Spare Parts

This appendix lists the available spare parts for the PowerFlex® 7000 medium voltage drive.

Components and Related Part Numbers

Item	Description	Part Number
Batteries	DPM Battery	346567-Q01
Control Boards		
ACB	Analog Control Board for 18 Pulse Drive	80190-560-01-R
ACB	Analog Control Board for NON 18 Pulse Drive	80190-560-02-R
DPM	Drive Processor Board	80190-580-01-R
XIO	External Input / Output board (120…240V AC)	80190-300-01-R
XIO	External Input / Output board (12…24V AC)	80190-300-02-R
Power Electronics		
SGCT single device		
400A	Single 400A SGCT	81004-286-51-R
800A	Single 800A SGCT	81001-450-51-R
1500A	Single 1500A SGCT	81001-451-61-R
1750A	Single 1750A SGCT	81001-451-71-R
SGCT Matched set of two		
400A	Matched set of two 400A SGCT	81004-286-52-R
800A	Matched set of two 800A SGCT	81001-450-52-R
1500A	Matched set of two 1500A SGCT	81001-451-62-R
1750A	Matched set of two 1750A SGCT	81001-451-72-R
SGCT Matched set of three		
400A	Matched set of three 400A SGCT	81004-286-53-R
800A	Matched set of three 800A SGCT	81001-450-53-R
1500A	Matched set of three 1500A SGCT	81001-451-63-R
1750A	Matched set of three 1750A SGCT	81001-451-73-R
SGCT Matched set of four		
1750A	Matched set of four 1750A SGCT, marine drive Dynamic Brake	81001-451-74-R
SCR single device		
350A	Single 350A SCR	81001-335-71-R
800A	Single 800A SCR	81003-437-51-R

Analog Control Board (ACB)

The Analog Control Board (ACB) is the hub for all control-level signals external to the drive. The drive routes analog I/O, external fault signals (through the XIO board), DPI communication modules, remote I/O, terminal interface, printers, modem, and other external communication devices through this board.



Figure 94 - ACB analog control board

The Analog Control Board (ACB) receives all of the Analog Signals from the drive's internal components. This includes the current and voltage feedback signals. The board also has isolated Digital I/O for e-stops, contactor control and status feedback. All of the test points for the currents, system voltages, control voltages, and flux are on these boards.

Table 5 - Connectors on Analog Control Board

ACB Connectors	Description
ACB-J1	Control I/O & Control Power Monitor
ACB-J2	Line current inputs, CT2U, CT2W
ACB-J3	Line current inputs, CT3U,CT3W
ACB-J4	Line current inputs, CT4U,CT4W
ACB-J5	Motor current inputs, HECSU,HECSW
ACB-J6	DClink current inputs,HECSDC1, HECSDC2
ACB-J7	Ground fault & CMC Neutral current inputs, GFCT, INN
ACB-J8	Isolated & Non-isolated analog inputs, AIN1,AIN2,AIN3 and Non-isolated outputs, AOUT1AOUT2,AOUT3,AOUT4
ACB-J9	Air pressure inputs, AP0,AP1
ACB-J10	Meter outputs, AOUT5,AOUT6,AOUT7,AOUT8 and Speed Pot input, AIN0
ACB-J11	Communication connections, printer outputs
ACB-J12	Communication connections, Terminal
ACB-J13	DC power supplies, XIO(+24V),+/-15V,+/-24V,+5V
ACB-J14	DC power supply monitoring, 5V1,5V2, DC-BUS
ACB-J15	DC-ABUS +56V output monitoring (UPS option)
ACB-J16	DPI interface
ACB-J17	Communication connections, scan port
ACB-J18	DC fail signal monitoring
ACB-J19	DC fail signal monitoring
ACB-J20	DC fail signal monitoring
ACB-J21	DC fail signal monitoring
ACB-J22	Communication connection, XIO link CAN interface
ACB-J23	Communication connection, parallel drive
ACB-J24	UPS fail signal monitoring
ACB-J25	Line voltage synchronous transfer feedback voltage inputs VSA,VSB,VSC
ACB-J26	Motor & line DC link and Neutral Point Voltage inputs
ACB-J27	AC Motor & Line voltage feedback inputs
ACB-J28	Encoder interface
ACB-J30	DPM connection, A/D SUB system
ACB-J31	DPM connection, DACs serial data
ACB-J32	DPM power supply, +5V
ACB-J33	DPM connection, Faults & other I/O
ACB-J34	DPM connection, Encoder

