptable	–	69.6 kA	816	2.78 ms	Configuration A
JKS-(110A...200A)	Acceptable	5960 A	–	810	3.34 ms	Configuration A
JKS-(225A...400A)	Acceptable	–	69.6 kA	816	2.78 ms	Configuration A
JKS-(225A...400A)	Acceptable	11.5 kA	–	812	2.92 ms	Configuration A
JKS-(450A...600A)	Acceptable	–	69.6 kA	816	2.78 ms	Configuration A
JKS-(450A...600A)	Acceptable	15.5 kA	–	810	0.4 ms	Configuration A

Bussmann 170M Fuses
Cooper Bussmann
P. O. Box 14460
St. Louis, MO 63178-4460

May 15, 2002

Sr. Project Engineer
Rockwell Automation
6400 West Enterprise Drive
P.O. Box 760

Mequon, WI 53092

Subject: DC Testing for 170M Fuses

Dear *X*

At the request of Rockwell Automation, Bussmann has completed the DC testing for the 170M fuses and is pleased to present the attached information indicating successful 'Self-Certification DC Rating' on all subject fuses.

Bussmann tested fuses to the following parameters specified by Rockwell Automation:

Short Circuit Current = 65 kA and 100 kA

Voltage = 810V DC

Time Constant ≥ 0.4 ms

Additional tests were performed for acceptability.

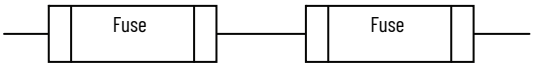
Short Circuit Current ≅ 30 times fuse amperage as minimum current interrupting rating or as tested

Voltage = 810V DC

Time Constant ≥ 0.4 ms

The attached table identifies the fuses tested, the actual circuit parameters, and the circuit configuration. In the attached table, the Interrupting Amps column specifies the fuses minimum and maximum amps the fuse will safely clear at 810V DC.

Circuit Configuration A



By way of this correspondence, Cooper Bussmann self-certifies the preceding fuses in end-user applications to the preceding parameters and the attached data sheet.

Should you have any questions regarding this correspondence, please contact me at the listed address and numbers.

Regards,

Strategic OEM Accounts Manager
Cooper Bussmann

Table 47 - Cooper Bussmann 170M, DC Fuse Test for Rockwell Automation

Fuse	Results	Circuit Parameters				
		Interrupting Amps		Volts DC	Time Constant	Circuit Configuration
		Min	Max			
170M6646	Acceptable	–	69.8 kA	812	2 ms	Configuration A
170M6646	Acceptable	10.2 kA	–	812	1.66 ms	Configuration A
170M6650	Acceptable	–	69.6 kA	812	2 ms	Configuration A
170M6650	Acceptable	21.1 kA	–	812	1.2 ms	Configuration A
170M7510		–	65 kA	810	2 ms	
170M7510		20 kA	–	810	2 ms	
170M6792		–	65 kA	810	2 ms	
170M6792		19 kA	–	810	2 ms	
170M6793		–	65 kA	810	2 ms	
170M6793		23 kA	–	810	2 ms	
170M6794		–	65 kA	810	2 ms	
170M6794		27.5 kA	–	810	2 ms	
170M6828		–	65 kA	810	2 ms	
170M6828		37 kA	–	810	2 ms	
170M6934	Acceptable	–	105.4 kA	810	1.8 ms	Configuration A
170M6934	Acceptable	45.2 kA	–	810	1.12 ms	Configuration A
170M7560		–	100 kA	810	2 ms	
170M7560		60 kA	–	810	2 ms	

Mersen HSJ Fuses

A test program was developed to confirm that Mersen HSJ (High-Speed J) fuses meet or exceed the requirements set by Rockwell Automation for the fuses on the common DC bus for all Allen-Bradley® architecture, component, and legacy drives.

The criteria for acceptance:

- 600V AC rectified, 810V DC average, fuses at (+) and (-) leg. Short circuit test at 65 kA.
- Time constant minimum 3 milliseconds (maximum 15 milliseconds).
- No overload protection required.
- Let-thru must be less than the rating of the conductors.

This testing is listed in UL file E2137 Vol2 Sec 31 page 1 and in CSA report 1662646.

DC Bus Capacitance Calculation Method

All drives have a DC bus capacitance that is proportional to their power ratings. When used in a common DC bus configuration, these capacitors directly connect in parallel. This connection results in the DC bus ripple being shared proportional to the power rating of the drive. The best DC bus ripple sharing happens when the ratio of the capacitance to the drive-rated current is consistent.

This ratio is expressed as µF/Amp ratio, which is the sum of all connected DC bus capacitance that is divided by the sum of the rated AC RMS output current of each inverter that connects to the DC bus. Evaluate every common DC bus drive system for any mismatch. When you find a mismatch, you must use an external capacitor bank.

These calculations are based on the following bus supply converter configurations.

- Single PowerFlex 755TM drive regenerative bus supply. See Regenerative Bus Supply Configuration on page 17.
- PowerFlex 755TM drive non-regenerative supply. See Non-regenerative Bus Supply Configuration on page 39.
- Two parallel PowerFlex 755TM drive regenerative bus supplies. See Paralleling Two PowerFlex 755TM Drive Regenerative Bus Supplies on page 51.

The data tables in this manual list the rated AC RMS output current for the drives and inverters. The following µF/A ratio calculations take the sum of inverter/drive rated AC RMS output current to obtain the total rated AC RMS output current. Alternatively, sum the rated DC input current of the inverter/drives and multiply this sum by 0.9 to obtain the approximate equivalent rated AC output amps used in the µF/A ratio calculations.

Common DC bus systems with PowerFlex 755TM drive bus supplies are designed based on a 40 µF/A ratio for 400/480V AC systems, and a 28 µF/A ratio for 600/690V AC systems, regardless of the mixture of approved inverters that connect to the common DC bus.

Calculation process:

1. Sum the DC bus capacitance of all drives that connect on the common DC bus plus the bus supply internal capacitance. See Appendix A on page 55 for the internal DC bus capacitance of each drive and bus supply. The sum is the system DC bus capacitance.
2. Sum the rated AC output current of the inverters that connect on the common DC bus. See Appendix A on page 55 for the rated AC output current of each inverter unit. Alternatively, sum the rated DC input amps of each inverter/drive and multiply this sum by 0.9 to obtain the approximate rated AC output current. Use the Normal Duty (ND) or Heavy Duty (HD) rated current values in the tables that are based on your application inverter/drive sizing. This sum is the system output amps.
3. Divide the system DC bus capacitance value by the system output amps value. The resulting ratio is the system µF/A ratio.
4. The required µF/A ratio depends on the system voltage:
   a. 400/480V AC, the minimum system µF/A ratio is 40 µF/A.

      If the calculated system µF/A ratio is equal to or greater than 40 µF/A, proceed to step 5.

      If the calculated system µF/A ratio is less than 40 µF/A, calculate the required additional capacitor bank:

      Additional capacitance = [40 µF * system output amps] - system DC bus capacitance; proceed to step 5.

   b. 600/690V AC, the minimum system µF/A ratio is 28 µF/A.

      If the calculated system µF/A ratio is equal to or greater than 28 µF/A, proceed to step 5.

      If the calculated system µF/A ratio is less than 28 µF/A, calculate the required additional capacitor bank:

      Additional capacitance = [28 µF * system output amps] - system DC bus capacitance; proceed to step 5.
5. Confirm that the PowerFlex 755TM drive bus supply can precharge the system DC bus capacitance, including any additional capacitor banks. You can find the bus supply internal and maximum external DC bus capacitance specifications in Appendix A on page 55.
   a. If (system DC bus capacitance + additional DC bus capacitance) is less than the bus supply maximum DC bus external capacitance, then the system design is okay. End.
   b. If (system DC bus capacitance + additional DC bus capacitance) is greater than the bus supply maximum external DC bus capacitance, then:

      If PowerFlex 755TM drive regenerative bus supply, choose the next higher rating and repeat step 1...step 5, or:

      If PowerFlex 755TM drive non-regenerative supply, set the precharge ramp time to a higher value. See publication 750-UM100 for information on setting the precharge ramp time.

Example One - DC Bus Capacitance Calculation

Table 48 - Machine Characteristics

Attribute	Value
System voltage	480V AC
Duty rating	Normal duty (ND)
Drive products	PowerFlex 755TM drive

Table 49 - Drive and System Data

Drive No.	Product Family	Cat. No.	Frame Size	AC Output Amps RMS (1)	Internal DC Bus Capacitance [µF] (1)
1	PowerFlex 755TM drive	20G1D3D302	8	302	9000
2	PowerFlex 755TM drive	20G1D3D430	8	430	9000
3	PowerFlex 755TM drive	20G1D3D545	8	545	15,000
4	PowerFlex 755TM drive	20G1D3D710	8	710	15,000
5	PowerFlex 755TM drive	20G1F3D960	9	960	18,000
			Totals	**2947**	**66,000**
Bus supply	PowerFlex 755TM drive regenerative bus supply	20JxFxD3K4	12	–	75,000
				External capacitance	0
				Total	**141,000**

(1) Data obtained from Appendix A on page 55.

