AC10 Variable Speed Drive

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ENGINEERING **YOUR** SUCCESS.

Summary

- **Product Overview**
- **Technical Specifications**
- **Clone Module**
- **Key Pad (Parameters Explanation)**
- **How to create Configuration using keyPad**
- **Update Firmware**
- **DSE Lite**

AC10 Product Range

- **3 Frame sizes, 0.75 – 90 kW IP66**

- **11 Frame sizes, 0.2 – 180 kW IP20**

AC10 IP66 – Drive – 0.4-90kW

Power	Power Supply
2,2 kW	230V single Phase (+/-15%)
15 kW	230V 3 Phases (+/-15%)
90 kW	400V 3 Phases (+10% /-15%)

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All at the touch of a button

- Standard ergonomic keypad providing full access to all drive functions
- Simple out of the box operation thanks to integrated macros and quick start guide

High Speed Operation

- Up to 590 Hz output for high speed operations such as spindles, centrifuges, mixers etc.

Customisation Options

- User customisable option panel for:
  - Isolators
  - Switches

- 0.5 Hz to provide extra starting torque for shifting high inertia loads
- Output power can be uprated for operation in lower ambient temperatures

Suited to all environments

- Robust IP66 rated enclosure for environmental protection
- Optional internal EMC filter allows use in C3 industrial environments
- Conformal coating provides protection in arduous class 3C3 environments
- 50 °C operating temperature

Flexible Connections

- Freely assignable digital inputs and outputs, and relay output to suit your application needs
- Internal dynamic brake switch as standard
- Connection to PLC or other Modbus RTU / RS485 network

Easy Connection Access

- Easy user access to connections with removable gland plate

AC10 IP20 – Drive – 0.4-180kW

Power	Power Supply
2,2 kW	230V single Phase (+/-15%)
15 kW	230V 3 Phases (+/-15%)
180 kW	400V 3 Phases (+10% /-15%)

Technical Specifications

- **Power Supply**
  - 380 480 Vac (+10% -15%) 0.2 -180 KW
  - 1*230Vac 240V (+/- 15%) 0,2-2.2kW
  - 3*230Vac 240   (+/- 15%) 0,2-15kW
  - Constant Torque 0,2-180kW
  - Supply Frequency : 50/60 Hz
  - EMC filter Cat C3 optionnal (industrial)

- **Output Frequency**
  - 590 Hz

- **Switching frequency**
  - 2 to 10kHz

- **Control module I/O (<30 KW)**
  - 2 Analog Input
  - 1 Analog Output (2 with new control board)
  - 6 Digital Input   (7 with new contol board)
  - 1 Digital Output
  - 1 Free Relay Output

- **Control module I/O(>30KW)**
  - 2 Analog Input
  - 2 Analog Output
  - 8 Digital Input
  - 2 Digital Output
  - 1 Free Relay Output

- **Ambient temperature (operation)**

  0...+50°C, no frost allowed

  40°C derating for constant torque   (IP 20)

- **Mounting**
  - IP20 or IP66
  - 3C3 standard

- **Safety**
  - Fire Mode (RUN until destruction)

- **Graphical Keypad**
  - IP20

- **Modbus RTU (Rs 485)**
  - 2 Wires

- **Overload**
  - 150% during 1 Minute
  - 200% during 3 Seconds

- **Control Mode**
  - V/Hz
  - Vector Sensorless

Clone module Part number 1002-00-00

- The drive parameters can be extracted from the drive and exported into another drive without the aid of a PC

This clone module is used as
RS485 – USB converter (2 Wires)

AC10 CLONE MODULE
Part number 1002-00-00

- Can be used on all AC10 Firmware issues including the DSE Lite function blocks

The converter can be plugged into a PC without a drive connected to extract or make parameter changes then download back into the drive

SET UP for the CLONE MODULE DRIVE to DRIVE

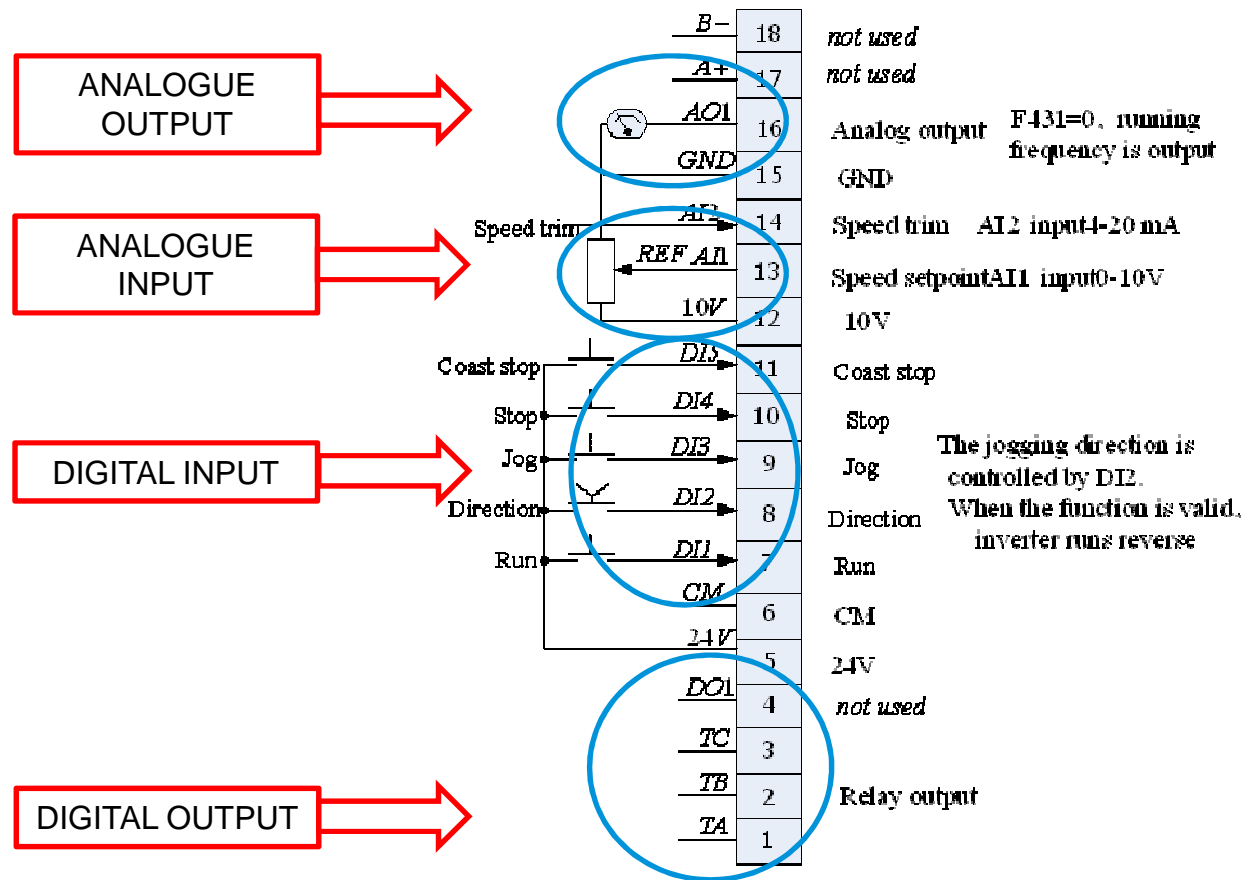| AC10 Drive parameters setting for clone stand alone with drive		
Parameter	SET	Setting Description
F900 Communication Address	1	Inverter Address
F901 Communication Mode	2	RTU
F903 Parity Check	0	Invalid
F904 Baud Rate(bps)	3	9600
Note :- When cloning the clone must be disconnected from the PC and must be connected to an external 5V supply		
COPY side to paddlock open	🔓	
LOAD side to paddlock closed	🔒	

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Control Overview

- Before we look at the different ways to configure the software we need to understand the control hardware.

- All drives will have digital and analogue input and output that can control the drive.

- These I/O are configured with external devices and can determine how the drive will function remotely.

Old style connector vs New style

NEW PCB AC10 IP20 0.2kW - 22kW			OLD PCB AC10 IP20 0.2kW - 22kW		
Terminal	Ident	Function	Terminal	Ident	Function
1	AO2	Analogue Output 2	1	B-	RS485 Tx-
2	AO1	Analogue Output 1	2	A+	RS485 Tx+
3	GND	Analogue 0V	3	AO1	Analogue Output 1
4	AI2	Analogue Input 2	3	GND	Analogue 0V
5	AI1	Analogue Input 1	4	AI2	Analogue Input 2
6	10V	Analogue 10V Supply	5	AI1	Analogue Input 1
7	DI6	Digital Input 6	6	10V	Analogue 10V Supply
8	DI5	Digital Input 5	8	DI5	Digital Input 5
9	DI4	Digital Input 4	9	DI4	Digital Input 4
10	DI3	Digital Input 3	10	DI3	Digital Input 3
11	DI2	Digital Input 2	11	DI2	Digital Input 2
12	DI1	Digital Input 1	12	DI1	Digital Input 1
13	CM	Digital 0V	13	CM	Digital 0V
14	24V	Digital 24V Supply	14	24V	Digital 24V Supply
15	DO1	Digital Output 1	15	DO1	Digital Output 1
16	TC	VOLT FREE TC - Common / TB - NC contact / TA - NO contact	16	TC	VOLT FREE TC - Common / TB - NC contact / TA - NO contact
17	TB		17	TB	
18	TA		18	TA	

Simple hardware overview

ANALOGUE OUTPUT

ANALOGUE INPUT

DIGITAL INPUT

DIGITAL OUTPUT

B−	18	not used
A+	17	not used
AO1	16	Analog output F431=0, running frequency is output
GND	15	GND
AI2	14	Speed trim AI2 input4-20 mA
REF AI1	13	Speed setpointAI1 input0-10V
10V	12	10V
DI5	11	Coast stop
DI4	10	Stop
DI3	9	Jog
DI2	8	Direction
DI1	7	Run
CM	6	CM
24V	5	24V
DO1	4	not used
TC	3	
TB	2	Relay output
TA	1	

Speed trim

Coast stop
Stop
Jog
Direction
Run

The jogging direction is controlled by DI2.
When the function is valid, inverter runs reverse

ANALOGUE INPUT : CONTROL

CONTROL ANALOGUE DEVICE HARDWARE	LINEAR ANALOGUE INPUT FOR CONTROL
POTENTIOMETER THERMISTOR PLC ANALOGUE OUTPUT DRIVE ANALOGUE OUTPUT + many more	RPM TORQUE RUNNING CURRENT DRIVE SPEED + many more

SIGNAL TYPICAL 0-10V / 4-20mA can be 0-5VDC / 0-20mA (signals can be scaled in drive)

This is not essential for the drive to run and only becomes essential if

- The drive is being controlled from a remote source this is not always the speed set point as this can be controlled locally and analogue inputs can be useful for warning of over temperature or used to monitor the speed for reference to a PID.

ANALOGUE OUTPUT : MONITORING

MONITORING ANALOGUE DEVICE HARDWARE	LINEAR ANALOGUE OUTPUT TO BE MONITORED
ANALOGUE METER DIGITAL PANEL METER PLC ANALOGUE INPUT DRIVE ANALOGUE INPUT + many more	RPM TORQUE RUNNING CURRENT DRIVE SPEED + many more

SIGNAL TYPICAL 0-10V / 4-20mA can be 0-5VDC / 0-20mA (signals can be scaled in drive)

This is not essential for the drive to run and only becomes essential if

- The drive is being used for a control mechanism for another hardware device such as a PLC or another drives speed set point or a load cell or the operator needs to monitor one of the above linear outputs.

DIGITAL INPUT : CONTROL

CONTROL DIGITAL DEVICE HARDWARE	DIGITAL INPUT FOR CONTROL SEQUENCING LOGIC
PUSH BUTTON SWITCH PLC DIGITAL OUTPUT DRIVE DIGITAL OUTPUT + many more	START STOP COAST / FAST STOP JOG + many more

SIGNAL TWO STATES 0VDC or 24VDC (LOGIC LEVEL HIGH / LOW)

This is not essential for the drive to run and only becomes essential if

- The drive is being controlled from a remote source and as with the analogue control.

DIGITAL OUTPUT : MONITORING

MONITORING ANALOGUE DEVICE HARDWARE	LINEAR ANALOGUE OUTPUT TO BE MONITORED
LED RELAY PLC DIGITAL INPUT DRIVE DIGITAL INPUT + many more	HEALTH ZERO SPEED RUNNING WARNING + many more

SIGNAL TWO STATES 0VDC or 24VDC (LOGIC LEVEL HIGH / LOW)

This is not essential for the drive to run and only becomes essential if

- The drive is being used for a control mechanism for another hardware device such as a PLC or another drive or the operator needs visual drive status.

AC10 Adjustments

- You are able to program completely the drive using the op station.

- Function parameters

  F100-F160 Basic parameters
  F200-F230 Running control mode
  F300-F330 Multifunctional Input and Output Terminals
  F400-F480 Analog Input and Output
  F500-F580 Multi-stage Speed Control
  F600-F670 Auxiliary Functions
  F700-F770 Timing Control and Protection
  F800-F830 Motor parameters
  F900-F930 Communication parameters
  FA00-FA80 PID parameters
  FC00-FC40 Torque control parameters

AC10 Practical

- Getting to know the MMI

- What the buttons are

- How to configure the Drive

- How we perform an auto tune

- How load an existing application

- How we can modify the application

The Keypad

LED shows running frequency, flashing target frequency, function code, parameter value or fault code.