Table 6 - Test Points on Analog Control Board

Test points	Name	Description
ACB-TP1	Vuv	Motor Voltage Feedback, UV
ACB-TP2	Vvw	Motor Voltage Feedback, VW
ACB-TP3	Vwu	Motor Voltage Feedback, WU
ACB-TP4	Iu	Motor Current, HECSU
ACB-TP5	Iw	Motor Current, HECSW
ACB-TP6	Vzs	Zero Sequence Generation Motor side, VZS
ACB-TP7	Vn	Motor Side Filter CAP Neutral Voltage, MFCN
ACB-TP8	V_pk	Motor Over Voltage Detection for UVW
ACB-TP9	Vdci1	Motor Side DCLINK Voltage for Bridge #1, VMDC1
ACB-TP10	Vdci2	Motor Side DCLINK Voltage for Bridge #2, VMDC2
ACB-TP11	Vuvs	Line Voltage Synchronous Feedback, VSAB
ACB-TP12	V2uv	Line Voltage Feedback, 2UV
ACB-TP13	V2vw	Line Voltage Feedback, 2VW
ACB-TP14	V2wu	Line Voltage Feedback, 2WU
ACB-TP15	I2u	Line current, CT2U
ACB-TP16	I2w	Line current, CT2W
ACB-TP17	Vzs2	Zero Sequence Generation Line side, VZS2
ACB-TP18	Vn1	Line Filter CAP Neutral Voltage for Bridge #1, LFCN1
ACB-TP19	V2_pk	AC over voltage detection for 2UVW
ACB-TP20	Vdcr1	Line side DCLINK Voltage for Bridge#1, VLDC1
ACB-TP21	Idc1	DCLINK current, HECSDC1
ACB-TP22	Vvws	Line Voltage Synchronous Feedback, VSBC
ACB-TP23	V3uv	Line Voltage Feedback, 3UV
ACB-TP24	V3vw	Line Voltage Feedback, 3VW
ACB-TP25	V3wu	Line Voltage Feedback, 3WU
ACB-TP26	I3u	Line current, CT3U
ACB-TP27	I3w	Line current, CT3W
ACB-TP28	Vzs3	Zero Sequence Generation Line side, VZS3
ACB-TP29	Vn2	Line Filter CAP Neutral Voltage for Bridge #2, LFCN2
ACB-TP30	V3_pk	AC over voltage detection for 3UVW
ACB-TP31	Vdcr2	Line side DCLINK Voltage for Bridge#2, VLDC2
ACB-TP32	Idc2	DCLINK current, HECSDC2
ACB-TP33	Vwus	Line Voltage Synchronous Feedback, VSCA
ACB-TP34	V4uv	Line Voltage Feedback,4UV
ACB-TP35	V4vw	Line Voltage Feedback,4VW
ACB-TP36	V4wu	Line Voltage Feedback,4WU
ACB-TP37	I4u	Line current,CT4U
ACB-TP38	I4w	Line current, CT4W
ACB-TP39	Vzs4	Zero Sequence Generation Line side,VZS4 (spare one)

Test points	Name	Description
ACB-TP40	Vnn	CMC Neutral Voltage, VNN
ACB-TP41	Inn	CMC Neutral current, INN
ACB-TP42	Ignd	Ground Fault current, GFCT
ACB-TP43	Vspr	Spare channel for inputs
ACB-TP44	Vmtrp	Motor Over Voltage Detection set point
ACB-TP45	A+	Encoder A+ input
ACB-TP46	B+	Encoder B+ input
ACB-TP47	Z+	Encoder Z+ input
ACB-TP48	A-	Encoder A-input
ACB-TP49	B-	Encoder B- input
ACB-TP50	Z-	Encoder Z- input

