CRANEtrol AD10

PROGRAMMING MANUAL

CRANEtrol is a division of
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AD10
Crane Control
INSTRUCTION MANUAL

WARNING

1. Do not touch any circuit components while the main AC power is on. In addition, after main power is removed the internal DC Bus capacitors will remained charged for up to 10 minutes. Failure to adhere to this warning could result in injury.
2. Do not connect the main AC power to terminals T1,T2 or T3, this will damage the unit!
3. Do not attempt to program the unit without fully reading and understanding the manual.
4. ***CAUTION***: Do not enter startup mode with any load on hook.

REV 03/03 P/N: 027-2050
September 2003
Crane Software Manual
Software ID: A80000 and A81000
Software Rev. Level: 1.101

WELCOME

Thank you for purchasing the CRANEtrol AD10 Crane and Hoist controller. The AD10 controller employs the latest hardware and software technology to provide unmatched performance, reliability and application flexibility for your overhead material handling equipment.

The AD10's flexible programming software allows quick and simple adaptation to your application. The AD10 "FH" series is designed for use in No Load Brake hoisting applications, which require a close loop system for torque proving and 100% torque at zero speed. The AD10 "FH" series offers a 1000:1 speed range, compared to 3:1 or 10:1 of typical hoisting systems.

The AD10 "F" series controller is designed for use in the Traverse axis or Load Brake Hoist applications. The AD10 "F" series controller operate in either open loop volts per hertz mode or closed loop flux vector mode.

Here is a sample of the AD10's crane specific software features.

- **Torque Proving Function** - Monitors output TORQUE NOT CURRENT, to insure that the AD10 has sufficient torque to support the load before releasing the brake unlike most crane controllers that simply monitor current.
- **Distinct Speed Control** - Up to 5 step speeds, as well as infinitely variable speed control. Analog speed control as well.
- **Micro-Speed** - Allows precise positioning of loads without jogging or plugging your motor.
- **Turbo Lift** - Allows the overspeeding of the hoist axis automatically if an empty hook condition is detected.
- **Fast Stop** - Allows a rapid deceleration to stop once a STOP command is given.
- **EOTA and EOTB** - Intelligent end of travel limit inputs. The EOTA input commands the AD10 to decel to minimum speed, indicating an end of travel warning. The EOTB input commands the AD10 to STOP immediately, display a visual warning and only allowing travel in the opposite direction.
- **Plug Reverse Function** - Allows a rapid change of direction, in the Traverse axis, by reversing the motor's phase sequence without setting the brake.
- **TL Gain Function** - Prevents the AD10 from attempting to lift a load beyond the capacity of the hoist. This also may be used as a load certification test.
- **Input and Output Phase Loss protection**
- **Fault History Log** - Recording the last 30 faults.
- **Analog/Digital Speed Reference Switchover** - Allows switching between analog type reference and digital type reference, without reconfiguring the input wiring.
- **Saflink Software** - Providing complete serial communications to the AD10 via a PC, for uploading and download ing parameter files, diagnostics as well as a six channel oscilloscope with triggering and storage capabilities.
- **Cranelink Radio Control** - Provides complete diagnostic, programming and monitoring of the crane while safely on the ground.
- **Brake Slip Pulse Count** - The AD10 will detect any movement in the motor shaft before the brake release command is given, during the initial start command. Shaft movement before the brake command is given indicates that the brake is not properly adjusted. This function sets the amount of slip that is permissible before a brake slip indication is displayed on the keypad.
- **Break Wear** - This function sets the output torque level that the motor must be below in order for the AD10 to shut off.

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1.0 RECEIVING

1.1 PRELIMINARY INSPECTION

RECEIVING:

After unpacking the AD10 controller:

- Verify that the part number on the unit nameplate corresponds to the packing slip.
- Check the unit for physical damage that may have occurred during shipment. If any part of the unit is missing or damaged, notify the carrier immediately
- Verify that all internal hardware (i.e. components, screws, etc.) are seated properly and fastened securely.
- If found any irregularities in the above items, contact your CRANEtrol representative.

CHECKING THE NAMEPLATE

Type :	AD10XGST34003A1			S/N 9862330
Main Power In :	480 Vac	8.9 A	50/60Hz	3Phase
Main Power Out :	0-480Vac	7.5A	0-400Hz	

INDUSTRIAL LISTED CONTROL EQUIPMENT

Figure 1: Identification Nameplate

Type: Inverter model
S/N: Serial Number
Main Power In: Power supply voltage - AC Input current - Frequency
Main Power Out: Output voltage - Output current - Output Frequency

Firmware Release	HW release					S/N BU	0062330 SW. CFG	Prod. CONF
	D	F	P	R	S			
2.000	0.A		0.A				1.000	D1

Figure 2: Firmware & Card Revision Level Nameplate

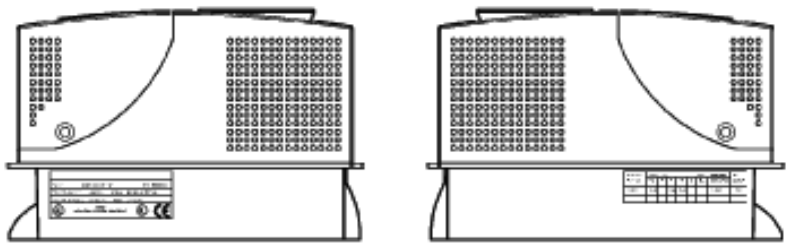


Figure 3: Nameplates Position

The technical specification of the AD10 Drive is stated in the tupe code. Example:

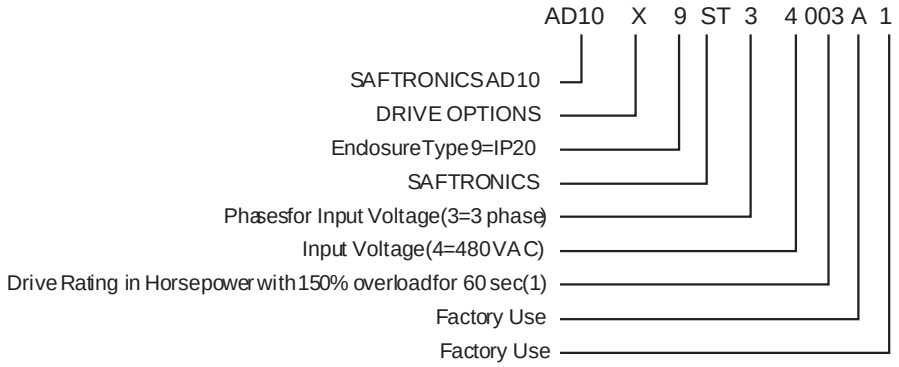


Figure 4: Inverter Type Designation

The above nameplate information is located on your AD10 controller. Two separate labels containing the drive specification data, such as voltage, current, weight, etc. and model/serial number data. Insure all information is correct before installing or applying your AD10 controller.

The Model & Serial Number label contains the following information:

- **Model**: this is the CRANEtrol Part Number. The suffix denotes the type of crane controller, “C” is the suffix for a Traverse/Load Brake controller. The “CH” suffix denotes a No Load Brake Hoist controller.
- **Serial No**: This is the controller’s serial number. Please refer to this for any service or technical assistance you may need.
- **So No**: This is your Sales Order Number.
- **Options**: This denotes the option cards installed on the AD10 controller.
- **Software**: This denotes the type of software installed in the AD10 controller.

1.2 STANDARD SPECIFICATIONS

1.2.1 Permissible Environmental Conditions

ENVIRONMENT	T_A Ambient temperature	[°C]	0 ... +40; +40…+50 with derating
		[°F]	32 ... +104; +104…+122 with derating
	Installation location		Pollution degree 2 or better (free from direct sunligth, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
	Degree of protection (according to IEC 60529)		IP20
			IP54 for the cabinet with externally mounted heatsink (size type 3F75 to 3020)
	Installation altitude		Up to 1000m above sea level; for higher altitudes a current reduction of 1.2% for every 100m of additional height applies .
	Temperature:		
	operation [1]		0…40°C (32°…104°F)
	operation [2]		0…50°C (32°…122°F)
	storage (drive with LED module)		-25…+55°C (-13…+131°F), class 1K4 per EN50178
	storage (drive with keypad)		-20…+55°C (-4…+131°F)
	transport (drive with LED module)		-25…+70°C (-13…+158°F), class 2K3 per EN50178
	transport (drive with keypad)		-20…+60°C (-4…+140°F)
	Air humidity:		
	operation		5 % to 85 %, 1 g/m^3 to 25 g/m^3 without moisture condensation or icing (Class 3K3 as per EN50178)
	storage		5% to 95 %, 1 g/m^3 to 29 g/m^3 (Class 1K3 as per EN50178)
	transport		95 % [3] 60 g/m [4]
			A light condensation of moisture may occur for a short time occasionally if the device is not in operation (class 2K3 as per EN50178)
	Air pressure:		
	operation	[kPa]	86 to 106 (class 3K3 as per EN50178)
	storage	[kPa]	86 to 106 (class 1K4 as per EN50178)
	transport	[kPa]	70 to 106 (class 2K3 as per EN50178)
STANDARD	Climatic conditions		IEC 68-2 Part 2 and 3
	Clearance and creepage		EN 50178, UL508C, UL840 degree of pollution 2
	Vibration		IEC68-2 Part 6
	EMC compatibility		EN61800-3 (see "EMC Guidelines" instruction book)
	Approvals		CE, UL, cUL : 0-200Hp, CSA : 250-800Hp
	Motor Overhead Protection		UL-recognized electronic thermal overoad² (I²T)

Table 1

1) Parameter Ambient temp = 40°C (104°)
Ambient temp = 0 ... 40°C (32°...104°F)
Over 40°C: - current reduction of 2% of rated output current per K
- remove front plate (better than class 3K3 as per EN50178)
2) Parameter Ambient temp = 50°C (122°F)
Ambient temp = 0 ... 50°C (32°...122°F)
Current derated to 0.8 rated ouput current
Over 40°C (104°): removal of the top cover (better than class 3K3 as per EN50178)
3) Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the device is brought suddenly from -25 ...+30°C (-13°...+86°F).
4) Greatest absolute air humidity if the device is brought suddenly from 70...15°C (158°...59°F).

1.3 AC INPUT / OUTPUT SPECIFICATIONS (4F75 TO 4200 SIZES)

	Type		4F75	4001	4002	4003	4005	4007	4010	4015	4020	4025	4030	4040	4050	4060	4075	4100	4125	4150	4200
OUTPUT	Inverter Output (IEC 146 class1), Continuous service	[kVA]	1.6	2.7	3.8	5	6.5	8.5	12	16.8	22.4	32	42	55	64	79	98	128	145	173	224
	Inverter Output (IEC 146 class2), 150% overload for 60s	[kVA]	1.4	2.4	3.4	4.5	5.9	7.7	10.9	15.3	20.3	29	38.2	50	58.3	72	89.2	116.5	132	157.5	204
	P_N mot (recommended motor output):																				
	@ U_{LN}=230Vac; f_{SW}=default; IEC 146 class1	[kW]	0.37	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	18.5	22	22	30	37	55	55	75	90
	@ U_{LN}=230Vac; f_{SW}=default; IEC 146 class2	[kW]	0.37	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	30	37	45	55	55	90
	@ U_{LN}=400Vac; f_{SW}=default; IEC 146 class1	[kW]	0.75	1.5	2.2	3	4	5.5	7.5	11	15	22	30	37	45	55	75	90	110	132	160
	@ U_{LN}=400Vac; f_{SW}=default; IEC 146 class2	[kW]	0.75	1.5	2.2	3	4	5.5	7.5	11	15	22	30	37	45	55	55	90	90	110	160
	@ U_{LN}=460Vac; IEC 146 class1	[Hp]	1	2	3	3	5	7.5	10	15	20	30	40	50	60	75	100	125	150	150	200
	@ U_{LN}=460Vac; IEC 146 class2	[Hp]	0.75	1.5	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
	U_2 Max output voltage	[V]	0.98x U_{LN} (AC Input voltage)																		
	f_2 Max output frequency (*)	[Hz]	400												200						
	I_{2N} Rated output current:																				
	@ U_{LN}=230-400Vac; f_{SW}= default; IEC 146 class1	[A]	2.4	4	5.6	7.5	9.6	12.6	17.7	24.8	33	47	63	79	93	114	142	185	210	250	324
	@ U_{LN}=230-400Vac; f_{SW}=default; IEC 146 class2	[A]	2.2	3.6	5.1	6.8	8.7	11.5	16.1	22.5	30	43	58	72	85	104	129	169	191	227	295
	@ U_{LN}=460Vac; f_{SW}=default; IEC 146 class1	[A]	2.1	3.5	4.9	6.5	8.3	11	15.4	21.6	28.7	40	54	68	81	99	124	160	183	217	282
	@ U_{LN}=460Vac; f_{SW}=default; IEC 146 class2	[A]	1.9	3.2	4.4	5.9	7.6	10	14	19.6	26	36	50	62	74	90	112	146	166	198	256
	f_{SW} switching frequency (Default)	[kHz]	8												4						
	f_{SW} switching frequency (Higher)	[kHz]	16									16			8						--
	Iovld (short term overload current, 200% of I_{2N} for 0.5s on 60s)	[A]	4.4	7.2	10.2	13.6	17.4	23	32.2	45	60	86	116	144	170	208	258	338	382	454	n.a.
	Derating factor:																				
	K_V at 460/480Vac		0.87					0.96	0.87	0.93	0.90	0.87									
	K_T for ambient temperature		0.8 @ 50°C (122°F)																		
	K_F for switching frequency		0.7 for higher f_{SW}																		
INPUT	U_{LN} AC Input voltage	[V]	230V (**) -15% ... 480V + 10%, 3Ph																		
	AC Input frequency	[Hz]	50/60Hz ±5%																		
	I_N AC Input current for continuous service: - Connection with 3-phase reactor																				
	@ 230Vac; IEC 146 class1	[A]	1.7	2.9	4	5.5	7	9.5	14	18.2	25	39	55	69	84	98	122	158	192	220	n.a.
	@ 400Vac; IEC 146 class1	[A]	1.9	3.3	4.5	6.2	7.9	10.7	15.8	20.4	28.2	44	62	77	94	110	137	177	216	247	309
	@ 460Vac; IEC 146 class1	[A]	1.7	2.9	3.9	5.4	6.7	9.3	13.8	17.8	24.5	37	53	66	82	96	120	153	188	214	268
	- Connection without 3-phase reactor																				
	@ 230Vac; IEC 146 class1	[A]	3.6	4.4	6.8	7.9	11	15.5	21.5	27.9	35.4	For these types an external inductance is recommended									
	@ 400Vac; IEC 146 class1	[A]	3.9	4.8	7.4	9	12	16.9	24.2	30.3	40										
	@ 460Vac; IEC 146 class1	[A]	3.4	4.2	6.4	7.8	10.4	14.7	21	26.4	34.8										
	Max short circuit power without line reactor (Zmin=1%)	[kVA]	160	270	380	500	650	850	1200	1700	2250	3200	4200	5500	6400	7900	9800	12800	14500	17300	22400
	Overvoltage threshold	[V]	820V_{DC}																		
	Undervoltage threshold	[V]	230V_{DC} (for 230V_{AC} mains), 400V_{DC} (for 400V_{AC} mains), 460V_{DC} for 460V_{AC} mains)																		
	Braking IGBT Unit (standard drive)		Standard internal (with external resistor); Braking torque 150%									Option internal (with external resistor); Braking torque 150%					External braking unit (optional)				

(**) For 4F75 to 4020 sizes, to work at 230VAC requires the product configuration to be D1 or higher.

Table 2

1.4 AD10 SPECIFICATIONS

GENERAL	ITEM	DESCRIPTION
Nominal Motor	230V, 3 Phase	15 Hp to 100 Hp
	460V, 3 Phase	3/4 Hp to 200 Hp
Enclosure, Standard	IP20	
Cooling Method	Internal Fan Cooled	3/4 Hp to 60 Hp
	External Power	75 to 200 Hp requires 115/230 VAC, 50/60 Hz external power supply
Standards	UL/cUL	
	CE	
Braking Torque	3/4 Hp to 60 Hp	Braking Module Built-in as standard
	75-200 Hp	Optional external braking module available
INPUT	**ITEM**	**DECRIPTION**
	230 VAC	230 VAC +/- 15% 50/60 Hz
	460 VAC	460 VAC +15%, -10%, 50/60 Hz
	AC Input Freq.	50/60 Hz +/- 5%
	Unbalance	3% max per EN61800-3 standard
	Power Dip	For input voltage greater than Vmin, the drive will operate at rated output continuously. For input voltage less than Vmin, the drive will discontinue firing and control power will remain for a time depending upon output current load and inverter size ranging from 0.25 Sec for 3/4 Hp to 18 sec for 200 Hp.
CONDITION	**ITEM**	**DECRIPTION**
Altitude		1000 meters or less
		Derate at 1.2% for each 100 meters from 1000 to 3000 meters (Above 3000 meters, consult factory)
Temperature	Ambient	-10 to 50 °C (units less than and equal to 30 Hp must have ventilation covers removed for 50°C)
	Storage	-20 to 55 °C
Vibration		Per Class 1K4 of EN50178
Humidity		5 - 85% Relative Humidity (Non-condensing)
OUTPUT	**ITEM**	**DECRIPTION**
	230 VAC, 3 Phase	3 Phase, 200V, 50 Hz or 3 Phase, 200V, 220V, 30V, 60Hz
	460 VAC, 3 Phase	3 Phase, 380V, 400V, 415V, 440V, 50Hz or 3 Phase, 380V, 400V, 440V, 460V, 480V, 60 Hz
	Frequency	50 / 60 Hz nominal
	Overload	150% of rated current for 1 min; 200% for 0.5 sec short term overload
	Max Frequency	400 Hz, 3/4 Hp to 40 Hp; 200 Hz, 50 Hp and above
	Carrier Freq	3/4 Hp to 40 Hp - 8 kHZ standard, 16 kHz optional with 30% current derating
		50 Hp and above - 4 kHZ standard, 8 kHz optional with 30% derating
CONTROL	**ITEM**	**DESCRIPTION**
Control Method	Sinusoidal PWM	V/Hz
		Sensorless Vector
		Field Oriented Vector with Digital Tachometer
		Field Oriented Vector with Sinusoidal Encoder
Operation	Methods	Digital / 120V Input

AD10 SPECIFICATIONS - CONTINUED

Reference Setting	Keypad	Increase or decrease speed or enter speed setpoints
	Analog	-10VDC o +10 VDC, 4-20 mA, 0-20 mA
	Configuration Tool	RS485 Standard
	Networks	Optional network cards
Acceleration Setting	Four Setting	0.0 - 10,000 seconds Independent Acc/Dec, selectable Linear or S-Curve (with adjustable S times)
	Ramp Control	Programmable Fast Stop, Freeze Ramp, Ramp Delay, Ramp Control
Speed Limiter		High and low values are presettable
Auto-Restart		Programmable
		Up to 99 restarts is available
Jog		Selectable with ot without ramp from keypad, terminals, or Bus
Tach Follower		Use the encoder input as a speed reference
Analog Control		Map the analog inputs for speed, current or PID reference control
Speed Ratio		A scalar multiplier of speed reference after the ramps for co-ordinated lines
Droop		Slow drive speed as a percentage of load or external signal for load sharing
Speed Up		Adjust the speed feedback for high inertia applications
Intertia Comp/loss comp		Inertia compensation and loss compensation for high performance process applications
Ramp 1 & 2		Two inputs for speed reference before the ramp(s)
Speed ref 1 & 2		Two inputs for speed reference after the ramp(s)
Speed zero logic		Adjustable zero speed detection and time delay
Dimension factor		Calibrate the drive speed reference to units other than RPM
Motor Autotune	Speed Tuning	Rotates motor on unconstrained load and tunes speed regulator
	Vector Tuning	Tunes current regulator without motor rotation; Flux and voltage regulators are selectable with or without rotation
Other Control Features	Test generators	Square wave generator with user config- urable offset, freq, and amplityde for regulator extra fine tuning
	DC braking	Configurable
	2nd motor parameters	Selection of a 2nd set of motor parameters for using the drive with 2 different motors
	Stop control	User configurable sequencing of the drive using enable, and start inputs
	Power loss stop control	During a power loss, use the motor energy to regenerate the DC bus and bring the motor to an orderly stop
	LINKS	Generic scaling blocks for user signal maniuplation
	PAD parameters	Virtual I/O for mapping drive I/O to the LAN, DGF, or links