4 LEDs indicate working status. RUN while running. FWD running forward and FRQ when the MMI is showing frequency.

Fitted as standard

Press "M" for function code, and "E" for original parameters. ▲ and ▼ keys can be used to select function codes and parameters. Press "E" again to confirm. In the mode of keypad control, ▲ and ▼ keys can also be used for dynamic speed control. "I" and "O" keys control start and stop. Press "O" key to reset inverter in fault status.

OPTIONAL
Remote mounted part no.1001-00-00

AC10 Menu Organization

Keys	Names	Remarks
M	**Menu**	To call function code and switch over display mode.
E	**Enter**	To call and save data.
▲	**Up**	To increase data (speed control or setting parameters)
▼	**Down**	To decrease data (speed control or setting parameters)
Ⓘ	**Run**	To start inverter
Ⓞ	**Stop or Reset**	To stop inverter; to reset in fault status; to change function codes in a code group or between two code groups. In the interface of function code, keep pressing "O" key for 3s, inverter will be stopped. (if stop command is controlled by keypad).

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AC10 KEYPAD

- The drive is programmed with the keypad

- You can configure the parameters to meet your application requirements

- You will have to spend time with the manual to understand what and how you want to start / stop / set speed and output values to external monitoring

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How to program AC10 :
Select the Macro

Press (M) until F100 is shown on the display
Press (O) until only the FWD LED is illuminated (X O X X)
Press (UP) to access parameter block F2xx
Press (O) until both the FWD and DGT LEDs are illuminated (X O O X)
Press (UP) until display shows F228
Press (E) to edit the application number
Use the (UP) and (DOWN) keys to select the application
Press (E) to confirm your selection

F228	Application selection	0: Custom 1: Basic speed control 2: auto/manual control 3: Stage speed control 4: Terminal control; 5: PID control;

USING THE KEY PAD CHANGE F228 = 1
The drive application is now in basic speed control

Macro 1: Basic Speed Control

Macro 2: Auto/Manual Control
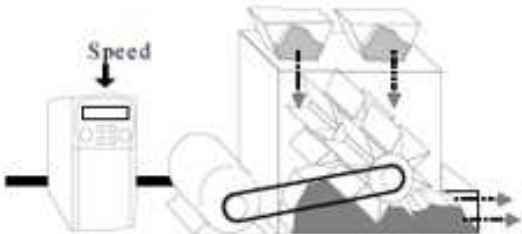
Macro 3: Preset Speeds Control
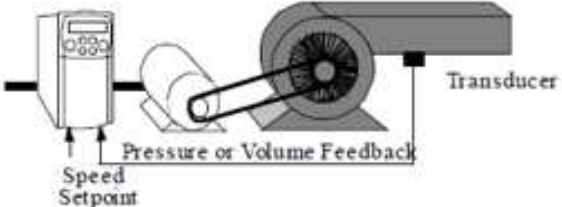

Standard parameters
- F228 Application
- F111 Max frequency
- F112 Min frequency
- F114 Accel time
- F115 Decel Time
- F803 Motor rated current
- F810 Motor rated frequency
- F124 Jog setpoint
- F209 Stop mode
- F137 Torque compensation
- F138 Linear compensation
- F108 Password
- F160 Reset to default values
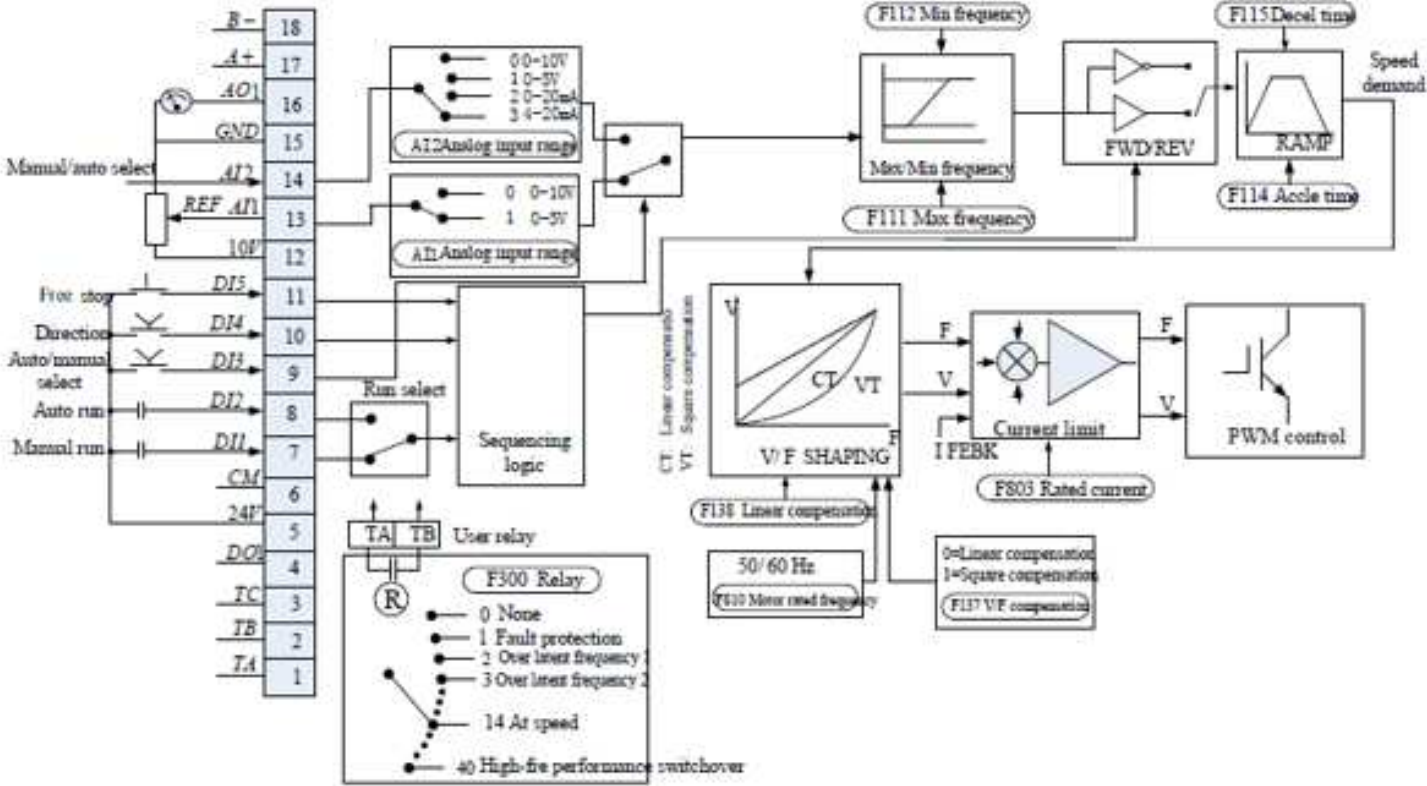
Application 3:
Preset Speeds Control

DIAGNOSTICS = F131
Frequency	Hz = 0
Analog Input	V = 4
Motor Current	A = 2
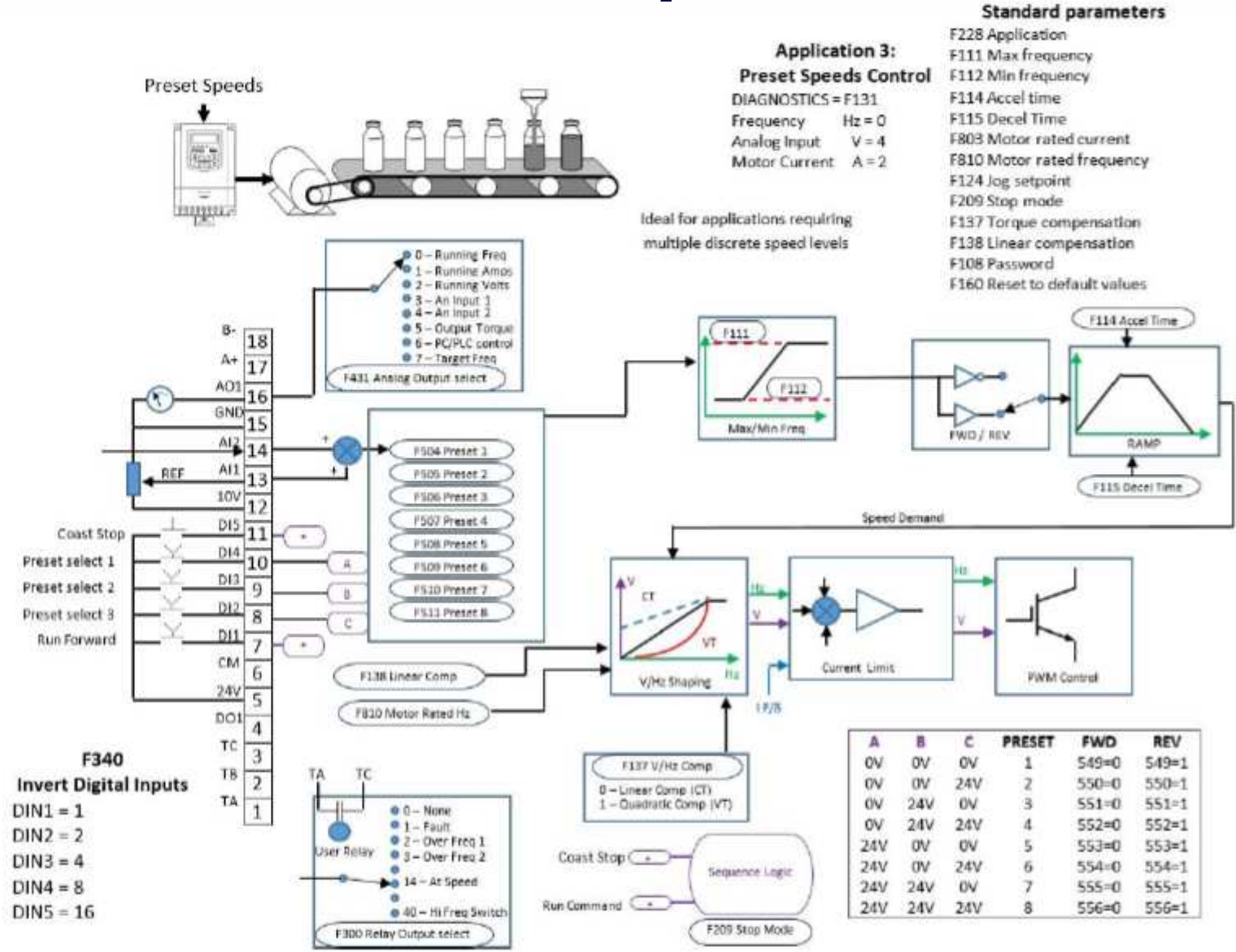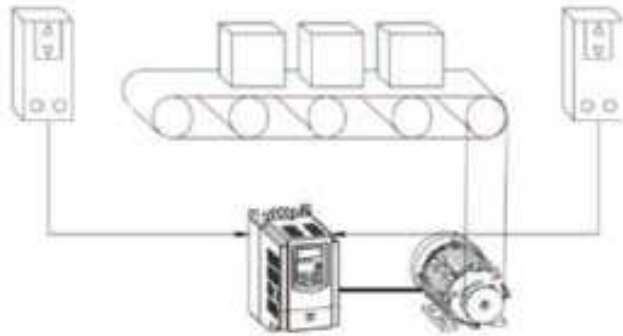
Ideal for applications requiring multiple discrete speed levels

Preset Speeds

A	B	C	PRESET	FWD	REV
0V	0V	0V	1	549=0	549=1
0V	0V	24V	2	550=0	550=1
0V	24V	0V	3	551=0	551=1
0V	24V	24V	4	552=0	552=1
24V	0V	0V	5	553=0	553=1
24V	0V	24V	6	554=0	554=1
24V	24V	0V	7	555=0	555=1
24V	24V	24V	8	556=0	556=1

F340
Invert Digital Inputs
- DIN1 = 1
- DIN2 = 2
- DIN3 = 4
- DIN4 = 8
- DIN5 = 16

Macro 4: Raise Lower

Macro 5: PID Control

How to program AC10 :
Select the type of Start/Stop

	Setting range: 0: No function 1: Two-line operation mode 1; 2: Two-line operation mode 2; 3: three-line operation mode 1; 4: three-line operation mode 2; 5: start/stop controlled by direction pulse	
F208 Terminal two-line/three-line operation control		Mfr's value: 0

When selecting two-line type or three-line type), F200, F201 and F202 are invalid.

Five modes are available for terminal operation control.

Note: In case of stage speed control, set F208 to 0. If F208 ≠0 (when selecting two-line type or three-line type), F200, F201 and F202 are invalid.

"FWD", "REV" and "X" are three terminals designated in programming DI1~DI5.

1: Two-line operation mode 1: this mode is the most popularly used two-line mode. The running direction of mode is controlled by FWD, REV terminals.