Test points	Name	Description
ACB-TP51	CP1	Control Power monitoring for channel 1
ACB-TP52	CP2	Control Power monitoring for channel 2
ACB-TP53	CP3	Control Power monitoring for channel 3
ACB-TP54	CP4	Control Power monitoring for channel 4
ACB-TP55	Vltrp	AC Over Voltage Detection set point for 2UVW & 3UVW
ACB-TP56	AGND	Analog ground
ACB-TP57	AGND	Analog ground
ACB-TP58	AGND	Analog ground
ACB-TP59	AGND	Analog ground
ACB-TP60	+5V	+5V DC power supply
ACB-TP61	+15V	+15V DC power supply
ACB-TP62	-15V	-15V DC power supply
ACB-TP63	+24V	+24V DC power supply
ACB-TP64	-24V	-24V DC power supply
ACB-TP65	24VCOM	+/- 24V common
ACB-TP66	DGND	Digital ground
ACB-TP67	AGND	Analog ground
ACB-TP68	AP1	Analog Control Inputs, Air pressure input, AP1
ACB-TP69	AP0	Analog Control Inputs, Air pressure input, AP0
ACB-TP70	AIN1	Analog Control Input, AIN1
ACB-TP71	AIN2	Analog Control Input, AIN2
ACB-TP72	AIN0	Analog Control Input, AIN0
ACB-TP73	AIN3	Analog Control Input, AIN3
ACB-TP74	IPIS	Input Isolating Switch
ACB-TP75	IPCS	Input Contactor Status
ACB-TP76	IP	Input Contactor Command
ACB-TP77	OPIS	Output Isolating Switch

Test points	Name	Description
ACB-TP78	OPCS	Output Contactor Status
ACB-TP79	OP	Output Contactor Command
ACB-TP80	BPIS	Bypass Isolating Switch
ACB-TP81	BPCS	Bypass Contactor Status
ACB-TP82	BP	Bypass Contactor Command
ACB-TP83	DGND	Digital Ground Return

LEDs

There are two power LEDs on the ACB labeled D7 and D9:

- D9 is the ±15V DC voltage-OK signal
- D7 is the +5V DC voltage present signal.

Interface Module (IFM)

The Interface Module makes all customer-usable connections to the ACB. The pin numbers listed on the following pages refer to IFM pin numbers.

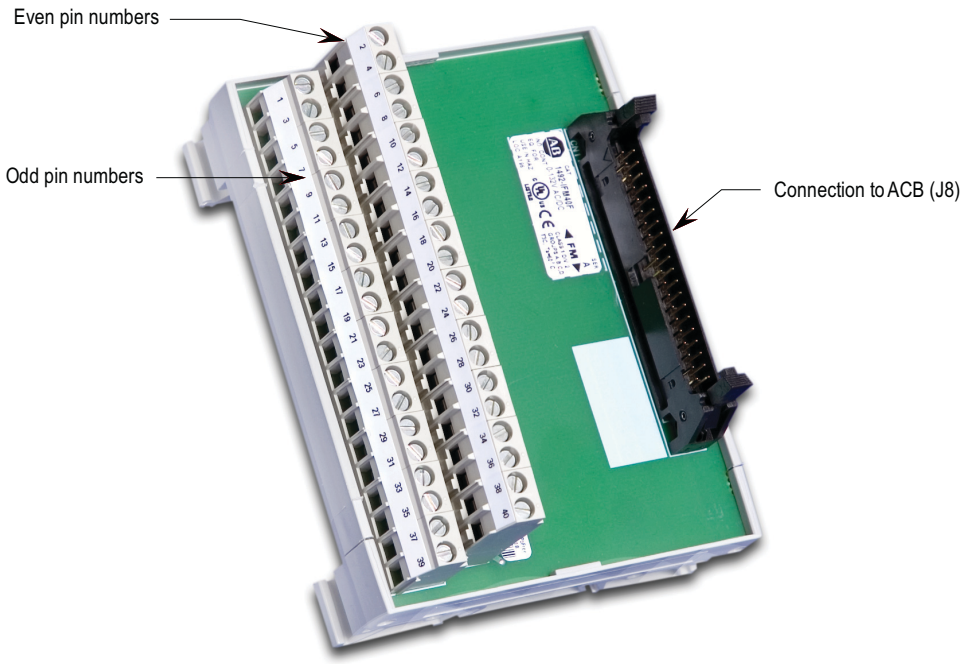


Figure 95 - Interface Module (IFM)

Analog Inputs and Outputs

The PowerFlex 7000 “B” Frame offers one isolated process current loop transmitter and three isolated process current loop receivers, embedded into the control. These are accessible on the ACB.