REGULATORS	*ITEM*	*DESCRIPTION*
General Speed Regulation control	Speed zero gains	Separate zero speed regulator gains
	Adaptive speed gains	Speed regulator gains settable by a profile. The profile can be adjusted based on speed, or another analog signal.
	Enable speed regulator	Speed regulator can be disabled
Torque Regulation Control	Torque control	Output torque or load can be controlled by analog input signal, LAN, or appl. card
	Torque limits	Torque current limits can be controlled by analog input signal, LAN or appl. card

AD10 SPECIFICATIONS - CONTINUED

Flux Regulation Control	Constant Current	For operation up to rated motor speed
	Voltage Control	For operation above rated motor speed
	Output Voltage Level	Manual or automatic adjustment of flux level above rated speed
	Flux Regulator Gains	User tunable voltage regulator gains
	Voltage Regulator Gains	User tunable flux regulator gains
V/Hz Regulator	Resolution	0.001 Hz @ 50 Hz, 0.005 Hz @ 300 Hz
	Accuracy	0.3 times nominal motor slip
	Control Range	50:1
	Slip Compensation	For speed compensation dependent upon load
	Manual Voltage Boost	Adjust boost via a parameter
	Auto Voltage Boost	Boost is selected automatically from motor parameters
	V/f Shape	V/Hz relationship can be set to linear or three other non-linear modes
	Energy Save	Reduces losses of light loads
	Catch a Spinning Motor	Smoothly pick up a rotating motor without stopping and without DB
Sensorless Vector	Resolution	.002* nominal speed (spd ref resolution = 0.25 RPM)
	Accuracy	.3% @ nominal speed (1.3% @ 2% nominal speed)
	Control Range	50:1 to 2.5 * nominal speed
	Max bandwidth	100 rad/sec, 15.9 Hz
	Torque Reg Resolution	1000:1 (rpm)
	Rorque Reg Accuracy	Typically 5% using rotor resistance adaptation
	Torque Control Range	20:1
	Torque Min Response Time	.8 ms
	Torque Maximum Bandwidth	2.4 krad/sec, 380 Hz
	Rotor Resistance adaptation	Compensates for changes in rotor resistance due to heating
	Low speed factor	Adjusts drive output to increase torque at low speeds (<2%)
	Sensorless Speed Filter	Adjusts speed feedback on light load applications
	Flux Correction Factor	Adjust estimated rotor flux on high inertia or regen loads
	Distortion Voltage Compensation	Adjust current regulation for voltage distortions
Field oriented vector (Encoder Feedback)	Resolution	.5 rpm (spd ref resolution = .25 rpm)
	Accuracy	Typical 0.02%
	Control Range	> 1000:1
	Max bandwidth	300 rad/sec, 47 Hz
	Torque reg Resolution	1:1000
	Torque Reg Accuracy	Typically 5% using rotor resistance adaptation
	Torque Control Range	20:1
	Torque Min Response Time	.8 mSec
	Torque Maximum Bandwidth	2.4 krad/sec, 380 Hz
	Lock Zero Position	Holds the position of the shaft at zerospeed
	Index Storing	The C (index or marker) channel of the encoder can be used to accumulate pulses for positioning controls

AD10 SPECIFICATIONS - CONTINUED

Field oriented vector (sinusoidal encoder)	Resolution	.25 rpm (PPR > 1900), >.25 (PPR < 1900) [spd ref resolution = .25 rpm]
	Accuracy	Typically 0.01%
	Control RAnge	> 10000:1
	Max bandwidth	300 rad/sec, 47 Hz
	Torque Reg Resolution	1:1000
	Torque Reg Accuracy	Typically 5% using rotor resistance adaptation
	Torque Control Range	20:1
	Torque Min Response Time	0.8 mSec
	Torque Maximum Bandwidth	2.4 krad/sec, 380 Hz
	Lock Zero Position	Holds the position of the shaft at zerospeed
	Index Storing	The C (index or marker) channel of the encoder can be used to accumulate count for positioning controls

KEYPAD	*ITEM*	*DESCRIPTION*
	Adjustable Viewing Angle for optimal viewing	
	Backlit LCD Display	
	Tactile Keys for start, stop, increase speed, decrease speed, jog, menu navigation, alarm reset	

INDICATION	*ITEM*	*DESCRIPTION*
Operation Mode	LCD	Speed, Voltage, Current, Encoder, Power Output, Torque, Motor Flux, Frequency, Ramp References, Speed References, Torque References, PID Output, Heatsink Temperature, Regulator Card Temperature, Overload Time Status, Braking Overload Status, I/O Status
	Selections	Programmable in %, RPM, or user selectable units.
Configuration Mode	Parameters fully programmable while drive is not running	
	Tuning and control parameters are adjustable while running	
Trip Mode	Undervoltage	Selectable latched or unlatched fault DC link undervoltage
	Overvoltage	Selectable latched or unlatched fault DC link overvoltage
	Overcurrent	Selectable latched or unlatched fault
	Heatsink Sensor	Heatsink Temperature greater than preset temperature for over 10 seconds; fault can be latched or unlatched
	Heatsink Overtemp	Heatsink Temperature greater than preset temperature for over 1seconds (25 to 200 Hp)
	Regulation OT	Regulation card Temperature greater than preset temperature for over 10 secs; fault can be latched or unlatched
	Module OT	IGBT Module overtemperature (3/4 to 20 Hp)
	Motor Overtemp	Motor Overtemperature Temperature , user selects action: warning, drive disable, quick stop, stop, curr limit stop
	BU overload	Braking unit calculated overload, user selects action: warning, drive disable, quick stop, stop, curr limit stop
	Speed fdk loss	Loss of speed feedback. Fault can be enabled or disabled.
	Output Stages	Short circuit detected in motor output or braking unit, disable drive. Fault can be latched or unlatched.
	Opt2	DGF Card error. User selects action: warning, drive disable, quick stop, stop, current limit stop.
	Hw Opt1 failure	Option card error. User selects action: warning, drive disable, quick stop, stop, current limit stop.
	Bus loss	Loss of LAN communication. User selects action: warning, drive disable, quick stop, stop, current limit stop.

AD10 SPECIFICATIONS - CONTINUED

	External fault	External fault input open. User selects action: warning, drive disable, quick stop, stop, current limit stop.
	Enable seq err	Drive powered up with enable input on. Fault can be turned off for auto restart.
Faults	Failure Supply	24 VDC power supply failure
	Cur fdk loss	Loss of internal current feedback
	DSP error	Processor failure
Diagnostics	History	Trip history - past ten events (Trip and Warning) with relative time stamp

PROTECTION	*ITEM*	*DESCRIPTION*
Overload		Electronic overload automatically reduces current limit
Overvoltage		Detection of DC link circuit overvoltage (460V series - 800V)
Incoming Surge		Inverter protection from surge voltage input (Max. 1.2 x 50 usec 7KV peak)
Undervoltage		Detection of DC link circuit undervoltage (230V modes - 200V, 460V modes - 400V)
Overheating		Inverter overheating protection by temperature detection
Short Circuit		Short circuit protection for inverter output circuit
Motor Overload		Electronic thermal overload relay control
		Calculation of thermal time constant can be preset
DB Resistor Overheating		Internal electronic thermal overload relay control
Motor Overheating		Overheating detection thermistor input
Signal Loss		Detection of loss of analog input 1 when used as a 4-20mA input

TERMINAL FUNCTIONS	*ITEM*	*DESCRIPTION*
Main Circuit		
Power Input	U1/L1, V1/L2, W1/L3	Three phase power source connections
Inverter Output	U2/T1, V2/T2, W2/T3	Three phase induction motor connections
DC input/output	C(+), D(-)	Access to the DC link for common DC bus, or external DB modules
Braking Unit	C (+), BR1(-)	Connections for the braking resistor - 3/4-20 Hp, 25-60 HP when ordered
Ground	PE1	Ground terminal for inverter chassis (housing)
Communication port	RS485	RS485 multi drop communication port for PC tools
	Std connector	Connection is through the standard DB9 pin connector

2.0 INSTALLATION

2.1 INSTALLATION MOUNTING CLEARANCE

NOTE! The dimensions and weights specifed in this manual should be taken into consideration when the device is mounted. The technical equipment required (carriage or crane for large weights) should be used. Improper handling and the use of unsuitable tools may cause damage.

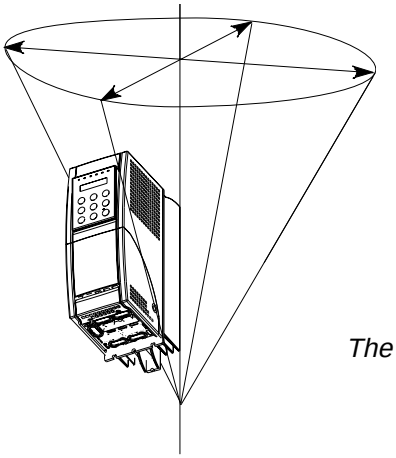


Figure 5: Maximum Angle of Inclination

The maximum angle of inclination is 30°.

NOTE! The Drives must be mounted in such a way that the free flow of air is ensured. The clearance to the device must be at least 150 mm (6 inches). On size 4200 the top and bottom clearance must be at least 380 mm (15 inches), on front and sides must be ensured a space of at least 140 mm (5.5 inches). Devices that generate a large amount of heat must not be mounted in the direct vicinity of the frequency inverter.

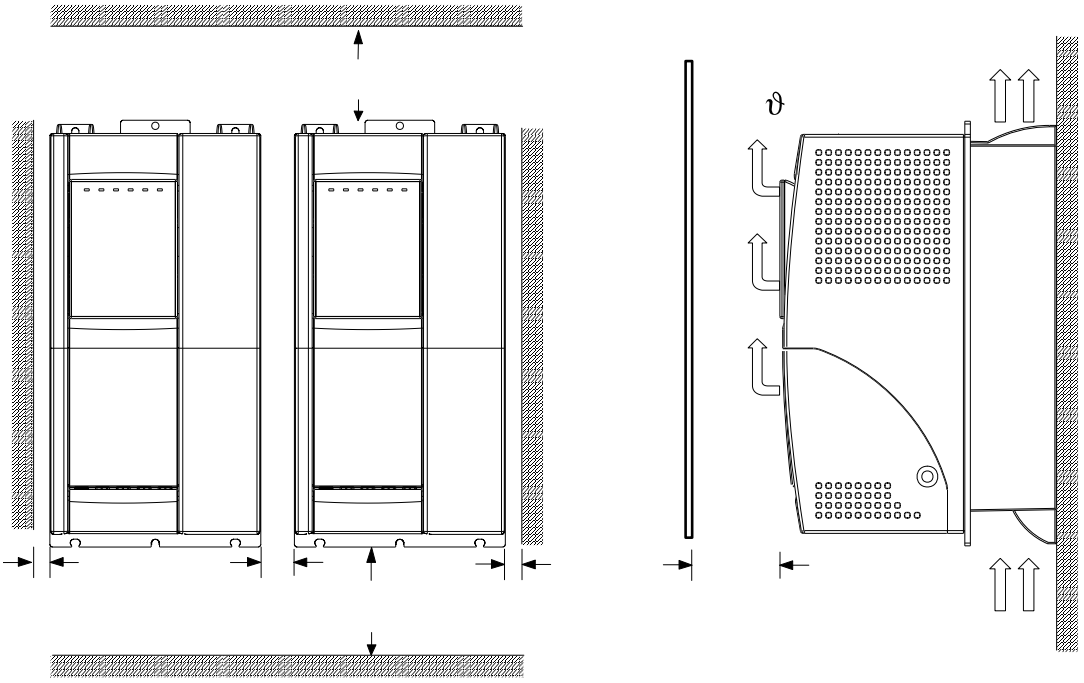


Figure 6: Mounting Clearance

NOTE! Fastening screws should be re-tightened after a few days of operation.

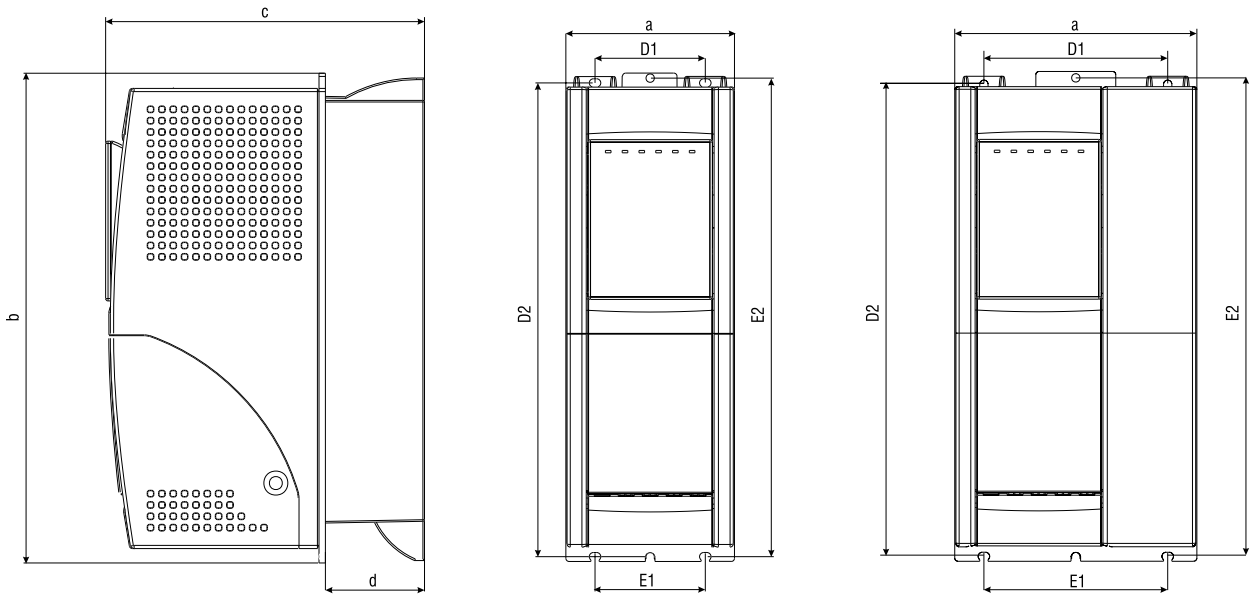


Figure 7: Drive dimensions (sizes 3/4 HP to 20 HP)

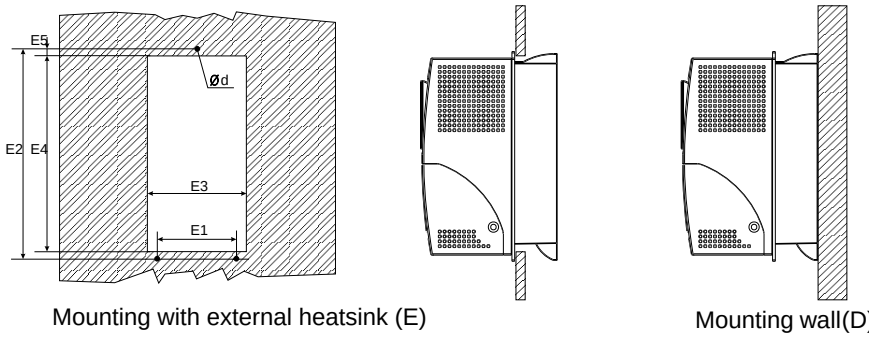


Figure 8: Mounting methods (sizes 3/4 HP to 20 HP)

HP		3/4	1	2	3	5	7.5	10	15	20
Drive dimensions:										
a	mm (inch)	105.5 (4.1)				151.5(5.9)			208(8.2)	
b	mm (inch)	306.5 (12.0)							323 (12.7)	
c	mm (inch)	199.5 (7.8)							240 (9.5)	
d	mm (inch)	62(2.4)							84 (3.3)	
D1	mm (inch)	69(2.7)				115(4.5)			168 (6.6)	
D2	mm (inch)	296.5 (11.6)							310.5 (12.2)	
E1	mm (inch)	69(2.7)				115(4.5)			164 (6.5)	
E2	mm (inch)	299.5 (11.7)							315 (12.4)	
E3	mm (inch)	99.5(3.9)				145.5(5.7)			199(7.8)	
E4	mm (inch)	284(11.2)							299.5 (11.8)	
E5	mm (inch)	9 (0.35)								
Ø d		M5								
Weight	kg (lbs)	3.5(7.7)	3.6(7.9)	3.7(8.1)		4.95 (10.9)			8.6 (19)	

Table 3: Drive dimensions and weights (sizes 3/4 HP to 20 HP)

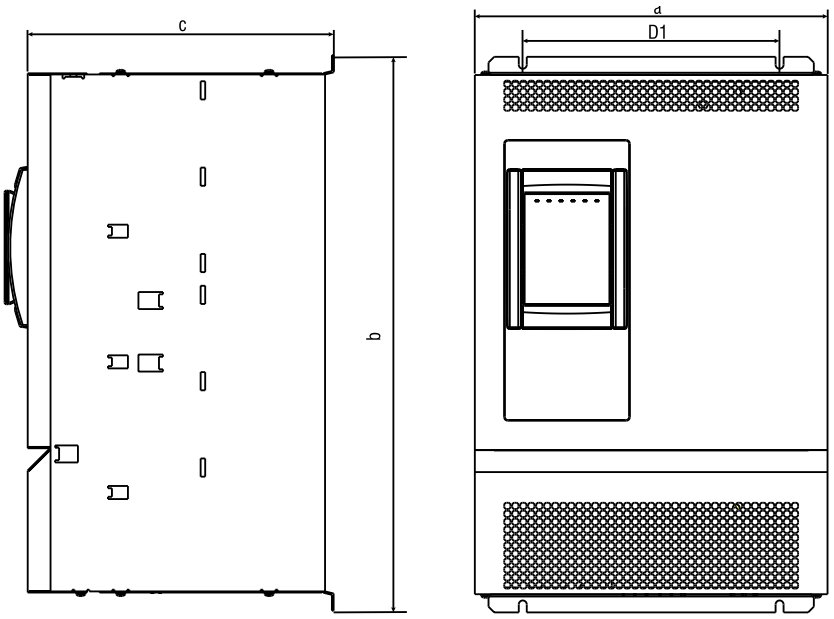


Figure 9: Drive dimensions (sizes 25 HP to 200 HP)

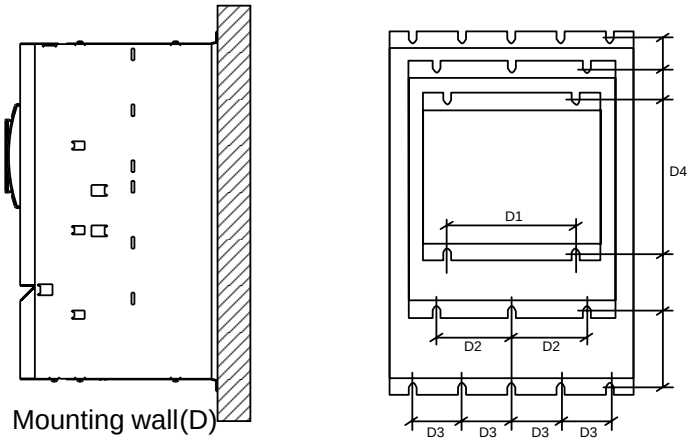


Figure 10: Mounting methods (sizes 25 HP to 200 HP)

HP		25	30	40	50	60	75	100	125	150	200
Drive dimensions:											
a	mm (inch)	309(12.1)			376(14.7)		509(20)				
b	mm (inch)	489(19.2)			564(22.2)		741(29.2)	909(35.8)			1095(43.1)
c	mm (inch)	268(10.5)	308(12.1)				297.5(11.7)				442(17.4)
D1	mm (inch)	225(8.8)									
D2	mm (inch)				150(5.9)						
D3	mm (inch)						100(3.9)				
D4	mm (inch)	475(18.7)			550(21.6)		725(28.5)	891(35)			1077(42.4)
Ø		M6									
Weight	**kg**	18	22	22.2	34	34	59	75.4	80.2	86.5	105
	lbs	39.6	48.5	48.9	74.9	74.9	130	166.1	176.7	190.6	231.4

Table 4: Drive dimensions and weights (sizes 25 HP to 200 HP)

2.2 WATTS LOSS, HEAT DISSIPATION, INTERNAL FANS AND MINIMUM CABINET OPENING SUGGESTED FOR COOLING

The heat dissipation of the Drives depends on the operating state of the connected motor. The table below shows values that refer to operation at default switching frequency (refers to the use of a standard 4 poles motor with a rated voltage equal to the rated voltage of the input supply), Tamb = 40°C , typ. motor power factor and nominal continuous current.