Table 50 - Additional Capacitance Calculations

Target µF/A ratio	40	µF/A	400/480V AC
Calculated µF/A ratio	**47.8**	µF/A	
Additional capacitance required	0	µF	Bus capacitance OK

Table 51 - Sample Bill of Materials

Cat. No.	Qty.	Description
20G1D3D302LNDNNNNN-C0-C12-P46	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 300 HP (361 A), ND - 250 HP (302 A), HD - 200 HP (248 A), 480V AC, 3 PH, frame 8, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE© control
20G1D3D430MNDNNNNN-C0-C11-P46	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 400 HP (485 A), ND - 350 HP (430 A), HD - 300 HP (361 A), 480V AC, 3 PH, frame 8, standard EMI protection and reflected wave (dV/dT) filtering, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G1D3D545LNANNNNN-P46	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 500 HP (617 A), ND - 450 HP (545 A), HD - 350 HP (454 A), 480V AC, 3 PH, frame 8, standard EMI protection, no HIM, and TotalFORCE control
20G1D3D710MNANNNNN-P46	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 650 HP (765 A), ND - 600 HP (710 A), HD - 450 HP (545 A), 480V AC, 3 PH, frame 8, standard EMI protection and reflected wave (dV/dT) filtering, no HIM, and TotalFORCE control
20G1D3D960LNDNNNNN-C12-P46	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 900 HP (1045 A), ND - 800 HP (960 A), HD - 700 HP (800 A), 480V AC, 3 PH, frame 9, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control
20J1F3D3K4LNDNNNNN	1	PowerFlex 755T bus supplies, air-cooled, regenerative and low harmonic bus supply (PowerFlex 755TM), type 1/IP21, floor mount, LD - 2632 HP (3784 A), ND - 2436 HP (3501 A), HD - 2132 HP (3065 A), 480V AC, 3 PH, frame 12, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control

Example Two DC Bus Capacitance Calculation

Table 52 - Machine Characteristics

Attribute	Value
System voltage	600V AC
Duty rating	Normal duty (ND)
Drive products	Mixed; PowerFlex 750, PowerFlex 755TM drives

Table 53 - Drive and System Data

Drive No.	Product Family	Cat. No.	Frame Size	AC Output Amps RMS (1)	Internal DC Bus Capacitance [µF] (1)
1	PowerFlex 755TM drive	20G1D3E1K1	10	1045	23,250
2	PowerFlex 755TM drive	20G1D3E242	8	242	4650
3	PowerFlex 755	20G11NE9P0	3	9	1500
4	PowerFlex 755	20G14NE012	6	12	2600
5	PowerFlex 755	20G11NE022	3	22	1500
6	PowerFlex 755	20G11NE027	4	27	1800
7	PowerFlex 755	20G14NE042	6	42	2600
8	PowerFlex 755	20G14NE052	5	52	3600
			Totals	**1451**	**41,500**
Bus Supply	PowerFlex 755TM drive Regenerative Bus Supply	20JxFxE1K5	10	–	23,250
				External Capacitance	0
				Total	**64,750**

(1) Data obtained from Appendix A.

Table 54 - Additional Capacitance Calculations

Target µF/A ratio	28	µF/A	600/690V AC
Calculated µF/A ratio	**44.6**	µF/A	
Additional capacitance required	0	µF	Bus capacitance OK

Table 55 - Sample Bill of Materials

Cat. No.	Qty.	Description
PN-50085 or ER-101011	1	Ground fault indicator filter
Zig-zag transformer	1	Contact your local Allen-Bradley distributor or Rockwell Automation sales office, or a transformer manufacturer for recommendations.
20J1F3E1K5LNDNNNNN-P50	1	PowerFlex 755T bus supplies, air-cooled, regenerative and low harmonic bus supply (PowerFlex 755TM), type 1/IP21, floor mount, LD - 1452 HP (1670 A), ND - 1279 HP (1471 A), HD - 1091 HP (1255 A), 600V AC, 3 PH, frame 10, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G1D3E1K1LNDNNNNN-C12	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 1250 HP (1220 A), ND - 1100 HP (1045 A), HD - 1000 HP (980 A), 600V AC, 3 PH, frame 10, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G1D3E242MNANNNNN	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 300 HP (295 A), ND - 250 HP (242 A), HD - 200 HP (192 A), 600V AC, 3 PH, frame 8, standard EMI protection and reflected wave (dV/dT) filtering, no HIM, and TotalFORCE control
20G11NE9P0AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP™, air-cooled, AC input with DC terminals, open type, 9 A, 7.5 HP ND, 5 HP HD, 600V AC, 3 PH, frame 3, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ15	2	600VAC 15 A class J HS fuse
1321-M048	1	Common mode choke, 45 A, open style
20G14NE012AN0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, DC input with precharge, open type, 12 A, 10 HP ND, 7.5 HP HD, 600V AC, 3 PH, frame 6, filtered, CM jumper removed, none, blank (no HIM)
HSJ20	2	600VAC 20 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style
20G11NE022AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type, 22 A, 20 HP ND, 15 HP HD, 600V AC, 3 PH, frame 3, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ40	2	600VAC 40 A class J HS fuse
1321-M048	1	Common mode choke, 45 A, open style
20G11NE027AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type, 27 A, 25 HP ND, 20 HP HD, 600V AC, 3 PH, frame 4, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ50	2	600VAC 50 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style
20G14NE042AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, DC input with precharge, open type, 42 A, 40 HP ND, 30 HP HD, 600V AC, 3 PH, frame 6, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ70	2	600VAC 70 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style
20G14NE052AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, DC input with precharge, open type, 52 A, 50 HP ND, 40 HP HD, 600V AC, 3 PH, frame 5, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ90	2	600VAC 90 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style

Example Three DC Bus Capacitance Calculation

Table 56 - Machine Characteristics

Attribute	Value
System voltage	480V AC
Duty rating	Normal Duty (ND)
Drive products	Mixed; PowerFlex 750, PowerFlex 755TM, Kinetix 5700 drives

Table 57 - Drive and System Data

Drive No.	Drive Product Family	Cat. No.	Frame Size	AC Output Amps RMS (1)	Internal DC Bus Capacitance [µF] (1)
1	PowerFlex 755TM	20G1D3D545	8	545	15,000
2	PowerFlex 755TM	20G1D3D710	8	710	15,000
3	PowerFlex 755	20G11ND8P0	2	8	705
4	PowerFlex 755	20G11ND022	2	22	1020
5	PowerFlex 755	20G11ND034	3	34	1500
6	PowerFlex 755	20G11ND052	4	52	2400
7	PowerFlex 755	20G14ND077	5	77	3600
8	PowerFlex 755	20G14ND186	6	186	9200
9	PowerFlex 755	20G14ND302	7	302	13,800
10	Kinetix 5700	2198-S130-ERS3	85 mm	65	840
11	Kinetix 5700	2198-S086-ERS3	85 mm	43	560
12	Kinetix 5700	2198-D032-ERS3	55 mm	26	390
	Kinetix 5700	2198-CAPMOD-2240	–	–	2240
			Totals	**2070**	**66,255**
Bus supply	PowerFlex 755TM regenerative bus supply	20JxFxE1K5	10	–	45,000
				External capacitance	0
				Total	**111,255**

(1) Data obtained from Appendix A on page 55.

Table 58 - Additional Capacitance Calculations

Target µF/A ratio	40	µF/A	400/480V AC PowerFlex mixed products
Calculated µF/A ratio	**53.7**	µF/A	
Additional capacitance required	0	µF	Bus capacitance OK

Table 59 - Sample Bill of Materials

Cat. No.	Qty.	Description
PN-50085 or ER-101011	1	Ground fault indicator filter
20J1F3D2K0LNDNNNNN-P50	1	PowerFlex 755T bus supplies, air-cooled, regenerative and low harmonic bus supply (PowerFlex 755TM), type 1/IP21, floor mount, LD - 1603 HP (2304 A), ND - 1483 HP (2131 A), HD - 1184 HP (1702 A), 480V AC, 3 PH, frame 10, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G1D3D545LNDNNNNN-C12	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 500 HP (617 A), ND - 450 HP (545 A), HD - 350 HP (454 A), 480V AC, 3 PH, frame 8, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G1D3D710MNANNNNN	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 650 HP (765 A), ND - 600 HP (710 A), HD - 450 HP (545 A), 480V AC, 3 PH, frame 8, standard EMI protection and reflected wave (dV/dT) filtering, no HIM, and TotalFORCE control
20G11ND8P0AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type/frame 2, 8 A, Fr2 5 HP ND, 55 HP HD, 480V AC, 3 PH, frame 2, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ15	2	600VAC 15 A class J HS fuse
1321-M048	1	Common mode choke, 45 A, open style
20G11ND022AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type, 22 A, 15 HP ND, 10 HP HD, 480V AC, 3 PH, frame 2, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ40	2	600VAC 40 A class J HS fuse
1321-M048	1	Common mode choke, 45 A, open style
20G11ND034AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type, 34 A, 25 HP ND, 20 HP HD, 480V AC, 3 PH, frame 3, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ60	2	600VAC 60 A class J HS fuse
1321-M048	1	Common mode choke, 45 A, open style
20G11ND052AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type, 52 A, 40 HP ND, 30 HP HD, 480V AC, 3 PH, frame 4, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ90	2	600VAC 90 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style
20G14ND077AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, DC input with precharge, open type, 77 A, 60 HP ND, 50 HP HD, 480V AC, 3 PH, frame 5, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ150	2	600VAC 150 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style
20G14ND186AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, DC input with precharge, open type, 186 A, 150 HP ND, 125 HP HD, 480V AC, 3 PH, frame 6, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ400	2	600VAC 400 A class J HS fuse
1321-M180	1	Common mode choke, 180 A, open style
20G14ND302AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, DC input with precharge, open type, 302 A, 250 HP ND, 200 HP HD, 480V AC, 3 PH, frame 7, filtered, CM jumper removed, DB transistor, blank (no HIM)
Bussman 170M6608	2	Bussmann/Eaton - Specialty fuses 500 A 690V 3FU/90 AR UC
SK-Y1-CMCORE1[(1)]	1	Rockwell Automation - Engineered to order (ETO) - Common mode core
HSJ300	2	600VAC 300 A class J HS fuse
2198-CAPMOD-2240	1	Kinetix 5700 drive capacitor module
2198-DCBUSCOND-RP312	1	Kinetix 5700 drive DC-bus conditioner module
2198-S130-ERS3	1	Kinetix 5700 drive 65 A single-axis module 85 mm
2198-S086-ERS3	1	Kinetix 5700 drive 43 A single-axis module 85 mm
2198-D032-ERS3	1	Kinetix 5700 drive 2x13 A dual-axis module 55 mm

(1) The previous part number was 30201-031-01.