The isolated Process Output is configured as 4-20 mA. The three isolated process inputs are individually configurable for either a range of -10/0/+10V or 4-20 mA.

The following information details the connections for each input and output.

Current Loop Transmitter

The current loop transmitter sends a 4-20mA output to an external receiver. The loop compliance on the transmitter is 12.5V. Loop compliance is the maximum voltage at which a transmitter can generate to achieve the maximum current and is usually a function of the power supply voltage. Therefore, the PowerFlex 7000 “B” Frame transmitter can drive a receiver with an input resistance up to 625 ohms. The figure below shows a block diagram of the transmitter.

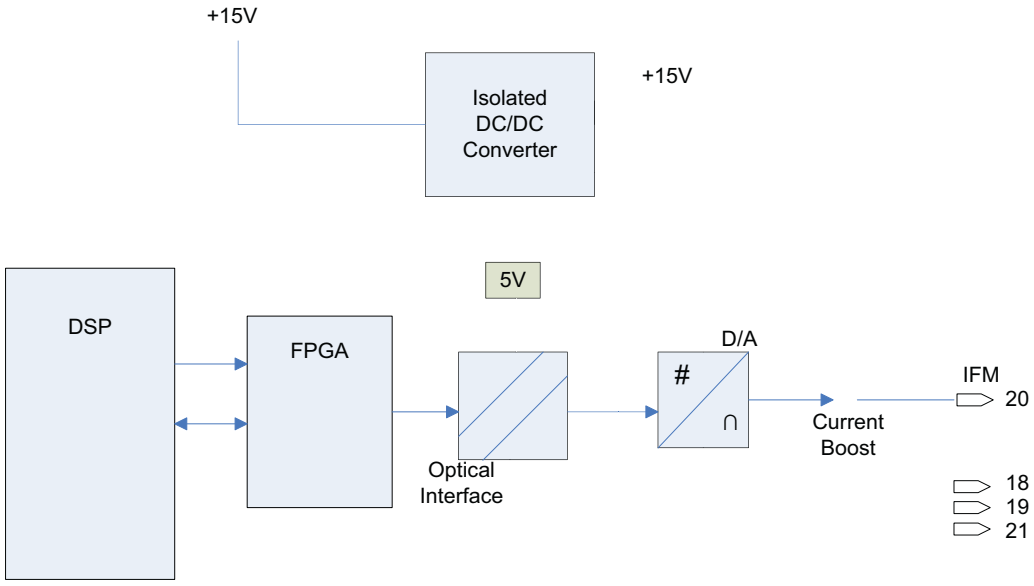


Figure 96 - Process Loop Transmitter block diagram

This type of transmitter is known as a 4-wire transmitter, and will “sink” current from a receiver. The receiver is connected by two wires only from pins 20 (+ connection) and either pins 18, 19, 21 (- connection).

The recommended connection is shown above. The type of shielded cable used is application specific and is determined by the length of the run, the characteristic impedance and the frequency content of the signal.

Isolated Process Receiver

These inputs are individually configurable to accept either a

-10/0/+10V input signal or a 4-20 mA signal. When configured for voltage input, each channel has an input impedance of 75 K ohms. When used as a current loop input, the transmitter must have a minimum loop compliance of 2 volts to satisfy the 100 ohm input impedance. Regardless of input configuration, each input is individually isolated to ± 100V DC or 70V RMS AC.

A block diagram of the receiver is shown below.