Type		4F75	4001	4002	4003	4005	4007	4010	4015	4020	4025	4030	4040	4050	4060	4075	4100	4125	4150	4200
P_V Heat dissipation:																				
@U_{LN}=400Vac [1]	[W]	48.2	77.5	104.0	138.3	179.5	233.6	327.4	373	512	658	864	1100	1250	1580	1950	2440	2850	3400	4400
@U_{LN}=460Vac [1]	[W]	45.0	72.0	96.3	126.7	164.1	215.6	300.8	340	468	582	780	1000	1100	1390	1750	2200	2560	3050	3950
[1] f_{SW}=default; I_2=I_{2N}																				
Airflow of fan:																				
Internal fan	[m^3/h]	11	11	11	11	11	11	11	30	30										
Heatsink fans	[m^3/h]	-	30	30	30	2x30	2x30	2x30	2x79	2x79	80	170		340		650	975			1820

Table 5: Heat Dissipation and Required Air Flow (4F75 to 4200 Sizes)

Type		4250	4300	4350	4400	4450	4500	4600	4700	4800
Watts Loss (variable torque)	[watts]	5040	5508	6426	7344	8262	9158	10989	12821	14652
Watts Loss (constant torque)	[watts]	3286	3723	4344	4964	5585	6152	7382	8613	9843
Air flow of fan:										
- Heatsink fans	[cfm]	600			1200			2400		
	[m^3/h]	1020			2040			4080		
		14x20			14x20x2			n.a.		

Table 6: Heat Dissipation and Required Air Flow (4250 to 4800 Sizes)

NOTE! All AD10 drives have internal fans.
Heat dissipation losses refer to default switching frequency.

3.0 WIRING

3.1 GENERAL GUIDELINES

1. Do not connect or disconnect any wiring while power is on.
2. Do not connect a phase-advancing capacitor or an LC/RC noise filter to the output of the AD10.
3. Be sure to install fusing or MCCB's between the AC main supply and the AD10, to protect the wiring.
4. Do not connect a magnetic starter or contactor to the output circuit for the purpose of starting and stopping the AD10.
5. Ensure that the power wiring and control wiring are separated.
6. Ensure that ALL low voltage control wiring, as well as Encoder wiring, is twisted pair, shielded type.
7. Ensure that all inductive loads (i.e. contactors, relays, magnetic valves, solenoids, etc.) have RC surge absorbers connected.
8. Never connect 120V user input directly to the control board terminals. The 120V user input should be connected to the 120V I/F option card (See pg.16).
9. Observe NEC codes as well as local wiring codes.
10. When using a ground fault interrupter, select one that is not affected by high frequency.
11. Ensure proper grounding resistance. 230V class: 100 Ohms or less/ 460V class 10 Ohms or less.
12. Never ground the AD10 in common with welding machines, motors, or other high current electrical equipment.
13. When using several AD10 units side by side, ground the units as shown below.

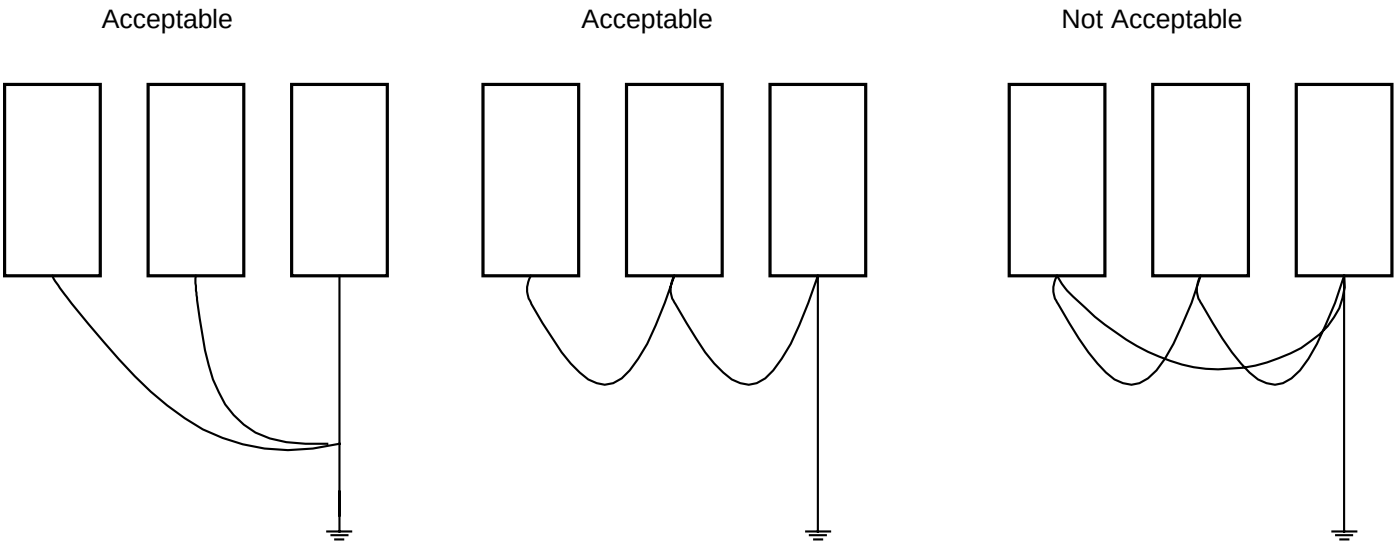


Figure 11

3.2 STANDARD AD10 CONNECTION DIAGRAM

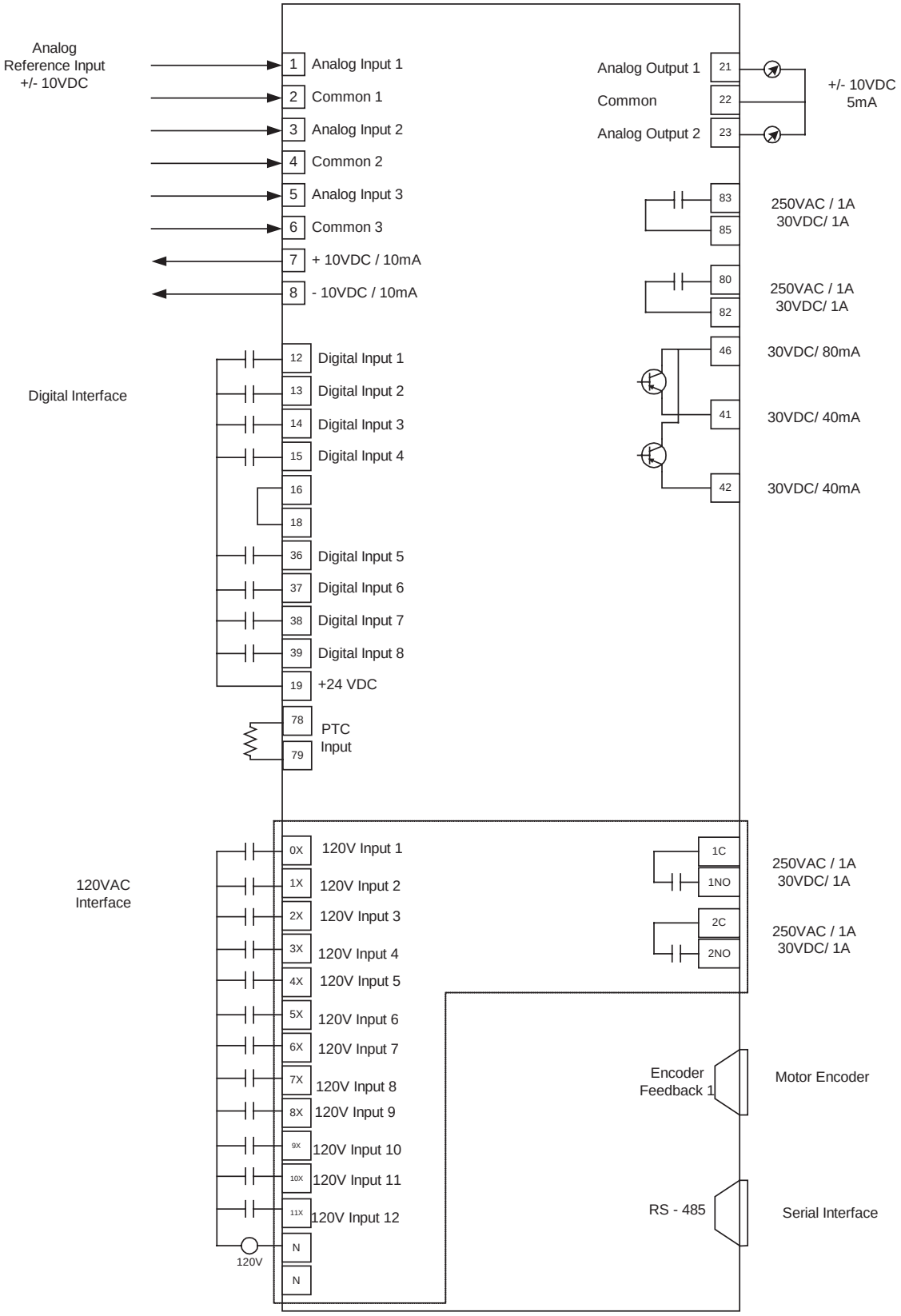
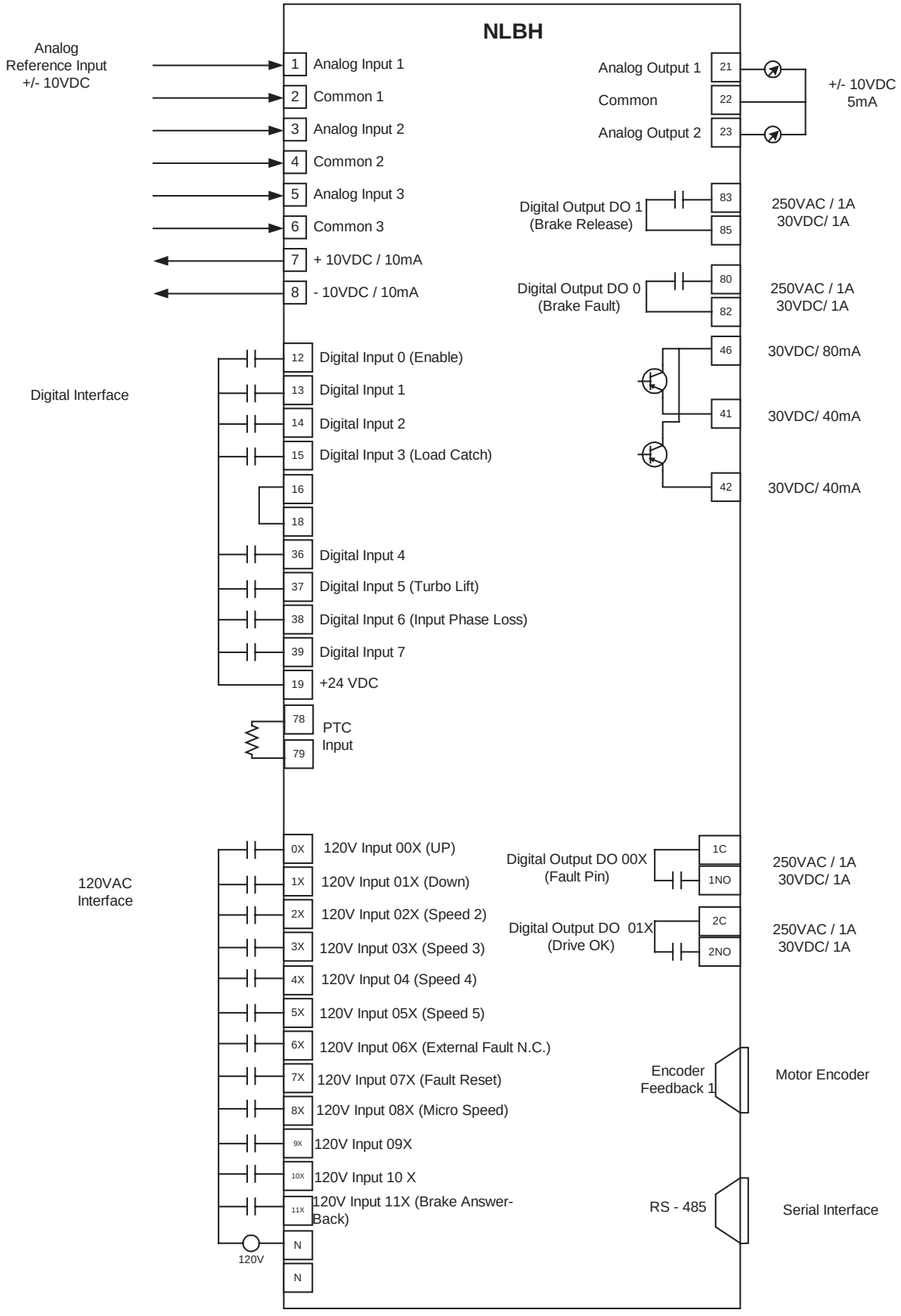
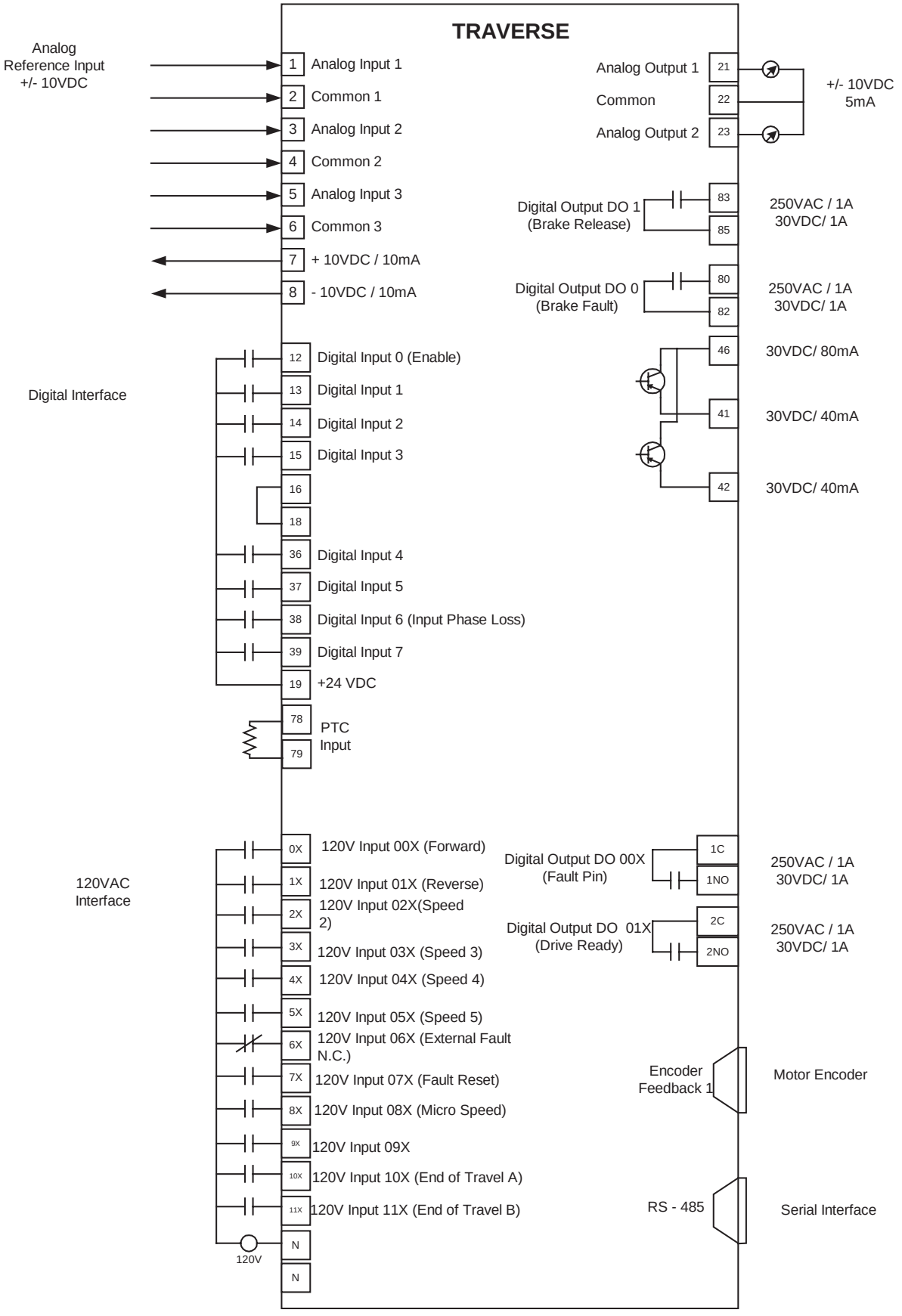
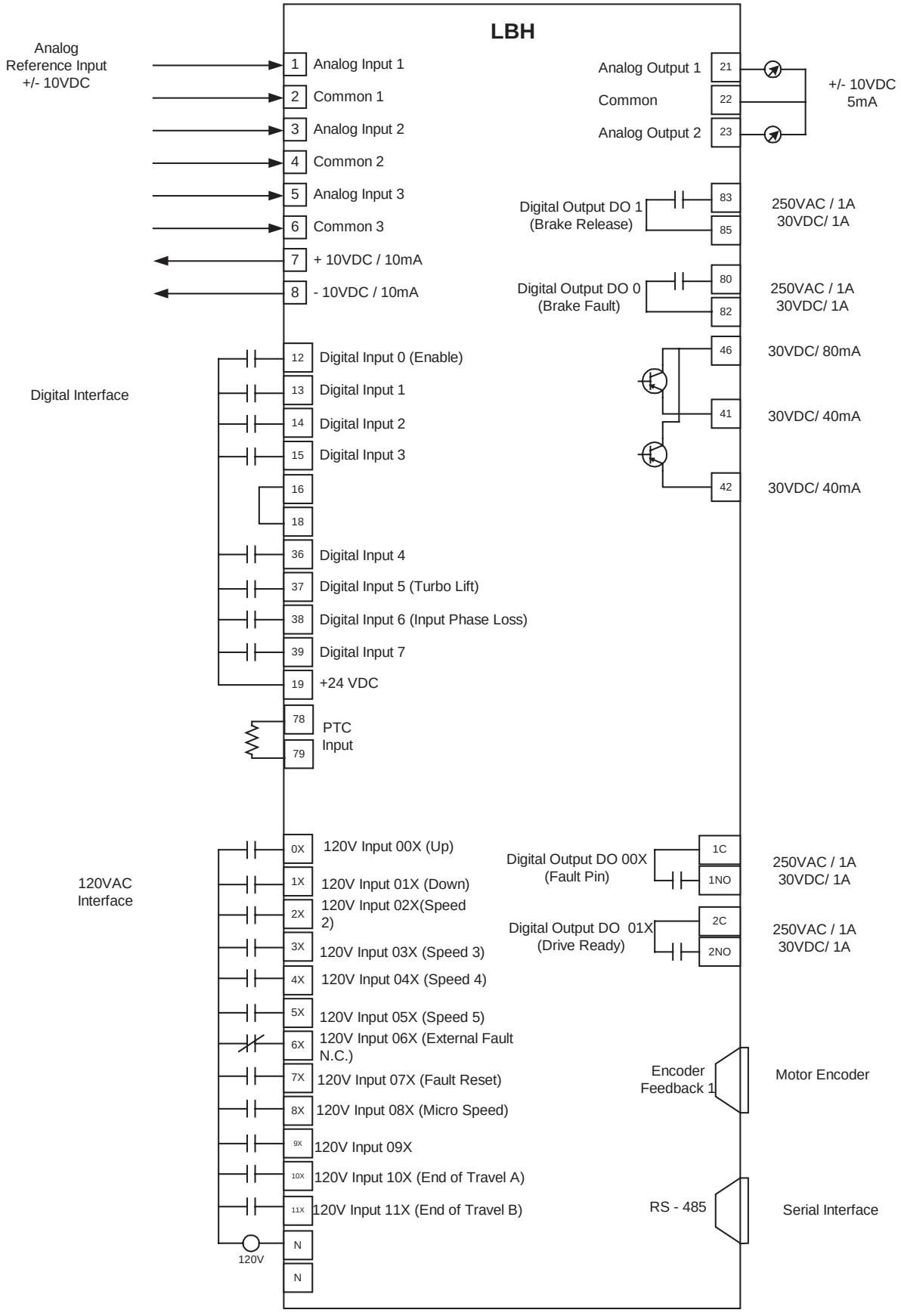