Example Four DC Bus Capacitance Calculation

Table 60 - Machine Characteristics

Attribute	Value
System voltage	400V AC
Duty rating	Normal duty (ND)
Drive products	Mixed; PowerFlex 750 drives, PowerFlex 755TM drives

Table 61 - Drive and System Data

Drive No.	Product Family	Cat. No.	Frame Size	AC Output Amps RMS (1)	Internal DC Bus Capacitance [µF] (1)
1	PowerFlex 755TM drive	20G1D3C540	8	540	9000
2	PowerFlex 755	20G11NC015	2	15.4	705
			Totals	**555.4**	**9705**
Bus supply	PowerFlex 755TM drive regenerative bus supply	20JxFxC540	8	–	9000
				External Capacitance	0
				Total	**18,705**

(1) Data obtained from Appendix A.

Table 62 - Additional Capacitance Calculations

Target µF/A ratio	40	µF/A	400/480V AC
Calculated µF/A ratio	**33.7**	µF/A	
Additional capacitance required	3511	µF	Additional capacitance required

Table 63 - Sample Bill of Materials

Cat. No.	Qty.	Description
PN-50085 or ER-101011	1	Ground fault indicator filter
20J1F3C540LNDNNNNN-P50	1	PowerFlex 755T bus supplies, air-cooled, regenerative and low harmonic bus supply (PowerFlex 755TM), type 1/IP21, floor mount, LD - 364 kW (628 A), ND - 336 kW (579 A), HD - 286 kW (494 A), 400V AC, 3 PH, frame 8, standard EMI protection, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G1D3C540MNDNNNNN-C11	1	PowerFlex 755T drives, air-cooled, common bus inverter with DC precharge (PowerFlex 755TM), type 1/IP21, floor mount, LD - 315 kW (585 A), ND - 315 kW (540 A), HD - 250 kW (460 A), 400V AC, 3 PH, frame 8, standard EMI protection and reflected wave (dV/dT) filtering, door-mounted HIM (20-750-C6S), and TotalFORCE control
20G11NC015AA0NNNNN	1	PowerFlex 755 AC drive, with embedded EtherNet/IP, air-cooled, AC input with DC terminals, open type, 15.4 A, 7.5 kW ND, 5.5 kW HD, 400V AC, 3 PH, frame 2, filtered, CM jumper removed, DB transistor, blank (no HIM)
HSJ25	2	600VAC 25 A class J HS fuse
1321-M048	1	Common mode choke, 45 A, open style

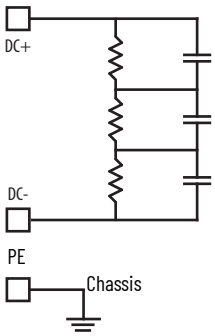
Notes:

Power Component Accessories

This section provides information on power system components that can be required to complete the common DC bus configurations described in this publication.

Bus Supply Capacitors

Evaluate every common DC bus drive system DC bus µF/A ratio as described in DC Bus Capacitance Calculation Method on page 91. If you find insufficient DC bus capacitance, you must use an external capacitor bank.



Additional DC bus capacitor modules must connect closest to the DC bus terminals of the largest connected inverter.

Capacitor modules can be custom designed or purchased from third-party manufacturers. Confirm that the capacitor modules are designed for the applicable system voltage and include the necessary components to protect the capacitors. Follow the manufacturer recommendation for wire length and capacitor bank mounting.

Optional factory-installed DC bus capacitor modules are available for the PowerFlex® 755TM drive non-regenerative bus supply. See Table 25 on page 67, Table 32 on page 74, Table 38 on page 80, and Table 44 on page 85 for more information.

The following external capacitor bank modules are available from Rockwell Automation. You can apply the part numbers that are shown in Table 64 to common DC bus systems up to 690V AC system voltage. The capacitor modules consist of capacitors in series with parallel combinations to achieve the stated total capacitance. Internal voltage balancing discharge resistors are included. Other configurations are available. Contact your local Allen-Bradley distributor or Rockwell Automation sales office for more information.

Table 64 - External Capacitor Bank Modules

Part No. (1)		Total Capacitance [µF]	Applicable System AC Voltage Rating	Enclosure Frame Size	Dimensions H x W x D [mm (in.)]
30339-304-*xx*	-11/12	2000	400/480/600/690V	Small	397 x 305 x 281 (15.63 x 12.00 x 11.06)
	-09/10	4000	400/480/600/690V	Small	397 x 305 x 281 (15.63 x 12.00 x 11.06)
	-07/08	6000	400/480/600/690V	Small	397 x 305 x 281 (15.63 x 12.00 x 11.06)
	-05/06	8000	400/480/600/690V	Large	692 x 305 x 281 (27.25 x 12 x 11.06)
	-03/04	10000	400/480/600/690V	Large	692 x 305 x 281 (27.25 x 12 x 11.06)
	-01/02	12000	400/480/600/690V	Large	692 x 305 x 281 (27.25 x 12 x 11.06)

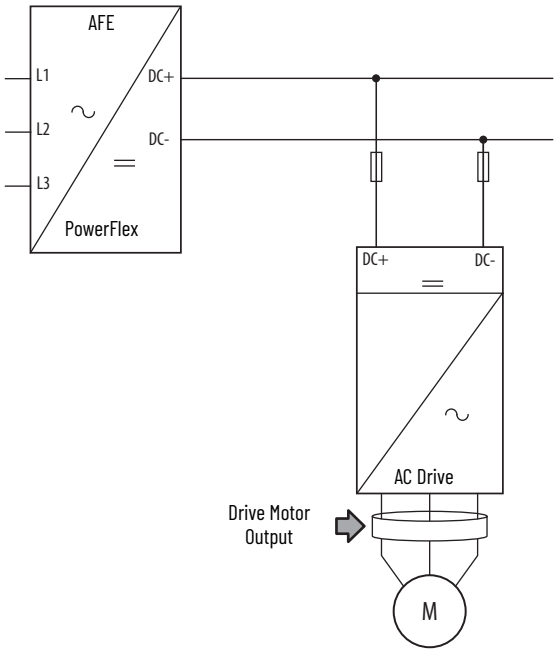
(1) Contact your local Allen-Bradley distributor or Rockwell Automation sales office for detailed ordering information.

Common Mode Core

The common mode core (CMC) is a passive ring-shaped filter that is composed of ferrite material, which is designed to attenuate any high frequency transient or disturbance on the wire or cable passing through it. This attenuation minimizes the risk of common mode interference with other circuitry.

Depending on the device in use as the DC bus supply, install the common mode core in the locations that are shown in Figure 25.

Figure 25 - Common Mode Core Locations



Usage With Regenerative Bus Supply

For systems with a PowerFlex 755TM drive regenerative bus supply, see Table 65. See Figure 31 on page 107 for locations.

Table 65 - PowerFlex 755TM Drive Regenerative Bus Supply Components

Drive Product Family	Drive Motor Output (1)
PowerFlex 750-series and PowerFlex 755TS	• Fr. 1...3:1321-M048 • Fr. 4...6:1321-M180 • Fr. 7:SK-Y1-CMCORE1
PowerFlex 755TM common bus	Fr. 8...15: Not required (2)
Kinetix® 5700 servo	Not required

(1) One common mode core at each drive motor output unless you use an output reactor dv/dt filter.
(2) For PowerFlex 755TM common bus drives, there are no provisions for AC output common mode cores; however, an optional reflective wave filter is available. See catalog number position 11 -filtering and CM cap configuration, EMI solutions.

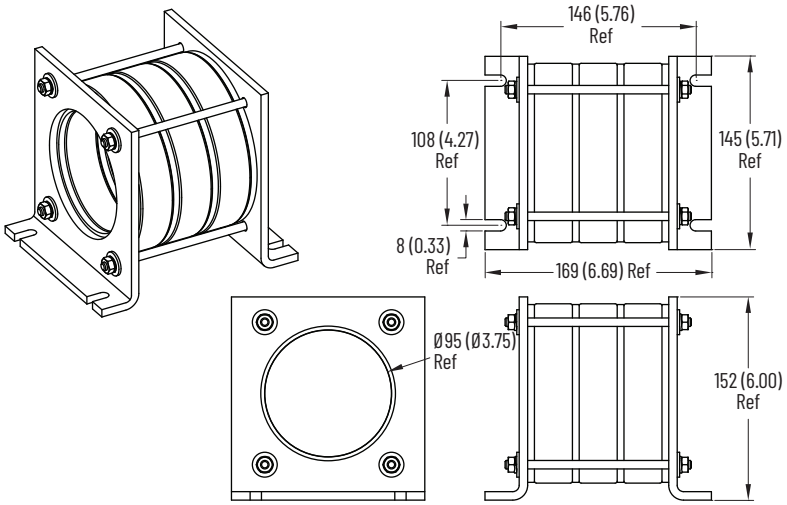
Various core shapes are available to accommodate different arrangements of wire diameters and turn ratios.

External Common Mode Core Options for Drive

Table 66 - Available External Common Mode Core Options

Option	Part No.	Additional Resources
1	1321-M048	• Publication 1321-IN001 • Publication 1321-TD001
2	1321-M180	
3	1321-M670	
4	SK-Y1-CMCORE1	Contact technical support for more information. See Figure 26 on page 101 for design details.

Figure 26 - Drive Common Mode Core Option 4 (SK-Y1-CMCORE1) Mounting Dimensions [mm (in.)]



Internal EMC Plate and Cores for Drive

Table 67 - Available Internal EMC Plate and Core Options

Option	PowerFlex 750-Series Drive	Voltage	Part No.(1)	Additional Resources
1	Frame size 1	400/480	20-750-EMC1-F1	See publication 750-IN006 for more details.
2	Frame size 2	400/480	20-750-EMC1-F2	
3	Frame size 3	400/480	20-750-EMC1-F3	
		600/690	20-750-EMC3-F3	
4	Frame size 4	400/480	20-750-EMC1-F4	
		600/690	20-750-EMC3-F4	
5	Frame size 5	400/480	20-750-EMC1-F5	
		600/690	20-750-EMC3-F5	
6	Frame size 6 in IP20 enclosure	600/690 (2)	20-750-EMC3-F6	
	Frame size 6 in IP54 enclosure		20-750-EMC5-F6	
7	Frame size 7 in IP20 enclosure	600/690 (2)	20-750-EMC3-F7	
	Frame size 7 in IP54 enclosure		20-750-EMC5-F7	

(1) These cores are only used for EMC compliance and are not meant for use to reduce circulating common mode currents.
(2) Internal EMC plate and cores are not available for 400/480 volt drives.