For example:　"FWD" terminal -----"open": stop, "closed": forward running;

　　　　　　　　"REV" terminal -----"open": stop, "closed": reverse running;

　　　　　　　　"CM" terminal　-----common port

K1	K2	Running command
0	0	Stop
1	0	Forward running
0	1	Reverse running
1	1	Stop
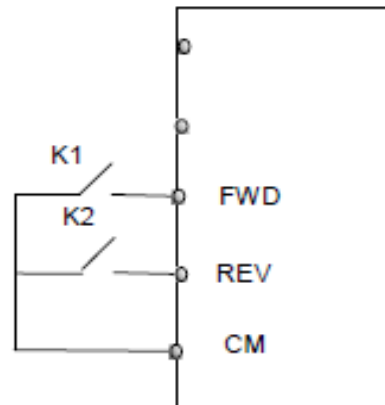
How to program AC10 :
Digital multifunctional input terminals

- You can set a specific code for configuring the digital inputs .
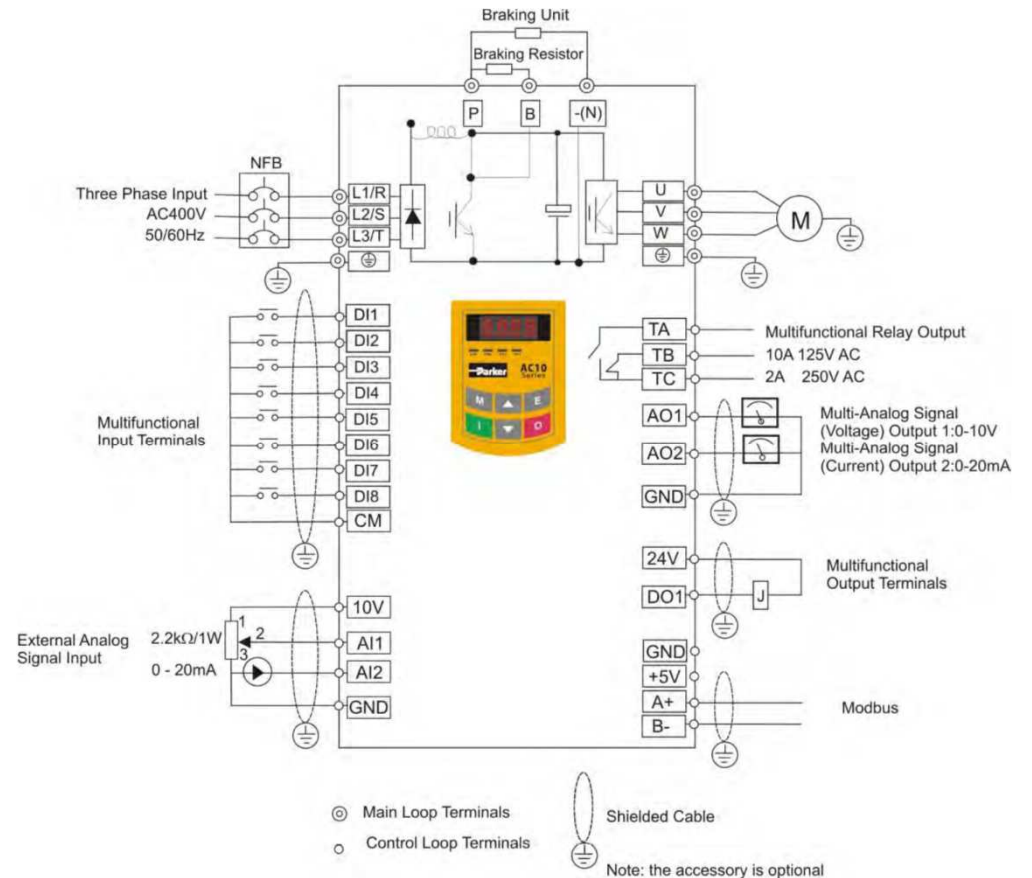
Digital Inputs :

DIG1 (F316) (Forward Jog) 11

DIG2 (F317) (External Coast stop) 9

DIG3 (F318)

  - - -

DIG8 (F323)

How to program AC10 :
Digital multifunctional input terminals

Setting range:
0: no function
1: Run
2: Stop
3: Multi-stage speed terminal 1
4: Multi-stage speed terminal 2
5: Multi-stage speed terminal 3
6: Multi-stage speed terminal 4
7: Reset
8: Free stop
9: External coast stop
10: Acceleration/deceleration forbidden
11: Forward run jogging
12: Reverse run jogging
13: UP frequency increasing terminal
14: DOWN frequency decreasing terminal
15: "FWD" terminal
16: "REV" terminal
17: Three-line type input "X" terminal

18: Acceleration/deceleration 1
19: Reserved
20: Speed/torque switchover
21: Frequency source switchover
32: Fire control switchover
33: Emergency fire control
34: Accel / decel switchover 2
37: Common-open PTC heat protection
38: Common-close PTC heat protection
48: High-frequency switchover
52: Jogging (no direction)
53: Watchdog
54: Frequency reset
55: switchover between manual running and auto running
56: Manual running
57: Auto running
58: Direction

How to program AC10 :
Instructions for digital multifunctional output terminal

- This is exactly the same method for the digital outputs

DIGITAL OUTPUT : Relay (F300)

DO1 (F301)

DO2 (F302)

How to program AC10 :
Instructions for digital multifunctional output terminal

0 No function
1 Inverter fault protection
2 At target frequency 1.
3 At target frequency 2
4 Free stop
5 In running status 1
6 DC braking
7 Acceleration/deceleration time switchover
8 Reserved
9 Reserved
10 Inverter overload pre-alarm

11 Motor overload pre-alarm
12 Stalling
14 In running status 2
15 Frequency arrival output At Speed
16 Overheat pre-alarm Warning
17 Over latent current output
18 Analog line disconnection protection
19 Reserved
20 At zero output current,
21 DO1 Output controlled by PC/PLC
22 Reserved
23 TA\TC Output controlled by PC/PLC
24 Watchdog The output is valid when inverter trips into Err6.
25-39 Reserved
40 Switchover of high-frequency performance

How to program AC10 :
Speed Setpoint

- You get the possibility to create the Speed setpoint by some different ways

Main frequency source is set by this function code.

Main Frequency Source X(F203)
- 1 Analog Input 1
- 2 Analog Input 2
- ....
- 9   PID
- 10 Modbus

Secondary frequency source is set by this function code.

Secondary Frequency Source Y (F204)
- 1 Analog Input 1
- 2 Analog Input 2
- ....
- 4   Stage speed Control
- 5   PID

0: X;
1: X+Y;
2: X or Y (terminal switchover);
3: X or X+Y (terminal switchover);
4: Combination of stage speed and analog
5: X-Y

Speed setpoint
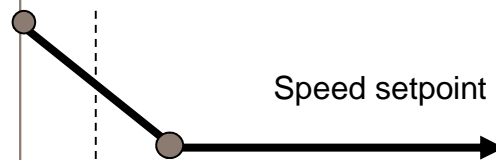
(F207) Select the channel of setting the frequency. The frequency is given by combination of main frequency X and secondary frequency Y.

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Quick Start

In this example we will create from the Macro 0 a complete configuration without using Macro

F160 Reverting to manufacturer values	Setting range: 0: Invalid 1: Valid	Mfr's value: 0

When there is problem with inverter's parameters and manufacturer values need to be restored, set F160=1. After "Reverting to manufacturer values" is done, F160 values will be automatically changed to 0.

Quick Start

- Select the application mode. See Chapter 9 for the application description.

F228 Application selection	Setting range: 0: Macro 0 1: Basic speed control 2: Auto/manual speed control 3: Preset speed control 4: Terminal speed control 5: PID control	Mfr's value: 0

F228 can be set to Mfr's value by F160=1.

- Select the control mode.

F106 Control mode	Setting range: 0:Sensorless vector control (SVC); 1: Reserved; 2: V/F; 3: Vector control 1 6 (Synchronous motor control mode)	Mfr's value: 2

0: Sensorless vector control is suitable for the application of high-performance requirement. One inverter can only drive one motor.

2: V/F control is suitable for common requirement of control precision or one inverter drives several motors.

3: Vector control 1 is auto torque promotion, which has the same function of F137=3. While studying motor parameters, motor does not need to be disconnected with load. One inverter can only drive one motor.

Quick Start

- Set the Motor Paramaters

F801 Rated power (kW)	Setting range: 0.75~1000	
F802 Rated voltage (V)	Setting range: 1~460	
F803 Rated current (A)	Setting range: 0.1~6500	
F804 Number of motor poles	Setting range: 2~100	4
F805 Rated rotary speed (rmp/min)	Setting range: 1~30000	
F810 Motor rated frequency (Hz)	Setting range: 1.0~650.0	50.00

Quick Start

Set the Frequency limits

F111	Max Frequency (Hz)	Setting range: F113~650.0	Mfr's value: 50.00
F112	Min Frequency (Hz)	Setting range: 0.00~F113	Mfr's value: 0.50

Max frequency is set by F111.

Min frequency is set by F112.

F114	First Acceleration Time (S)	Setting range: 0.1~3000	Mfr's value: subject to inverter model
F115	First Deceleration Time (S)		
F116	Second Acceleration Time (S)		
F117	Second Deceleration Time (S)		

F119 is used to set the reference of setting accel/decel time.

Quick Start

9.2 Operation Control

	Setting range:	
F200 Source of start command	0: Keypad command; 1: Terminal command; 2: Keypad + Terminal; 3: MODBUS; 4: Keypad + Terminal + MODBUS	Mfr's value: 4
F201 Source of stop command	Setting range: 0: Keypad command; 1: Terminal command; 2: Keypad + Terminal; 3: MODBUS; 4: Keypad + Terminal + MODBUS	Mfr's value: 4

F200 and F201 are the resource of selecting inverter control commands.

Inverter control commands include: starting, stopping, forward running, reverse running, jogging, etc.

"Keypad command" refers to the start/stop commands given by the "I" or "O" key on the keypad.

"Terminal command" refers to the start/stop command given by the "I" terminal defined by F316-F323.

When F200=3 and F201=3, the running command is given by MODBUS communication.

When F200=2 and F201=2, "keypad command" and "terminal command" are valid at the mean time, F200=4 and F201=4 are the same.

Quick Start

• Set the frequency Source

F203 Main frequency source X	Setting range: 0: Memory of digital given; 1: External analog AI1; 2: External analog AI2; 3: Reserved; 4: Stage speed control; 5: No memory of digital given; 6: Reserved; 7: Reserved; 8:Reserved; 9: PID adjusting; 1 0: MODBUS	Mfr's value: 0

Main frequency source is set by this function code.

0: Memory of digital given

Its initial value is the value of F113. The frequency can be adjusted through the key "up" or "down", or through the "up", "down" terminals.

"Memory of digital given" means after inverter stops, the target frequency is the running frequency before stop. If the user would like to save target frequency in memory when the power is disconnected, please set F220=1, i.e. frequency memory after power down is valid.

F204 Secondary frequency source Y	Setting range: 0: Memory of digital given; 1: External analog AI1; 2: External analog AI2; 3: Reserved; 4: Stage speed control; 5: PID adjusting; 6: Reserved;	Mfr's value: 0

When secondary frequency Y is given to channel as independent frequency, it has the same function with main frequency source X.

Quick Start

F207 Frequency source selecting	Setting range: 0: X; 1: X+Y; 2: X or Y (terminal switchover); 3: X or X+Y (terminal switchover); 4: Combination of stage speed and analog 5: X-Y 6: Reserved	Mfr's value: 0

Select the channel of setting the frequency. The frequency is given by combination of main frequency X and secondary frequency Y.

• Set the Starting method

F208 Terminal two-line/three-line operation control	Setting range: 0: No function 1: Two-line operation mode 1; 2: Two-line operation mode 2; 3: three-line operation mode 1; 4: three-line operation mode 2; 5: start/stop controlled by direction pulse	Mfr's value: 0

When selecting two-line type or three-line type), F200, F201 and F202 are invalid.

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Quick Start

- Set the Starting method

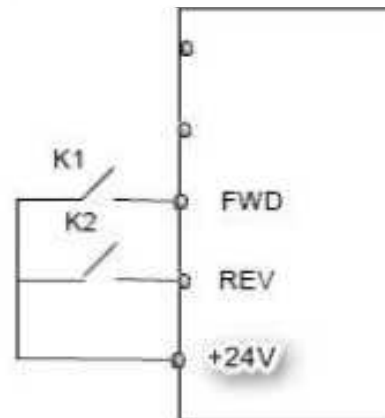| F208 Terminal two-line/three-line operation control	Setting range: 0: No function 1: Two-line operation mode 1; 2: Two-line operation mode 2; 3: three-line operation mode 1; 4: three-line operation mode 2; 5: start/stop controlled by direction pulse	Mfr's value: 0

When selecting two-line type or three-line type), F200, F201 and F202 are invalid.

1: Two-line operation mode 1: this mode is the most popularly used two-line mode. The running direction of mode is controlled by FWD, REV terminals.

