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Powerflex update 2015

Petr Drahota
Commercial Engineer Drives

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Rockwell Automation

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PowerFlex 527

Current Status

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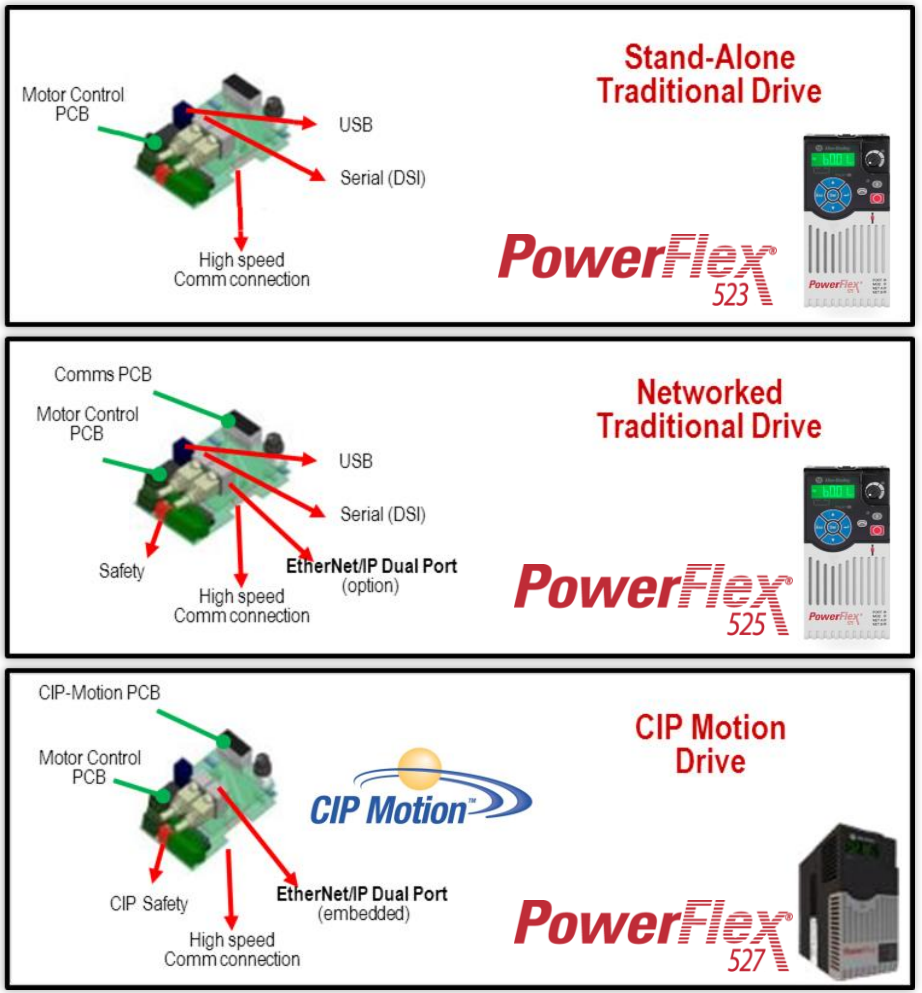
Product Scalability

- Single power structure supports three control architectures



PowerFlex® 520-Series

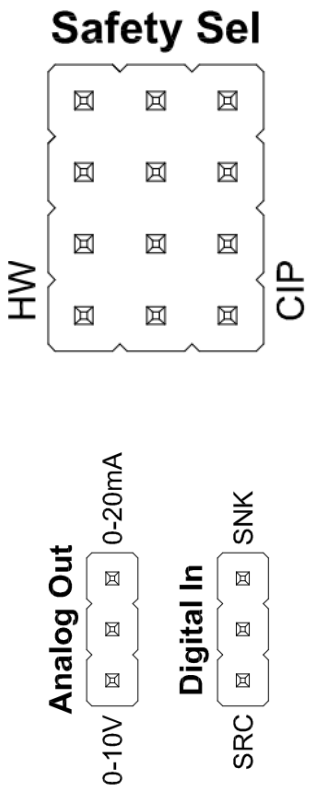
PowerFlex 527 Preview

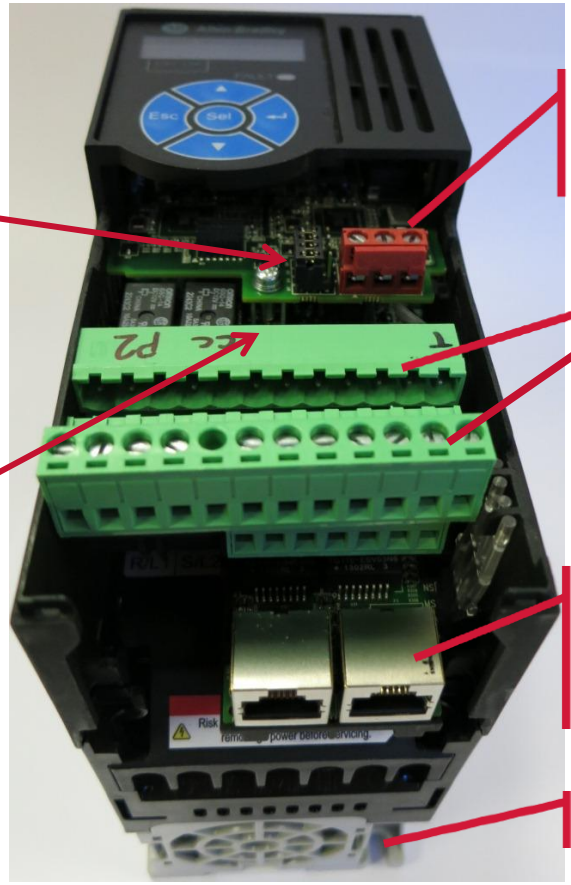
Rockwell Automation

- **CIP Motion** product up to 22 kW

- Removable control terminal blocks
- Encoder feedback
- Embedded dual-port Ethernet
- Safety functionality (hard-wired)
- CIP Safety Safe-Torque-Off with Logix V24
- All motor control modes
- No torque regulation but limitation
- sPM motor control in open loop only

- Control interface





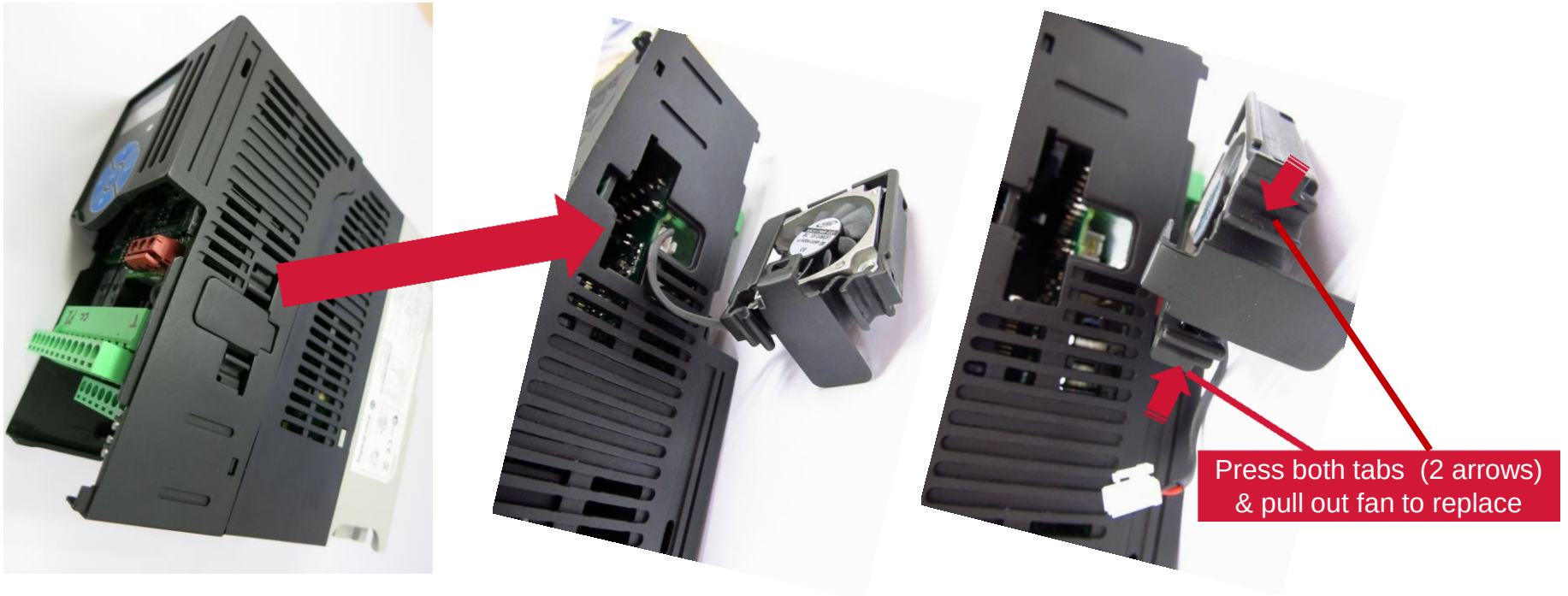
Embedded Safety
Hard wired: SIL3/PLe
CIP safety: SIL3/PLe