Ground Fault Indicator Filter

A ground fault occurs when there is an imbalance of current in a system. The sum of the currents that enter the node must equal the sum leaving the node. The largest cause of the ground fault is the leakage current through power devices and other high impedance paths to ground.

Figure 27 - Analog Filter

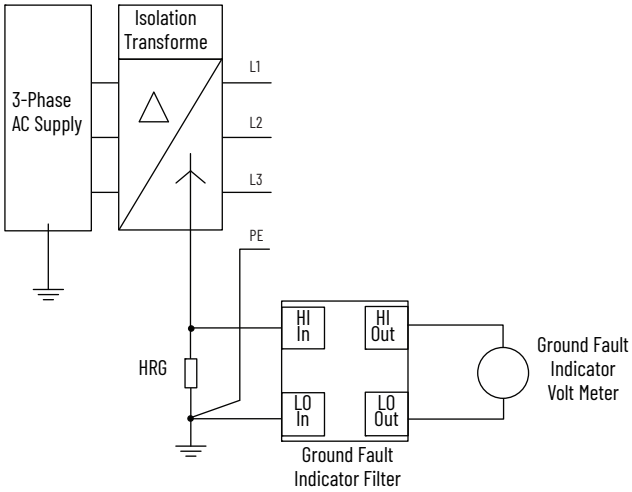
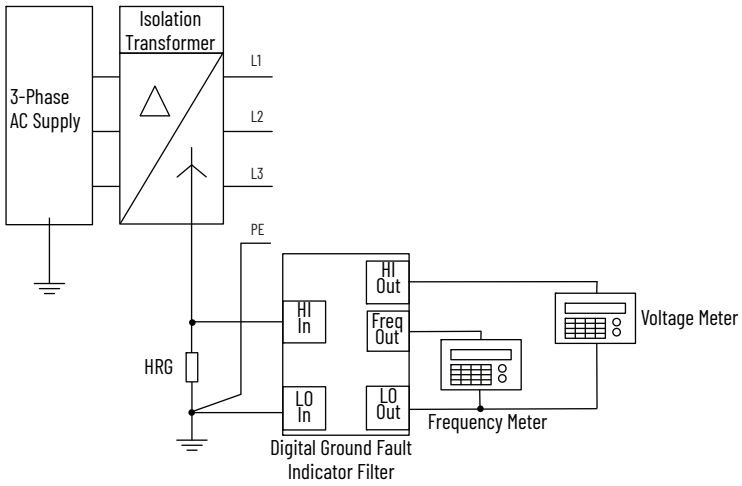


Figure 28 - Digital Filter



In high-resistance grounded systems, a ground fault sensor is placed across the resistor to sense or detect these currents. When the threshold is exceeded, the sensor provides an alarm output that can initiate safety circuitry to disable a system.

The current waveform that is associated with a drive has a harmonic-rich current signature that can cause the ground fault indicator filter to trip. The filter is designed to average the current signature, while still providing protection.

Follow the manufacturer recommendation to mount the ground fault indicator filter.

Analog Ground Fault Indicator Filter

The NEMA 1 enclosure is 226 x 335 x 335 mm (8.9 x 13.2 x 13.2 in.) and weighs 26 kg (57.3 lb).

Contact technical support for part number PN-50085 or Bryne and Schaefer for part number ER-101011.

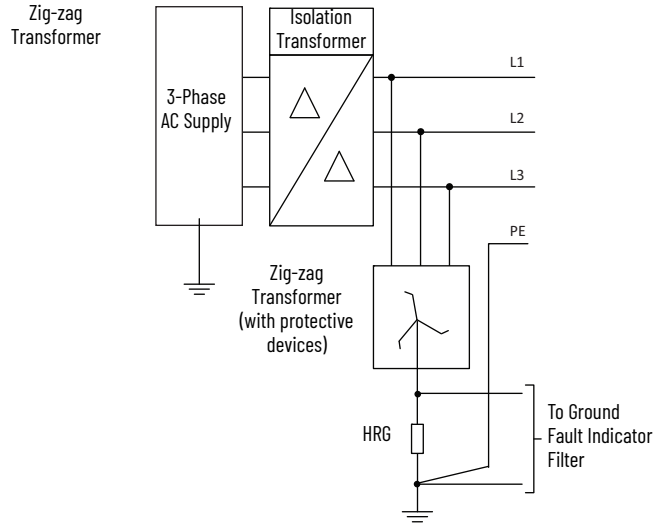
Digital Ground Fault Indicator Filter

Contact your local Allen-Bradley distributor or Rockwell Automation sales office for the following component part numbers.

- Ground fault indicator filter: PN-662557
- Voltage meter: PN-639089
- Frequency meter: PN-638821
- Ground fault filter enclosed package: PN-662550

Zig-zag Transformer

When you use an ungrounded system for power distribution, you can use a zig-zag transformer to create an artificial neutral for sensing ground faults. A typical ground fault-detection arrangement has a zig-zag transformer that sources a neutral resistor with a ground fault indicator filter sense circuit.



Contact your local Allen-Bradley distributor or Rockwell Automation sales office, or a transformer manufacturer for recommendations.

PowerFlex 755TM Drive System DC Bus Ratings

The PowerFlex 755TM drive common DC bus system offers two busbar rating options, 3000 A DC or 4700 A DC at 40 °C (104 °F) ambient temperature. When you configure the PowerFlex 755TM drive common DC bus system, you must select the same busbar option for all PowerFlex 755TM drive system enclosures in the lineup.

The 3000 A DC busbar is standard for 20J*x*F*x* PowerFlex 755TM drive regenerative bus supplies, 20G*x*D/E*x* common bus drives frames 8...10, and 20JEH*x* PowerFlex 755TM drive non-regenerative bus supplies with the -P47 system bus option. If you determind that 4700 A DC busbar is required per system characteristics, then add the -P46 power option to the catalog number of these products.

Use the following rules to determine whether the -P46 option 4700 ADC busbar must be specified.

- If the sum of all inverter/drive rated DC input amps within the system is greater than 3000 amps DC.

Or

- If any 20G*x*D/E*x* common bus drive or 20J*x*F*x* drive regenerative bus supply is frames 11...15. All 20G*x*D/E*x* common bus drives and 20J*x*F*x* drive regenerative bus supplies (frames 11...15), come with 4700 A DC rated system busbars installed as a standard offering.

Or

- If any 20G*x*D/E*x* common bus drive or 20JxF drive regenerative bus supply is frames 8...10 with -P46 option code in its respective catalog number.

Figure 29 - Frame 10 Bus Supply (Typical Layout for Frames 10...15)

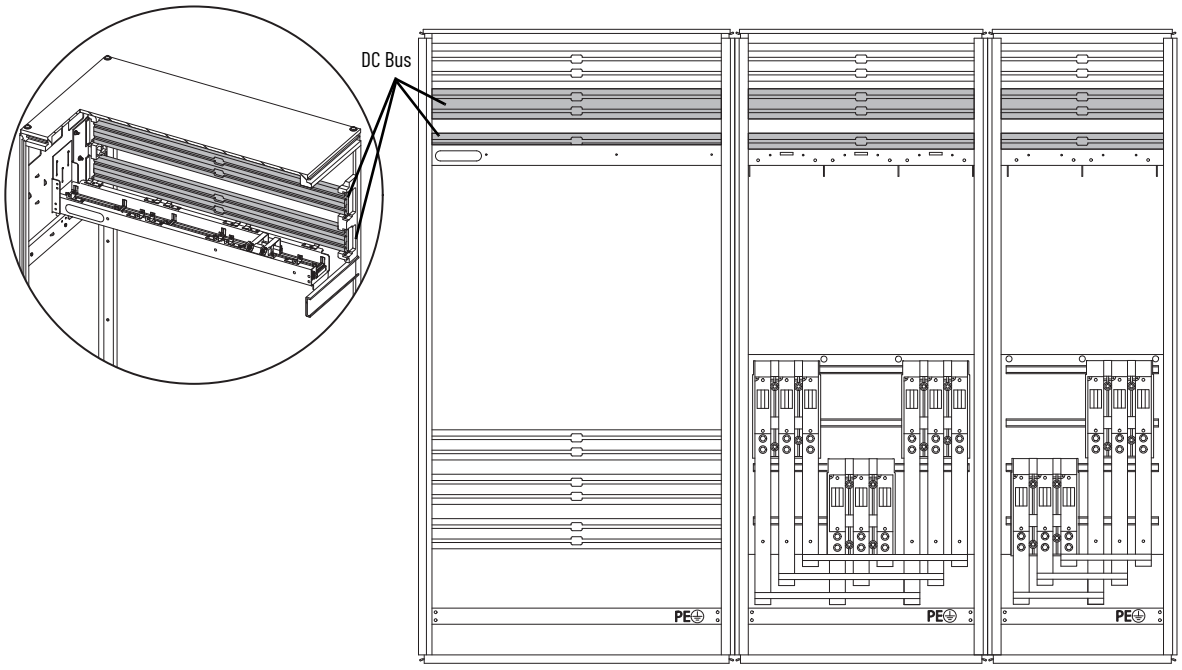
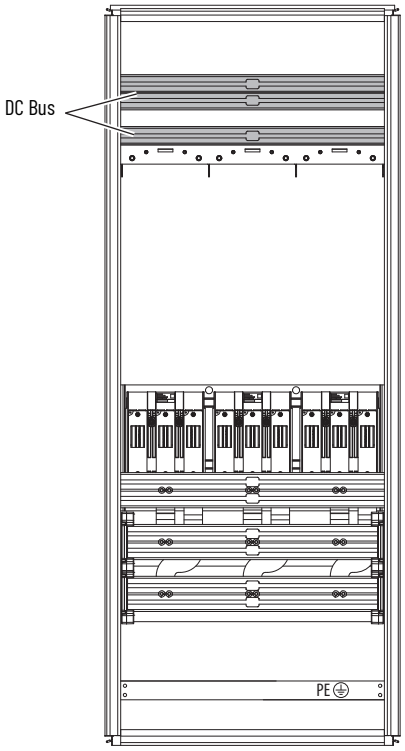