Figure 12




TRAVERSE
Analog Reference Input +/- 10VDC
1 Analog Input 1
2 Common 1
3 Analog Input 2
4 Common 2
5 Analog Input 3
6 Common 3
7 + 10VDC / 10mA
8 - 10VDC / 10mA
Analog Output 1 21
Common 22
Analog Output 2 23
+/- 10VDC 5mA
Digital Output DO 1 (Brake Release)
83
85
250VAC / 1A 30VDC/ 1A
Digital Output DO 0 (Brake Fault)
80
82
250VAC / 1A 30VDC/ 1A
46
30VDC/ 80mA
41
30VDC/ 40mA
42
30VDC/ 40mA
Digital Interface
12 Digital Input 0 (Enable)
13 Digital Input 1
14 Digital Input 2
15 Digital Input 3
16
18
36 Digital Input 4
37 Digital Input 5
38 Digital Input 6 (Input Phase Loss)
39 Digital Input 7
19 +24 VDC
78
79
PTC Input
120VAC Interface
0X 120V Input 00X (Forward)
1X 120V Input 01X (Reverse)
2X 120V Input 02X(Speed 2)
3X 120V Input 03X (Speed 3)
4X 120V Input 04X (Speed 4)
5X 120V Input 05X (Speed 5)
6X 120V Input 06X (External Fault N.C.)
7X 120V Input 07X (Fault Reset)
8X 120V Input 08X (Micro Speed)
9X 120V Input 09X
10X 120V Input 10X (End of Travel A)
11X 120V Input 11X (End of Travel B)
N
N
120V
Digital Output DO 00X (Fault Pin)
1C
1NO
250VAC / 1A 30VDC/ 1A
Digital Output DO 01X (Drive Ready)
2C
2NO
250VAC / 1A 30VDC/ 1A
Encoder Feedback 1
Motor Encoder
RS - 485
Serial Interface



3.3 AD10 OPTION CARD LOCATIONS

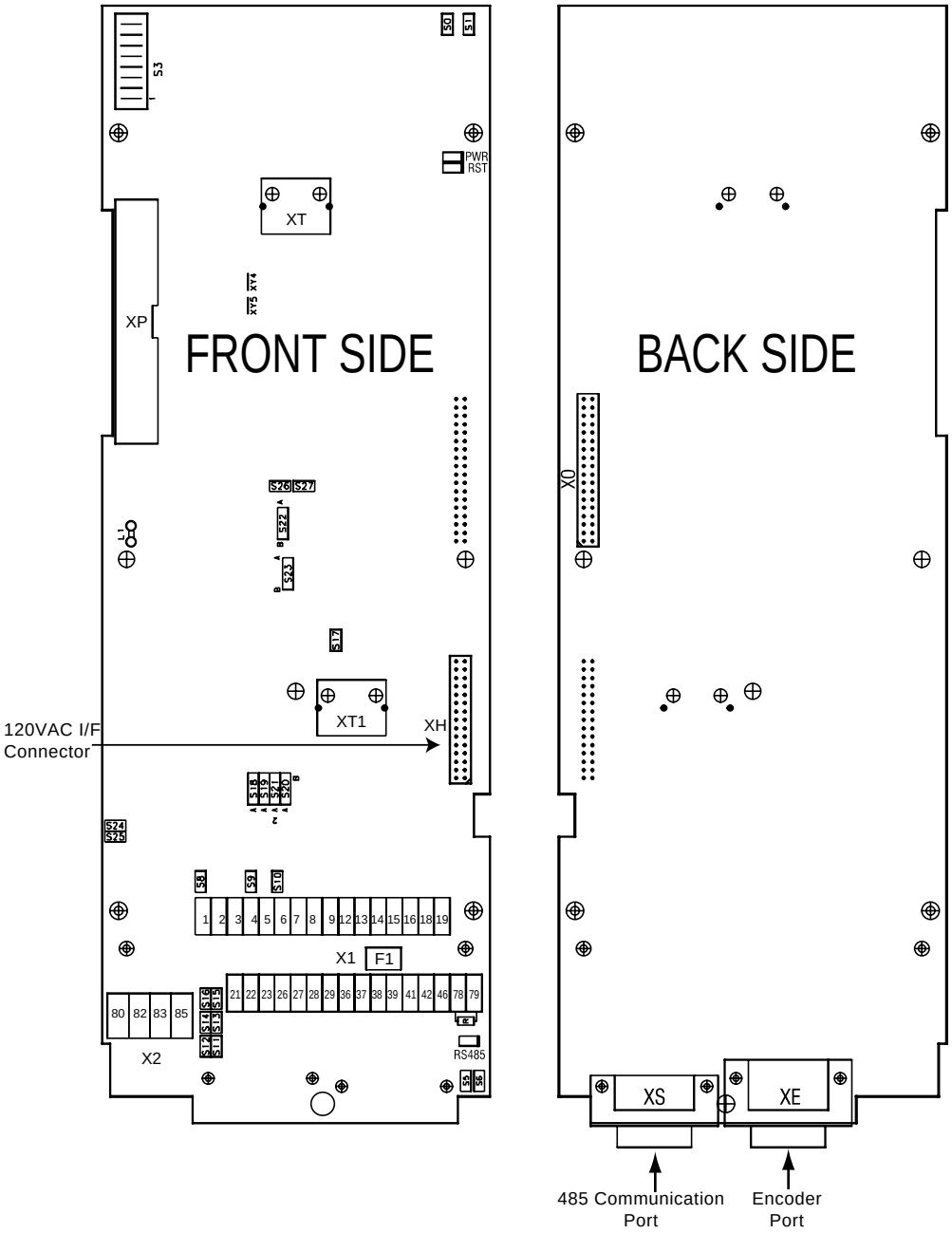


Figure 13

NOTE! The 120V I/F card is mounted as standard for both “F” and “FH” series units.

3.4 ENCODER TERMINALS (XE CONNECTOR)

Designation	Function	I/Q	max.voltage	max.current
PIN 1	Channel B- For B- digital or B- COS incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 2	-			
PIN 3	Channel C+ For C+ digital or analog zero pulse or index	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 4	Channel C- For C- digital or analog zero pulse or index	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 5	Channel A+ For A+ digital or A+ SIN incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 6	Channel A- For A- digital or A- SIN incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 7	Reference point for +5V encoder supply voltage	Q	–	–
PIN 8	Channel B+ For B+ digital or B+ COS incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 9	+5V encoder supply voltage	Q	+5 V	200 mA
PIN 10	Channel E+ For E+ digital commutation or SIN+ absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 11	Channel E- For E- digital commutation or SIN- absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 12	Channel F+ For F+ digital commutation or COS+ absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 13	Channel F- For F- digital commutation or COS- absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 14	Channel G+ For G+ digital commutation signal	I	5 V digital or 1 V pp analog	10 mA digital
PIN 15	Channel G- For G- digital commutation signal	I	5 V digital or 1 V pp analog	10 mA digital

Figure 14

Encoder feedback from the motor shaft is required for NLB Hoist applications. The encoder wiring to the AD10 should follow the above diagram (C channel not required).

1. Direct coupling of the encoder to the motor shaft is required, if unable to direct connect the encoder, contact your CRANEtrol Representative.
2. Do not connect the encoder to the low speed shaft of a speed reducer.
3. Use twisted pair, shielded cable separated from ANY high voltage wiring. Separate conduit for the encoder wiring is recommended.

3.5 AD10 120V I/F CARD WIRING

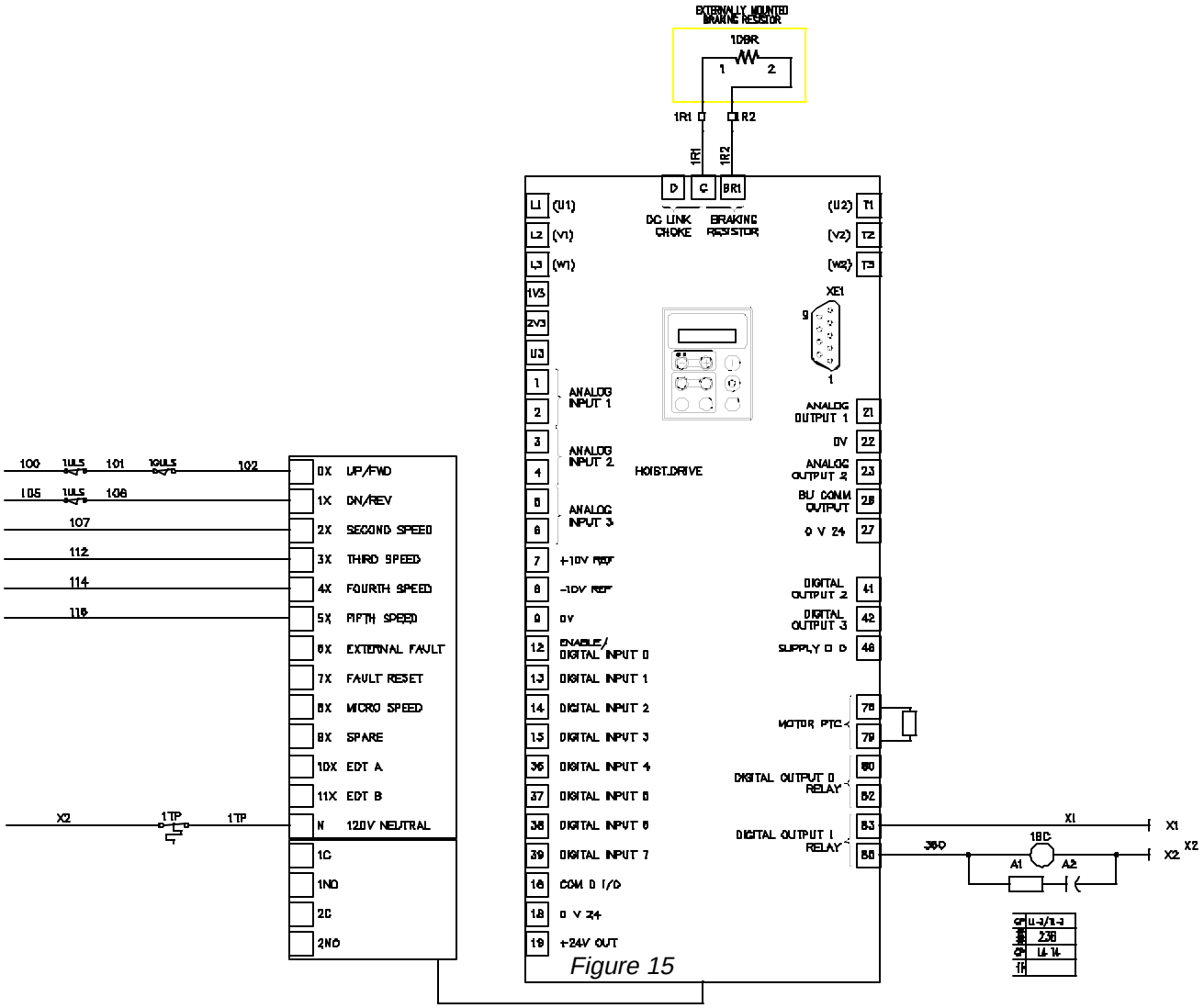


Figure 15

The 120V I/F card is required for use with 120VAC input logic control. The 120V I/F card mounts directly to the main control card on connector “XH”. The above diagram represents a typical 5 step speed interconnection(factory default). Refer to custom functions for other speed control options, and for more information on the multifunction input functions. The speed control method determines how many multifunction input are available to you. For example, if you choose 3 step I/V speed control, terminals OX thru 3X are dedicated for the speed control inputs and leaves terminals 4X thru 11X available for multifunction programming.

3.6 AD10 DYNAMIC BRAKING WIRING

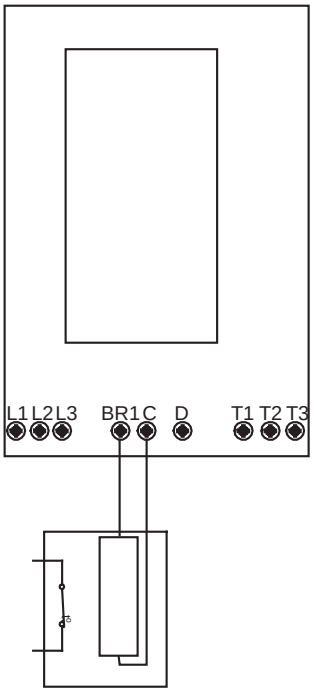


Figure 16:
AD10 Dynamic Braking Wiring

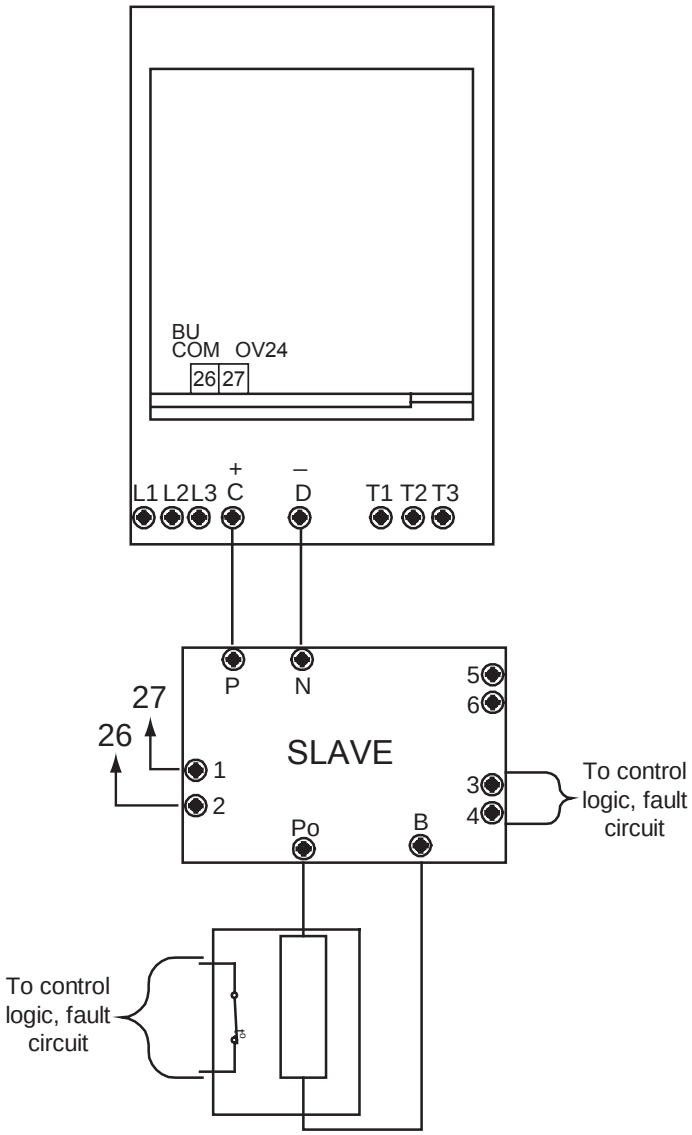


Figure 17: AD10 External Braking Module

Note!

The AD10 unit has a built in DB transistor, for models 4F75 thru 4060. Generally, these units only require an external DB resistor to be connected to terminals C and BR1. However, when an external DB module is used, the DB module should be connected per Fig. 17.

In either case a thermistor should be used to protect the resistor and disconnect main power to the unit. If an external DB module is used, the Fault output (term. 3 and 4) in the module should be wired in series with the thermistor, to disconnect power to the unit if either the DB module or the DB resistor fail.

3.7 AD10 MULTIPLE DYNAMIC BRAKE MODULE WIRING

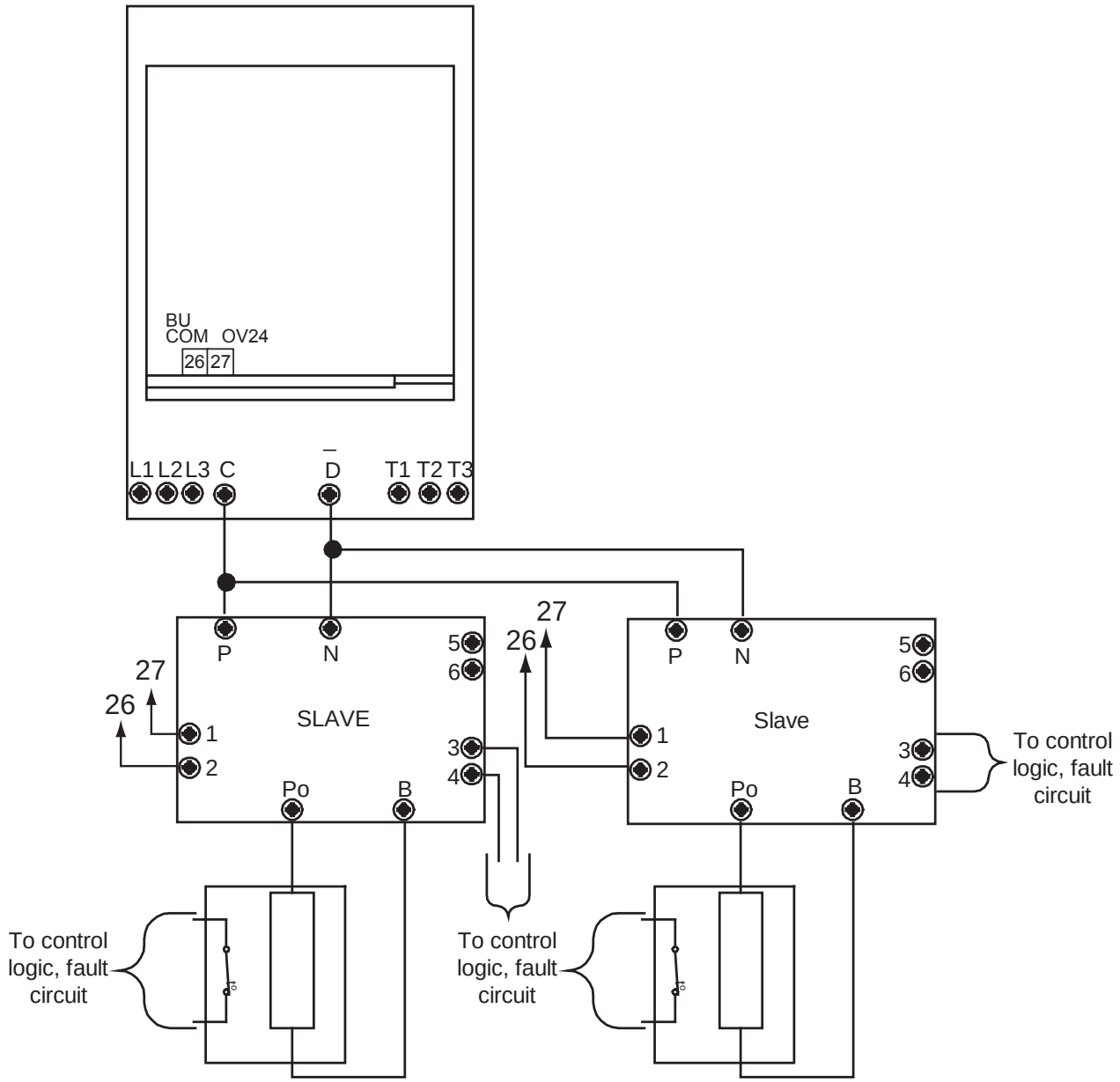


Figure 18

Note!

When connecting multiple SDBU's in parallel, ensure that the first SDBU is set up as the Master unit and the following SDBU's are set up as slave units.