Removable Control Terminal Block

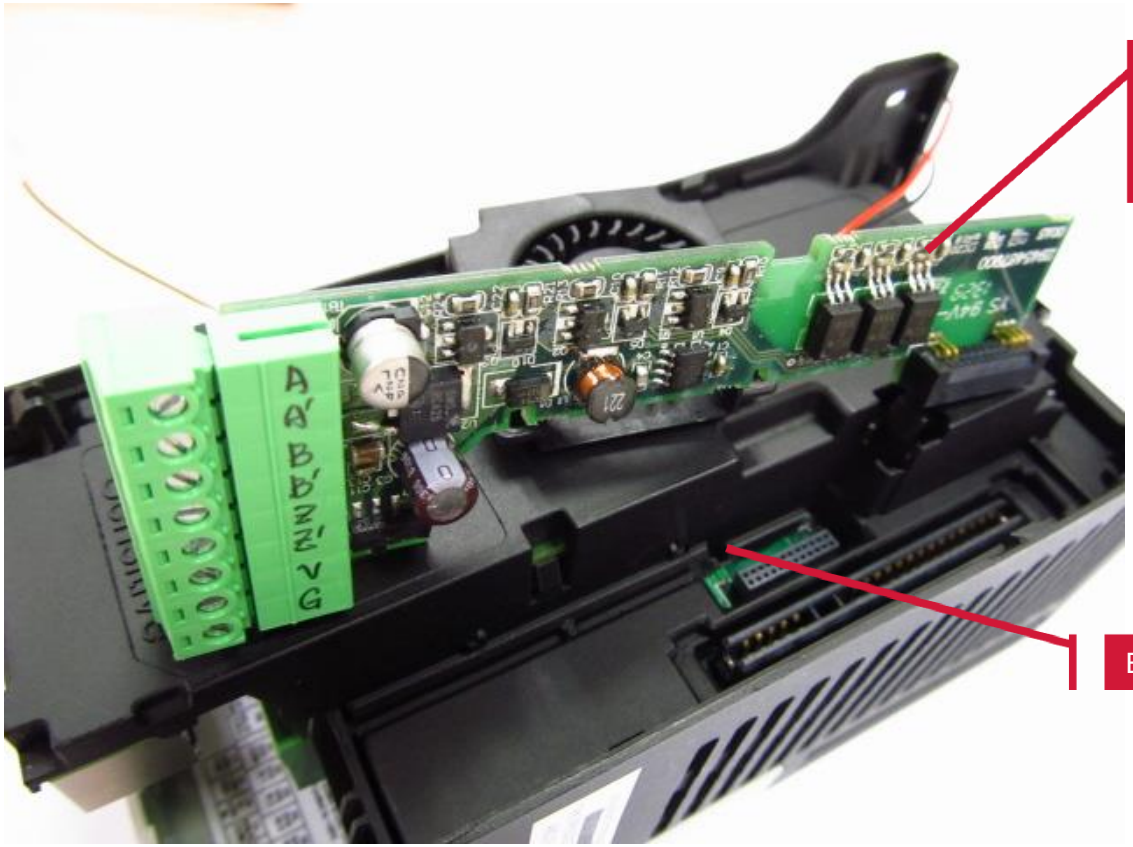
Embedded Dual Port EtherNet/IP with Device Level Ring (DLR)

Heat Sink Fan

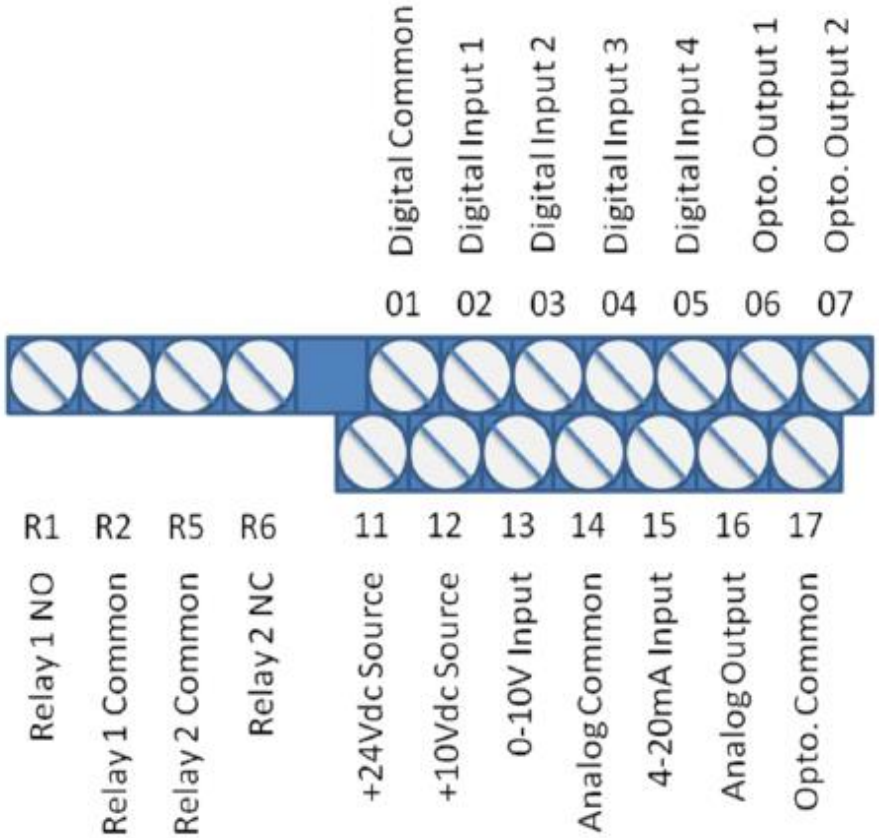
- Internal fan for multi-processor high density control



- Optional encoder card option
  - With removable terminal block (plastic retaining cover not shown)



- I/O Layout



PowerFlex® 520-Series
Integrated Motion & Drive Roadmap

Rockwell Automation

V21 | V22 | V23 | V24

PF527

CIP Motion

CIP Safety
Safe Torque Off

CIP Safety
Advanced Safety (SLS)

Optimized for size & cost

PF755

CIP Motion

CIP Safety
Safe Torque Off
Advanced Safety (SLS)