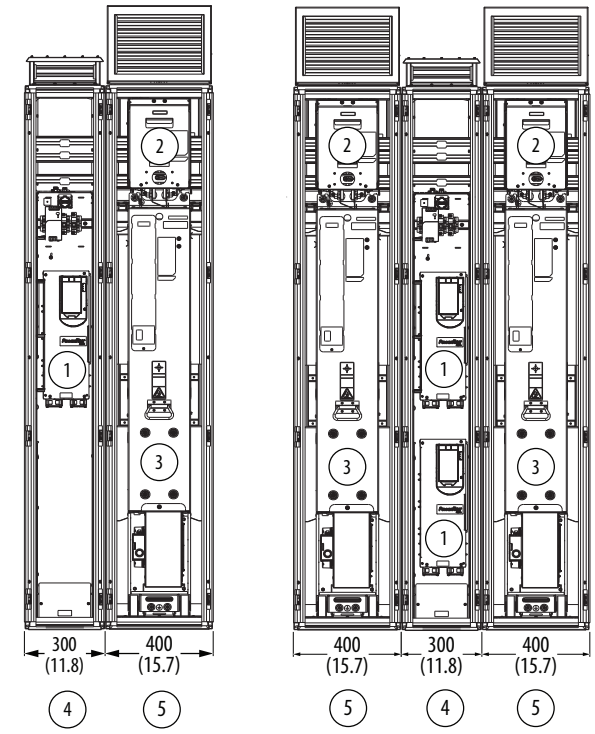
Figure 30 - Frame 10 Common Bus Drive (Typical Layout for Frames 10...15)



PowerFlex 755TM Drive Control Pod Rule

Every PowerFlex 755TM common bus drive in the common bus system needs one control pod. This configuration is done with combinations of C11 - single pod (with control bay) and or C12 - dual pod (with control bay) control options.

Table 68 - C11 and C12 Control Options



C11 Single Pod (with Control Bay) C12 Dual Pod (with Control Bay)

Item	Description
1	Control pod
2	DC precharge module (optional)
3	Motor side inverter
4	Control bay (optional)
5	Power bay

DC Bus Conditioners

The DC bus conditioner is used to reduce voltage stress levels on components such as optos, circuit boards, and magnetics. A reduced voltage level increases the reliability of components.

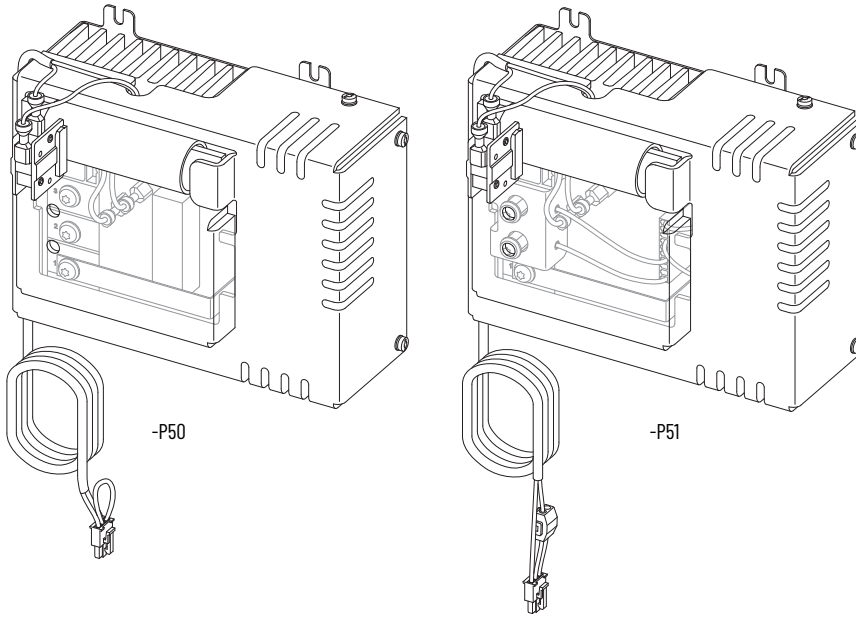
Bus conditioner modules are used with frames 8...15 PowerFlex 755TM drive regenerative bus supplies, PowerFlex 755TL/TR drives, and PowerFlex 755TM drive non-regenerative supplies, single-density (1X), and dual-density (2X) modules. Frames 6...7 PowerFlex 755TM drive regenerative bus supplies and frames 5...7 PowerFlex 755TL/TR AC drives have built-in bus conditioner circuits.

Bus conditioner modules are factory-installed and available as options (-P50 and -P51). Only specify the -P50 or -P51 optional factory-installed bus conditioner if your power system isn't solid grounded.

The marine bus conditioner option (-P51) is typically used for ungrounded shipboard applications. For frames 5...7, remove the DR discharge jumper for marine applications.

Each bus conditioner has a fuse indicator and heatsink thermal switch. The contacts are tied in and monitored by the bus supply controller. The DC bus conditioner is factory-installed at the top of the power bay behind the DC busbars.

DC bus conditioner modules are only used with PowerFlex 755TM drive bus supplies and PowerFlex 755TL/TR AC drives and are not installed within PowerFlex 755TM common bus drives. The correct number of bus conditioners are installed in the product at our factory.



DC bus conditioners are available for 400/480/600/690V AC source voltages, with 14.1 µF capacitance, rated 100 W.

The DC bus conditioner units are 210 x 156 x 89 mm (8.3 x 6.1 x 3.5 in.) and weigh 2.29 kg (5.05 lb).

Contact technical support for the following replacements:

- Frames 8...15 and 1X...2X, -P50 bus conditioner module: 20-750-MDCBUS-COND
- Frames 8...15 and 1X...2X, -P51 bus conditioner module (low-leakage current to ground and marine discharge circuit): 20-750-MDCBUS1-COND
- Frame 7 built-in bus conditioner: 20-750-MDCBUS-COND-F7M
- Frame 7 built-in marine discharge board: 20-750-MDSCD-DB

For more information about DC bus conditioner modules and the quantity that is used for each type of PowerFlex 755TM drive bus supply and -P50 or -P51 option selection, see publication 750-IN101.

Kinetix 5700 Servo Drives

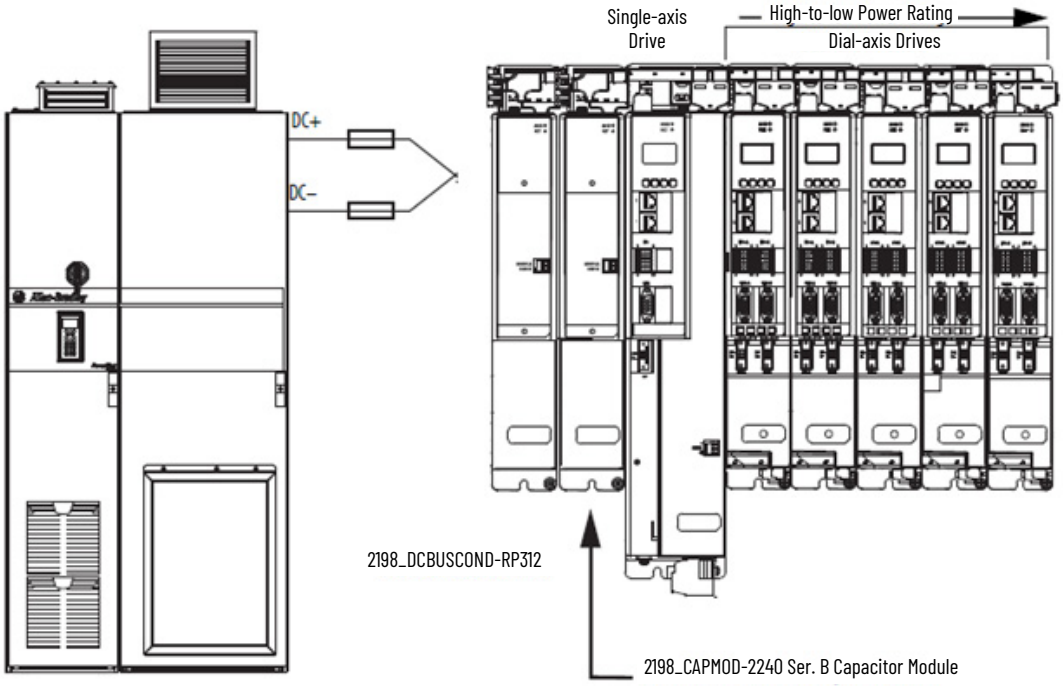
The Kinetix 5700 is a common-bus servo drive system. Inverters are connected in drive clusters and have a DC bus link that connects all modules in the drive cluster. For each drive cluster supplied by a regenerative common bus drive supply, there must be a capacitor module, a DC bus conditioner module, and the DC+ and DC-inputs must be fused.

To connect a Kinetix 5700 servo drive cluster to a regenerative bus supply, a capacitor module and bus conditioner are required.

- Add the 2198-CAPMOD-2240 Ser. B capacitor module to the right of the bus conditioner module.
- Add the 2198-DCBUSCOND-RP312 bus conditioner module to the left of the capacitor module.

If Kinetix 5700 drives are used with an external non-regenerative DC-bus power supply, the 2198-CAPMOD-2240 capacitor module is required along with the 2198-CAPMODDCBUS-IO extension module to provide connections to the DC+ and DC- lug terminals. See publication 2198-UM002.