3.8 SDBU TERMINAL DIAGRAM

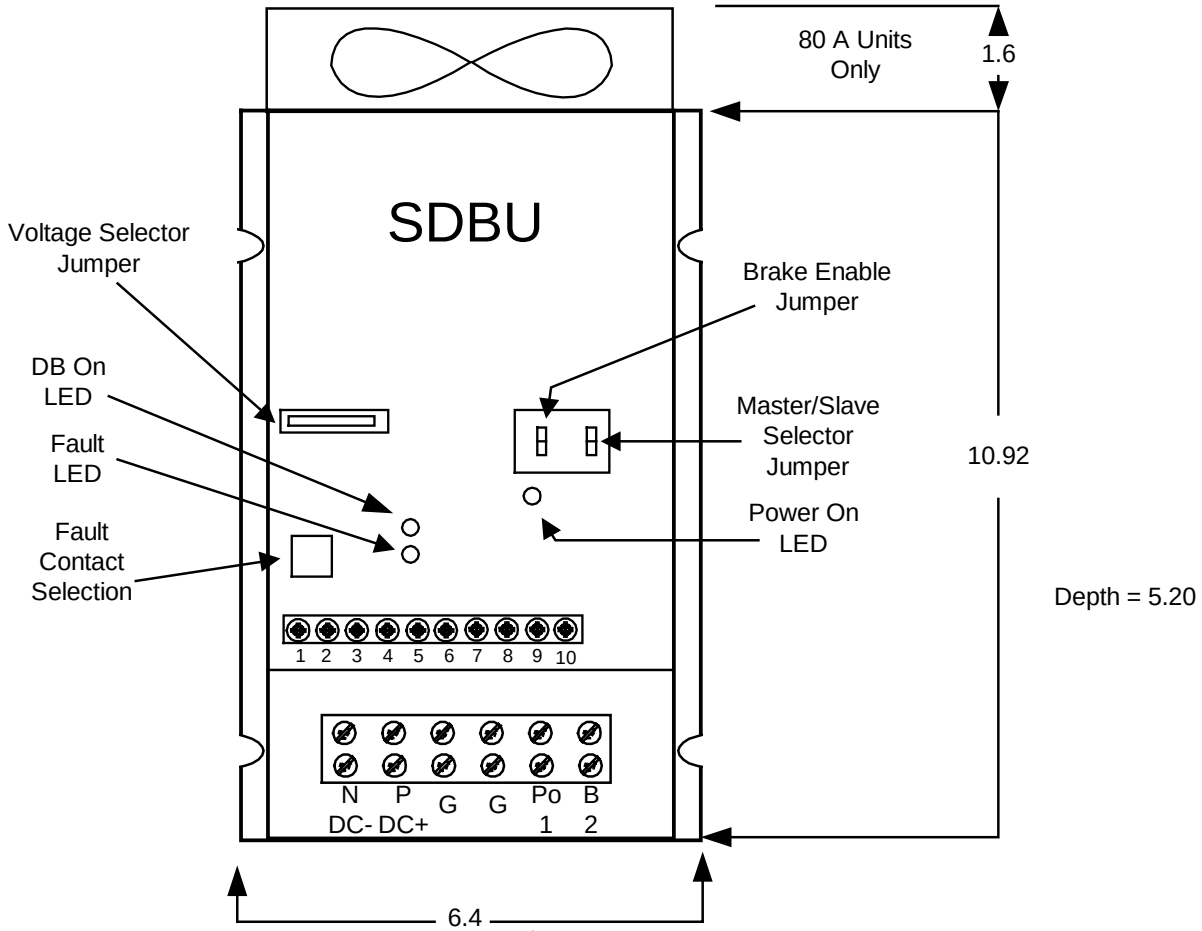


Figure 19

Terminal Number	Description
N (DC-)	Negative Power Connection from VG5 DC Bus.
P (DC+)	Positive Power Connection from VG5 DC Bus.
G	Ground
Po (1)	Output Power to DB Resistor
B (2)	Output Power to DB Resistor
1	Slave Input (+)
2	Slave Input (-)
3	Fault Output(N.O. or N.C. Selectable)
4	Fault Output(Common)
5	Master Output (+)
6	Master Output (-)
7	Isolated Input (+)
8	Isolated Input (-)
9	120VAC Fan/ Brake Enable
10	120VAC Fan/ Brake Enable

Table 7: SDBU Terminal Description

3.9 SDBU SETTINGS AND LED INDICATORS

Jumpers	200V Class	400V Class	575V Class
JP1	-	380V	-
JP2	200V	400V	500V
JP3	208V	415V	-
JP4	220V	440V	-
JP5	230V	460V	575V

Table 8: Voltage Level Jumpers - JP1 - JP5

Brake Enable Selection - JP6

This function is used to select the SDBU enable safety feature. If the AD10 is not running, but power is applied, the input supply voltage could rise and trigger the SDBU module on. In this situation, the SDBU would be on 100% of the time, and may cause overheating or failure of the DB resistors. This safety enable function allows you to enable the SDBU while running and disable it while idle. Please see page 28 for SDBU recommended control wiring.
JP6 - Upper Position = Enabled
JP6 - Lower Position = Disabled

Master/Slave Selection - JP7

This function allows the configuration setting of the SDBU. In single SDBU module applications, the module is always set as the Master. In multiple SDBU applications the module closest to the AD10 is set as the Master, and the remaining modules are set as the Slave module.

Power On LED - DS1

This LED verifies that DC voltage is present on terminals N (DC-) and P (DC+).

Brake On LED - DS2

This LED indicates that the SDBU unit is active (braking).

Fault LED - DS3

This LED indicates a SDBU fault.

4.0 PROGRAMMING

4.1 KEYPAD OPERATION

The keypad (Fig. 20) is made of a LCD display with two 16-digit lines, seven LEDs and nine function keys. It is used:
- to start and stop the drive (this function can be disabled)
- to increase/decrease speed and jog
- to display the speed, voltage, diagnostics etc. during the operation
- to set parameters and enter commands

The LED module is made of 6 LEDs. It is used to display status and diagnostic information during the operation. Keypad and LED module can be installed or removed also while the drive is running.

Figure 20: Keypad

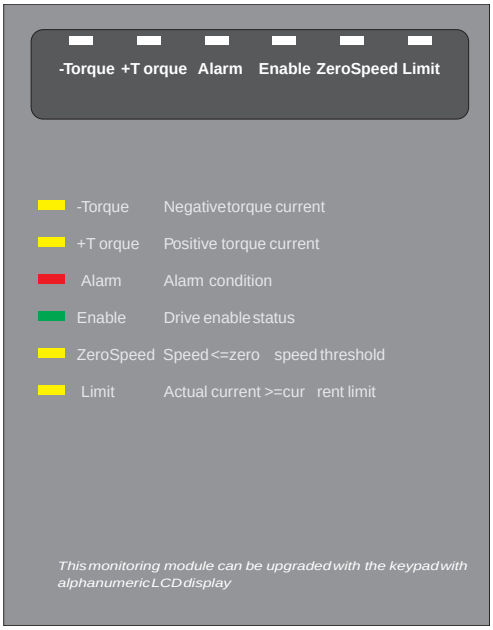


Figure 21: LED Module

Note! A replacement keypad cable longer than 20 cm must be shielded.

4.1.1 LEDs & Keys

The LEDs present on the keypad are used to quickly diagnose the operating state of the drive.

Designation	Color	Function
-Torque	yellow	the LED is lit when the drive operates with a negative torque
+T orque	yellow	the LED is lit when the drive operates with a positive torque
ALARM	red	the LED is lit when the drive signals a trip
ENABLE	green	the LED is lit when the drive is enabled
Zero speed	yellow	the LED is lit when motor speed is zero
Limit	yellow	the LED is lit when the drive operates at a current limit
Shift	yellow	the LED is lit when the keypad second functions are enabled

ts030g

Table 9

Control keys	Text reference	Function
	[START]	START key commands the Drive to the Enable (***Stop mode***= off) and Run state. When ***IO keys mode***= Disabled the key is not active. ***Command select***= I O key
	[STOP]	STOP key commands to stop the Drive from the Run state. (***Command select***= I O key) **Warning** this may have safety critical impact. It is suggested not to change the default setting. Pressing this button for 2 sec, the drive will be disabled. Stop key also resets the sequencer after an alarm event
	[Increase] / [Jog]	Plus key increases the speed reference for Motor pot function. After pressing shift key , holding this key causes the drive to Jog (default direction = forward = CW)
	[Decrease] / [Rotation control]	Minus key decreases the speed reference for Motor pot function. After pressing shift key , this key toggles motor rotation direction in Jog mode and Motor pot function.
	[Down arrow] / [Help]	Used to scroll down menu items in menu navigation, picklists in selectors, or digit values in numeric editing. After pressing shift key , an item-specific information menu is entered when applicable. Help menu can be browsed with up/down arrows. Left arrow returns to normal mode.
	[Up arrow] / [Alarm]	Used to scroll up menu items in menu navigation, picklists in selectors, or digit values in numeric editing. After pressing Shift key , the Alarm list display mode is entered. Active alarms and Alarms pending for acknowledge can be browsed with up/downs arrows. Alarms can be acknowledged whit the Enter key. Left arrow returns to normal mode.
	[Left arrow] / [Escape]	Used to go up one level in menu navigation; to scroll digits in numeric edit mode, to return to normal mode from alarm list or help modes. After pressing shift key , it is used to Escape out of numeric edit or selection with no change.
	[Enter] / [Home]	Used to go down one level in menu navigation; to enter Selections or numeric values after editing, to issue commands, to acknowledge alarms in the Alarm list mode. Home second function is not implemented.
	[Shift]	Shift button enables the keypad second functions (Rotation control, Jog, Help, Alarm, Escape, Home)

Table 10: Control keys description

4.1.2 Power Up

Power up the drive.
The drive will begin a self test and initialization procedure which will take approximately 10 seconds. During this period, the display will cycle through various indications.
During this process, the below message will appear on the display and all LED's will simultaneously blink one time:

Figure 22

NOTE! During this operation "Drive OK" relay (teminals 80-82 on regulation board) is not active. The self test and initialization must be complete before the status of the relay is correct.

After the **30 seconds,** the keypad will display the following:

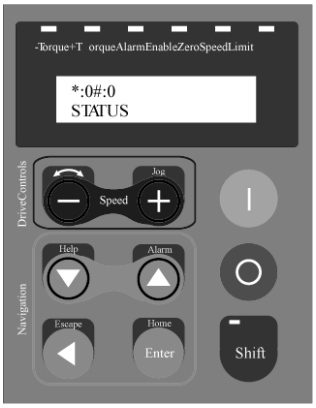


Figure 23

The field indicated by the "*:" is used to show the Ramp reference value (**Ramp out mon**) once the motor is running.
The field indicated by the "#:" is used to show the motor speed in RPM (**Norm speed**) once the motor is running.

Note! If the drive is connected to a 230V input, the red "Alarm" LED will blink indicating an UNDER-VOLTAGE condition since the drive is factory configured for 460V. Proceed to the Drive initial setup procedure in section 4.2.1 for instructions on completing the configuration and startup.

4.1.3 Moving Inside a Menu

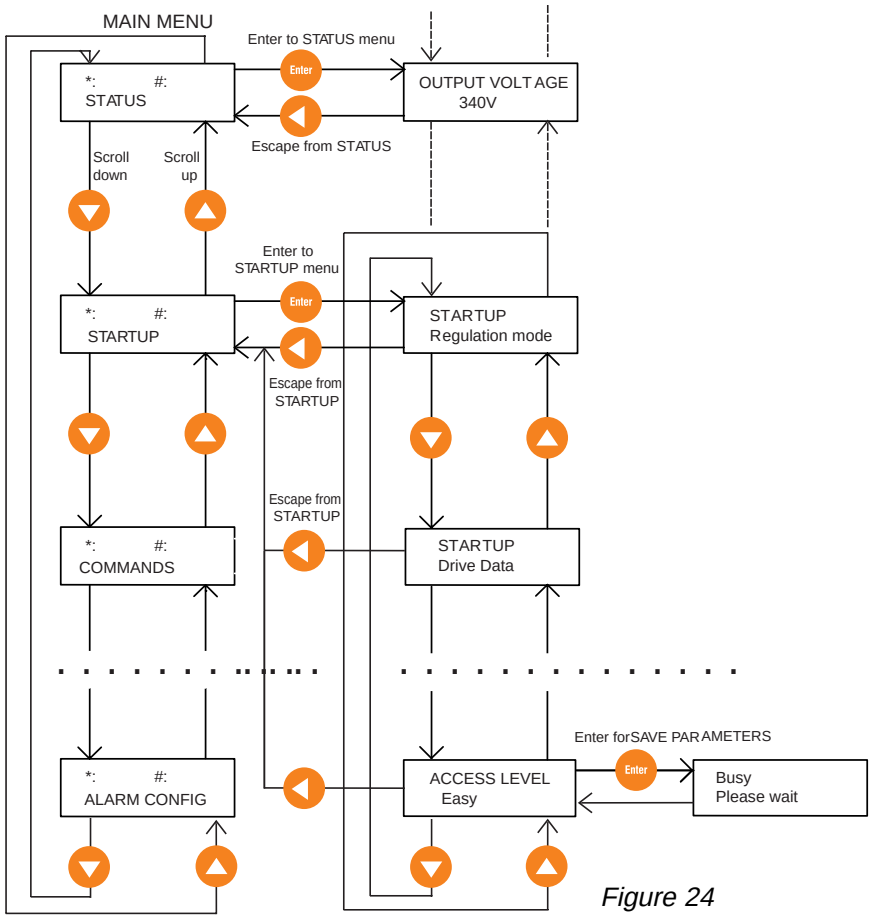


Figure 24

4.1.4 Using Keypad Help (Help is not available for some menu entries)

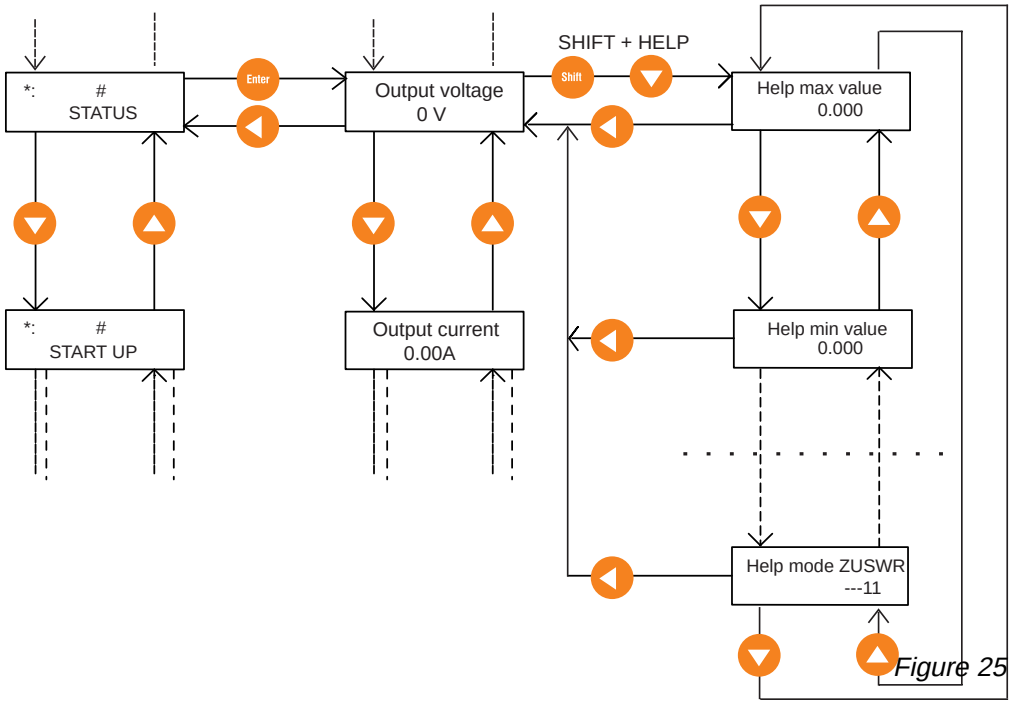


Figure 25

4.1.5 Using Keypad Alarm List

When the red “Alarm” LED blinks, it is indicating one (or more) alarm conditions.
See following steps to reset it:

1) Press Shift + Alarm
   The “Alarm list” will be displayed.

2) Press Enter
   Press Enter one or more times untill “Sequencer” message appears, to acknowledge the alarms.

   NOTE! If the alarm is still active, red LED will blink again. If it not active, red LED will stop.

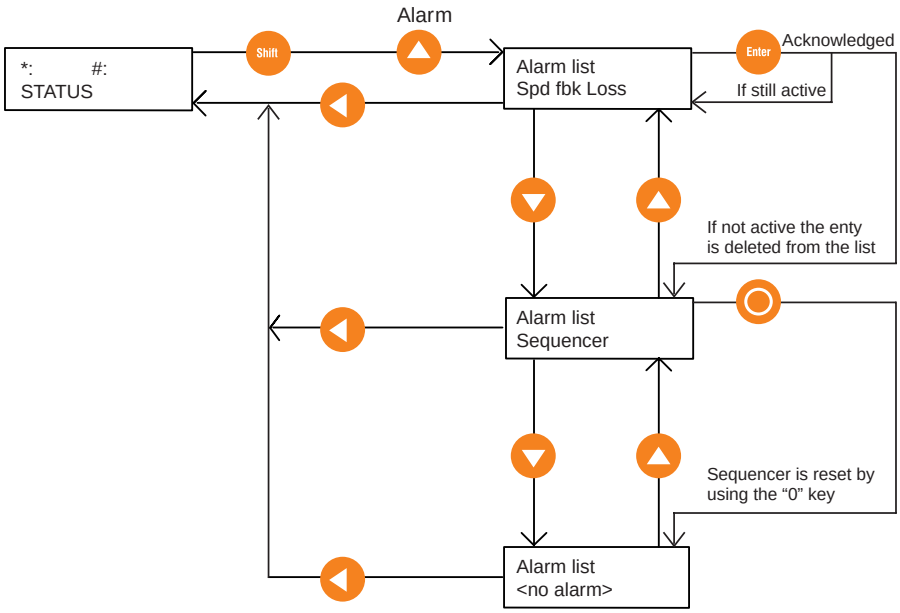


Figure 26

3) Press [O] key to reset the Sequencer.
   The Alarm List shows all the occurred alarms, both if they are due to protections and to errors when limit values are exceeded.
   In order to disappear from the alarm list, alarm have to be acknowledged. The acknowledgement is possible only if the alarm is no longer active. The alarms are automatically acknowledged after two minutes.

   Note!
   Pressing Enter will acknowledge the alarm. Acknowledging the alarm will only remove it from the active alarm list. If the alarm condition also resulted in a drive trip, the sequence will also need to be reset. This can be done by pressing the [O] key. The drive cannot be re-enabled or started after a trip condition unless the drive sequencer is reset.

The drive State Machine controls the drive running and starting, accounting for protection & alarming, command sequence and reset status.