Optimized for High power
And retrofit

K5500

CIP Motion

CIP Safety
Safe Torque Off

CIP Safety
Advanced Safety (SLS)

K5700

Optimized for motion
performance & multi axis

CIP Motion

CIP Safety
Safe Torque Off

CIP Safety
Advanced Safety (SLS)

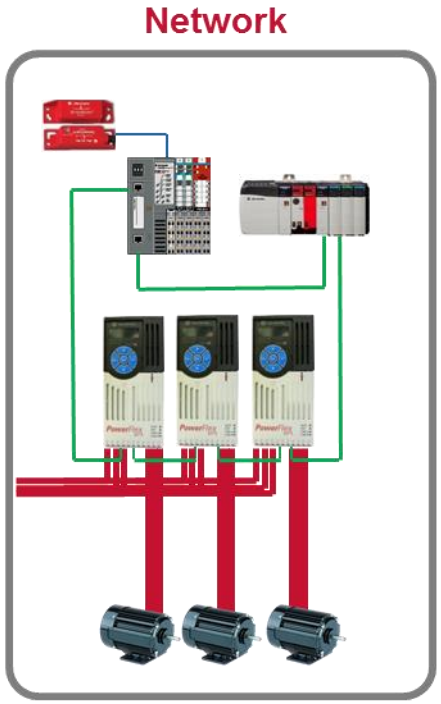
PowerFlex 527 Commercial Launch Update

Rockwell Automation

AFS scheduled for
11. May 2015

PF527 Safety Rating Update

Rockwell Automation



PowerFlex 527

SIL3 / PLe (HW) & SIL 3 / PLe (Network)

- Hardwired rating originally intended to match the PF525 SIL2/PLd rating
- Hardwired solution now upgraded to SIL3/PLe
- Both Network and HW solutions comply to SIL3/PLe in PF527

PowerFlex® 520-Series

PowerFlex 527 Preview

Rockwell Automation

- **CIP Motion** product up to 22 kW

- Typical customers
  - OEM partners where KNX products are used

- Typical applications
  - Fans
  - Conveyors
  - Pumps

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PowerFlex 700H

LifeCycle Status

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PowerFlex 700H LifeCycle Status

- October 2014 -"End of Life" status (previously known as"Silver Series")
  - Drives and Spare parts available for sale
- June 30, 2016 – "Discontinued" status
  - Drives no longer available for sale
  - Repair services and spare parts for sale based on availability

PowerFlex 750 Series:

- ***Easy*** to Install & Use
- ***Easy*** to Maintain & Service
- ***Easy*** to Monitor & Diagnose
- ***Smart*** Features for Extra Savings

In Place Of:		Migrate To:
Standard PF700H drives	→	Standard PF750 series drives
Packaged PF700H drives	→	Packaged PF750 series drives ("21G") or Contact LSC
18 Pulse PF700H drives	→	Contact LSC for 18 Pulse PF755

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PowerFlex 755 firmware

Nuclear Export Compliance

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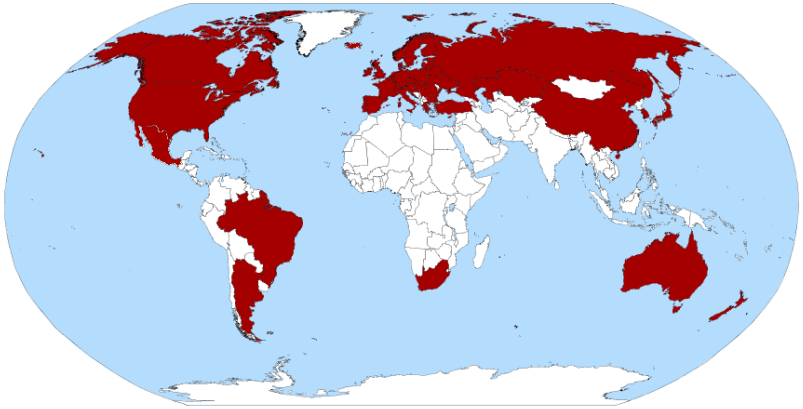
PowerFlex 750 Series Drives Firmware
Overview

Rockwell Automation

- On August 7, 2014 the United States Department of Commerce changed the export regulations for variable frequency drives as a result of an updated guideline from the Nuclear Supplier Group (NSG).
- Participating Governments to the NSG:

ARGENTINA, AUSTRALIA, AUSTRIA, BELARUS, BELGIUM, BRAZIL, BULGARIA, CANADA, CHINA, CROATIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, ICELAND, IRELAND, ITALY, JAPAN, KAZAKHSTAN, REPUBLIC OF KOREA, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, MEXICO, NETHERLANDS, NEW ZEALAND, NORWAY, POLAND, PORTUGAL, ROMANIA, RUSSIAN FEDERATION, SERBIA, SLOVAKIA, SLOVENIA, SOUTH AFRICA, SPAIN, SWEDEN, SWITZERLAND, TURKEY, UKRAINE, UNITED KINGDOM, and UNITED STATES



- The export compliance date for Rockwell Automation in the United States is February 9, 2015

PowerFlex 750 Series Drives Firmware
Overview

Rockwell Automation

- Issue: The Nuclear Supplier Group (NSG) has introduced a new guideline that requires frequency changing devices that are usable as variable/fixed frequency motor drives having all the characteristics list below to be heavily regulated.
  - Multiphase output providing a power of 40 VA or greater
  - Operating at a frequency of 600Hz or more
  - Frequency control better (less) than 0.2%

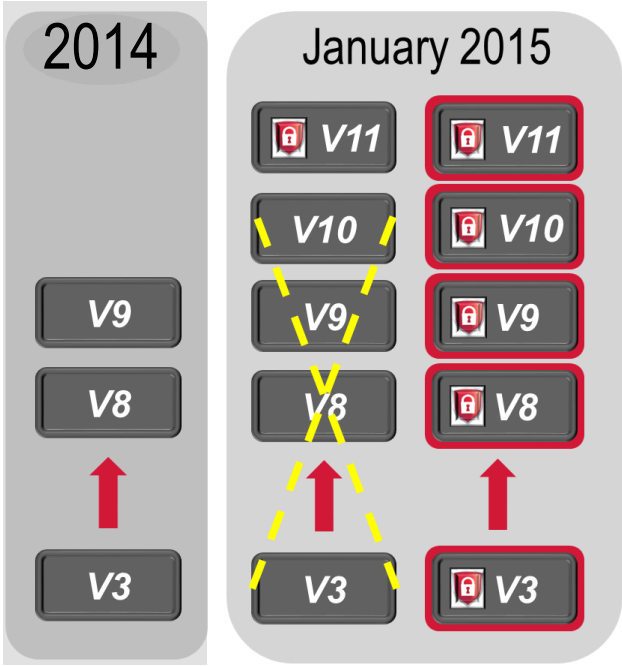
- Solution: Insert an internal limit within the drive firmware that limits the max frequency to 590Hz, leaving the database value at 650Hz
  - Will not change the series designator of the product
  - All tools and visual screens would show a max limit of 650Hz, but the drive would not accept a value greater than 590Hz
  - Requires the implementation of the Secure Flash function

PowerFlex 750-Series Firmware

Potential Customer Impact

Rockwell Automation

- Starting with V11, all drives will receive a “secure” flash firmware version.
- Drives can not be flashed back to the current (“non secure”) flash firmware versions.
- All non secure versions will be removed from the web as soon as V11 is released
- “Secure” versions of prior firmware releases (previous to V11) will be available for customers, however an existing drive must be flash upgraded to V11 before it can receive an earlier “secure” firmware versions.
- All “secure” versions will limit output frequency to 590 Hz