Figure 31 - Example Kinetix 5700 Servo Drive System with PowerFlex 755TM Drive Bus Supply



See the following Kinetix 5700 drive publications for more information about common DC bus applications.

- 2198-IN014
- 2198-UM002
- MOTION-AT007

Notes:

PowerFlex 755TL/TR AC Drive Electrical Ratings and DC Bus Capacitance

400V AC Rating

Table 69 - PowerFlex 755TL/TR Drive (Frames 5...15), 400V AC Input

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
C015	5	7.5	-	15.4	3000	3984
		-	5.5	11.5		
C022	5	11	-	22	3000	3984
		-	7.5	15.4		
C030	5	15	-	30	3000	3984
		-	11	22		
C037	5	18.5	-	37	3000	3984
			15	30		
C043	5	22	-	43	3000	3984
		-	18.5	37		
C060	5	30	-	60	4500	2484
		-	22	43		
C072	5	37	-	72	4500	2484
		-	30	60		
C085	5	45	-	85	4500	2484
		-	37	72		
C104	5	55	-	104	4500	2484
		-	45	85		
C140	6	75	-	140	9200	2248
		-	55	104		
C176	6	90	-	170	9200	2248
		-	75	140		
C205	6	110	-	205	13,800	3696
		-	90	170		
C260	6	132	-	260	13,800	3696
		-	110	205		
C302	7	160	-	302	18,000	62,784
		-	132	260		
C367	7	200	-	367	18,000	62,784
		-	160	302		
C460	7	250	-	460	18,000	62,784
		-	200	367		

Table 69 - PowerFlex 755TL/TR Drive (Frames 5...15), 400V AC Input (Continued)

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
C540	7	315	-	540	18,000	62,784
		-	250	460		
C585	7	315	-	600	18,000	62,784
		-	250	500		
C302	8	160	-	302	18,000	54,720
		-	132	260		
C367	8	200	-	367	18,000	54,720
		-	160	302		
C460	8	250	-	460	18,000	54,720
		-	200	367		
C540	8	315	-	540	18,000	54,720
		-	250	460		
C585	8	315	-	585	30,000	73,680
		-	250	472		
C650	8	355	-	650	30,000	73,680
		-	315	540		
C750	8	400	-	750	30,000	73,680
		-	351	585		
C770	8	400	-	770	30,000	73,680
		-	355	650		
C920	9	500	-	920	36,000	103,968
		-	400	770		
C1K0	9	560	-	1040	36,000	103,968
		-	500	920		
C1K1	9	630	-	1112	60,000	136,992
		-	500	1040		
C1K2	9	710	-	1175	60,000	136,992
		-	560	1090		
C1K4	9	800	-	1465	60,000	136,992
		-	630	1175		
C1K6	10	850	-	1590	90,000	200,304
		-	710	1465		
C1K7	10	1000	-	1715	90,000	200,304
		-	800	1480		
C2K1	10	1250	-	2156	90,000	200,304
		-	1000	1715		
C2K8 [2]	11	1650	-	2849	90,000	263,616
		-	1400	2330		
C3K5 [2]	12	2000	-	3542	150,000	326,928
		-	1650	3032		
C4K2 [2]	13	2200	-	4235	18,0000	390,240
		-	1953	3575		

Table 69 - PowerFlex 755TL/TR Drive (Frames 5...15), 400V AC Input (Continued)

Cat. No. 20Gx (1)	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
C5K6 (2)	14	2920	-	5621	240,000	516,864
		-	2592	4745		
C7K0 (2)	15	3640	-	7007	300,000	643,488
		-	3231	5915		

(1) Drive input type (position 5 of catalog number) =
6 (regenerative PowerFlex® 755TR AC drives frames 5...7)
7 (low harmonic PowerFlex 755TL AC drives frames 5...7)
F (regenerative PowerFlex 755TR AC drives frames 9...15)
G (low harmonic PowerFlex 755TL AC drives frames 8...10)
(2) PowerFlex 755TR regenerative AC drives only. PowerFlex 755TL low harmonic AC drives not available in frames 11...15.

480V AC Input

Table 70 - PowerFlex 755TL/TR Drives (Frames 5...15), 480V AC Input

Cat. No. 20Gx (1)	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		HP		Continuous Amps		
		ND	HD			
D014	5	10	-	14	3000	3192
		-	7.5	11		
D022	5	15	-	22	3000	3192
		-	10	14		
D027	5	20	-	27	3000	3192
		-	15	22		
D034	5	25	-	34	3000	3192
		-	20	27		
D040	5	30	-	40	3000	1692
		-	25	34		
D052	5	40	-	52	4500	1692
		-	30	40		
D065	5	50	-	65	4500	1692
		-	40	52		
D077	5	60	-	77	4500	1692
		-	50	65		
D096	5	75	-	96	4500	1692
		-	60	77		
D125	6	100	-	125	9200	880
		-	75	96		
D156	6	125	-	156	9200	880
		-	100	125		
D186	6	150	-	186	13,800	2184
		-	125	156		
D248	6	200	-	248	13,800	2184
		-	150	186		
D302	7	250	-	305	18,000	59,472
		-	200	248		
D361	7	300	-	361	18,000	59,472
		-	250	302		

Table 70 - PowerFlex 755TL/TR Drives (Frames 5...15), 480V AC Input (Continued)

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		HP		Continuous Amps		
		ND	HD			
D430	7	350	-	430	18,000	59,472
		-	300	361		
D505	7	400	-	505	18,000	59,472
		-	350	430		
D617	7	500	-	600	18,000	59,472
		-	400	500		
D302	8	250	-	302	18,000	47,088
		-	200	248		
D361	8	300	-	361	18,000	47,088
		-	250	302		
D430	8	350	-	430	18,000	47,088
		-	300	361		
D505	8	400	-	505	18,000	47,088
		-	350	430		
D545	8	450	-	545	30,000	65,472
		-	350	454		
D617	8	500	-	617	30,000	65,472
		-	400	485		
D710	8	600	-	710	30,000	65,472
		-	450	545		
D740	8	650	-	740	30,000	65,472
		-	500	617		
D800	9	700	-	800	36,000	87,840
		-	600	740		
D960	9	800	-	960	36,000	87,840
		-	700	800		
D1K0	9	900	-	1045	60,000	116,112
		-	750	960		
D1K1	9	1000	-	1135	60,000	116,112
		-	800	1045		
D1K3	9	1100	-	1365	60,000	116,112
		-	900	1135		
D1K4	10	1250	-	1420	90,000	177,408
		-	1000	1365		
D1K6	10	1500	-	1655	90,000	177,408
		-	1100	1420		
D2K0	10	1800	-	2072	90,000	177,408
		-	1500	1655		
D2K6 [2]	11	2400	-	2738	120,000	233,232
		-	2000	2240		
D3K4 [2]	12	3000	-	3404	150,000	289,200
		-	2400	2980		
D4K0 [2]	13	3600	-	4070	180,000	345,168
		-	2800	3394		

Table 70 - PowerFlex 755TL/TR Drives (Frames 5...15), 480V AC Input (Continued)

Cat. No. 20Gx (1)	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		HP		Continuous Amps		
		ND	HD			
D5K4(2)	14	4800	-	5402	240,000	456,960
		-	3700	4504		
D6K7(2)	15	6000	-	6734	300,000	568,752
		-	4600	5615		

(1) Drive input type (position 5 of catalog number) =
6 (regenerative PowerFlex 755TR AC drives frames 5...7)
7 (low harmonic PowerFlex 755TL AC drives frames 5...7)
F (regenerative PowerFlex 755TR AC drives frames 9...15)
G (low harmonic PowerFlex 755TL AC drives frames 8...10)
(2) PowerFlex 755TR regenerative AC drives only. PowerFlex 755TL low harmonic AC drives not available in frames 11...15.

600V AC Input

Table 71 - PowerFlex 755TL/TR Drives (Frames 5...15), 600V AC Input

Cat. No. 20Gx (1)	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		HP		Continuous Amps		
		ND	HD			
E011	5	10	-	11	1400	1422
		-	7.5	9		
E017	5	15	-	17	1400	1422
		-	10	11		
E022	5	20	-	22	1400	1422
		-	15	17		
E027	5	25	-	27	1400	1422
		-	20	22		
E032	5	30	-	32	1400	1422
		-	25	27		
E041	5	40	-	41	2100	722
		-	30	32		
E052	5	50	-	52	2100	722
		-	40	41		
E062	5	60	-	62	2100	722
		-	50	52		
E077	6	75	-	77	3100	1386
		-	60	62		
E099	6	100	-	99	3100	1386
		-	75	77		
E125	6	125	-	125	4650	1852
		-	100	99		
E144	6	150	-	144	4650	1852
		-	125	125		
E192	7	200	-	192	9300	26,383
		-	150	144		

Table 71 - PowerFlex 755TL/TR Drives (Frames 5...15), 600V AC Input (Continued)

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		HP		Continuous Amps		
		ND	HD			
E242	7	250	-	242	9300	26,383
		-	200	192		
E295	7	300	-	295	9300	26,383
		-	250	242		
E355	7	350	-	355	9300	26,383
		-	300	295		
E395	7	400	-	395	9300	26,383
		-	350	355		
E242	8	250	-	242	9300	26,383
		-	200	192		
E295	8	300	-	295	9300	26,383
		-	250	242		
E355	8	350	-	355	9300	26,383
		-	300	295		
E395	8	400	-	395	9300	26,383
		-	350	355		
E435	8	450	-	435	15,500	33,690
		-	400	395		
E545	8	550	-	545	15,500	33,690
		-	450	450		
E595	9	600	-	580	18,600	43,694
		-	550	545		
E690	9	700	-	690	18,600	43,694
		-	600	595		
E760	9	800	-	760	31,000	57,502
		-	700	690		
E825	9	900	-	825	31,000	57,502
		-	800	760		
E980	9	1000	-	980	31,000	57,502
		-	900	825		
E1K1	10	1100	-	1045	46,500	82,625
		-	1000	980		
E1K2	10	1250	-	1220	46,500	82,625
		-	1100	1045		
E1K5	10	1500	-	1430	46,500	82,625
		-	1250	1220		
E2K0 [2]	11	2000	-	1946	62,000	113,795
		-	1800	1700		

Table 71 - PowerFlex 755TL/TR Drives (Frames 5...15), 600V AC Input (Continued)

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		HP		Continuous Amps		
		ND	HD			
E2K4[2]	12	2500	-	2420	77,500	141,034
		-	2100	2070		
E2K9[2]	13	3100	-	2998	93,000	177,547
		-	2500	2475		
E3K9[2]	14	4100	-	3979	124,000	235,050
		-	3300	3285		
E4K9[2]	15	5100	-	4960	155,000	292,653
		-	4100	4095		

(1) Drive input type (position 5 of catalog number) =
6 (regenerative PowerFlex 755TR AC drives frames 5...7)
= 7 (low harmonic PowerFlex 755TL AC drives frames 5...7)
= F (regenerative PowerFlex 755TR AC drives frames 9...15)
= G (low harmonic PowerFlex 755TL AC drives frames 8...10)

(2) PowerFlex 755TR regenerative AC drives only. PowerFlex 755TL low harmonic AC drives not available in frames 11...15.