The table below displays various operation states by Sequencer status number:

Sequencer Status	State
1	Magnetization running
2	Magnetization completed, Stop
3	Start
4	Fast stop, Stop
5	Fast stop, Start
9	No alarm, drive is ready to accept all commands
10	Magnetization running and Start command already present
12	Alarm active
16	Alarm not active, waiting for reset

Table 11: Sequencer Status

To read the sequencer status of the State Machine, go to menu:

*: #: STATUS	Enter	Output voltage OV	Up 3 times to	STATUS Advanced status

Press Enter:

DC link voltage 580V	Up 3 times to	Sequencer status 12

4.1.6 Drive Menu - Main Level

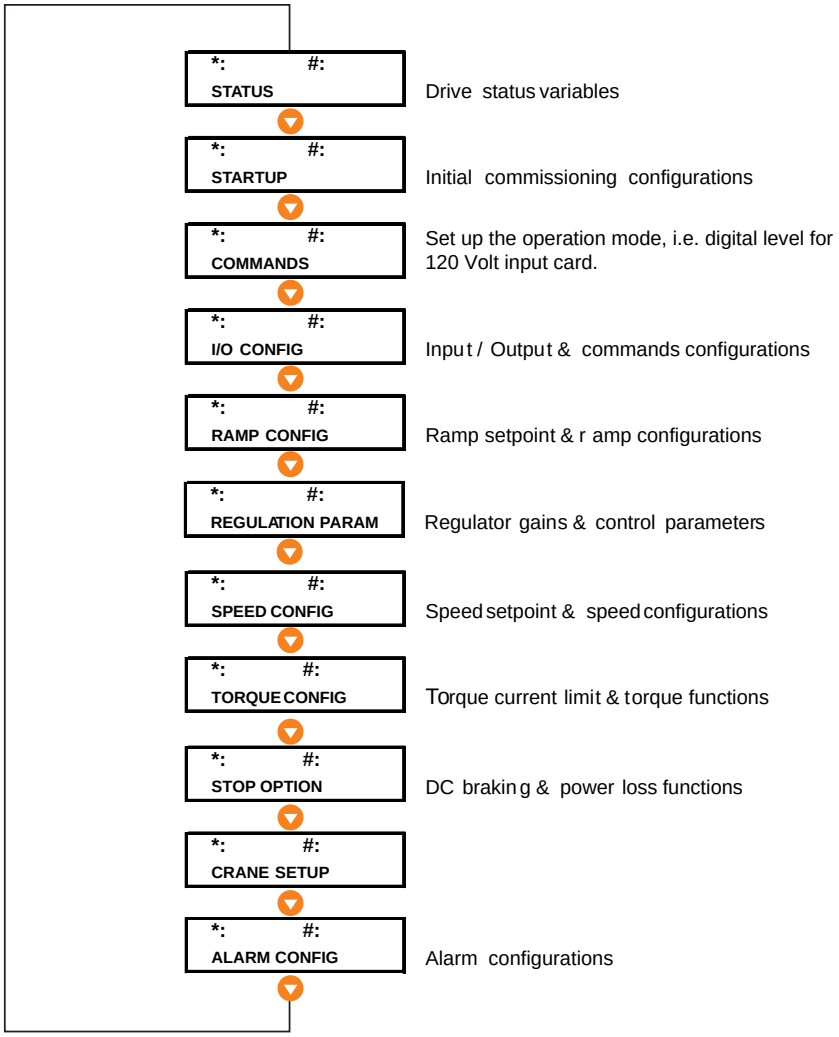


Figure 27

Keypad Display of Folders	**Description** of Folders
STATUS	Drive operational and alarm information.
STARTUP	Drive setup blocks, including Autotune.
COMMANDS	Sets up the operation mode, i.e. Digital Level for 120 volt input card.
I/O CONFIG	Analog and Digital input/output configuration.
RAMP CONFIG	Configuration of acceleration and deceleration times and ramp rates.
REGULATION PARAM	Speed and Current regulator gains.
SPEED CONFIG	Speed set point – Top and Bottom speeds. *Note!* Speed steps are configured in rpm not hertz.
TORQUE CONFIG	Sets torque limits.
STOP OPTION	DC Braking.
CRANE SETUP	Shortcut to configuration of most drive parameters, for the crane application.
ALARM CONFIG	Sets the action of the alarms.

4.1.7 AD10 Minimum Start-up Procedure

To change any parameter, press the "ENTER" key when the parameter is displayed, then move the flashing cursor over the digit you wish to change. After changes are complete, press the "ESCAPE" key and the display will prompt you to either save your changes, or press "ESCAPE" to cancel the changes.

When the drive completes the startup sequence, the keypad will display:

"Status"

Press the "DOWN ARROW one time, the keypad will display:

"Startup"

Press the "ENTER" key one time, the keypad will display:

"Startup - Regulation mode"

Press the "DOWN ARROW" one time, the keypad will display:

"Drive Data"

Press the "DOWN ARROW" one time, the keypad will display:

"Motor Data"

Press the "ENTER" key one time, the keypad will display:

"Rated Voltage"

Press the "DOWN ARROW" one time, the keypad will display:

"Rated Frequency"

Press the "DOWN ARROW" one time, the keypad will display:

"Rated Current"

Press the "DOWN ARROW" one time, the keypad will display:

"Rated Speed"

Press the "DOWN ARROW" one time, the keypad will display:

"Rated Power" (KVA)

Press the "ESCAPE" key one time, the keypad will display:

"Motor Data"

Press the "DOWN ARROW" one time, the keypad will display:

"Autotune"

Press the "ENTER" key one time, the keypad will display:

"Complete still start?"

Press the "ENTER" key one time, the keypad will display:

"Complete still - Press I key"

Press the "I" key one time, the keypad will display:

Complete Still 1
?? %

When "Still 1" is complete, the drive will automatically start "Still 2"
The keypad will display:

Complete Still 2
?? %

This tuning process can take 15 minutes or more to complete. Please wait.

When "Still 2 is complete , the keypad will display, "Autotune End", flashing.

Press the "ESCAPE" key one time, the keypad will display:

"Complete still - Press I key"

Press the "ESCAPE" key one time, the keypad will display:

"Complete still start?"

Press the "ESCAPE" key one time, the keypad will display:

"Startup - Autotune"

Press the "DOWN ARROW" one time, the keypad will display:

"Startup - Full scale speed"

Press the "DOWN ARROW" one time, the keypad will display:

"Startup - Encoders config"

Press the "DOWN ARROW" one time, the keypad will display:

"Startup - BU Protection"

Press the "ENTER" key one time, the keypad will display:

"BU Control - Internal"

Press the "DOWN ARROW" one time, the keypad will display:

"BU Resistance - ?? Ohms"

Press the "DOWN ARROW" one time, the keypad will display:

"BU Res Cont Pwr - ??.?? KW"

Press the "ESCAPE" key one time, the keypad will display:

"Startup - BU Protection"

Press the "ESCAPE" key one time, the keypad will display:

"Save Parameters?"
"Yes - Enter No - Esc"

Press the "ENTER" key one time, the keypad will display:

"Startup"

Press the "SHIFT" key one time, then the "HOME" key one time, the keypad will display:

"Status"

Cycle the main power. Make sure that the drive completely powers down before re-applying main power.

4.1.8 Drive Menu Sublevel

Group Folder	**Keypad Display** of Sub Folders	**Description** of Sub Folders
STATUS (NLBH No Load Brake Hoist – Field oriented Only)	Status	Displays operating information. i.e. Output Voltage, Output Current, Torque Reference, Output Frequency
	I/O Status	Displays I/O information
	Advance Status	Displays Advance operating information. i.e. DC Link Voltage, Torque Current, Encoder Speed, Drive Operating Temperature
	Drive ID Status	Drive Capacity, Size, Name, Software Version, Life Time (in Hours), System Time (24 hour clock) – Date (ddmmyy)
	Alarm Log	Stores Last 30 Faults (with System Time & Date)

Folder	**Keypad Display**
Status (NLBH No Load Brake Hoist – Field oriented Only) (Note example at right is shown with the motor at Stop.)	Output voltage 0V
	Output Current 0.00 A
	Output power 0.0 kW
	Torque ref 0.0 Nm (Note to convert Newton-meters to Pound-feet Multiply by 0.7376)
	Output Frequency 0.0 Hz
	Norm Speed 0 rpm
	Speed ref 0 rpm
	Ramp ref 0 rpm

Sub Folder	Keypad Display	Description
I/O Status (NLBH No Load Brake Hoist – Field oriented Only) (Note example at right is shown with the motor at Stop.) “E” Enable terminal “A” Terminal 10 Digital Input “B” Terminal 11 Digital Input “X” Expanded – 120 Volt input card CRANEtrol PN 100-0162-01	DI 7654321E 01000001	Standard digital inputs
	DO 3210 0000	Standard digital outputs
	DIX BA9876543210 000001000000	Expanded digital inputs
	DOX 76543210 00000010	Expanded digital outputs

Sub Folder	Keypad Display	Description
Advance Status (NLBH No Load Brake Hoist – Field oriented Only) (Note example at right is shown with the motor at Stop.) * 230 Volt Drive ** Auto Tune dependant	DC link voltage 325 V*	Drive DC Bus voltage
	Magnetizing curr 0.00 A	Drive magnetizing current in Amps
	Torque curr 0.00 A	Drive torque current in Amps
	Magn curr ref 0.93 A**	Magnetizing current reference in Amps
	Torque curr ref 0.00 A	Torque current reference in Amps
	Flux ref 0.31 Wb **	Drive flux in reference Webers
	Flux 0.00 Wb	Flux in Webers
	Norm Std enc spd 0 rpm	Standard encoder speed (Std)
	Norm Exp enc spd 0 rpm	Expanded encoder speed (Exp)
	HT sensor temp 28°C	Heatsink temperature°C
	RG sensor temp 27°C	Temperature on the regulation card°C
	IG sensor temp 0°C	Temperature of the heatsink incoming air temperature°C (For models 25 Hp and higher.)

Sub Folder	Keypad Display	Description
Drive ID Status (Available only in Advanced Status) (NLBH No Load Brake Hoist – Field oriented Only) (Note example at right is shown with the motor at Stop.) * kVA dependant ** 5 letters and or numbers combination. However, Must start with a letter .	Drive cont curr 4.00 A*	Drive maximum continuos current rating
	Drive size 1.5kW – 1.5Hp*	Drive size rating in kW of Hp
	Drive type 288	288 = CRANEtrol
	Drive name ACDC1**	Set using CRANElink AD10 software
	Software version V80. 4. 0	V80 – is NLBH V81 – is Traverse/LBH
	Software type 0	Factory use
	Software status 1	Factory use
	Life time XX.XX hours	Drive life time accumulated with power on.
	Sys time-ddmmyy XX:XX:XX 010170	Default time & date – Non adjustable 00:00:00 010170

Group Folder	Sub Folder	Description
STARTUP	Regulation mode	Operating mode i.e. Field Oriented (**FOC**), Volts per Frequency (**VF**)
	Drive data	Voltage rating, Switching frequency
	Motor data	Motor nameplate data
	Autotune	Standing Still or Rotating
	Full scale speed	Set operation speed in RPM
	Encoders config	Set Type, Pulses
	BU protection	Internal, External, Off
	Load default ?	Loads Factory Defaults
	Abort ?	Quits Startup Mode without saving changes.
	Access level	Sets programming level.

Sub Folder	Description
Regulation Mode Note: **Does Not Require any Adjustments** Any changes in the regulation mode can cause the software not to function properly. Once the software is loaded the Regulation mode is set.	(**FOC**) Field Oriented V80 – No Load Brake Hoist (**NLBH**) V81 – Traverse/ Load Brake Hoist (**LBH**)
	(**VF**) Volts per Frequency V81 – Traverse/ Load Brake Hoist (**LBH**)

The drive can be active with 3 different regulation modes:

- **Scalar voltage / frequency: V/f control - Traverse / Load Brake Hoist**
- **Flux vector control with speed feedback: Field oriented - NLBH**
- **Flux vector control without speed feedback: Sensorless vect**

All the regulation modes require setting of the drive and motor data parameters. Internal motor parameters, such as rotor resistance, stator resistance parameter etc., will be automatically set by running the autotune procedure.

Drive, motor and selftune data are set and saved via the SETUP MODE menu in a file called "Setup".

Sub Folder	Keypad Display	Description	Setting range
Drive Data	Mains voltage 460 V	Power supply voltage	230 – 380 – 400 – 415 – 440 – **460**
	Ambient temp 40 °C	Ambient temperature	**40 °C** – 50 °C
	Switching freq 8 kHz	PWM Switching frequency	2 – 4 – **8** – 16 kHz
	Spd ref/fbk res 0.250 rpm	Resolution of the speed references	0.125rpm, **0.250rpm**, 0.500rpm

Note! Speed resolution affects maximum value allowed for process speed (parameter Full scale speed to be set later). Therefore such resolution must be selected that application process speed will fit allowed range.

Speed resolution	Process speed max.value
0.125 rpm	**2048 rpm**
0.25 rpm	**4096 rpm**
0.5 rpm	**8192 rpm**

Note! Remove any load from the hoist before entering "Startup" mode. Failure to do so may result in the unexpected lowering of the load.

Sub Folder	Keypad Display	Description	Setting range
Motor Data Note: Example Drive size 1.5kW – 1.5Hp *Loads European motor values; 380 V, 50 Hz, 1445 rpm	Rated voltage 460.00 V	Motor rated voltage	**460**
	Rated frequency 60.00 Hz	Motor rated frequency	**60.00 Hz**
	Rated current 2.10 A	Motor rated current. **Note!** The value should not be less than approx. 0.3 times the drive rated current.	**2.10 A**
	Rated speed 1776.00 rpm	Motor rated speed. **Note!** The value is intended to be the motor full load sp eed at the rated frequency.	**1776.00 rpm**
	Rated power 1.12 kW	Motor rated power. **Note!** Leave default values if this data is not available from the motor nameplate.	**1.12 kW** (Motor Hp X 0.746 = kW)
	Cosfi 0.77	Motor cos factor) **Note!** Leave default values if this data is not available from the motor nameplate.	**0.77**
	Efficiency 89.20 %	Motor efficiency	**89.20%**
	Load default mot Standard 400 V	It selects and loads the motor standard parameters.	Standard **400 V*** or Standard 460 V

Sub Folder	Keypad Display	Description	Setting range
Autotune	STARTUP Autotune	Selects Autotune mode	Complete still Start ? Or Complete rot Start ?

Sub Folder	Keypad Display	Description	Default Setting
Full scale speed	STARTUP Full scale speed	Sets operational full speed setting.*Caution Do Not exceed maximum gearbox input speed.*	1800 rpm

Sub Folder	Keypad Display	Description	Setting range
Encoders config * Requires Expanded Encoder Card	Int spd fbk sel Std encoder	Encoder input selection: Standard encoder or Expanded encoder*	Std encoder or Exp encoder
	Std enc type Digital	Encoder type connected to the std input	Digital Or Frequency input
	Std enc pulses 1024 ppr	Encoder pulses per revolution (ppr) value of the standard input	1024 ppr
	Std enc supply 5.41 V	Power supply voltage of the standard Encoder input	5.41 V, 5.68 V, 5.91 V, 6.16 V
	Std sin enc Vp 0.50 V	Peak voltage value of the sinusoidal encoder connected to the standard input	0.50 V – 1.5 V
	Exp enc type Digital	Encoder type connected to the exp input	Digital Or Frequency input
	Exp enc pulses 1024 ppr	Encoder pulses per revolution (ppr) value of the expanded input	1024 ppr

Sub Folder	Keypad Display	Description	Setting range
BU protection	BU control Internal	BU control	Off, Internal , External
	BU resistance 100.00 ohm	BU Braking resistance	*kVA dependant
	BU res cont pwr 0.50 kW	Resistance continuos power	*kVA dependant

Sub Folder	Keypad Display	Description
Load default ?	STARTUP Load default ?	Loads Factory default settings

Sub Folder	Keypad Display	Description
Abort ?	STARTUP Abort ?	Quits Startup Mode without saving changes.

Sub Folder	Keypad Display	Description	Setting range
Access level * Consult Factory before entering Full Access	Access level Easy	Sets programming level	Easy or Full*

Group Folder	Sub Folder	Description
I/O CONFIG	Analog inputs	3 standard analog inputs configured as voltage or current differential inputs. i.e. Joystick, PLC analog output card
	Analog outputs	2 standard analog outputs. i.e. Meters, PLC analog input cards
	Digital inputs	8 standard digital inputs, dry contacts. 12 expanded digital inputs, 120 VAC
	Digital outputs	4 standard digital 2 Multi-Function Contact 250VAC 1A or less. 2 PHC Output +30V/80 mA or less. 2 expanded digital Multi-Function Contact 250VAC 1A or less.

Select the desired configuration and press Enter to confirm the selection.

I/O keys The drive is controlled from the keyboard using the I O keys
Digital edge The drive is controlled from a communication or application card using an Edge sensitive signal
Digital level The drive is controlled from a communication or application card using a Level sensitive signal
Terminal edge The drive is controlled via terminal strip using an Edge sensitive signal
Terminal level The drive is controlled via terminal strip using a Level sensitive signal

Note! *When using the 120 V input card, digital level must be selected.*

Note! *After downloading drive parameters from a file, or entering the STARTUP MENU through the keypad, the drive can only be restarted after:*

a) cycling drive power
or:
b) - when *Commands select = Terminal level*, cycling input *Digital input 0*
- when *Commands select = Terminal edge*, cycling input *Digital input 0*, and the digital input selected by **Term strstp src**
- when *Commands select = Digital level*, cycling the digital signals selected by **Digital StrStp src** and **Digital enable src**
- when *Commands select = Digital edge*, cycle input *Digital input 0* or the digital signals selected by **Digital Enable src** (if not selected to ONE), and by **Digital StrStp src**

Sub Folder	Keypad Display	Description	Setting Range
Analog inputs	Analog inputs Analog input 1	Select voltage or current input type, scale, upper and lower limits, and tuning.	* Please, go to the next section for further explanation.
	Analog inputs Analog input 2	Select voltage or current input type, scale, upper and lower limits, and tuning.	* Please, go to the next section for further explanation.
	Analog inputs Analog input 3	Select voltage or current input type, scale, upper and lower limits, and tuning.	* Please, go to the next section for further explanation.
	Analog inputs Analog input 1X	Select voltage or current input type, scale, upper and lower limits, and tuning.	* Please, go to the next section for further explanation.
	Analog inputs Analog input 2X	Select voltage or current input type, scale, upper and lower limits, and tuning.	* Please, go to the next section for further explanation.
	Exp ana inp en Disabled	Enable or Disable the Expanded inputs.	**Disable**, Enable
	Analog inputs Destinations	Displays how the inputs are configured.	

Sub Folder	Keypad Display	Description	Setting Range
Analog inputs Analog input 1	An inp 1 type -10V…+10V	Selects voltage or current input type.	-10V…+10V, 0…20mA,0…10V, 4…20mA
	An inp 1 scale 1.000	Scales the input signal level.	+1.000, -16.000 to +15.999
	An inp 1 lo lim -16384 cnt	Set lower limit of the analog input signal.	-16384 cnt, -32768 to +32767 cnt
	An inp 1 hi lim 16383 cnt	Set upper limit of the analog input signal.	16383 cnt, - 32768 to + 32767
	AI 1 offs tune Start ?	Adjust the lower level of the analog input signal offset.	Calculated by tune procedure.

Sub Folder	Keypad Display	Description	Setting Range
Analog outputs	Analog outputs Analog output 1	Select source, upper and lower limits, and monitor.	* Please, go to the next section for further explanation.
	Analog outputs Analog output 2	Select source, upper and lower limits, and monitor.	* Please, go to the next section for further explanation.
	Analog outputs Analog output 1X	Select source, upper and lower limits, and monitor.	* Please, go to the next section for further explanation.
	Analog outputs Analog output 2X	Select source, upper and lower limits, and monitor.	* Please, go to the next section for further explanation.
	Analog outputs Analog output 3X	Select source, upper and lower limits, and monitor.	* Please, go to the next section for further explanation.
	Analog outputs Analog output 4X	Select source, upper and lower limits, and monitor.	* Please, go to the next section for further explanation.
	Exp ana out en Disabled	Enable or Disable the Expanded inputs.	Disable, Enable

Sub Folder	Keypad Display	Description	Setting range
Ramp Config	Acc 0 speed 1800 rpm	Acceleration delta speed = 1800 rpm, delta time = 2 s. Acceleration from 0 rpm to 1800 rpm, is 2 seconds.	1 – **1800** – 1800000 rpm
	Acc 0 time 2 s		1 – **2** – 8985 seconds
	Dec 0 speed 1800 rpm	Deceleration delta speed = 1800 rpm, delta time = 1 s Deceleration from 1800 rpm to 0 rpm, is 1 second.	1 – **1800** – 1799999 rpm
	Dec 0 time 1 s		**1** – 8985 seconds
	RAMP CONFIG Ramp setpoint	Sets the ramp reference source.	**Crane Ref.** ***No Adjustment is Required!***

- Acc 0 speed - Delta speed acceleration - speed variation in rpm
- Acc 0 time - Delta time acceleration - time, in seconds, needed to perform the Acc 0 speed
- Dec 0 speed - Delta speed deceleration - speed variation in rpm
- Dec 0 time - Delta time deceleration - time, in seconds, needed to perform the Dec 0 speed

Ramp Setting

The drive allows to select **4 different sets** of Ramp times. Each set of Ramp times consist of Ramp and S-Ramp acceleration / deceleration times and a Fast Stop deceleration time.
The function has two input sources: **Multi Ramp set 0 src** and **Multi ramp set 1 src**.
According to the state of the signals connected to the sources, it is possible to **select** one of the **Multi Ramp Sets** output: MR0, MR1, MR2, MR3.