PowerFlex 750-Series Firmware

Literature library

Rockwell Automation

Title	Catalog Numbers	Publication Type	Publication Number	Language	Pub Date
PowerFlex 755 Drives (revision 7.002) Release Notes	20G, 21G	Release Notes	750-RN029C-EN-P	English	November 2014
PowerFlex 753 AC Drives (revision 5.002) Release Notes	20F	Release Notes	750-RN020B-EN-P	English	November 2014
PowerFlex 753 Drives (revision 6.005) Release Notes	20F	Release Notes	750-RN026B-EN-P	English	November 2014
PowerFlex 755 Drives (v8.002) Release Notes	20G	Release Notes	750-RN031B-EN-P	English	November 2014
PowerFlex 755 Drives (revision 4.002) Release Notes	20G, 21G	Release Notes	750-RN019C-EN-P	English	November 2014
PowerFlex 753 Drives (revision 10.003) Release Notes	20F	Release Notes	750-RN034B-EN-P	English	November 2014
PowerFlex 755 Drives (revision 10.003) Release Notes	20G	Release Notes	750-RN035B-EN-P	English	November 2014
PowerFlex 755 Drives (revision 11.001) Release Notes	20G	Release Notes	750-RN037A-EN-P	English	November 2014
PowerFlex 753 Drives (revision 7.002) Release Notes	20F	Release Notes	750-RN028C-EN-P	English	November 2014
PowerFlex 753 Drives (revision 11.001) Release Notes	20F	Release Notes	750-RN036A-EN-P	English	November 2014
PowerFlex 755 Drives (revision 6.005) Release Notes	20G	Release Notes	750-RN027B-EN-P	English	November 2014

PowerFlex 750-Series Firmware

Excerpt from the RN

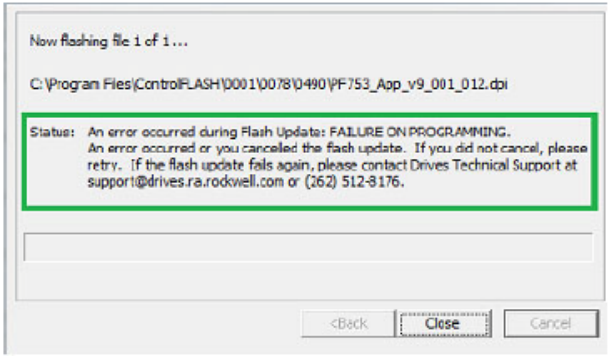
Rockwell Automation

Max Output Frequency Limited to 590Hz

This revision of drive firmware places a limit on the maximum output frequency of the drive. In previous versions of drive firmware the maximum operating frequency of the drive was 650Hz. The new maximum output frequency limit is 590Hz. If a previous application allows for a maximum output frequency greater than 590Hz, the drive will ramp to the command frequency set point and once it reaches a value greater than 590Hz for a period of time greater than 16ms the drive will trip on a Fault 31, "Over-Freq".

Implementation of Secure Flash

With this revision of drive firmware, an encryption layer with digital signature has been attached to the drive firmware flash file. This encryption layer will not allow the flashing of firmware files that have not been digitally signed by Rockwell Automation. When flashing from a revision of firmware that is not digitally signed, users will first need to flash up to V11.001 to enable the secure flash feature to read the digital signature. Once at V11.001, a customer can flash to any desired firmware revision level that has a secure digital signature. Previous versions of drive firmware that don't have a secure digital signature embedded in the flash file will display the error shown below when a flash is attempted.

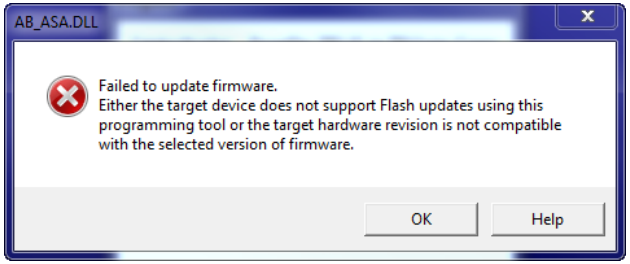


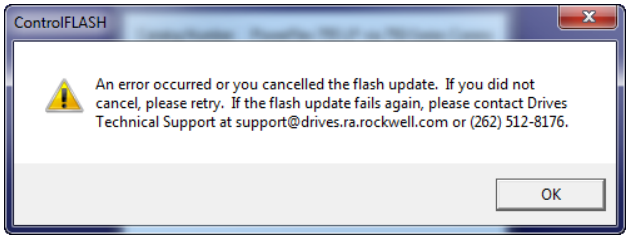
PowerFlex 750 Series Drives Firmware

Unsecure Flash Attempt

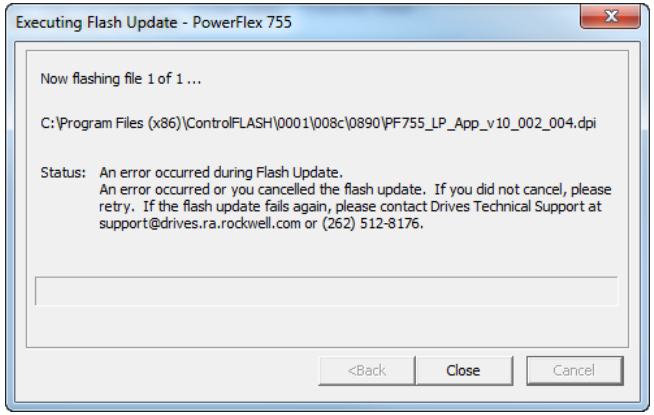
If an attempt to flash a non-secure file over a secure file a DPI error will occur and a notification will be displayed.

- ControlFLASH





- Drive Executive/Tools



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PowerFlex HI-POWER update

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Rockwell Automation

Stand-Alone Drives
Product Enhancements (Summer 2013)

Rockwell Automation

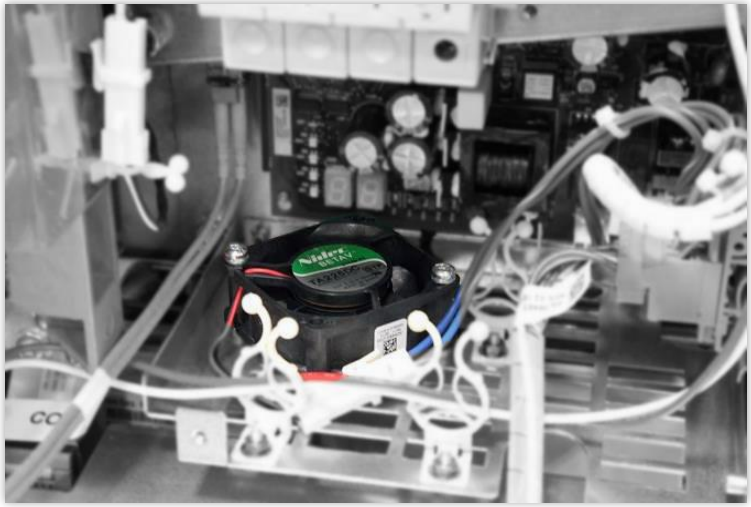
- Galvanized, unpainted covers on drive
  - Converter
  - Inverter
  - Pod
  - Fan tray
- Unpainted interior of cabinet

Stand-Alone Drives

Product Enhancements (Summer 2013)

Rockwell Automation

- Larger bars
  - Converter input
- Additional stirring fans
  - Converter board
  - Input fuses