690V AC Input

Table 72 - PowerFlex 755TL/TR Drives Frames 5...15 690V AC Input

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
F015	5	11	-	15	1400	1372
		-	7.5	12		
F020	5	15	-	20	1400	1372
		-	11	15		
F023	5	18.5	-	23	1400	1372
		-	15	20		
F030	5	22	-	30	1400	1372
		-	18.5	23		
F034	5	30	-	34	1400	1372
		-	22	30		
F046	5	37	-	46	2100	672
		-	30	34		
F050	5	45	-	50	2100	672
		-	37	46		
F061	5	55	-	61	2100	672
		-	45	50		
F082	6	75	-	82	3100	1335
		-	55	61		
F098	6	90	-	98	3100	1335
		-	75	82		

Table 72 - PowerFlex 755TL/TR Drives Frames 5...15 690V AC Input (Continued)

Cat. No. 20Gx [1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
F119	6	110	-	119	4650	1751
		-	90	98		
F142	6	132	-	142	4650	1751
		-	110	119		
F171	7	160	-	171	9300	24,065
		-	132	142		
F215	7	200	-	215	9300	24,065
		-	160	171		
F265	7	250	-	265	9300	24,065
		-	200	215		
F330	7	315	-	330	9300	24,065
		-	250	265		
F370	7	355	-	370	9300	24,065
		-	315	330		
F215	8	200	-	215	9300	24,065
		-	160	171		
F265	8	250	-	265	9300	24,065
		-	200	215		
F330	8	315	-	330	9300	24,065
		-	250	265		
F370	8	355	-	370	9300	24,065
		-	315	330		
F415	8	400	-	415	15,500	30,062
		-	355	370		
F505	8	500	-	505	15,500	30,062
		-	400	415		
F565	9	560	-	565	18,600	39,965
		-	500	505		
F650	9	630	-	650	18,600	39,965
		-	560	565		
F735	9	710	-	735	31,000	51,958
		-	630	650		
F820	9	800	-	820	31,000	51,958
		-	710	735		
F920	9	900	-	920	31,000	51,958
		-	800	820		
F1K0	10	1000	-	1030	46,500	81,415
		-	900	920		

Table 72 - PowerFlex 755TL/TR Drives Frames 5...15 690V AC Input (Continued)

Cat. No. 20Gx[1]	Frame Size	AC Output Rating			Internal DC Bus Capacitance [µF]	External Capacitance, Max [µF]
		kW		Continuous Amps		
		ND	HD			
F1K1	10	1100	-	1150	46,500	81,415
		-	1000	1030		
F1K4	10	1400	-	1419	46,500	81,415
		-	1100	1162		
F1K8[2]	11	1800	-	1865	62,000	106,134
		-	1500	1535		
F2K3[2]	12	2300	-	2318	77,500	131,458
		-	2000	2020		
F2K7[2]	13	2750	-	2778	93,000	157,589
		-	2200	2283		
F3K6[2]	14	3650	-	3687	124,000	208,640
		-	2920	3030		
F4K5[2]	15	4550	-	4596	155,000	259,590
		-	3640	3777		

(1) Drive input type (position 5 of catalog number) =
6 (regenerative PowerFlex 755TR AC drives frames 5...7)
7 (low harmonic PowerFlex 755TL AC drives frames 5...7)
F (regenerative PowerFlex 755TR AC drives frames 9...15)
G (low harmonic PowerFlex 755TL AC drives frames 8...10)

(2) PowerFlex 755TR regenerative AC drives only. PowerFlex 755TL low harmonic AC drives not available in frames 11...15.

Notes:

Mixed Architecture Resources

This appendix provides information about mixing various drive product lines and frame sizes that can combine on a common DC bus system. There are applications where you cannot use some products on the same common DC bus, and others where you can use external measures to allow mixing frame sizes and different drive architectures.

PowerFlex 750-Series 600V AC Mixed Architectures

To protect certain power components from damage, PowerFlex® 750-series 600V class AC drives (frames 3...5) have a lower DC bus overvoltage trip threshold than the larger frame, dual-rated 600/690V class PowerFlex 750-series AC drives.

For many applications, you must apply PowerFlex 750-series drives (frames 3...5) on the same common DC bus system with other larger frame 600/690V PowerFlex drives. When you apply 600V class drives (frames 3...5) with other larger frame PowerFlex 750-series and PowerFlex 755TM common bus drives on the same common DC bus system, you must implement measures to maintain that the DC bus voltage does not exceed the frames 3...5 DC bus overvoltage trip threshold during routine operation of the equipment.

Table 73 on page 119 shows the DC bus trip thresholds for various 600/690V Class PowerFlex drives that you can use on the same common DC bus system.

IMPORTANT You cannot use PowerFlex 750-series 600V class drives (frames 3...5) with 690V AC power sources.

Table 73 - DC Bus Trip Thresholds

Voltage Class	Supported Common DC Bus Drives	DC Bus Overvoltage Trip Voltage
600/690V	600V PowerFlex 750-series (frames 3...5)	1013V DC
	600/690V PowerFlex 750-series (frames 6...7)	1162V DC
	600/690V PowerFlex 755TM drive CBI (frames 8...15)	1172V DC

DC Bus Voltage Control Methods

We recommend a DC bus voltage control method, along with coordinated shutdown of larger frame PowerFlex drives if there is a DC bus overvoltage fault on any of the frame 3...5 drives. Configure the regenerative device to clamp the DC bus voltage during normal routine operation of the equipment to less than the lowest DC bus overvoltage trip level, in this case the 600V AC PowerFlex 750-series drives (frames 3...5).

The PowerFlex 755TM drive regenerative bus supply is a suitable method for controlling the DC bus voltage when implementing 600V PowerFlex 750-series drives (frames 3...5) on the same common DC bus system with other larger frame PowerFlex inverters. See Regenerative Bus Supply Configuration on page 17 for information on the use of the PowerFlex 755TM drive regenerative bus supply.

When using a PowerFlex 755TM drive non-regenerative supply, there are several external regenerative solutions to control DC bus voltage and help prevent nuisance DC bus overvoltage tripping, and possible damage to the 600V inverters:

- Common brake chopper and DB resistor - Third-party device, contact the manufacturer for application information.
- Regen unit - Third-party device, contact manufacturer for application information.

Figure 32 shows external regenerative methods with the PowerFlex 755TM drive non-regenerative supply.

Figure 32 - 600V AC PowerFlex 750-Series Mixed Architecture with PowerFlex 755TM Drive Non-regenerative Supply