For example: "FWD" terminal -----"open": stop, "closed": forward running;

"REV" terminal -----"open": stop, "closed": reverse running;

K1	K2	Running command
0	0	Stop
1	0	Forward running
0	1	Reverse running
1	1	Stop

• Set the Digital input Terminals function

9.3.2 Digital multifunctional input terminals

F316	DI1 terminal function setting	Setting range:	Mfr's value: 11
F317	DI2 terminal function setting	0: no function 1: Run	Mfr's value: 9
F318	DI3 terminal function setting	2: Stop	Mfr's value: 15
F319	DI4 terminal function setting	3: multi-stage speed 1 4: multi-stage speed 2	Mfr's value: 16
F320	DI5 terminal function setting	5: multi-stage speed 3 6: multi-stage speed 4 7: reset 8: free stop 9: external coast stop 10: acceleration/deceleration forbidden 11: forward run jogging 12: reverse run jogging 13: UP frequency increasing terminal 14: DOWN frequency decreasing terminal 15: "FWD" terminal 16: "REV" terminal 17: three-line type input "X" terminal 18: acceleration/deceleration time switchover 1 19: Reserved 20: switchover between speed and torque 21: frequency source switchover terminal 32: Fire pressure switchover 33: Emergency fire control 34: Acceleration / deceleration switchover 2 37: Common-open PTC heat protection 38: Common-close PTC heat protection 48: High-frequency switchover 52: Jogging (no direction) 53: Watchdog 54: Frequency reset 55: switchover between manual running and auto running 56: Manual running 57: Auto running 58: Direction	Mfr's value: 7

This parameter is used for setting the corresponding function for multifunctional digital input terminal.

Both free stop and external coast stop of the terminal have the highest priority.

RUNNING THE AUTO TUNE (Vector Mode)

THERE ARE TWO TYPE OF AUTO TUNE AVAILABLE ON THE AC10

- Stationary – used when the rotor cannot be disconnected

- Rotating – used when the rotor can be disconnected and move freely

RUNNING THE AUTO TUNE

Both types of auto tune are selected by the same parameter F800

- F800 = 2 then stationary auto tune is selected

- F800 = 1 then rotating auto tune is selected

SET F800 TO ONE OF THE ABOVE VALUES THEN PRESS START

RUNNING THE AUTO TUNE

- Regardless of the selection of F800 the auto tune will run and set the drive parameters to match the motor connected

- If you reselect F800 you will see the drive resets the parameter back to 0

The drive has calculated things such as
- **Stator resistance**
- **Rotor resistance**
- **Leakage inductance**
- **Mutual inductance**

This will improve the way the motor rotates and improves the drive to motor efficiency

AC10 APPLICATIONS

- APPLICATIONS ARE DRIVEN BY VALUES IN PARAMETER BLOCKS THAT CAN BE CHANGED BY THE MMI or PDB SOFTWARE TOOL via RS485 COMMS

- Applications are still driven with values in parameter blocks but now are more visual with using DSE Lite instead of PDB

AC10 APPLICATIONS

- MORE TIME SPENT WITH COMPLEX APPLICATIONS DUE TO PARAMETER SET UP BUT ONCE DONE EASILY REPLICATED INTO OTHER DRIVES

- More complex applications can now be created faster and be more visual than before using DSE Lite

AC10 APPLICATIONS

- New tools for monitoring parameters with DSE Lite

 Monitor Table

  Charting Tool

AC10 APPLICATIONS

- 5 PRE DEFINED APPLICATIONS WITH DETAILED PARAMETER SETTINGS

- ALL PARAMETERS INDEXED IN USER MANUAL

- 2 x ANALOGUE INPUTS

- 1 x ANALOGUE OUTPUT NEW = 2

- 5 x DIGITAL INPUTS NEW = 6

- 1 x DIGITAL OUTPUTS

- 1 x RELAY OUTPUT VFC 5A @ 230VAC

AC10

- Getting to know the product

- It is important when using the drive that all reference is made to the manual

- Manual help built in with DSE Lite just click on function block for description of function

- DSE Manual kept up to date with DSE updates

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AC10 Updating Drive Firmware

- In the install instructions the example uses a MOXA UPORT 1130 serial to USB adapter in 4 wire configuration

- After loading the MOXA drivers you will need to set up the device for 4 wire operation in the windows device manager
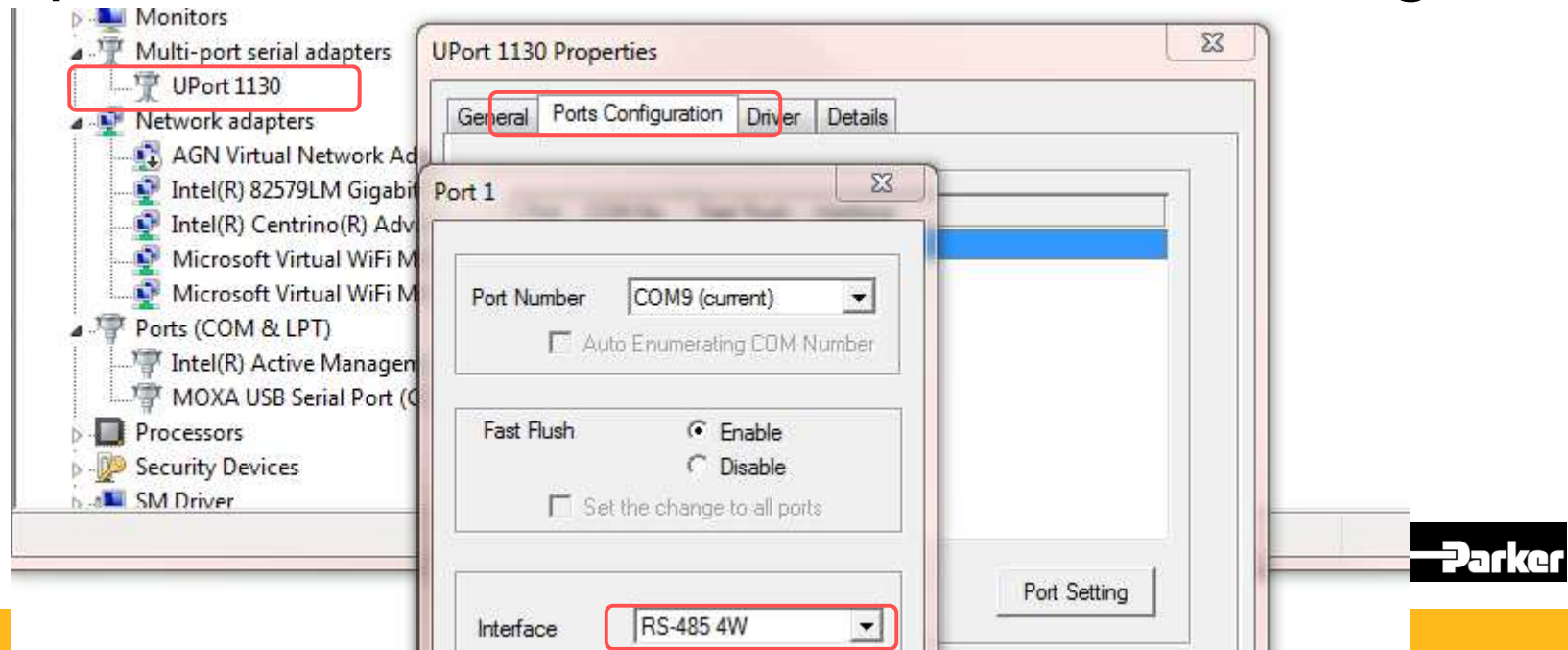
AC10 Updating Drive Firmware

- The following instructions and installer can be found on the Parker Download site

DSELite Configuration Tool [Version 3.05 - 06/2016] For AC10 / AC650 / AC690 / AC890 / DC590 series drives		
DSELite Program	DSELite_Install.exe	211mb
AC10 Firmware V2.27 (for IP20 version / frames 1 - 5)	AC10 Firmware Installer Firmware Update Process for AC10 (IP20, Frames 1-5)	

- This gives a step by step instruction on what hardware and software is required to perform a Firmware update

AC10 Updating Drive Firmware

- Before commencing the download using the process instructions be aware

AC10 Firmware Update Process IP20 Frame 1-5

The firmware of an AC10 IP20 0.2kW-22kW (excluding 3Ph 230V 15kW) can be updated using the process described here. These can be identified by the Model Number as being frame 1-5.

For example, is an IP20 AC10 Frame 2 so can be updated.

Required Tools:
1) Programming software (Windows)
2) RS485 4-wire Converter
3) Programming Cable
4) Jumper for J9 link (bent paper-clip will do.)

The programming software can be downloaded from http://divapps.parker.com/divapps/ssde/ssde/Downloads/AC10FwInstaller/publish.htm It includes the latest version of firmware.

Any RS485 converter can be used as long as it supports 4-wire mode. A good example is the Moxa Uport1130 Rs-422/485 USB-to-Serial Adaptor.

The Programming Cable is an RJ45 (Ethernet standard) connected as follows:

the same cable connected to a Moxa converter:

Jumper for J9 link:

AC10 Updating Drive Firmware

- **Important Notes Before Continuing with Firmware Update**

1. Check the Drive values of F103 (kW rating of the Drive) and F104 (Phase and Voltage rating of the Drive). These values will need to be re-entered after the Firmware upgrade. On a system fitted Drive the Drive label with this information is not always visible.

2. Do you need to save the existing Configuration installed in the Drive? The Firmware upgrade will set all the values in the Drive back to default. The installed configuration can be extracted with DSE before commencing with the Firmware upgrade. Once you have started updating the Drive Firmware you cannot restore the Drive configuration without a saved DSE parameter extraction.

AC10 Updating Drive Firmware

- **Important Notes when performing the Firmware Update**
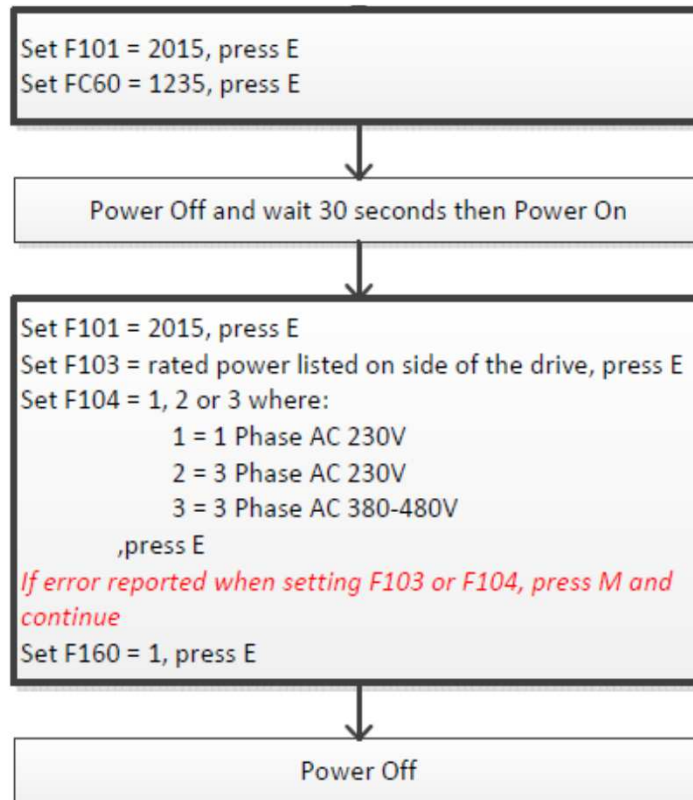
1. After linking the pins of J9 and powering the Drive from the mains socket check the display of the Drive is blank. If the display is illuminated remove the power and refit and check the J9 link. **The display should be blank during this operation**

AC10 Updating Drive Firmware

Important Notes resetting all of the parameters back to factory default (F160 will not set all parameters)

Perform the following.

Set F101 = 2015, press E
Set FC60 = 1235, press E

Power Off and wait 30 seconds then Power On

Set F101 = 2015, press E
Set F103 = rated power listed on side of the drive, press E
Set F104 = 1, 2 or 3 where:
   1 = 1 Phase AC 230V
   2 = 3 Phase AC 230V
   3 = 3 Phase AC 380-480V
  ,press E
If error reported when setting F103 or F104, press M and continue
Set F160 = 1, press E

Power Off

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AC10 Updating Drive Firmware

- The firmware of an AC10 IP20 0.2kW-22kW (excluding 3Ph 230V 15kW) can be updated using the process

- described here. These can be identified by the Model Number as being frame 1-5.

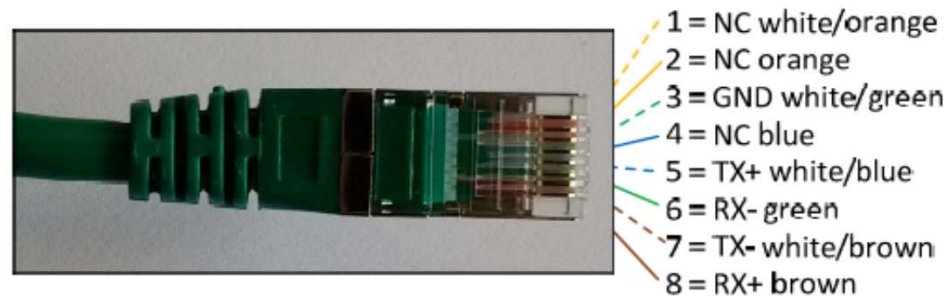- For example, is an IP20 AC10 Frame 2 so can be updated.