Normally MR0 is used. The factory settings are:
- Acceleration delta speed = 1000 rpm, delta time = 10 s
- Deceleration delta speed = 1000 rpm, delta time = 10 s
- Fast Stop Deceleration delta speed = 10000 rpm, delta time = 10 s
- Acceleration S curve = 0.100 s, Deceleration S curve = 0.100 s

Example: setting the Acceleration ramp of MR0

*: #: RAMP CONFIG	Enter	RAMP CONFIG Ramp setpoint

Scroll Down to:

RAMP CONFIG	Enter	Multi ramp Multi ramp src

Scroll Down to:

Multi ramp Multi ramp cfg	Enter	Multi ramp cfg Multi ramp set 0	Enter	Multi ramp set 0 Acc set 0	Enter	MR0 acc dtl spd 1000 rpm

Press Enter to change acceleration delta speed factory value:

MR0 acc dtl spd +0000100<u>0</u> rpm	to	MR0 acc dtl spd +0000<u>1</u>500 rpm	<u>Enter</u>	MR0 acc dtl spd 1500 rpm

Scroll <u>Down</u> to change acceleration delta time factory value:

MR0 acc dtl time 10 s	<u>Enter</u>	MR0 acc dtl time +0000001<u>0</u> s	to	Mr0 acc dtl time +0000000<u>1</u> s	<u>Enter</u>	MR0 acc dtl time 1 s

Press <u>Left</u> to exit:

Multi ramp set 0 Acc set 0	<u>Down</u>	Multi ramp set 0 Dec set 0

Press <u>Enter</u> to change deceleration delta/time speed factory value, follow the same procedure as above.
See attached sheet.

For more details see chapter RAMP CONFIGURATION in the User's Guide.
MR0 acc dlt spd, is the delta speed factor value. This sets the rpm's you will accelerate to in the **MR0** acc dlt time.
MR0 acc dlt time, is the delta time factor value. This sets how quick you will accelerate to in the **MR0** acc dlt spd.
i.e. this will setup the ramp rate from 0 Hz to 60 Hz..

Motor Poles	Motor RPM
2	3600
4	1800
6	1200
9	800
12	600

e.g. 3-second accel, to 60 Hz with a 4-pole motor.
In **MR0** acc dlt spd, key in +0000<u>1800</u> rpm.
In **MR0** acc dlt time, key in +0000000<u>3</u> s.

e.g. 3-second decel, from 60 Hz to 0 Hz, with a 4-pole motor.
In **MR0** dec dlt spd, key in +0000<u>1800</u> rpm.
In **MR0** dec dlt time, key in +0000000<u>3</u> s.

Note! *Using the keypad, only whole numbers can be entered.*

e.g. 1.5 second decel, from 60 Hz to 0 Hz, with a 4-pole motor.
In **MR0** dec dlt spd, key in +0000<u>3600</u> rpm.
In **MR0** dec dlt time, key in +0000000<u>3</u> s.

This will give you a deceleration rate of 1.5 seconds from 1800 rpm to 0 rpm. As you will note this is a multiplier factor of 2. In order to do a 0.25 increment change you need to use a multiplier of 4 in both the rpm's and second's.

Note! *For traverse axis, MR1 delta speeds and times need to be set up the same as MR0 delta speeds and times. If Plug Reverse is enabled set <u>only</u> the MR1 delta times shorter than MR0 delta times.*

Note! *It is important to remember that the hardware configuration on the regulation card has to be set according to the selected input.*

Speed Configuration

Group Folder	Sub Folder	Description
SPEED CONFIG	Speed setpoint	Used to set the maximum forward and reverse speeds.
	Jog	Used to configure the jog command speed references. ***No Adjustment is RequiredThis function is not used in the Crane Application.***
	Moto pot	Used to configure the keypad command speed references.***No Adjustment is RequiredThis function is not used in the Crane Application.***

Sub Folder	Keypad Display	Description	Setting range
Speed setpoint	Speed ref1 src Int speed ref 1	Selects the reference source point.	**Int speed ref 1** ***No Adjustment is Required!***
	Int speed ref 1 0 rpm	Internal speed reference offset.	**0 rpm** ***No Adjustment is Required!***
	Speed top 1980 rpm	Sets the maximum speed in the forward/ up direction. Always a positive number.	0 – **1980** – 3599 rpm
	Speed bottom -1980 rpm	Sets the maximum speed in the reverse/ down direction. Always a negative number.	0 – (**-1980**) – (-3599) rpm

Stop Option

Group Folder	Sub Folder	Description
Stop Option	DC braking	Sets up the drive to apply DC injection braking to stop motor rotation. ***No Adjustment is Required! This function is not used in the Crane Application.***

No Load Brake Hoist

Group Folder	Sub Folder	Description
CRANE SETUP	CONFIG PARAM	Configuration of Start/ Stop commands, Fast Stop, acceleration/ deceleration times, and Speed Loss. ***Generally No Adjustment is Required!***
	DIGITAL OUTPUT	Configuration of Digital Outputs. ***No Adjustment is Required!***
	REFERENCE	Configuration of Speed Selection, Speed Steps, Micro Speed.
	TURBO LIFT	Configuration of Turbo Lift Mode.
	BRAKE CONTROL	Configuration of Brake Setup, Proving Torque, etc.
	FAULT CONFIGS	Enable/ Disable Pushbutton Fault.
	MONITOR	Monitor point for the Crane Specific Faults

Sub Folder	Keypad Display	Description	Setting range
CONFIG PARAM	Term StrStp src ONE	Source of the Start (1) command and of the terminal strip Stop (0) command.	NULL (0), **ONE** (1), or Digital input terminals.
	Term Start src ONE	Command source for the terminal strip Start.	NULL (0), **ONE** (1), or Digital input terminals.
	Term Stop src NULL	Command source for the terminal strip Stop.	**NULL** (0), ONE (1), or Digital input terminals.
	Dig Enable src ONE	Digital Enable command source.	NULL (0), **ONE** (1), or Digital input terminals.
	Dig StrStp src Crane Run Out	Source of the Start (1) command and of the digital Stop (0) command. *No Adjustment is Required!*	**Crane Run Out**
	FastStop src Travel B Out	Fast Stop command source. *Generally No Adjustment is Required!*	**Travel B Out**
	Command select Digital Level	Logic for the Start/Stop Edge or Level sensitive signal. *Generally No Adjustment is Required!*	**Digital Level**
	Acc 0 speed 1800 rpm	Delta speed acceleration – speed variation in rpm.	1 – **1800 –** 1800000 rpm
	Acc 0 time 2 s	Delta time acceleration - time, in seconds, needed to perform the acc dtl sdp.	1 – **2** – 8985 seconds
	Dec 0 speed 1800 rpm	Delta speed deceleration – speed variation in rpm.	1 – **1800 –** 1799999 rpm
	Dec 0 time 1 s	Delta time deceleration - time, in seconds, needed to perform the dec dtl spd.	1 – **1** – 10000 seconds
	Acc 1 speed 1800 rpm	Delta speed acceleration – speed variation in rpm.	1 – **1800 –** 1799999 rpm
	Acc 1 time 1 s	Delta time acceleration - time, in seconds, needed to perform the acc dtl sdp.	1 – **1** – 10000 seconds
	Dec 1 speed 1800 rpm	Delta speed deceleration – speed variation in rpm.	1 – **1800 –** 1800000 rpm
	Dec 1 time 2 s	Delta time deceleration - time, in seconds, needed to perform the dec dtl spd.	1 – **2** – 10000 seconds
	Speed Loss Timer 1.5 s	Encoder loss detection timer.	0 – **1.5** – 262.1 seconds
	Speed Loss Level 5.0 %	Encoder loss – speed error level.	0 – **5.0** – 199.9%
	Cmp 1 inp 1 40.0	Output Phase Loss – compare block. *Generally No Adjustment is Required!*	- 32768.0 – **40.0 –** 32767

Sub Folder	Keypad Display	Description	Setting range
DIGITAL OUTPUT **Note these parameters Do Not Require any adjustment!**	DO 0 src Brake Fault	Standard Digital Output – Will close upon any Brake Fault conditions.	NULL, ONE, **Brake Rel. Out** , Crane Fault, Pbutton FLT Out, Plug Reverse Out, Crane Run Out, Direction Out, Turbo Lift Out, Travel A Out, Travel B Out, **Brake Fault** , PT Fault, Brk Slip Fault, External Fault, Plug Reverse, **Fault Pin** , Dig pad 12, Drive Ready, Enable SM mon, Start SM mon, FastStop SM mon, ALM Sequencer, **Drive OK** , Jog state, Enable cmd mon , and 23 other drive conditions.
	DO 1 src Brake Rel. Out	Standard Digital Output – Will close when Proving Torque has reached the programmed level.	
	DO 0X src Fault Pin	Expanded Digital Output – Will close upon any fault condition, other than Brake faults.	
	DO 1X src Drive OK	Expanded Digital Output – Closed when there are no drive faults.	

The "OK relay" can be selected as:

Drive OK The contact closes when the drive is powered up with no failure alarms (factory setting).

Drive Ready The contact closes when the following conditions are fulfilled:
- The drive is powered up
- There are no failure alarms present
- The drive is enabled. The enable operation is defined by parameters [En/disable mode] & [Commands sel]
- The magnetizing procedure has been completed. (Drive is ready to deliver torque)

Note! *The contact opens immediately on a drive failure, or when the drive is disabled.*

Sub Folder	Keypad Display	Description	Setting range
Reference	Ramp ref 1 src Crane Ref	This signal controls the Block Function and is therefore defined as a control signal.	**Crane Ref.** ***No Adjustment is Required!***
	Maximum Speed 100 %	Sets the maximum speed in percentage based on the RPM setting in the "STARTUP Folder - Full scale speed."	0 – **100 %**
	Step Speed 1 10 %	Pre-set speed 1 *	0 – **10** – 100 %
	Step Speed 2 25 %	Pre-set speed 2 *	0 – **25** – 100 %
	Step Speed 3 50 %	Pre-set speed 3 *	0 – **50** – 100 %
	Step Speed 4 75 %	Pre-set speed 4 *	0 – **75** – 100 %
	Step Speed 5 100 %	Pre-set speed 5 *	0 – **100** %
	Micro Speed Gain 10 %	Micro Speed Gain Value. **	0 – **10** – 100 %
	2/3IV Stepsize 4.0 %	Infinitely Variable Step Size ***	0 – **4.0** – 100 %
	2/3IV Steptime 0.25 s	Infinitely Variable Step Time ***	0.00 – **0.25** – 3.00 seconds
	Step Speed Mode 5 Step	Speed Reference Select	**5 Step**, 3 Step, 2 Step IV, 3 Step IV, Analogue

* Pre-Set Speed Point Settings
These parameters are used to set your multi-step speed values. Depending on the setting of Step Speed Mode, up to 5 step. The setting of Step Speed Mode selects the type of speed control used.

** Micro Speed Gain Value
This function allows the AD10 to run at a percentage of your normal speed reference for precise positioning.

*** Infinitely Variable Step
This function sets the increase in step size and time. Example:
Infinitely Variable Step Size = 4.0 %
Infinitely Variable Step Time = 0.25 seconds
As the increase command is issued, the AD10 will increase the speed by 2.4 Hz (4.0 %) within 0.25 seconds. If the increase command is held for 1.5 seconds the AD10 will increase in output frequency by 14.4 Hz from the last hold command or from the 1st speed set point of 6.0 Hz (10 %).

Sub Folder	Keypad Display	Description	Setting range
TURBO LIFT	TL Det. Speed 100 %	Turbo-Lift Detection Speed – The speed points where turbo-lift becomes active.	0 – **100** %
	TL.Det. Torque 10.0 %	Turbo-Lift Detect Torque value	0 – **10** – 300 %
	TL.Det. Time 2.00 s	Turbo-Lift Time value	0.00 – **2.00** – 3.00 seconds
	TL Speed 100 %	Turbo-Lift speed limit. *Caution Do Not exceed maximum gearbox input speed.*	0 – **100** %

Turbo Lift Conditions:

1. The AD10 must be running at the Turbo-Lift Detection Speed.
2. The output torque must be below the value of Turbo-Lift Detect Torque value.
3. The output torque must be below the value of Turbo-Lift Detect Torque value, for the time value of the Turbo-Lift Time value parameter.
4. If any of the above conditions are not maintained, the Turbo-Lift function will be disabled.

Note! If turbo-lift is used, turbo lift speed becomes the full-scale speed. This parameter can be found in the Startup folder under the Full-scale speed sub folder.
Example: 4-pole motor with nameplate rated speed of 1785 rpm @ 60 Hz.
No turbo lift - full scale speed = 1800 rpm @ 60 Hz.
Turbo-lift - Full scale speed = 2160 rpm @ 72 Hz
2700 rpm @ 90 Hz
3600 rpm @ 120 Hz

Sub Folder	Keypad Display	Description	Setting range
BRAKE CONTROL	Loadfloat Time 5.00 s	Load Float Time	0.00 – **5.00** – 60.00 seconds
	Release Speed 5 %	Starting Reference	0 – **5** – 20 %
	Brake Rel. Time 0.30 s	Brake Release Time	0.00 – **0.30** – 3.00 seconds
	Brake Set Time 0.50 s	Brake Mechanical Set Time	0.00 – **0.50** – 3.00 seconds
	Torque Level 100 %	Proving Torque value	0 – **100** – 200 %
	Proving Time 3.00 s	Proving Torque Time limit value	0.00 – **3.00 –** 5.00 seconds
	Brake Check LVL 50 %	Brake Check Torque value	0 – **50** – 100 %
	Brake Check Time 1.00 s	Brake Check Time	0.00 – **1.00 –** 10.00 seconds
	Brake Slip Count 500	Brake Slip PPR Count	0 – **500** – 32767 PPR
	Magn ramp time 1.02 s	Ramp time of the magnetizing current	* kVA Dependant, it is set by the Autotune.
	Load Catch Count 50 cnt	Load Catch PPR Count Must be Enabled, by using DI 3 input.	0 – **50** – 32767 PPR
	Load Catch Time 0.50 s	Load Catch Time	0.00 – **0.50** – 262.13 seconds

Load Float Time
This function set the amount of time the AD10 will maintain zero speed and 100% torque during the stop sequence before setting the brake. The Load Float function allows the repositioning of the load after a stop command without going through the brake sequence.

Release Speed
This function applies a positive reference output when a start command is used. This reference generates the output proving torque. No adjustment is necessary.

Brake Release Time
This function sets a delay time between the time that the output torque has reached the Torque Level and the brake release command is given.

Brake Set Time
This function sets the time it takes for the brake to mechanically set.

Torque Level
Sets the amount of output torque that must be developed before the Brake Release command is active.

Proving Time
This function seta a limit on the amount of time that the output torque must reach the Torque Level in. If the output torque does not reach this level, within the time value in Proving Time, the AD10 will trip on a PT (Proving Time) fault.

Brake Check Level
This function sets the output torque level that the motor must be below in order for the AD10 to shut off.

Brake Check Time
This function sets the amount of time the AD10 checks to see if the brake has actually set.

Brake Slip Count
The AD10 will detect any movement in the motor shaft before the brake release command is given, during the initial start command. Shaft movement before the brake command is given indicates that the brake is not properly adjusted. This function sets the amount of slip that is permissible before a brake slip fault is given. This value is set in PPR (pulses per revolution) count.

Magn ramp time
Ramp time of the magnetizing current in the motor. The shorter the ramp time the faster the proving torque value is reached. However, to short of a time can result in nuisance faults.

Load Catch Count
This function constantly monitors the motor's encoder pulses while not in operation. When enabled by the Standard Digital Input # 3 is used. The AD10 will detect PG pulses and enable the drive to hold the load and activate an output alarm. The AD10 can be moved to a safe position and reset. This parameter sets the level of PG counts before Load Catch is enabled.

Load Catch Time
This function sets the dwell time after the Load Catch Count value is reached before the Load Catch is enabled.

Sub Folder	Keypad Display	Description	Setting range
FAULT CONFIGS	PB Flt Selection Off	This function is used with a pendant station type control, to detect an out of sequence input. An out of sequence input indicates a wiring mistake.	**Off,** On
	Brake Fault Off	Indicates any type of brake fault.	**Off**, Monitor Point Only
	Pbutton FLT Out Off	Indicates an out of sequence input indicates a wiring mistake.	**Off**, Monitor Point Only
	Brk Check Fault Off	Indicates the brake has not mechanically set.	**Off**, Monitor Point Only
	Brk Slip Fault Off	Exceeded the **Brake Slip Count** value.	**Off**, Monitor Point Only
	PT Fault Off	Indicates the motor did not reach the **Proving Torque** value within the **Proving Time**.	**Off**, Monitor Point Only
	Pbutton FLT Out Off	Indicates an out of sequence input indicates a wiring mistake.	**Off**, Monitor Point Only
	Travel B Out Off	Indicated that the motion has reached the End of **Travel B Out** point. All Motion stops.	**Off**, Monitor Point Only

Sub Folder	Keypad Display	Description	Setting range
MONITOR	Phase Loss Alrm Off	Indicates a input phase loss has been detected	**Off**, Monitor Point Only
	Load Catch Alrm Off	Indicates when Load Catch is active.	**Off**, Monitor Point Only
	Brake Rel. Out Off	Indicates the Brake Release command is active.	**Off**, Monitor Poin t Only
	Turbo Lift Out Off	Indicates the Turbo Lift command is active.	**Off**, Monitor Point Only
	Travel A Out Off	Indicated that the motion has reached the End of **Travel A Out** point. Slows down to 1 st speed setting.	Off**, Monitor Point Only**
	Travel B Out Off	Indicated that the motion has reached the End of **Travel B Out** point. All Motion stops.	Off**, Monitor Point Only**
	Brake Fault Off	Indicates any type of brake fault.	Off**, Monitor Point Only**
	Pbutton FLT Out Off	Indicates an out of sequence input indicat es a wiring mistake.	**Off**, Monitor Point Only
	Brk Check Fault Off	Indicates the brake has not mechanically set.	**Off**, Monitor Point Only
	Brk Slip Fault Off	Exceeded the **Brake Slip Count** value.	**Off**, Monitor Point Only
	PT Fault Off	Indicates the motor di d not reach the **Proving Torque** value within the **Proving Time**.	**Off**, Monitor Point Only
	Crane Run Out Off	Indicates the Crane Run command is active.	**Off**, Monitor Point Only
	Direction Out Off	Indicates the Reverse Direction command is active.	**Off**, Monitor Point Only
	Crane Fault Off	Indicates there is a Crane application fault.	**Off**, Monitor Point Only
	Zero Servo Off	Indicates the Zero Servo command is active.	**Off**, Monitor Point Only
	External Fault Off	Indicates there is an External Fault condition.	**Off**, Monitor Point Only
	Plug Reverse Out Off	Not Used in the NLBH software.	**Off**, Monitor Point Only
	Speed Loss Err Off	Indicates there is a loss of the encoder signal.	**Off**, Monitor Point Only
	Crane Ref 0	Indicates the hoist is running.	Monitor Point Only

Speed Configuration

Sub Folder	Keypad Display	Description	Setting range
ALARM CONFIG	ALARM CONFIG Fault reset	Fault reset source.	**DI 7X monitor** *No Adjustment is Required!*
	ALARM CONFIG Undervoltage	Vdc Link< UV T hreshold	**Off** or On
	ALARM CONFIG Overvoltage	Vdc Link> OV Threshold	**Off** or On
	ALARM CO NFIG IGBT desaturat	Too much current on output bridge.	**Off** or On
	ALARM CONFIG Inst overcurrent	Too much current on output bridge.	Off **or On**
	ALARM CONFIG Ground fault	Output Phase discharge to ground	Ignore, **Warnin g**, Disable drive, Stop, Fast stop, Curr limstp
	ALARM CONFIG External fault	Input pin. Programmable	**External Fault** *No Adjustment is Required!*
	ALARM CONFIG Motor OT	Input Motor Over temperature	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CO NFIG Heatsink S OT	Heatsink Overtemperature	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Regulation S OT	Regulation Overtemperature	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Intake air S OT	Only > 15Kw Intake air Overtemperature	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG ISBus fault	Isbus card	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Comm card fault	Sbi Card (Serial Bus Interface)	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Appl card fault	Dgfc card (Programmable option card)	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Drive overload	Reached Drive Overload limit	Ignore, Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Motor overload	Reached Motor Overload limit	Ignore, Warning**, Disable drive**, Stop, Fast stop, Curr limstp

	ALARM CONFIG BU overload	Reached BU Overload limit	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Fwd Rev Ctrl	Fwd and Rev both high	Ignore, Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Overspeed	Actual speed > threshold with drive running. Programmable	Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG Spd fbk loss	Loss of the reading of the speed sensor.	Ignore, Warning**, Disable drive**, Stop, Fast stop, Curr limstp
	ALARM CONFIG UV repetit ive	In 5 minutes xx UV fault occurred. Xx programmable. If xx is set equal to the maximum the alarm is disable.	1 – **5** – 1000
	ALARM CONFIG Hw fault	Loss of synchronization with expansion or peripherals. (120 VAC Input card.)	Monitor Point Only

5.0 TROUBLESHOOTING

5.1 LIST OF ERROR ALARM EVENTS

Entering bad data or conflicting data into the drive configuration will cause user errors to be displayed.