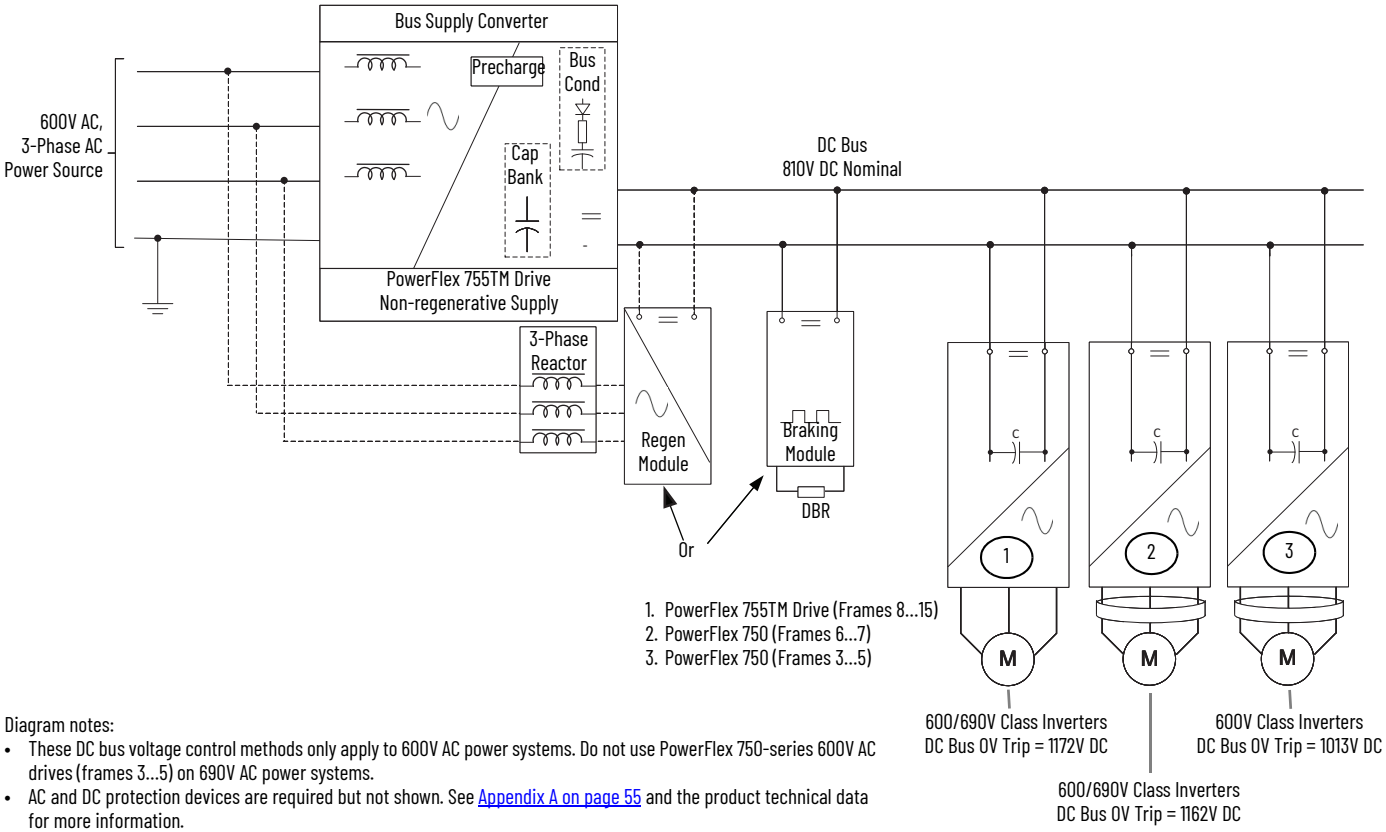


Diagram notes:
- These DC bus voltage control methods only apply to 600V AC power systems. Do not use PowerFlex 750-series 600V AC drives (frames 3...5) on 690V AC power systems.
- AC and DC protection devices are required but not shown. See Appendix A on page 55 and the product technical data for more information.
- Additional bus capacitance can be required. See DC Bus Capacitance Calculation Method on page 91 for more information.
- This diagram shows a solid ground AC source. High-resistance grounded AC sources can be used with additional equipment.
- Regen modules and braking modules are not available from Rockwell Automation. Contact third-party suppliers for more information.

Logic Interlocking

With the normal DC bus voltage control, you must also monitor DC bus overvoltage fault status of all frame 3...5 drives and implement fault detection logic and countermeasures to help prevent excessive DC bus voltage.

ATTENTION: A DC bus overvoltage fault on any 600V class PowerFlex 750-series drives (frames 3...5) must initiate shutdown (help prevent output IGBT modulation) of all PowerFlex 750-series drives (frames 6...7) and all PowerFlex 755TM common bus drives on the same common DC bus. This action maintains that there is no regeneration from these drives and subsequent rise of the DC bus voltage. The logic to initiate shutdown of the larger PowerFlex inverters can be accomplished with Logix application code and EtherNet/IP™ communication or through hardwired digital I/O.
To mitigate damage to the frame 3...5 drive units, the shutdown countermeasures must occur as quickly as possible and within 250 milliseconds of the first DC bus overvoltage trip event.

IMPORTANT We recommend you monitor the health of the DC bus control equipment (chopper/DB resistor, regenerative unit, or regenerative bus supply) for fault conditions that can prevent regeneration, and the DC bus voltage control. If the DC bus voltage control equipment faults, implement logic to shut down all drives on the common DC bus.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

Resource	Description
PowerFlex 755TS Products DC Fuses and Fuse Holder Installation Instructions, publication 750-IN121	Provides installation instructions for catalog number 20-750-DCFUSE series DC fuses and 20-750-DCFH series fuse holders.
PowerFlex 755TS Products with TotalFORCE Control Technical Data, publication 750-TD104	Provides detailed information on drive specifications, option specifications, fuses, and circuit breaker ratings.
PowerFlex 755TS Products with TotalFORCE Control Installation Instructions, publication 750-IN119	Provides the basic steps to install PowerFlex® 755TS AC drive products.
PowerFlex Drives with TotalFORCE Control Programming Manual, publication 750-PM101	Provides detailed information for PowerFlex TotalFORCE® firmware on startup, control algorithms, status indicators, parameters, programming, faults, alarms, events, and troubleshooting.
PowerFlex Drives with TotalFORCE Control Parameters Reference Data, publication 750-RD101	Provides detailed information for PowerFlex TotalFORCE firmware on startup, control algorithms, status indicators, parameters, programming, faults, alarms, events, and troubleshooting.
PowerFlex Drives with TotalFORCE Control Conditions Reference Data, publication 750-RD102	Provides detailed information for PowerFlex TotalFORCE firmware on startup, control algorithms, status indicators, parameters, programming, faults, alarms, events, and troubleshooting.
PowerFlex Low Voltage Drives Selection Guide, publication PFLEX-SG002	Provides overview and selection information for PowerFlex low voltage drive products.
PowerFlex Drives with TotalFORCE Control Built-in EtherNet/IP Adapter User Manual, publication 750COM-UM009	Provides information on how to install, configure, and troubleshoot applications for the PowerFlex drives with the built-in EtherNet/IP™ adapter.
PowerFlex 755TM Non-Regenerative Supply User Manual, publication 750-UM100	Provides information for installation, configuration, startup, troubleshooting, and application information.
PowerFlex 755TM Non-Regenerative Supply Specifications, publication 750-TD103	Product technical data and specifications.
PowerFlex 750-Series Drive Technical Data, publication 750-TD001	Provides technical data on PowerFlex 750-series drives.
PowerFlex 755TM IP00 Open Type Kits Technical Data, publication 750-TD101	Provides detailed information on kit selection, kit ratings and specifications, and option specifications.
PowerFlex 750-Series Products with TotalFORCE Control Technical Data, publication 750-TD100	
1321 Power Conditioning Products Technical Data, publication 1321-TD001	Information on line reactors and isolation transformers.
Kinetix 5700, 5500, 5300, and 5100 Servo Drives Specifications Technical Data, publication KNX-TD003	Product specifications for Kinetix® Integrated Motion over the EtherNet/IP network, Integrated Motion over the Sercos interface, EtherNet/IP networking, and component servo drive families.
PowerFlex Drives with TotalFORCE Control Installation Instructions, publication 750-IN100	Provides the basic steps to install PowerFlex 755TL low harmonic drives, PowerFlex 755TR regenerative drives, and PowerFlex 755TM drive systems.
PowerFlex 755TM IP00 Open Type Kits Installation Instructions, publication 750-IN101	Provides instructions to install IP00 Open Type kits in user-supplied enclosures.
PowerFlex 755T Flux Vector Tuning, publication 750-AT006	Provides guidance on how to tune Flux Vector position and velocity loops, filters, and other features to achieve the level of performance that is required for a given application.
PowerFlex 750-Series Products with TotalFORCE Control Hardware Service Manual, publication 750-TG100	Provides detailed information on preventive maintenance, component tests, and hardware replacement procedures.
PowerFlex 755TS Products with TotalFORCE Control Hardware Service Manual, publication 750-TG101	Provides detailed information on preventive maintenance, component tests, and hardware replacement procedures.
PowerFlex 755TS Products with TotalFORCE Control Product Information, publication 750-PC112	Provides specifications for Bulletin 20G PowerFlex 755TS products.
PowerFlex 755TS Products with TotalFORCE Control Renewal Parts Product Information, publication 750-PC113	Provides sources for information on Bulletin 20GE and 20G2 PowerFlex 755TS products with TotalFORCE control renewal parts.
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives Installation Instructions, publication DRIVES-IN001	Provides basic information to install, protect, wire, and ground pulse width modulated (PWM) AC drives.
Industry Installation Guidelines for Pulse Width Modulated (PWM) AC Drives Application Techniques, publication DRIVES-AT003	Provide basic information for different enclosure systems, environmental/ location considerations, and power and grounding considerations that are necessary to install a Pulse Width Modulated (PWM) AC drive.
PowerFlex 750-Series AC Drives Installation Instructions, publication 750-IN001	Provides the basic steps to install PowerFlex 750-series drives.
PowerFlex 750-Series EMC Plate and Cores - Frames 1...7 Installation Instructions, publication 750-IN006	Provides installation information for PowerFlex 750-series EMC plate and cores.
PowerFlex 755 AC Drives EMC Cores Installation Instructions, publication 750-IN024	Provides installation information for PowerFlex 755 AC drives EMC cores.
PowerFlex 750-Series Drive Programming Manual, publication 750-PM001	Provides information on programming PowerFlex 750-series drives.
1321-M*xxx* Common Mode Chokes Installation Instructions, publication 1321-IN001	Provides information on installation of 1321-M common mode chokes.

Resource	Description
Kinetix 5700 Servo Drives User Manual, publication 2198-UM002	Provides information on installation, configuration, startup, troubleshooting, and applications for your Kinetix servo drive system.
Kinetix 5700 Drive Systems Design Guide, publication KNX-RM010	Provides information to help you select the required (drive specific) drive module, power accessory, connector kit, motor cable, and interface cable catalog numbers for your drive and motor/actuator motion control system.
Kinetix 5700 System Mounting Toolkit Installation Instructions, publication 2198-IN012	Provides information on installation of the Kinetix 5700 drive system mounting toolkit.
Kinetix 5700 Capacitor Modules and Extension Module Installation Instructions, publication 2198-IN008	Provides information on installation of Kinetix 5700 drive capacitor modules.
Kinetix 5700 DC-bus Link Kits Installation Instructions, publication 2198-IN007	Provides information on installation of Kinetix 5700 drive DC-bus connector kits.
Shared-bus Connection Kits Installation Instructions, publication 2198-IN005	Provides information on installation of shared-bus connector kits for the Kinetix 5500 and Kinetix 5700 servo drive families.
2090-Series Single Motor Cables Installation Instructions, publication 2090-IN051	Provides information on installation of 2090-Series single motor cables.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Publication DRIVES-AT005E-EN-P - July 2023
Supersedes Publication DRIVES-AT005D-EN-P - May 2022