AC10 Updating Drive Firmware

Required Tools:

1) Programming software (Windows)

2) RS485 4-wire Converter

3) Programming Cable

4) Jumper for J9 link (bent paper-clip will do.)

- The programming software can be downloaded from
- http://divapps.parker.com/divapps/ssde/ssde/Downloads/AC10FwInstaller/publish.htm
- It includes the latest version of firmware.

AC10 Updating Drive Firmware

Any RS485 converter can be used as long as it supports 4-wire mode. A good example is the Moxa Uport1130 Rs-422/485 USB-to-Serial Adaptor.
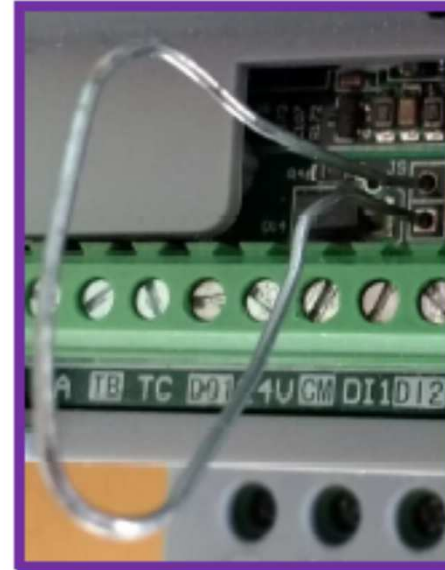
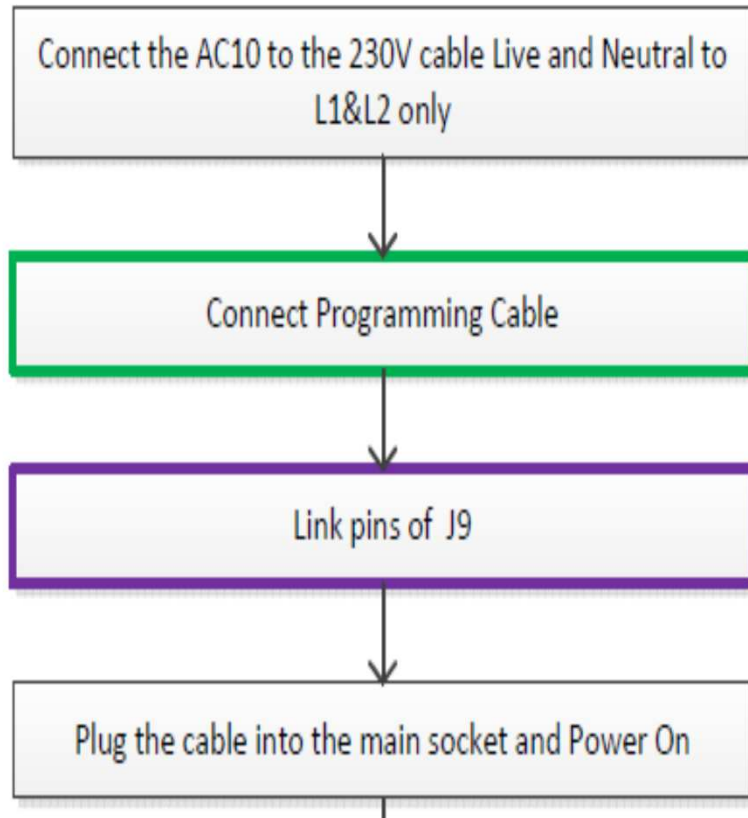The Programming Cable is an RJ45 (Ethernet standard) connected as follows:

1 = NC white/orange
2 = NC orange
3 = GND white/green
4 = NC blue
5 = TX+ white/blue
6 = RX- green
7 = TX- white/brown
8 = RX+ brown

the same cable connected to a Moxa converter:

AC10 Updating Drive Firmware

Connect the AC10 to the 230V cable Live and Neutral to L1&L2 only

↓

Connect Programming Cable

↓

Link pins of J9

↓

Plug the cable into the main socket and Power On

AC10 Updating Drive Firmware

AC10 Updating Drive Firmware

```
                              │
                              ▼
        ┌─────────────────────────────────────────────┐
        │           Remove Link from  J9              │
        └─────────────────────────────────────────────┘
                              │
                              ▼
        ┌─────────────────────────────────────────────┐
        │        Disconnect Programming Cable         │
        └─────────────────────────────────────────────┘
                              │
                              ▼
        ┌─────────────────────────────────────────────┐
        │                  Power On                   │
        └─────────────────────────────────────────────┘
                              │
                              ▼
        ┌─────────────────────────────────────────────┐
        │  Set F101 = 2015, press E                   │
        │  Set FC60 = 1235, press E                   │
        └─────────────────────────────────────────────┘
                              │
```

AC10 Updating Drive Firmware

Power Off and wait 30 seconds then Power On

Set F101 = 2015, press E

Set F103 = rated power listed on side of the drive, press E

Set F104 = 1, 2 or 3 where:

        1 = 1 Phase AC 230V

        2 = 3 Phase AC 230V

        3 = 3 Phase AC 380-480V

     ,press E

If error reported when setting F103 or F104, press M and continue

Set F160 = 1, press E

Power Off
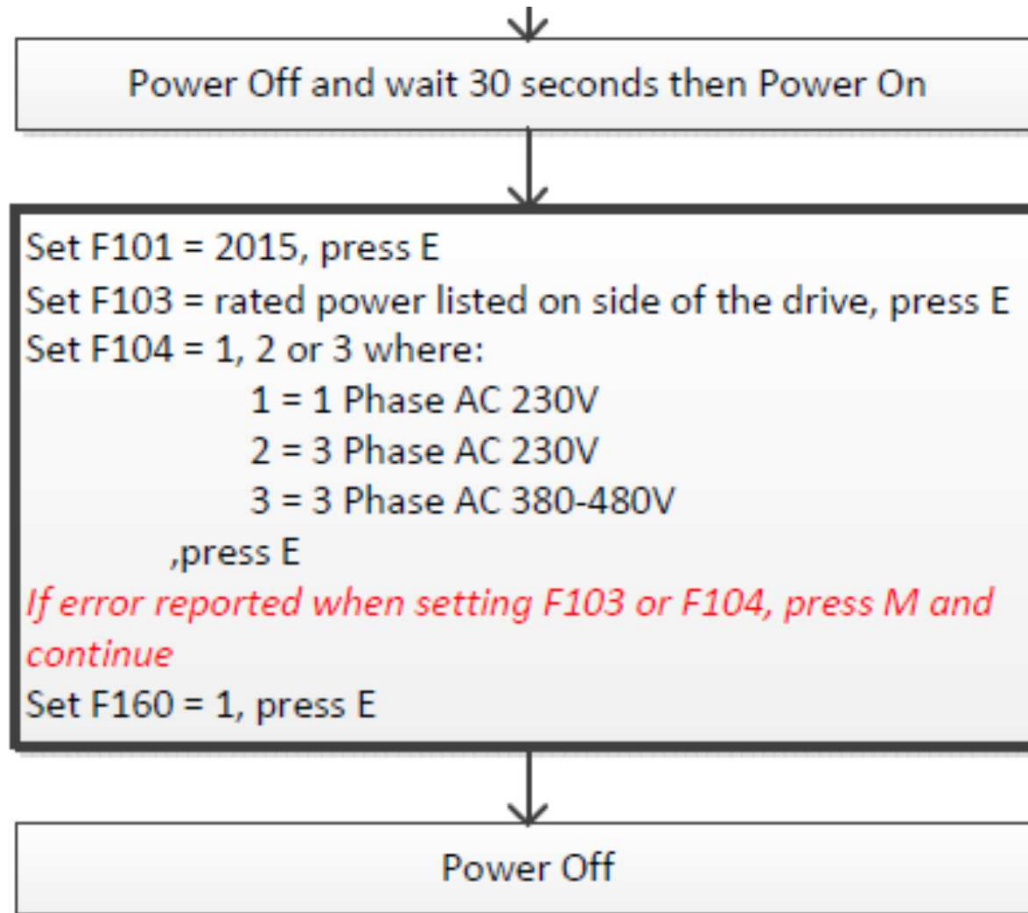
AC10 Updating Drive Firmware

- Before commencing with Drive Configuration check values in

- F103 – Drive kW rating
- F104 – Drive Phase and Voltage
- F105 – Drive Software Version

AC10 DSE Lite
DSE Lite can be found on the Parker Software Download site

DSELite Configuration Tool [Version 3.05 - 06/2016] For AC10 / AC650 / AC690 / AC890 / DC590 series drives		
DSELite Program	DSELite_Install.exe	211mb
AC10 Firmware V2.27 (for IP20 version / frames 1 - 5)	AC10 Firmware Installer Firmware Update Process for AC10 (IP20, Frames 1-5)	

Download and install DSE Lite following the installer instructions
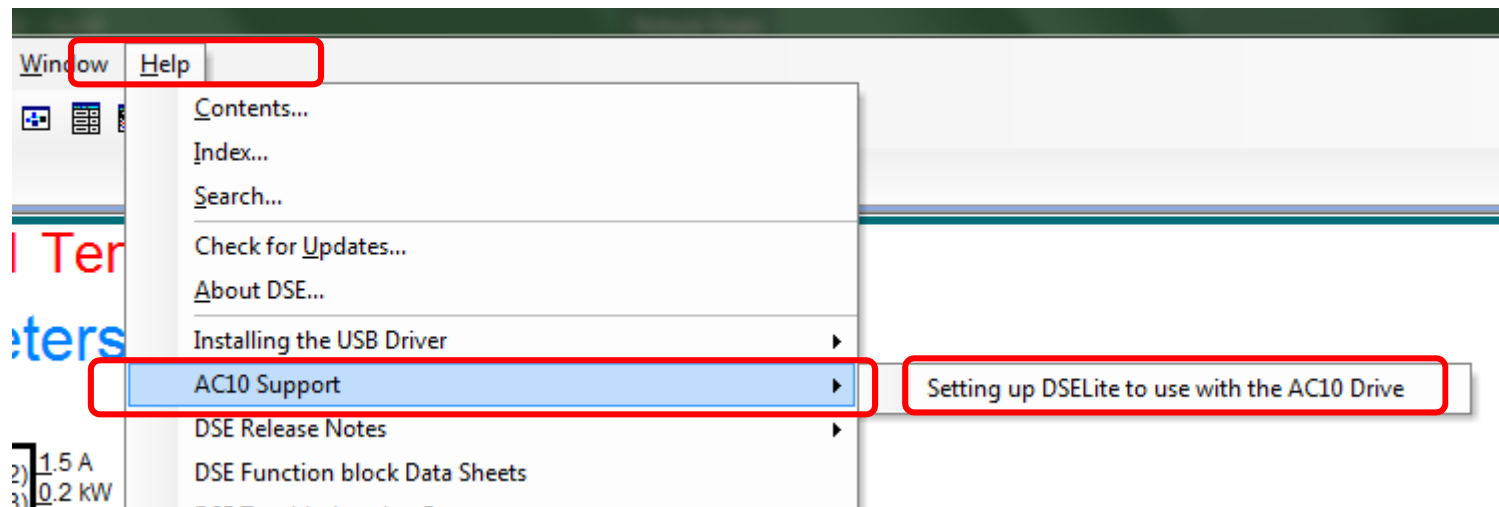
AC10 DSE Lite