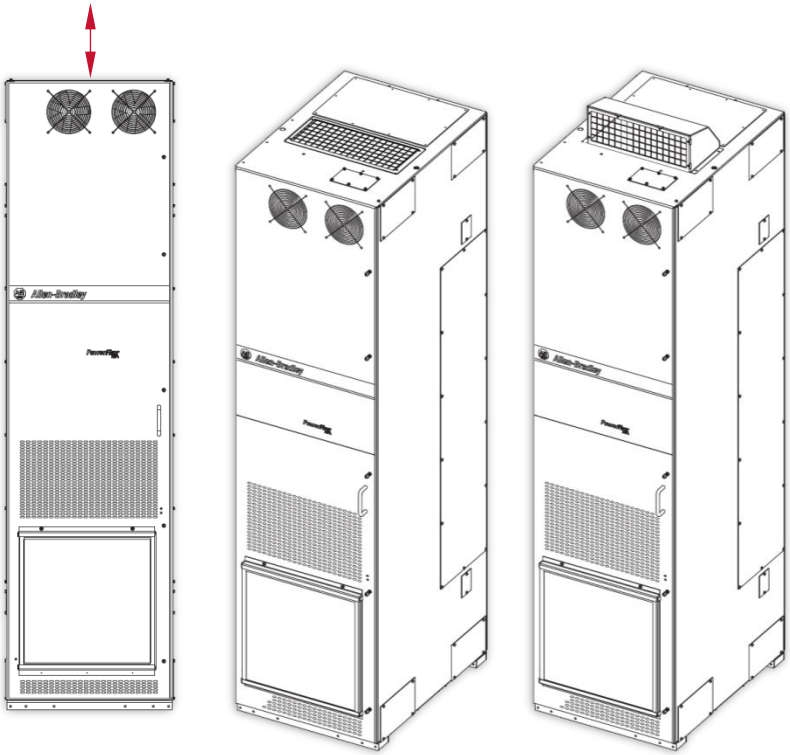


Stand-Alone Drives
Enclosure Styles

- IP20
  - IP21 solution from PCB
- IP54
  - 800 mm depth only
  - Roof fans and air inlet filters
- IP00
  - Connector and duct kits available

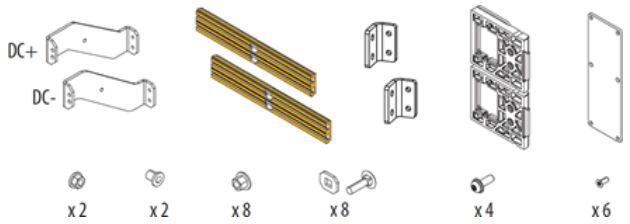
Stand-Alone Drives
Product Enhancements (Summer 2013)

- New IP20 hood
  - Height reduction
  - 182 mm clearance required



Stand-Alone Drives
Frame 8 DC Bus Access

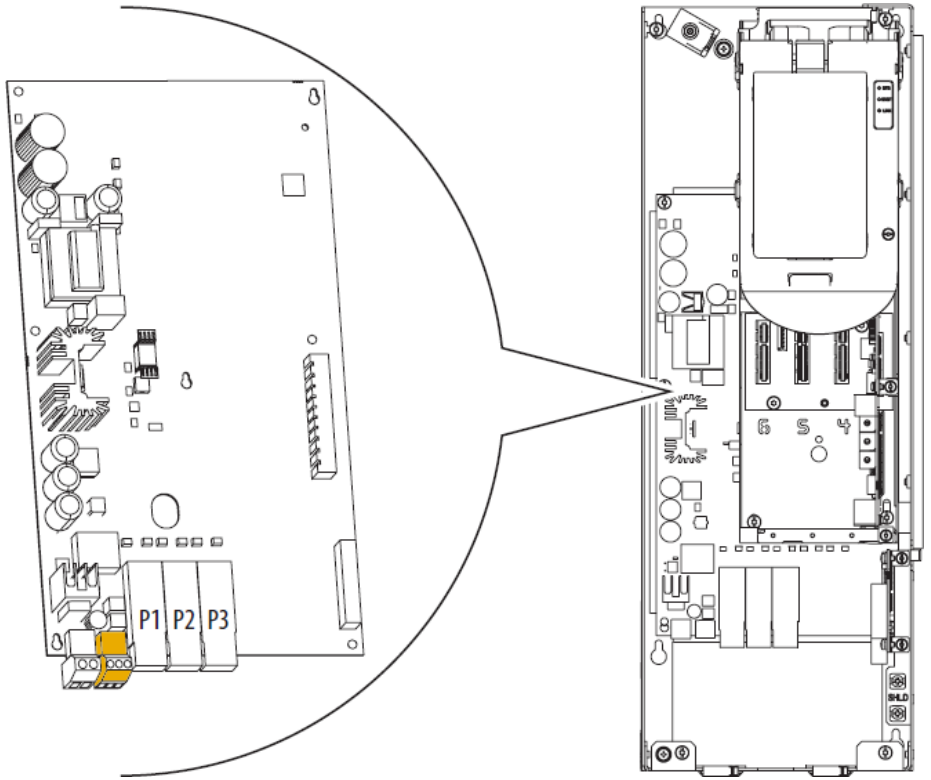
- Shipment without DC drive bars
- DC kit 20-750-BUS1A-F8
  - Includes side and back bus bars, and hardware



- Installation manual updated

Stand-Alone Drives
Auxiliary power input

- Auxiliary power 24 V_{DC}
  - 3 A
  - PELV or SELV



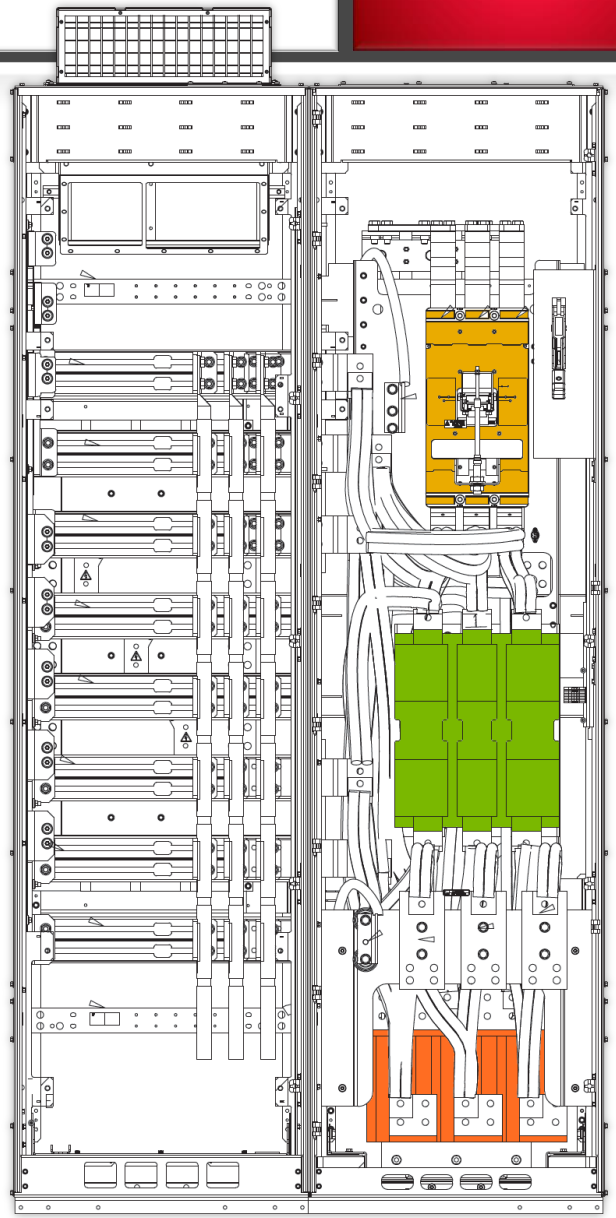
Stand-Alone Drives
Automatic Configuration

Rockwell Automation

- Automatic determination of total drive rating
  - At every power-up
  - By sum of individual drive sections
- Detection of change
  - Prompting user to make decision
  - Keep original configuration?
  - Reconfigure as smaller system?
- N-1 feature
  - For continued operation with faulted or failed drive sections
  - Run at partial application load
  - Choice of actions when a section stops working
    (Fault Coast, Fault Ramp Stop, Continue)