These type of errors can be:
- Configuration errors
- Data Base errors (DB errors)

Refer to the following paragraphs for descriptions.

5.1.1 Configuration Errors

Configuration errors can occur by entering incompatible or invalid parameter data.
The error indicates which parameters are causing the problem in the Setup Mode:
- Motor data
- Drive data
- Start Up parameter

The drive reports configuration error by the following example description:

Calc error: 606
Param: 0000

The “Calc error”number denotes the cause of invalid calculation. The error number reported by this process is set in part of the reply signal.
The Calc error numbers is composed as follows:
Calc error = Offset + Error code

The Offset denotes the type error:

0	for specific errors
100	for errors originated by the database calculation (see DB error paragraph)
500	for errors due to floating point calculation (exception, divide by zero etc..)
600	for errors originated by the configuration calculations (range and so on).

The Error code denotes the origin cause of the error (for the Error code values lists see below).
For example, Calc error number ***606*** is a configuration error (600) caused by speed base value (6) out of range.
The “Param” number is not meaningful.

Error code values lists

Error code values for Offset 0 :

0	no error
1	signal not managed in current configurator state
2	cannot stop regulation
3	recipe export error
4	recipe import error
5	error while loading selftune data
6	error while loading motor data
7	reserved
8	error while loading customer specific data
9	error while loading drive size data
10	error while writing file size.

11 error while apply database. The operation is refused because errors arised during group calculation.To reset the errors it is necessary re-enter the data, and confirm correctness
12 error while saving too changes

Error code values for Offset 100: See DB errors, section 1.11.1.2.

Error code values for Offset 500 (500 + error code):

3 Integer overflow
4 Floating overflow
5 Floating underflow
7 Divide by zero
9 Undefined float
10 Conversion error
11 Floating point stack underflow
12 Floating point stack overflow

Error code values for Offset 600 (600 + error code):

0 no error
1 switching freq. error
2 mains voltage error
3 ambient temperature error
4 regulation mode error
5 take selection error
6 base speed error
7 drive size error

Drive size setting ***Note!*** *If the User changes the Drive size, the drive will display:*
Drv size: new size - old size
For example: **Drive size: 0 - 1**
For the drive size number the table below:

Drive size - 6K	Size number
0.75 KW - 0.75 Hp	0
1.5 KW - 1.5 Hp	1
2.2 KW - 2.0 Hp	2
3.0 KW - 3.0 Hp	3
4.0 KW - 5.0 Hp	4
5.5 KW - 7.5 Hp	5
7.5 KW - 10 Hp	6
11 KW - 15 Hp	7
15 KW - 20 Hp	8
22 KW - 25 Hp	9
30 KW - 30 Hp	10
37 KW - 40 Hp	11
45 KW - 50 Hp	12
55 KW - 60 Hp	13
75 KW - 75 Hp	14
90 KW - 100 Hp	15
110 KW - 125 Hp	16
132 KW - 150 Hp	17
160 KW - 200 Hp	18

Drive size - DS	Size number
250 Hp	2
300 Hp	3
350 Hp	4
400 Hp	5
450 Hp	6
500 Hp	7
600 Hp	8
700 Hp	9
800 Hp	10

Table 14

5.1.2 Database Errors (DB Errors)

DB errors are caused by a incorrect setting in a single parameter. This problem is originated in the database calculation. For example the most common are:

- DB error Limit HIGH
- DB error Limit LOW

The message DB error is displayed by the drive in this format:
DB err IPA: error code

The IPA denotes the parameter number which caused the DB error calculation. The error code denotes the type error.

Example of message DB error displayed:

DB ERR 3420: 5

This means that the DB error is caused by IPA **3420** (V/f voltage) which is below the low limit; Error code 5 denotes the type error (for the DB error code values list see below). To find the low limit, which depends on drive configuration, it is possible to go to the V/f voltage parameter on the keypad.
Press the Shift key and then the Help key, the following will be displayed:

Max Value
min Value
Def(ault) Value
unit
raw value
IPA
Description
(Access) mode

In most cases it is enough to set a new value which is within the limits.
DB error code list

0	no error	20	Value not valid
1	SBI PROBLEM 0x01	21	Process doesn't reply
2	Generic error	22	Wrong record size
3	Attribute not exist	23	Attribute read only
4	Limit High	24	SBI PROBLEM 0x18
5	Limit Low	25	Command not yet implemented
11	Division by zero	26	Command wrong
12	Int Overflow	27	Read file error
13	Int Underflow	28	Header wrong
14	Long Overflow	29	Reserved for internal use
15	Long Underflow	30	Parameter not exist
16	Domain Error	31	Parameter read only
17	Indirection Error	32	parameter "z" only
18	Reached wrong eof	48	SBI PROBLEM 0x30
19	Dbase not configured		

5.2 LIST OF ERROR CODES FOR ALL AUTOTUNE PROCEDURES

The different autotune procedures for Current regulator, Flux regulator, Speed regulator or Analog input calibration may generate error messages that are described in table 14.

ERROR NUMBER	ERROR TEXT	DESCRIPTION
0	No error	
1	Abort	the user entered Escape or O key, or removed enable permissive (term 12 low)
2	DB access <IPA>	an attempt to access the database at the speficied index occurred during autotune procedure
3	No break point	failure in measuring inverter voltage distortion
4	Rs high lim	failure in measuring motor stator Resistance
5	Rs low lim	failure in measuring motor stator Resistance
6	DTL high lim	failure in computing compensation for the inverter voltage distortion
7	DTL low lim	failure in computing compensation for the inverter voltage distortion
8	DTS high lim	failure in computing compensation for the inverter voltage distortion
9	DTS low lim	failure in computing compensation for the inverter voltage distortion
10	LsS high lim	failure in calculating motor leakage inductance
11	LsS low lim	failure in calculating motor leakage inductance
12	ImNom not found	identification of rated magnetizing current failed
13	ImNom not found	identification of maximum magnetizing current failed
14	RrV low lim	Voltage limit exceeded during measurement for the calculation of motor rotor resistance
15	RrV high lim	Voltage limit exceeded during measurement for the calculation of motor rotor resistance
16	Rr high lim	failure in calculating motor rotor resistance
17	Rr low lim	failure in calculating motor rotor resistance
18	AI too high	value of analog input is too high for full scale autocalibration
19	AI too low	value of analog input is too low for full scale autocalibration
20	Rr2 high lim	failure in calculating motor rotor resistance
21	Rr2 low lim	failure in calculating motor rotor resistance
22	Drive disabled	Enable permissive (term 12) was found low when attempting to start autotune procedure
23	Rr timeout	timeout occurred during measurement for the calculation of motor rotor resistance
24	Rr2 timeout	timeout occurred during measurement for the calculation of motor rotor resistance
25	LsS timeout	timeout occurred during measurement for the calculation of motor leakage inductance
26	Drive enabled	Drive was found to be already enabled when attempting to initiate autotune procedure
27	Friction null	Drive was unable to identify a value for load friction
28	Drive stalled	Drive was unable to spin the shaft
29	Max spd exceeded	Drive speed limit for Speed regulator autotune was exceeded
30	Torque too high	Torque setting for Speed regulator autotune was too high
31	Load applied	Load torque was detected on the shaft
32	Calc error	An error occurred when processing measurement data
33	Config error <errcode>	The spedified Configurator error occurred during database configuration based on autotune data
34	Motor is running	Motor speed was found to be non zero when attempting to initiate autotune procedure
35	Cmd not supported	Command not supported in the current state

Table 15: Error Messages from Autotune Procedures
(For a complete list of error codes, visit www.cranetrol.com)

5.3 LIST OF REGULATION ALARM EVENTS

Table 15 provides a description of regulation alarm events and information on how to configure the intended drive behaviour on their occurrence (where applicable).

Alarm name	Description (Cause of fault)	Drive activity After alarm	Hold off	Restart	Restart time list	Code in the Alarm	Bit position in Al.list
Failure supply	One or more of the power supply circuits in the control section failed	Disable drive	No	No	NA	21	1
Undervoltage	Voltage on the drive DC link is lower than the minimum threshold for the given Mains voltage setting	Disable drive	No	Yes. Logic is based on the number of attempts	Yes	22	2
Overvoltage	Voltage on the drive DC link is higher than the maximum threshold for the given Mains voltage setting	Disable drive	No	Yes	Yes	23	3
IGBT desat flt	IGBT instantaneous overcurrent was detected by gate desaturation sensing circuit	Disable drive	No	Yes. No more than 2 attempts in 30 seconds	Yes	24	4
Inst Overcurrent	IGBT instantaneous overcurrent was detected by output current sensor	Disable drive	No	Yes No more than 2 at./30sec.	Yes	25	5
Ground fault	Output phase discharge to ground	Programmable	No	No	Yes	26	6
Curr fbk loss	A failure of current sensor feeedback or power supply was detected	Disable drive	No	No	No	27	7
External fault	External fault input is active	Programmable	Programmable	Yes	Programmable	28	8
Spd fbk loss	A failure of the speed feedback sensor or power supply was detected	Programmable	No	No	No	29	9
Module OT	IGBT overtemperature was detected by internal sensor (models 0.75 to 20 Hp only)	Disable drive	Constant, 10 msec	No	No	30	10
Heatsink OT	Heatsink overtemperature was detected by thermal contact (only for models 25 Hp and over)	Disable drive	Constant, 1000 msec	No	No	31	11
Motor OT	Motor overtemperature was detected by thermal contact or PTC thermistor	Programmable	Programmable	Yes	Programmable	32	12
Heatsink S OT	Heatsink linear temperature sensor threshold was exceeded	Programmable	Programmable	Yes	Programmable	33	13
Regulat S OT	Regulation board linear temperature sensor threshold was exceeded	Programmable	Programmable	Yes	Programmable	34	14
Intake Air S OT	Cooling air intake linear temperature sensor threshold was exceeded (only for models 25Hp and over)	Programmable	Programmable	Yes	Programmable	35	15
ISBus fault	Fault of optional ISBus LAN communication	Programmable	No	Yes	Programmable	36	16
Comm card fault	Fault of optional LAN communication board	Programmable	No	Yes	Programmable	37	17
Appl card fault	Fault of optional application coprocessor board	Disable drive	No	No	No	38	18
Drv overload	Drive overload accumulator exceeded trip threshold	Programmable	No	No	No	39	19
Mot overload	Motor overload accumulator exceeded trip threshold	Programmable	No	No	No	40	20
BU overload	Braking resistor overload accumulator exceeded trip threshold	Programmable	No	No	No	41	21
Data lost	Data corrupted in non-volatile memory	Disable drive	No	No	No	42	22
Fwd Rev Ctrl	Forward and Reverse commands were detected active at the same time	Programmable	No	No	No	43	23
Max time	Software task time overrun was detected	Disable drive	No	No	No	44	24
Sequencer	Command sequencer was tripped by an alarm event	Disable drive	No	No	No	45	25
PLS timeout	The duration of a voltage dip caused Power Loss Stop function restart logic to timeout	Disable drive	No	No	No	46	26
Overspeed	Maximum speed threshold was exceeded while drive in RUN state	Programmable	Programmable	No	No	47	27
UV repetitive	More than a programmable number of UV fault were detected in 5 minutes	Disable drive. If n. of faults is set to max the Alarm is disabled.	No	No	No	48	28
IOC repetitive	More than 2 OC faults were detected in 30 sec.	Disable drive	No	No	No	49	29
IGBTdesat repet	More than 2 IGBT desat faults were detected in 30 sec.	Disable drive	No	No	No	50	30
WatchDog user	The drive failed to retrigger the communication watchdog within the specified time	Disable drive	No	No	No	51	31
Hw fail	Communication failure between Drive Regulation board and one of its options or I/O expansions	Disable drive	No	No	No	52	32

Table 16: Regulation Alarm Events

5.4 HINTS ON HOW TO CORRECT SOME REGULATION ALARM EVENTS

External fault External failure, acquired from a digital input or communication channel. If using a terminal input: The signal on the terminal is missing. Make sure to tie common point of digital inputs (term 16) with power supply reference point (term. 18 if using internal power supply).

Failure supply ***Caution!*** Switch off voltage before removing terminal strips. In most cases the cause is in the external wiring. Pull out the plug-in terminal strips of the regulator card and acknowledge the Alarm. If no other faults are indicated, check your wiring for a short-circuit, in some cases with the cable shielding. If this has not corrected the fault, contact your service representative.

Heatsink OT (For models 25Hp and higher).
Temperature of the heatsink too high. Check for failure of a device fan, ambient temperature too high, dirty, heatsink or cooling opening obstructed.

Heatsink S OT Ambient temperature too high.
Failure of device fan, dirty heatsink or cooling opening obstructed.

Intake Air S OT (For models 25Hp and higher).
Temperature of the cooling air too high.

IGBT desat flt Internal Overcurrent failure of IGBT power section
Switch off device and restart. If you are unsuccessful, contact your service representative.
(For drives wihich are 250 Hp and higher).
IGBT Desat can be generated by following conditions:
- IGBT Gating failure or overcurrent
- Overvoltage on DC bus
- Motor over istantaneous current
- AC rectifier converter control card failure (IS200 AVSC):
  - power supply low
  - loss of AC input phase

Inst Overcurrent Overcurrent in the motor circuit.
Short-circuit or ground fault at the output of the drive
Remove power to the main circuit, wait for the prescribed time to discharge DC link and check power connections.
Reapply power and attempt a restart. If still unsuccessful, contact your service representative.

Module OT (For models from 0.75 to 20 HP).
Temperature of the IGBT module too high.
Failure of device fan.
Failure in the IGBT module on power section.
Fast overload current duty cycle too high.

Motor OT Overtemperature of the motor (indicated via thermistor on terminals 78/79)
Cable between thermistor connection on motor and terminals 78 and 79 interrupted.
Overheating of motor:
- Load cycle too heavy
- Ambient temperature at site of motor too high
- Motor has an external fan: fan failed
- Motor does not have an external fan: too large a load at low speed. The cooling effect of the fan on the motor shaft is too low for this load cycle. Change cycle or fit external fan.
- Motor used above its frequency specification, causing extra magnetic losses.

Overvoltage Overvoltage in intermediate circuit due to energy feedback from the motor
Lengthen deceleration ramp. If not possible, use a braking unit to reduce the energy feedback.

Regulat S OT Temperature of the Regulation board of the Drive too High.
Ambient temperature too high.

Speed fbk loss Failure in the speed feedback sensor signals.
Encoder not connected, or incorrectly connected or not supplied:
Check encoder signals as per section 1.10. If the indicated value does not change or random values are shown, check the power supply and the cabling of the encoder.
Parameter and input setting on the regulation card is not consistent with encoder type.

Undervoltage Mains voltage parameter incorrectly set (eg. Mains voltage set for 460 V, although the drive is run on 400 V). Remedy: set parameter correctly and then acknowledge (*) the fault.
The incoming voltage to the power section of the device is too low due to:
- too low an AC input voltage or long voltage dips
- poor cable connections (e.g. terminals on contactor, choke, filter, etc, not properly secured).
Check connections.

(*) By default all alarms are auto-acknowledged after a 180 sec timeout. To acknowledge a fault press “Alarm” (Shift + Up arrow), scroll to the desired Alarm list entry and Enter

5.5 HINTS ON HOW TO CORRECT OTHER FAULTY CONDITIONS

Motor not turning Failure alarm is displayed: see section 5.4.
Once the error has been corrected, acknowlegde the alarm and press the I and O key to reset the command sequencer.
Keypad display is dark: AC voltage supply to terminals U1/V1/W1 missing or Regulation power supply overloaded. Check for short circuit on signal wiring.
Enable terminal permissive missing (Check configuration of the reg. terminals).
Drive not accepting commands: drive in SETUP MODE.
The analog input used for the reference value was not assigned or assigned differently.

Motor turning in the wrong direction
Polarity of the speed reference signal incorrect.
Motor incorrectly connected.
Note for **Regulation mode** = “Field oriented” only:
if the motor lets itself be controlled in the wrong direction the two encoder cables (A+ and A- or B+ and B-) have to be swaped around in addition to two leads of the motor cable.

Motor not reaching nominal speed
Drive is at speed limit. Remedy: check Speed top and Speed bottom.
Drive working at current limit (LED Ilimit) Possible causes:
- Motor overloaded
- Inverter sized too small
- Incorrect **V/f shape** characteristic set
- **Torque reduct** input active

The value entered for the number of encoder pulses is too high.
A correction value reduces the main speed reference value. Remedy: check control pattern configuration
If main speed reference is acquired via analog input, **Full scale speed** set too low may result in restricting range of analog inputs.
Check encoder rotation.

Motor accelerates immediately to maximum speed

Reference value set via terminals: Check whether the value varies from min. to max. value.
Potentiometer used for reference value setting: is there a 0V connection present?
Encoder not connected, or incorrectly connected or not supplied:
Check encoder signals as per section 1.10. If the indicated value does not change or random values are shown, check the power supply and the cabling of the encoder. If the indicated value is opposite than the speed reference, reverse the encoder connections (exchange channel A+ and A- or B+ and B-).

Motor accelerates too slowly

Ramp value incorrectly set.
Drive working at current limit (LED Ilimit) Possible causes:
- Motor overloaded
- Drive sized too small
- Incorrect V/f characteristics set

Motor decelerates too slowly

Ramp value incorrectly set

Motor turns slowly, although reference value = Zero

Minimum speed logic active
Unused speed reference configured to an open analog input. Remedy: set source parameters for any unused speed reference to OFF.
Main speed referece source is an analog input: disconnect reference value on used analog input,
- if drive now stands still, the effect is due to the cable resistance of the 0V cable.
- if the drive is still turning: carry out offset compensation of the analog input.

The speed during acceleration with maximum current is not linear

Reduce the Speed integral gain and proportional gain proportionally. If this does not lead to an improvement, retune the speed regulator.

Speed oscillating

Speed regulator integral gain vs proportional gain ratio is too high.
Motor potentiometer function not executed.
When operating with remote keys: **Mpot up src** and/or **Mpot down src** and **Mpot invers src** were not mapped to digital inputs or LAN channel bits.

Jog operation not possible

A start command is still present.
When operating with remote keys: **Jog cmd src** and/or **Jog invers src** were not mapped to digital inputs or LAN channel bits

Internal speed reference values not actuated

Mlt spd s 0 src, Mlt spd s 1 src or **Mlt spd s 2 src** were not mapped to digital inputs or LAN channel bits

Multi-Ramp function not reacting

Mlt ramp s 0 src or **Mlt ramp s 1 src** were not mapped to digital inputs or LAN channel bits.

5.6 CRANE FAULTS

To view crane faults from the keypad from the power up screen of “STATUS”
Press the Down arrow until “CUSTOM FUNCTIONS” screen.
Press Enter, then Down to “NLBH Appl.”.
Press Enter, then Down to “NLBH PrmSelect”.
Press Enter, then Down key. The faults will show as a “I” or “O”. “I” indicates the fault is active.

Display	Meaning
Brake Rel. Out	Brake output is active
PButton FLT Out	Control wiring fault
Plug Reverse Out	Plug Reverse is active
Crane Run Out	Run command is acive
Direction Out	
Turbo Lift Out	Turbo Lift is active
Travel A Out	End of travel A is active, slows to 1st speed
Travel B Out	End of travel B is active, stops travel in present direction
Crane Fault	One of the following conditions is present - PT Fault, Travel B output, or PButton Output is active
Zero Servo	Inverter output is on at zero speed
Brake fault	Brake has not mechanically set
PT Fault	Proving time over
Brk Slip Fault	Brake slip indication
Brk Check Fault	Brake has not mechanically set
External Fault	Same as crane fault
Speed Loss Err	A speed arror has been detected, that is greater than the “Spee Loss Level” and “Speed Loss Timer” in Crane Setup, Config Parameter.

Hoist Drive

Speed Loss Fault - Trips with a heavy load going up. Extend the Speed Loss Timer. As there is a speed difference greater than the Speed Loss Timer and Speed Loss Level.

Bridge Drive - FOC Control Mode

Slow response when a run command is first issued. Shorten the Magn ramp time, and increase the Release Speed value.

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