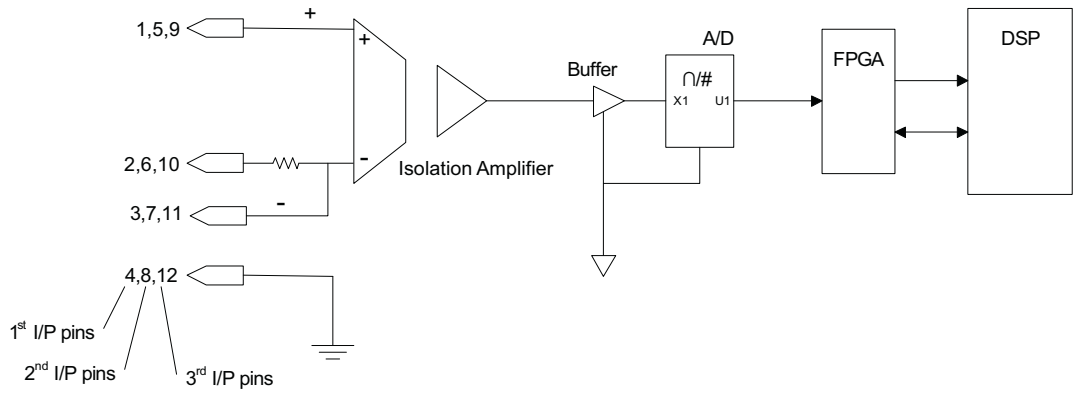


Figure 97 - Process Loop Receiver block diagram

The receiver can accept 4-wire transmitters. The figure below shows the recommended connections. Again, the type of shielded cable used is application specific as per the transmitter.

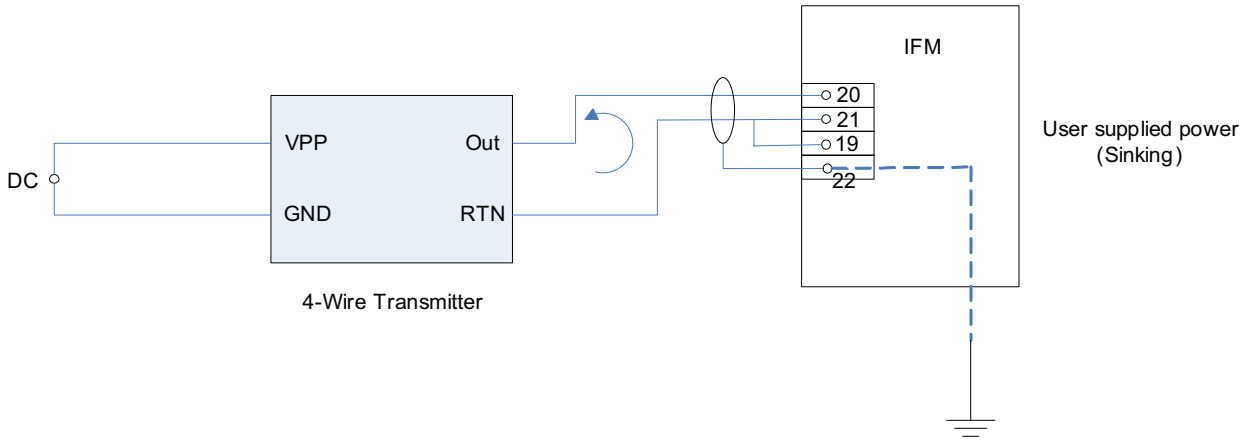


Figure 98 - Process Loop Receiver connections

Non-Isolated Process Outputs

The drive supplies four non-isolated -10/0/+10 V outputs for customer use. These outputs can drive loads with impedances as low as 600 ohms. These outputs are referenced to the Drive AGND; isolate them if you require them to drive outside the frame enclosure.