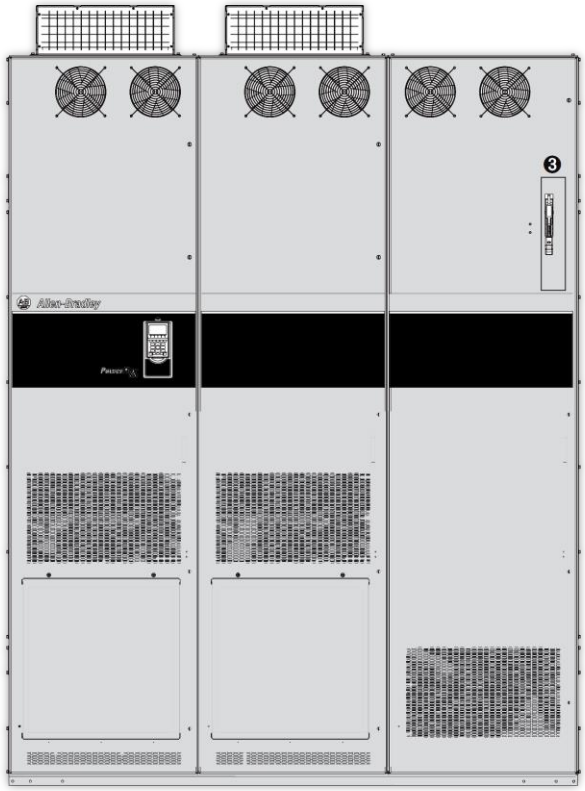
Power Options
Packaged Drives

- Frame 8
  - Input thermal magnetic circuit breaker
  - Input non-fused disconnect switch
  - Input contactor
  - Output contactor
  - Input line reactors
  - Output reactors
  - 600 and 800 mm depth



Power Options
Packaged Drives

- Frame 9
  - Input thermal magnetic circuit breaker
  - Input line reactor
  - Output reactor
- Frame 10
  - Input thermal magnetic circuit breaker
  - 800 mm depth only
  - Engineered to order only (ETO)



Power Options
Packaged Drives

21G Power Option Bay

Overview

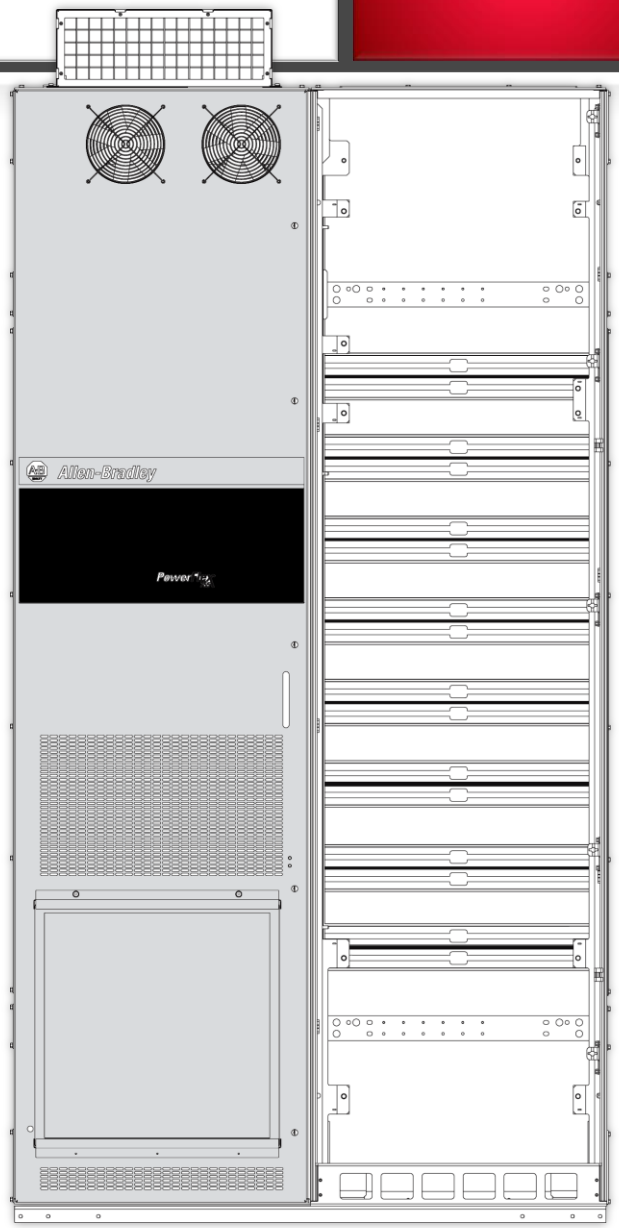
Rockwell Automation

Code	Power Option	Fr 8	Fr 9	Fr 10
P3	Circuit Breaker	X	X	X
P5	Molded Case Switch	X		
P11/P12	Input / Output Contactor	X		
L1/L2	3% Input / Output Reactor	X	X	
L3/L4	5% Input / Output Reactor	X		
P20/P22/P24	MCC Bus: 1200A / 2000A / 3000A	X	X	X
P30	UPS Control Bus ***(Common Bus DC only)***	X	X	X
P14	Wiring Only Bay	X	X	X

Only one selection from each color group can be chosen for a given unit.

Power Options
Wiring Only Bay

- Frames 8..10
  - Extra bay for flexible field connections
  - No drive input protection
  - Customer supplied documentation
  - 600 mm width
  - 600 and 800 mm depth



21G Power Option Bay
Disconnects

Rockwell Automation

- Circuit Breaker (P3)
  - Available on all frames
- Molded Case Switch (P5)
  - Only on Frame 8

- Frame 10 units with circuit breakers will be entered as ETO.
- Bottom values of frame 10 will be configured on a roll-out cart, like frame 9.
- Upper values will be mounted on a sub-panel and require a wiring bay to land the input power cabling.

- Frame 8 disconnect is mounted to sub-panel.
- Input power is landed on the line side of the disconnect.

- Frame 9 circuit breaker is mounted on a roll-out cart.
- Input power is landed on the horizontal bars behind the roll-out cart.

21G Power Option Bay

Reactors

- 3% Line/Load Reactor (L1/L2)
  - Available on frames 8 & 9
  - Must select disconnect
- 5% Line/Load Reactor (L3/L4)
  - Only on Frame 8
  - Must select disconnect

- No reactor option on Frame 10

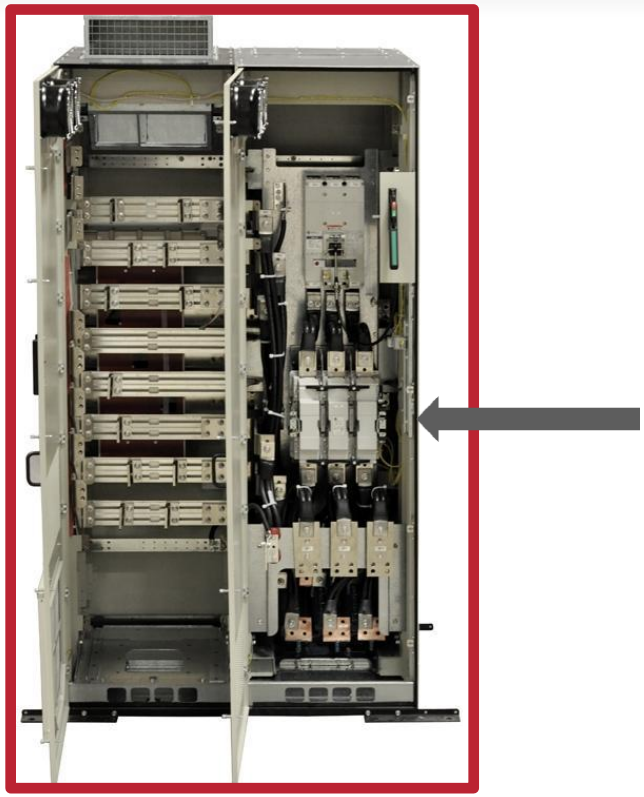
- Frame 8 reactor is mounted on cabinet floor.
- Line reactor is connected to disconnect and to drive input bars.
- Load reactor is connected to drive output bars. Customer motor connection made at reactor.