- Run DSE Lite from the desktop shortcut or from the programs list shown below
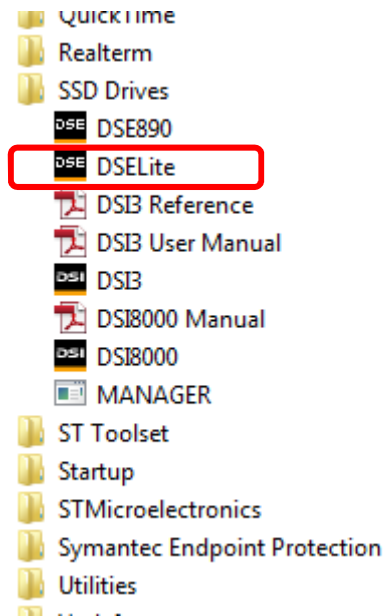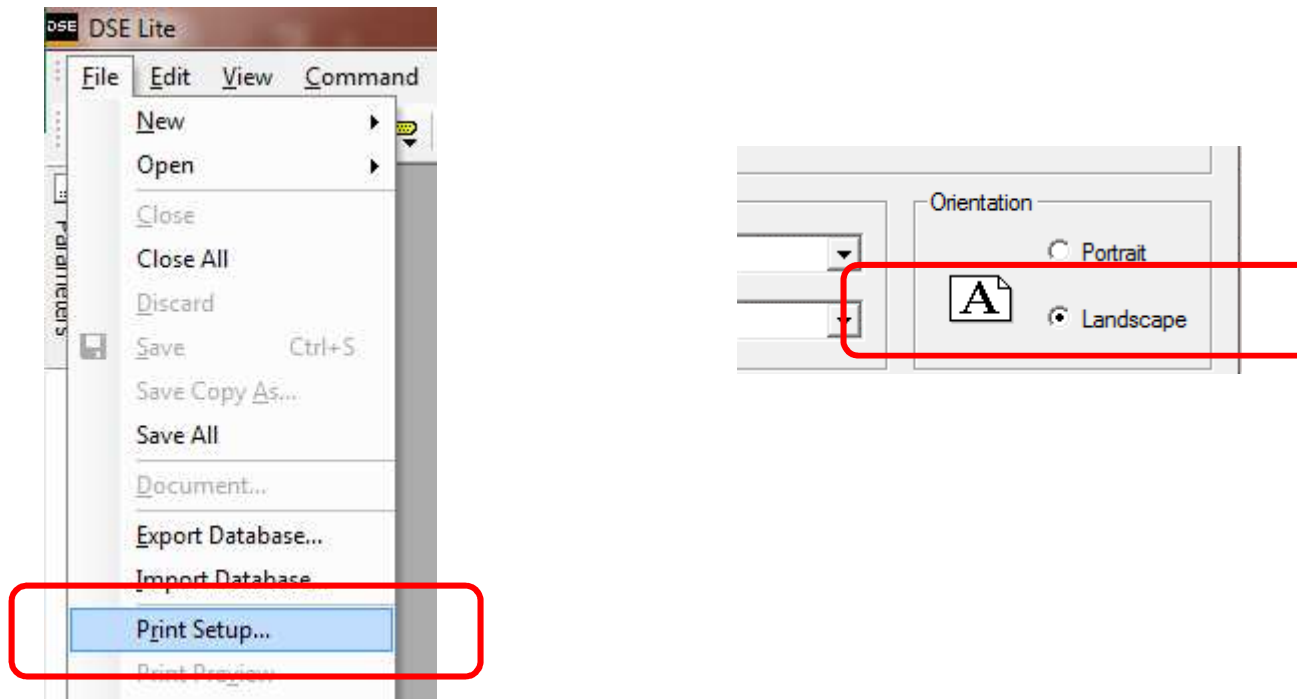
AC10 DSE Lite

- Help and support files are built into the DSE Lite program

- This shows clear instructions for setting the communication settings for use with AC10 Drives

AC10 DSE Lite

- It is also worth setting the page to landscape to fit the drive configuration templates as shown below

- Close DSE and Install USB drivers

AC10 DSE Lite

- Installing the clone module USB drivers
- The drivers are available on the disc included with the Clone Module
- The only problem is driver will try to update on the Internet
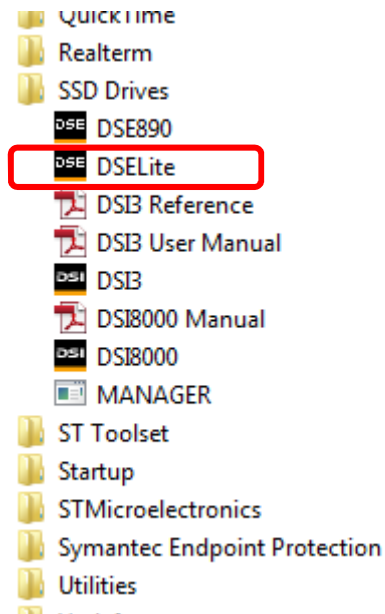
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AC10 DSE Lite

- Install the Clone Module driver

- Plug the Clone module or any other RS485 to USB converter to be used with DSE in the laptop and go to device manager to find the Comm port used
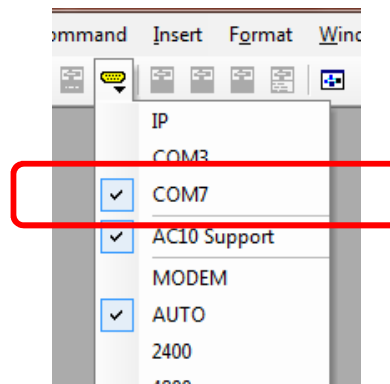
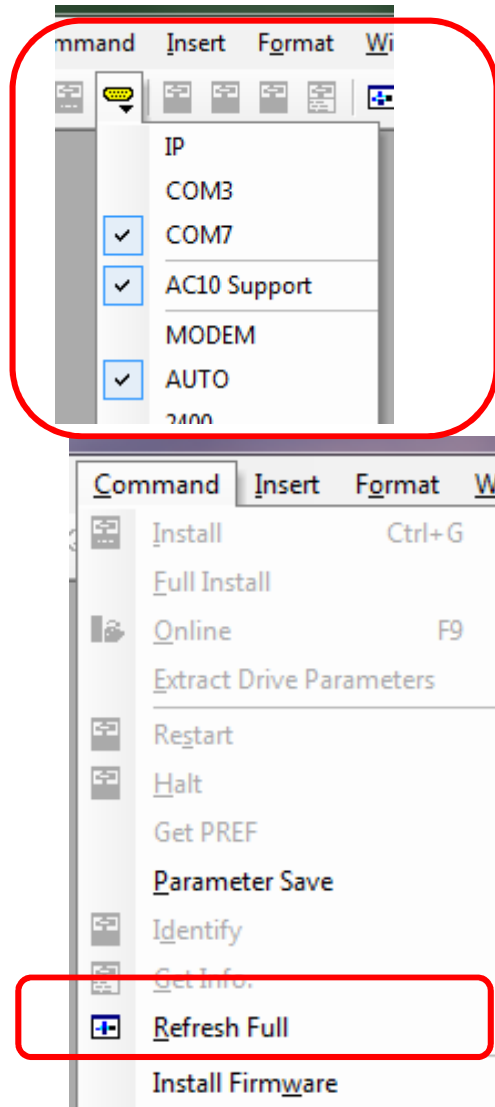- The snapshot above shows Com7 this is what I need to set in DSE

AC10 DSE Lite

- Run DSE Lite from the desktop shortcut or from the programs list shown below

- Enter the com port as shown from your device manager

AC10 DSE Lite

**Check DSE
Communication Setting**

**Perform Refresh Full this
is to ensure
communications are
established with the Drive
and DSE**

Drive Setting

F900 : 1 (Broadcast Address)
F901 : 2 (Modbus RTU)
F904 : 4 (Baud rate 19200)

You can use DSE Lite with AC10 from the
Firmware V2.22 (F105 for Checking Firmware
Version)

AC10 DSE Lite

- Check the scratch pad at the bottom of the DSE screen

Scratch Pad

Thu Aug 04 09:24:06 2016
Database ID is 'SSD Drives (Ted Soukal)', user name is 'Edward'
loading 'C:\SSD_LINK\TOOLS\WIN3\CELite3.dat' (ID #6168) done.
loading 'C:\SSD_LINK\symbols\DEFAULT5.690' (for 690v5 Drive) done.
AC10 version 2.27 - 1Ph 230V 1.5A 0.20kW (connected to DSELite @ 9600 baud, drive NOT running)

- This shows the drive rating firmware version and the drive status
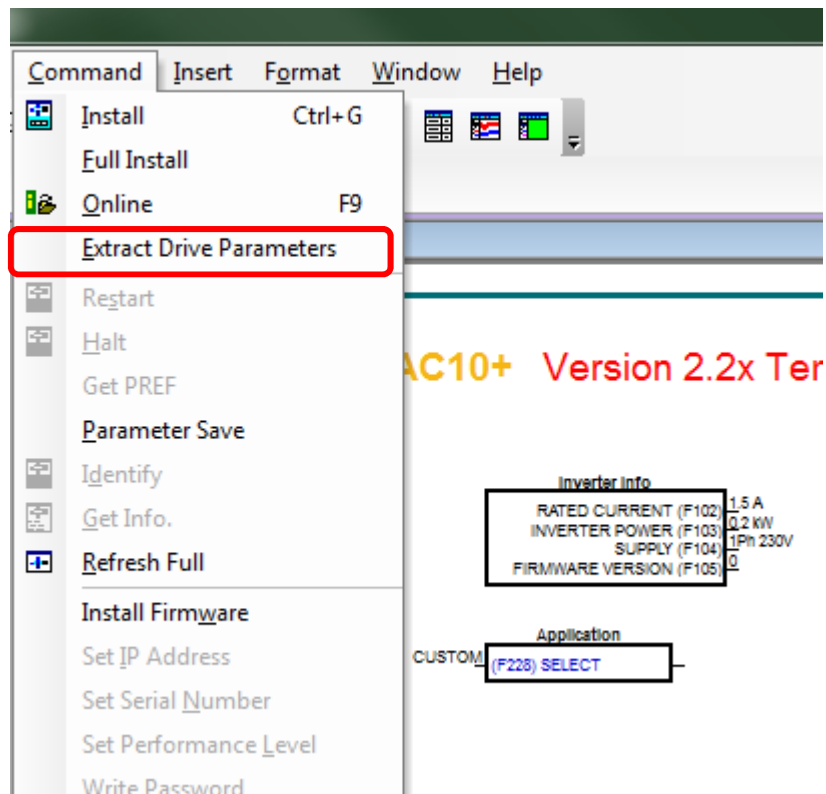
AC10 DSE Lite
- Loading a new template
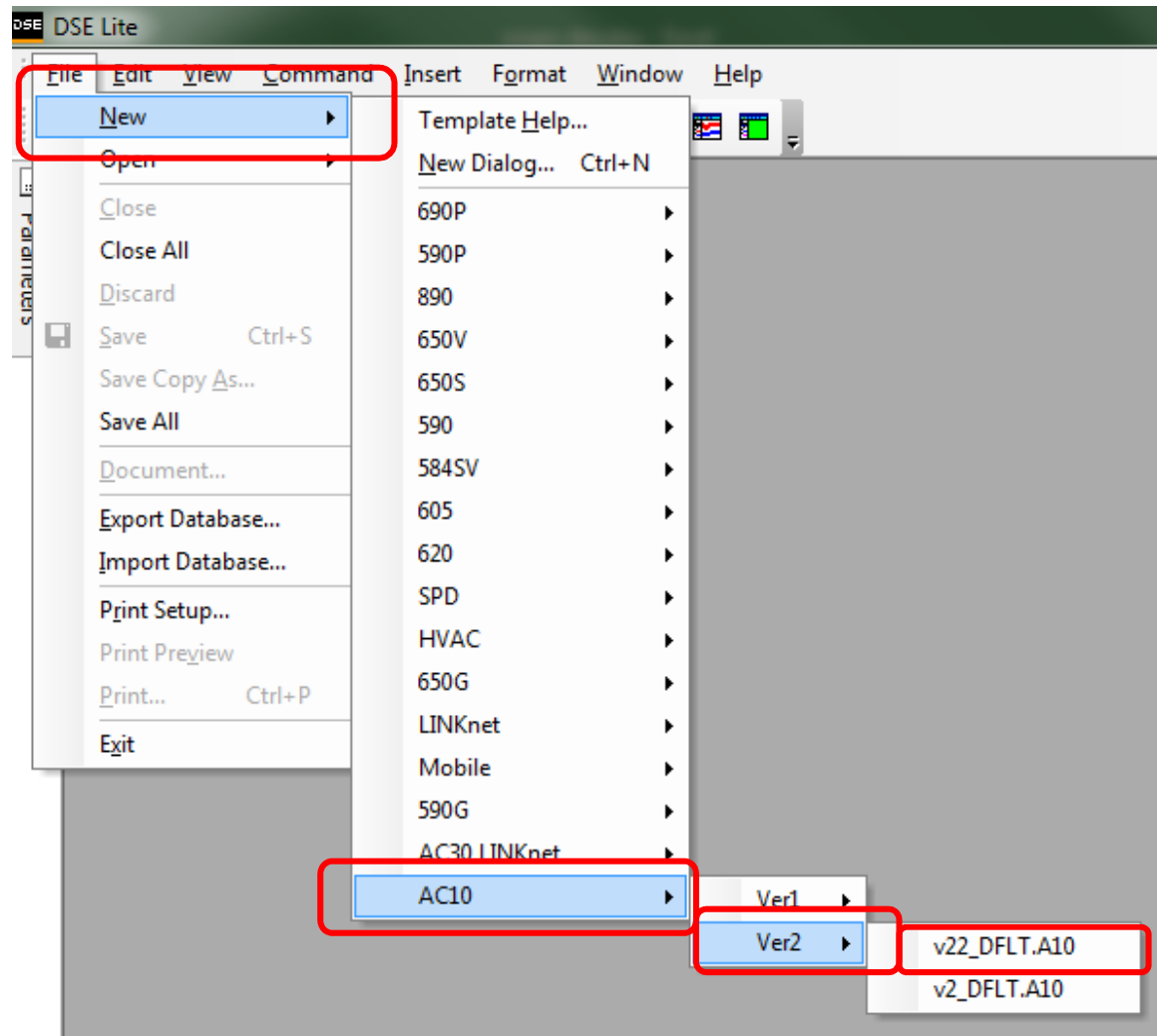
AC10 DSE Lite

- Using the drive keypad set F228 to one of the pre-defined applications that suits your application