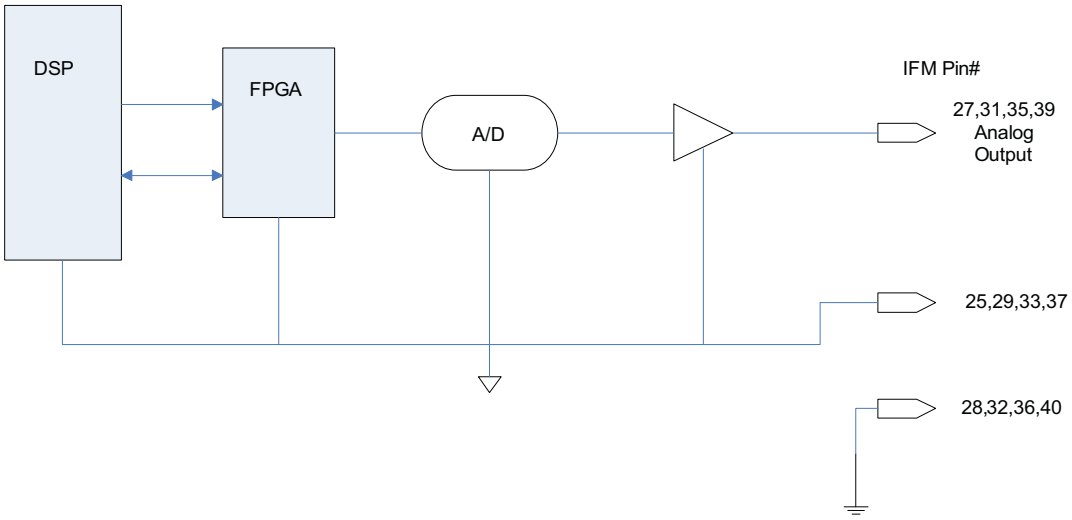


Figure 99 - Non-isolated configurable ACB analog outputs

Auxiliary +24V Power Supply

The DC/DC converter has a built-in isolated 24V power supply (Connector P3). Use this supply for any equipment requiring up to 24 watts at +24 volts. You can also use it to power any custom drive options, such as isolation modules for additional Process Control Outputs. The health of this power supply is monitored in the drive.

PIN NO.	DESCRIPTION
1	ISOLATOR (+24V, 1A)
2	ISOL_COMM (com4)
3	EARTH

Replacing the ACB Analog Control Board

To replace the ACB Analog Control Boards:

1. Isolate and lock out all power to the drive.
2. Remove the transparent sheet on top of the Drive Processor Module and the Drive Processor Module itself before removing the ACB. Remove the transparent sheet on top of the DPM by removing the 4 screws.
3. Use static strap before removing any connectors.

4. Remove the connectors J4, J11 and J12 on DPM after proper identification and marking if necessary. Use the electrical drawing as the reference. Remove the 4 screws holding it on the standoffs above the ACB.
5. Remove the DPM mounted on the four, 34-pin connectors.
6. Remove the screws holding encoder interface board and gently remove the board mounted on the 8 pin connector
7. Remove the connectors J1, J2, J3, J4, J5, J6, J7,J8, J9, J10, J12, J13, J14, J16, J22, J24, J25, J26, J27 on ACB after proper identification and marking if necessary. Use the electrical drawing as the reference.
8. Remove the ACB board by removing the 4 screws, and 6 standoffs screwed to support the DPM & encoder interface board.
9. Reverse steps 8 – 2 reinstall the boards into the low voltage control cabinet.
10. Apply low voltage power and complete both system and medium voltage tests to ensure the new board functions properly.

Tachometer Feedback Board

Encoder Options

There are two positional encoder interface boards usable with the PowerFlex 7000 Forge Control. The encoder interface boards do not have any user accessible test points; however, buffered and isolated versions of each of the signals A+, A-, B+, B-, Z+ and Z- are available on the ACB at test points TP45-TP50.

Regardless of the type of encoder board, observe the following conditions.

1. Do not attach encoders with open collector outputs to the drive. Acceptable outputs are Analog Line Driver or Push Pull.
2. The drive will not operate properly if using single ended Quadrature encoders. Rockwell Automation recommends using differential inputs only for these types of encoders. Single ended outputs are only acceptable for Positional Encoders.

20B-ENC-1 & 20B-ENC-1-MX3 Encoder Interface

This encoder interface enables connecting the drive to a standard Quadrature Encoder. The 20B-ENC encoder interface provides 3 optically isolated differential encoder inputs for A and B phases as well as a Z track. You cannot configure these inputs for use with a single ended encoder. The board only supports differential encoders. The board also provides a galvanically isolated 12V/3Watt supply to power the attached encoder. You can configure the 20B-