- Frame 9 reactor is mounted on a roll-out cart.
- Reactor is connected to breaker and/or drive via bus bars.
- Customer motor connection made on horizontal bus behind roll-out cart.

21G Power Option Bay

Contactors

- 3% Line/Load Contactor (P11/P12)
  - Available on frames 8 only.
  - Must select disconnect
  - Contactor cannot be ordered with drives containing MCC bus due to interference issue



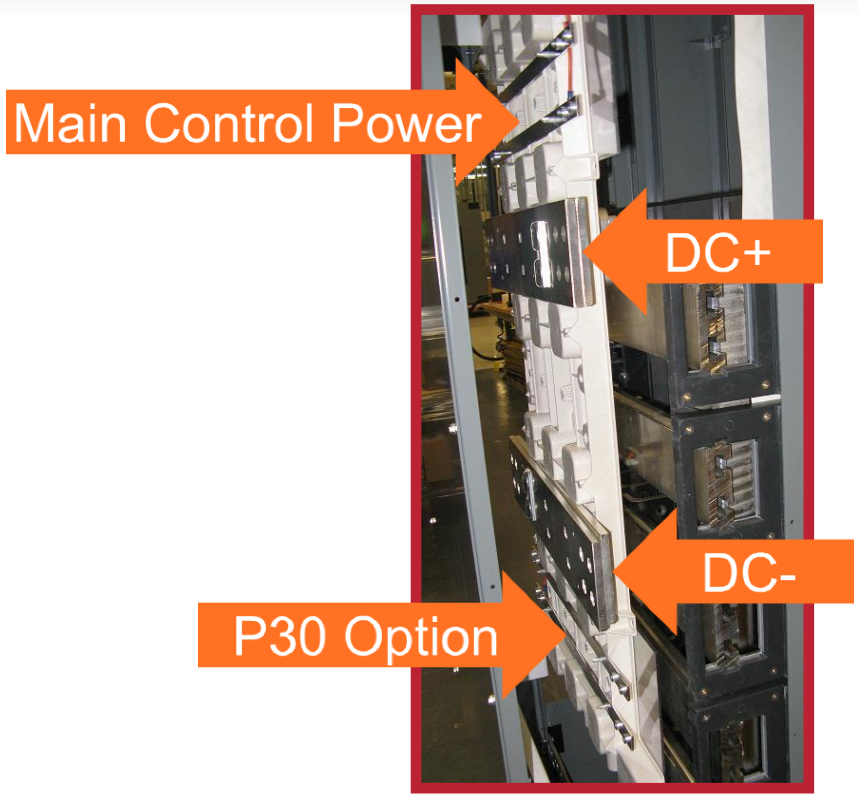
- No contactor option on Frames 9 or 10

- Frame 8 contactor is mounted to sub-panel.
- Line contactor is connected to disconnect and to drive input bars or to line reactor.
- Load contactor is connected to drive output bars. Customer motor connection made on load contactor or on load reactor.
- Cannot have contactor with MCC bus due to interference.

21G Power Option Bay

MCC Bus – Common-Bus DC Input

- MCC Bus Ratings
  - 1200A (P20)
  - 2000A (P22)
  - 3000A (P24)
- Splice kits available
  - Drive to drive
  - Drive to CL2500 cabinet
- Transition bay
  - Drive to CL2100 cabinet
- P30 option provides second pair of bus-bars for back-up, single-phase control power



- View of cabinet left-side with panels removed.
- MCC bars electrically connected to drive horizontal bars for input power

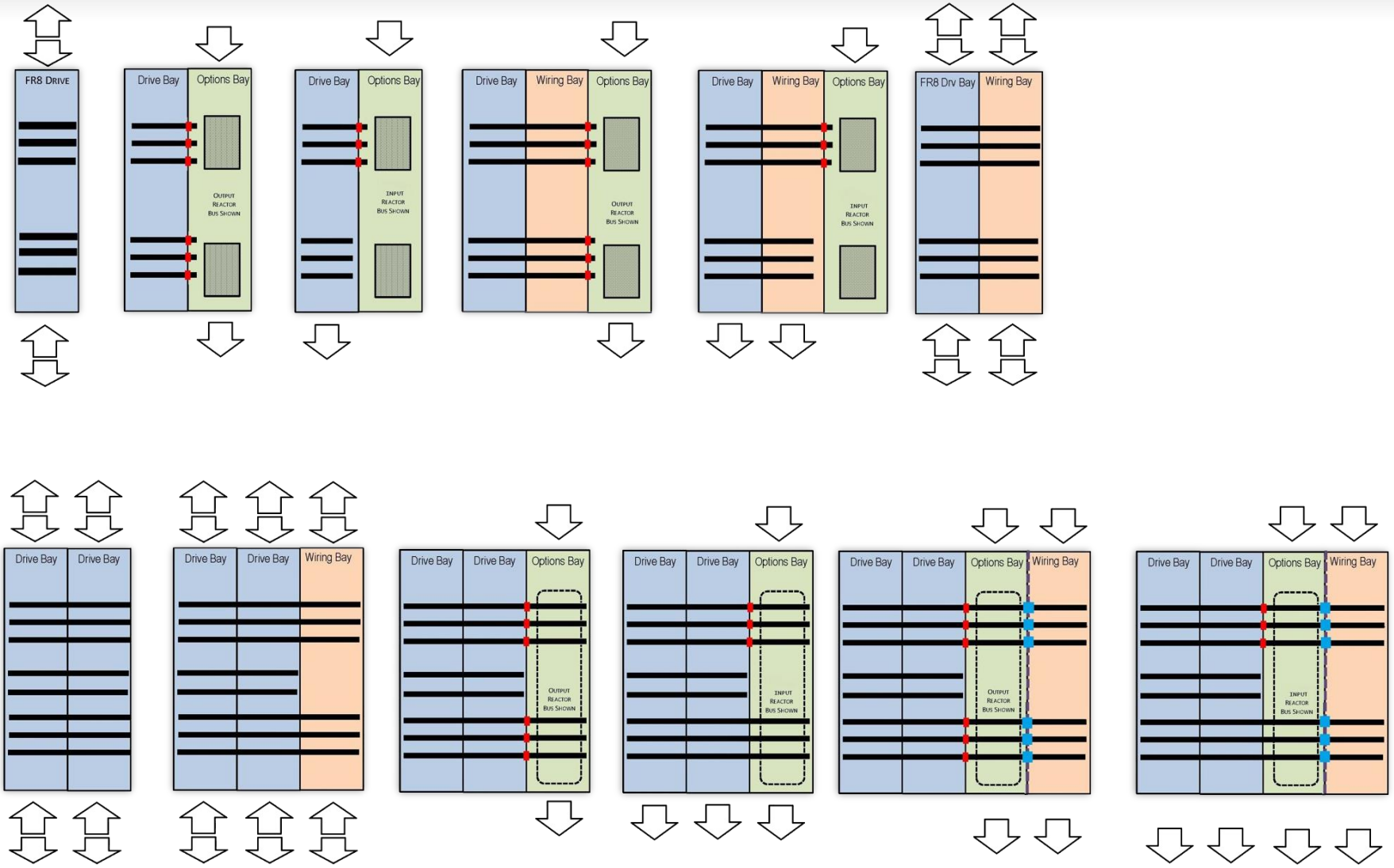
21G Power Option Bay

Wiring Bay

- Applications
  - Customers does not want to roll-out drive
  - IP54 application with top entry and/or exit of power cabling
- Available with all cabinets

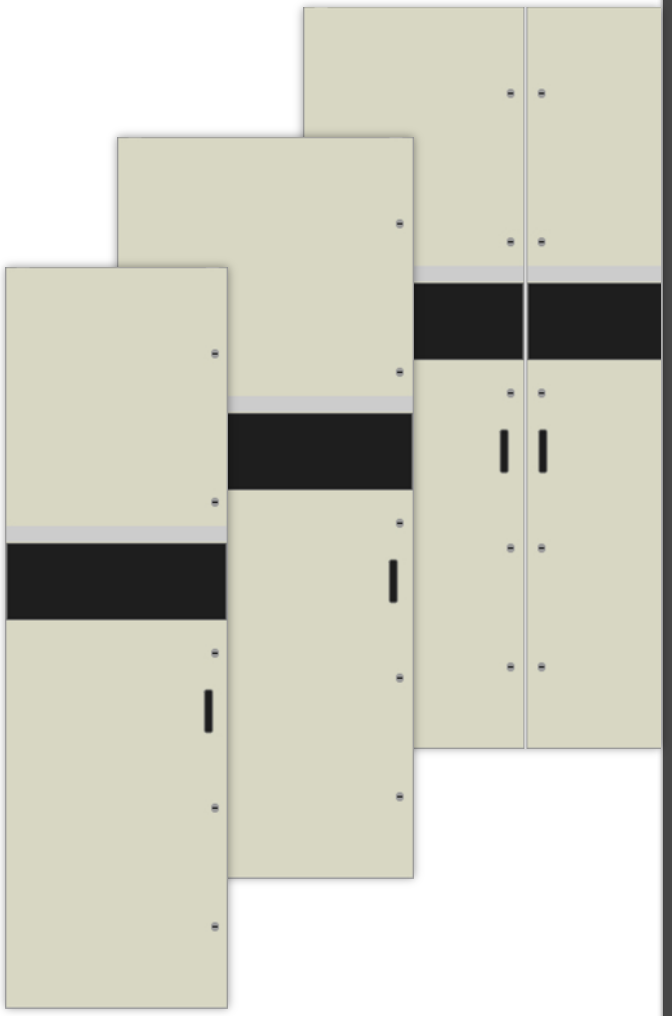
Power Options

Wiring Options



Power Options
Empty Power Bay

- Series of separate kits
  - User selectable
  - No factory installation
  - Hoffmann® design and manufacturing
- CENTERLINE 2500 look
  - Colour RAL 7032
  - Door labels (stripe)
  - Hoffmann type latches (countersunk)
  - IP54 with no door openings
  - Side panel openings on both sides
    - Reuse of Drive covers



Power Options

Empty Power Bay

21G Power Option Bay

Overview

Rockwell Automation

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P3	Circuit Breaker	X	X	X
P5	Molded Case Switch	X		
P11/P12	Input / Output Contactor	X		
L1/L2	3% Input / Output Reactor	X	X	
L3/L4	5% Input / Output Reactor	X		
P20/P22/P24	MCC Bus: 1200A / 2000A / 3000A	X	X	X
P30	UPS Control Bus ***(Common Bus DC only)***	X	X	X
P14	Wiring Only Bay	X	X	X

Only one selection from each color group can be chosen for a given unit.

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PowerFlex miscalaneous

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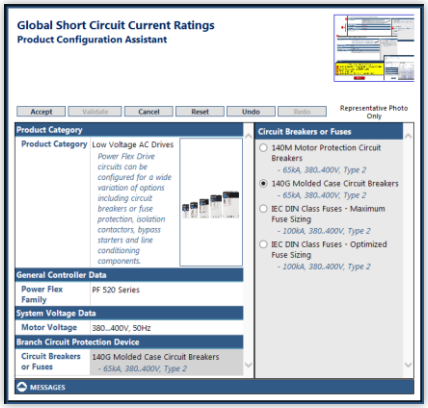
Rockwell Automation

Installation and Protection
Short-Circuit Current Ratings (SCCR)

- Update of global SSCR tool



- High ratings for protective devices
  - Based on 65 kA SSC level
  - Safe approach
  - Can be reduced based on actual customer requirements
- Re-test of PowerFlex 520-Series with Bulletin 140G required
- RA interpretation of standards requires SCCR values on nameplates
  - Added for 25-RF filters (100 kA)
  - Schaffner filters tested but not documented

Intelligent Motor Control
Automatic Device Configuration

Rockwell Automation

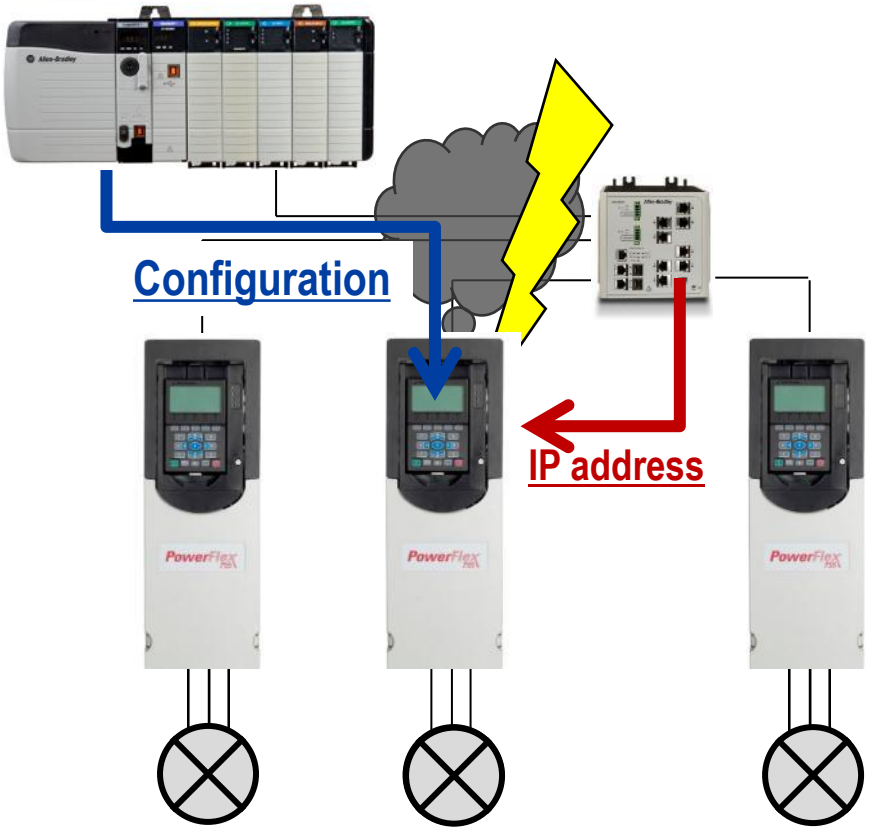
Improve Asset Utilization

- Embedded diagnostics
- Remote Monitoring
- Automatic device configuration
- Troubleshooting wizards

- **Reduce unplanned downtime**
- **Reduce time to repair**
- **Centralized maintenance staff**

Automatic Device Configuration (ADC) of equipment eventually replaced

Powerful combination of resources
Field device + controller + communication infrastructure



Installation and Protection
Bulletin 1321 Line Reactors

Rockwell Automation

- Change reactors to varnished only
  - No longer painted blue
  - Less customer dissatisfaction due to chipped or scratched paint
  - Shipment since mid June 2014

- IEC compliant grounding
  - Still no proper solution
  - Removal of insulation of chassis required