1. Basic speed control

2. Auto / manual speed control

3. Pre-set speed control
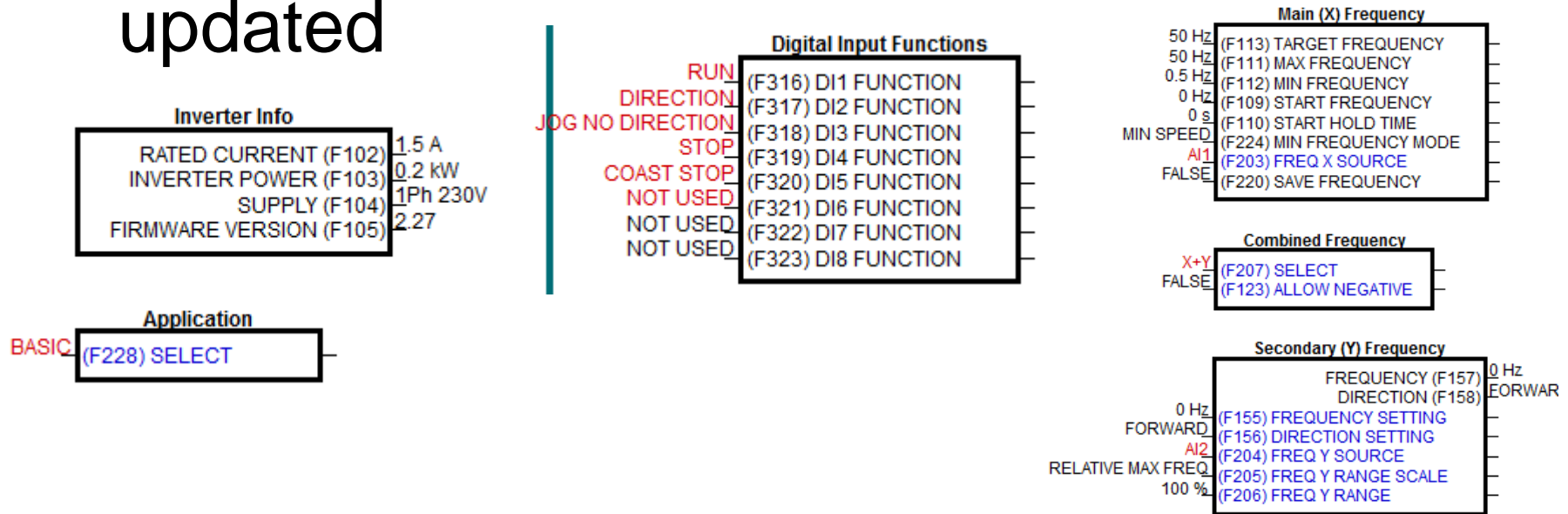
4. Raise Lower control

5. PID control

AC10 DSE Lite

- Extract the drive parameters

AC10 DSE Lite

- Now check the template and see the new values set from the drive highlighted in red
- Also the Inverter info function block is now updated

AC10 DSE Lite

- This is equivalent to the way DSE templates were downloaded now the macros or default configurations are uploaded depending on the setting in the drive of parameter F228

- Warning changing the Application in DSE and downloading will not change the parameters required for that application in the drive

- **Always change F228 in the drive then extract drive parameters**

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AC10 DSE Lite

Going online and checking values
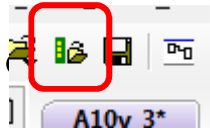
click on the icon shown
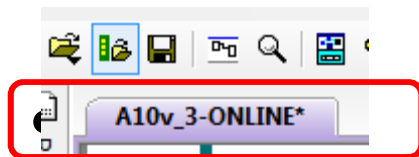
The template now shows online you cannot download to the drive when online

Move the cursor over over any output and

Left click the mouse to read the current value in the drive

AC10 DSE Lite

Now right click on an input value such as a digital input
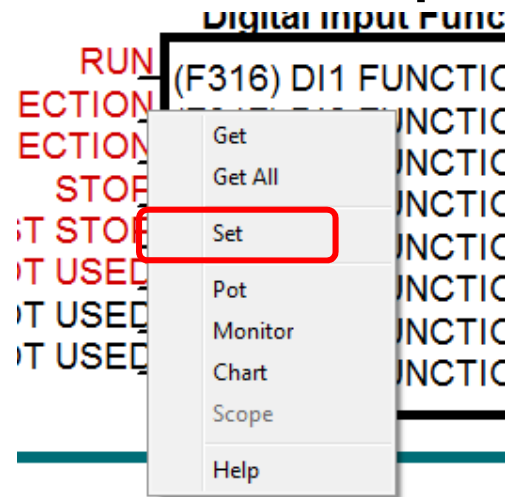
Select set and change the value this value will be changed in the drive and in the current configuration

AC10 DSE Lite

Now select monitor output frequency
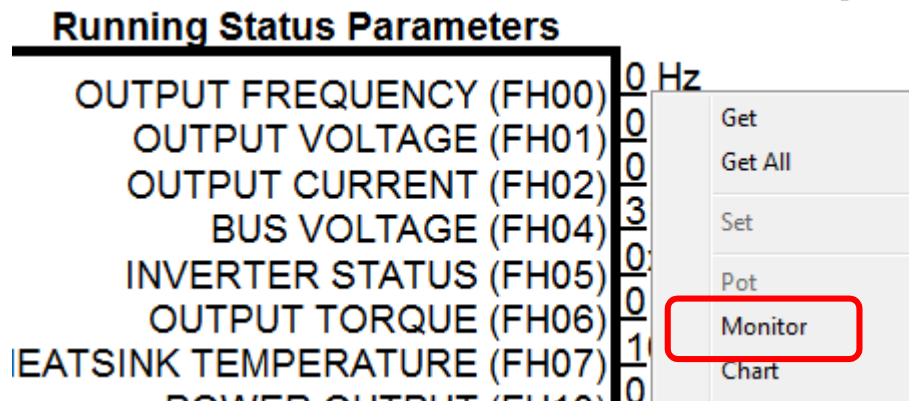
Now run the drive and vary the speed

The value of the drive output frequency will vary in real-time

AC10 DSE Lite

Now select chart output frequency
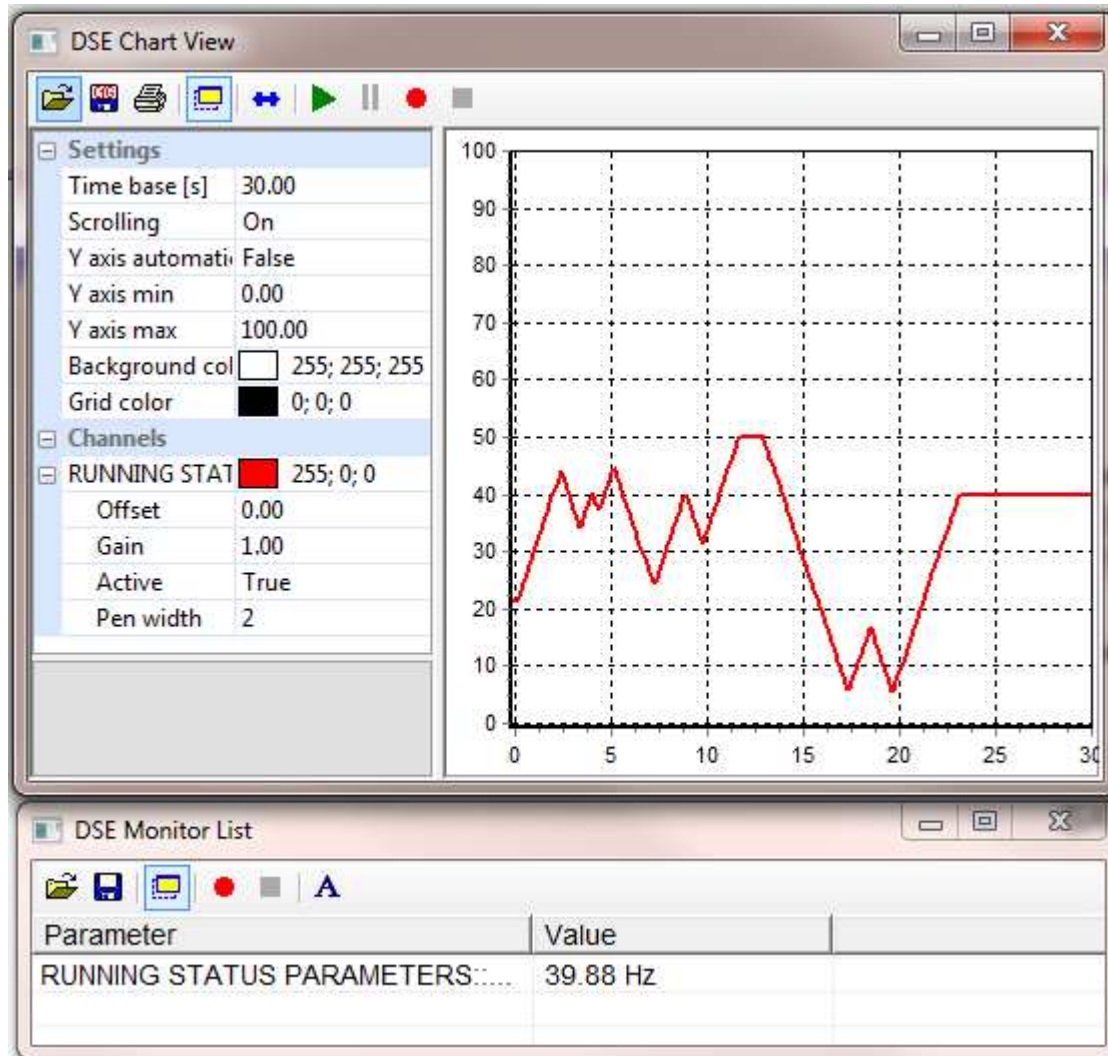
10 Analog Function blocks

- Calculation
- Compare
- Timers
- Counters

Value Func 1

OUTPUT (FD04)   0
0 (FD00) INPUT A
0 (FD01) INPUT B
0 (FD02) INPUT C
A>=B (FD03) TYPE

Value Func 2

OUTPUT (FD09)   0
0 (FD05) INPUT A
0 (FD06) INPUT B
0 (FD07) INPUT C
(A*B)/C (FD08) TYPE

Value Func 10

OUTPUT (FD49)   0
0 (FD45) INPUT A
0 (FD46) INPUT B
0 (FD47) INPUT C
ON DELAY (FD48) TYPE
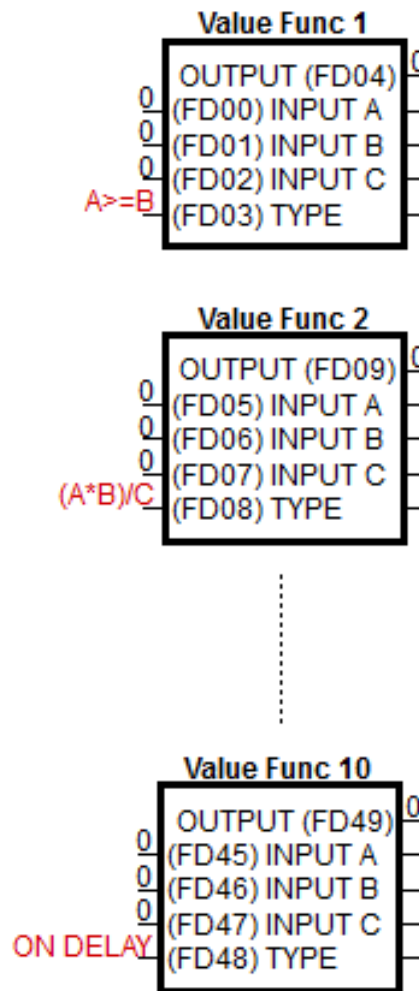
0 : IF(C) -A
1 : ABS(A+B+C)
2 : SWITCH(A,B)
3 : (A*B)/C
4 : A+B+C
5 : A-B-C
6 : CLAMP
7 : A>B+/-C
8 : A>=B
9 : ABS(A)>B+/-C
10 : ABS(A)>=B
11 : A(1+B)
12 : IF(C) HOLD(A)
13 : BINARY DECODE
14 : ON DELAY
15 : OFF DELAY
16 : DURATION TIMER
17 : MINIMUM PULSE
18 : PULSE TRAIN
19 : WINDOW
20 : UP/DWN COUNTER
21 : (A*B)/C ROUND
22 : WINDOW NO HYST
23 : ((A*B)/100)+C
24 : MIN(A,B,C)
25 : MAX(A,B,C)

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10 Logical Function blocks:

- ➢ Logical Gates
- ➢ Edge
- ➢ Flip- Flop

Logic Func 1

		TRUE
FALSE	OUTPUT (FH04)	
FALSE	(FH00) INPUT A	
FALSE	(FH01) INPUT B	
AND(A,B,C)	(FH02) INPUT C	
	(FH03) TYPE	

Logic Func 2

		TRUE
FALSE	OUTPUT (FH09)	
FALSE	(FH05) INPUT A	
FALSE	(FH06) INPUT B	
OR(A,B,!C)	(FH07) INPUT C	
	(FH08) TYPE	

Logic Func 8

		TRUE
FALSE	OUTPUT (FH39)	
FALSE	(FH35) INPUT A	
FALSE	(FH36) INPUT B	
0-1 EDGE(A)	(FH37) INPUT C	
	(FH38) TYPE	
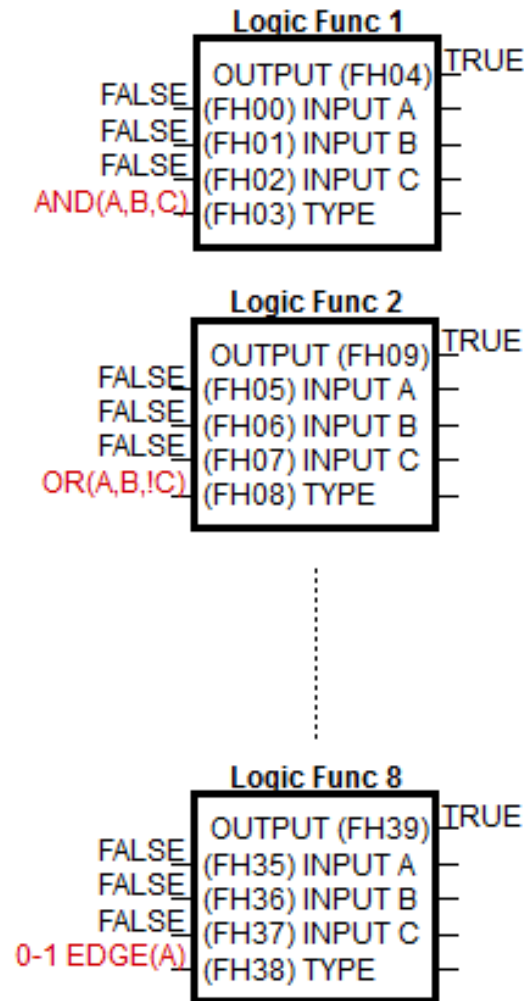
0 : NOT(A)
1 : AND(A,B,C)
2 : NAND(A,B,C)
3 : OR(A,B,C)
4 : NOR(A,B,C)
5 : XOR(A,B)
6 : 0-1 EDGE(A)
7 : 1-0 EDGE(A)
8 : AND(A,B,!C)
9 : OR(A,B,!C)
10 : S FLIP-FLOP
11 : R FLIP-FLOP
12 : LATCH
13 : SWITCH
14 : (A AND B) OR C
15 : (A OR B) AND C

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AC10 DSE Lite

- Now we have a configuration and can use software monitoring tools we will modify the function of the basic speed application (F228=1)

- Firstly select the icon to come offline after closing the charting and monitoring tools

AC10 DSE Lite

- Example a customer wants a basic speed application but needs to reconfigure the digital inputs to one normally closed STOP pushbutton one Normally open START pushbutton he needs the digital output to illuminate an LED when the temperature on his sensor is above 65deg he wants the fan to run at 20Hz when the temp is above 25deg switch off below 20deg then as the temperature increases the fan to run to 50Hz linear to temperature above 25degC

AC10 DSE Lite

- Double click on the digital input function block and set the digital inputs

Digital Input Functions

RUN
ION
ION
TOP
TOP
SED
SED
SED

(F316) DI1 FUNCTION
(F317) DI2 FUNCTION
(F318) DI3 FUNCTION
(F319) DI4 FUNCTION
(F320) DI5 FUNCTION
(F321) DI6 FUNCTION
(F322) DI7 FUNCTION
(F323) DI8 FUNCTION

DSE DIGITAL INPUT FUNCTIONS (356292)

☒

Parameters

(F316) DI1 FUNCTION	RUN
(F317) DI2 FUNCTION	DIRECTION
(F318) DI3 FUNCTION	JOG NO DIRECTION
(F319) DI4 FUNCTION	STOP
(F320) DI5 FUNCTION	COAST STOP
(F321) DI6 FUNCTION	NOT USED
(F322) DI7 FUNCTION	NOT USED

Digital Input Functions

RUN
STOP
NOT USED
NOT USED
NOT USED
NOT USED
NOT USED
NOT USED

(F316) DI1 FUNCTION
(F317) DI2 FUNCTION
(F318) DI3 FUNCTION
(F319) DI4 FUNCTION
(F320) DI5 FUNCTION
(F321) DI6 FUNCTION
(F322) DI7 FUNCTION
(F323) DI8 FUNCTION

Change the values of the block
DI1 = RUN the START pushbutton
DI2 = STOP the STOP pushbutton

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AC10 DSE Lite

Because the customer is using a normally closed pushbutton we need to invert digital input 2 select digital inputs and change F340 to 2 to negate digital 2 input

AC10 DSE Lite

Now add a value function block for digital output this will switch when the sensor is above 65deg

The value function block is wired from the analogue input and the output wired to F458 = DO1 then we have to change the source for the digital output function F301

AC10 DSE Lite

Now we need to add the function of setting the speed depending on the sensor on analogue input 1

Main Functions:

Sequencing

Sequencing

0	(FW00) COMMAND
0 s	(F120) DIRECTION CHANGE DEAD-TIME
FALSE	(F122) INHIBIT REVERSE
KEYPAD+TERMINAL+MODBUS	(F200) START COMMAND SOURCE
KEYPAD+TERMINAL+MODBUS	(F201) STOP COMMAND SOURCE
FORWARD	(F202) DIRECTION SOURCE
RAMP	(F209) STOP MODE
FALSE	(F329) INHIBIT POWER-UP START

Main (X) Frequency

Main (X) Frequency

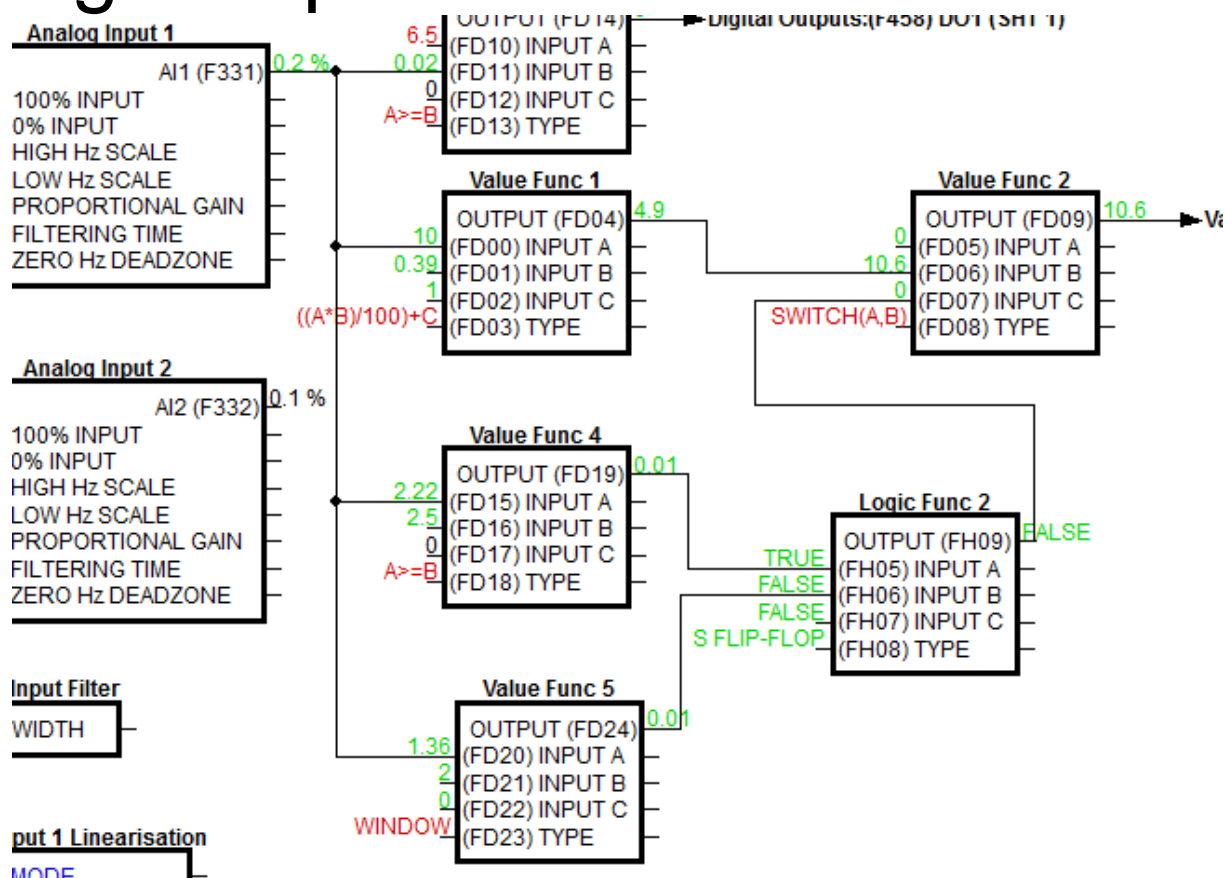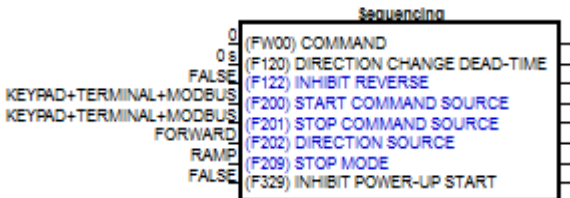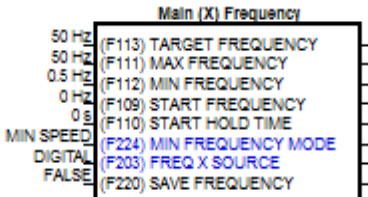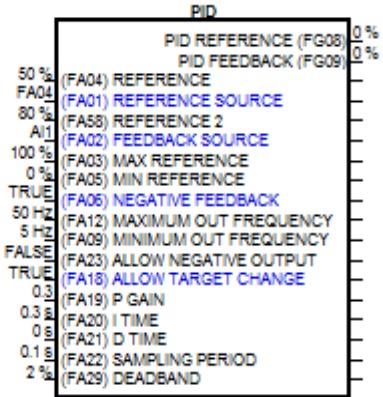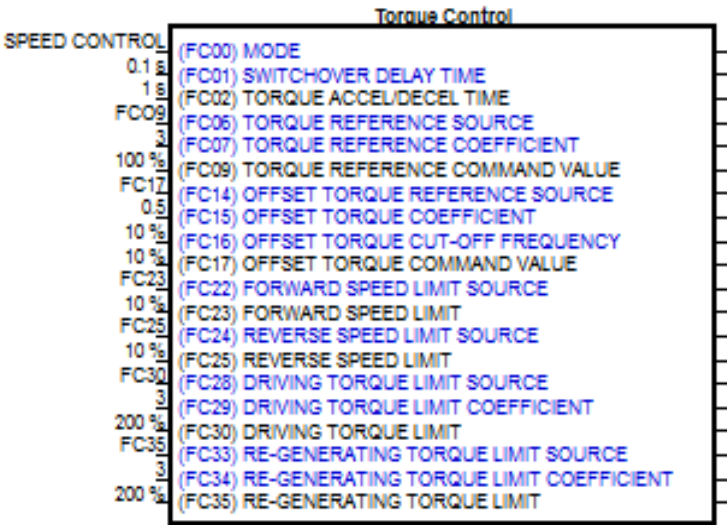|	
50 Hz	(F113) TARGET FREQUENCY
50 Hz	(F111) MAX FREQUENCY
0.5 Hz	(F112) MIN FREQUENCY
0 Hz	(F109) START FREQUENCY
0 s	(F110) START HOLD TIME
MIN SPEED	(F224) MIN FREQUENCY MODE
DIGITAL	(F203) FREQ X SOURCE
FALSE	(F220) SAVE FREQUENCY

Pid

PID

	PID REFERENCE (FG08)	0 %
	PID FEEDBACK (FG09)	0 %
50 %	(FA04) REFERENCE	
FA04	(FA01) REFERENCE SOURCE	
80 %	(FA58) REFERENCE 2	
AI1	(FA02) FEEDBACK SOURCE	
100 %	(FA03) MAX REFERENCE	
0 %	(FA05) MIN REFERENCE	
TRUE	(FA06) NEGATIVE FEEDBACK	
50 Hz	(FA12) MAXIMUM OUT FREQUENCY	
5 Hz	(FA09) MINIMUM OUT FREQUENCY	
FALSE	(FA23) ALLOW NEGATIVE OUTPUT	
TRUE	(FA18) ALLOW TARGET CHANGE	
0.3	(FA19) P GAIN	
0.3 s	(FA20) I TIME	
0 s	(FA21) D TIME	
0.1 s	(FA22) SAMPLING PERIOD	
2 %	(FA29) DEADBAND	

Torque Control

Torque Control

SPEED CONTROL	(FC00) MODE
0.1 s	(FC01) SWITCHOVER DELAY TIME
1 s	(FC02) TORQUE ACCEL/DECEL TIME
FCO9	(FC06) TORQUE REFERENCE SOURCE
3	(FC07) TORQUE REFERENCE COEFFICIENT
100 %	(FC09) TORQUE REFERENCE COMMAND VALUE
FC17	(FC14) OFFSET TORQUE REFERENCE SOURCE
0.5	(FC15) OFFSET TORQUE COEFFICIENT
10 %	(FC16) OFFSET TORQUE CUT-OFF FREQUENCY
10 %	(FC17) OFFSET TORQUE COMMAND VALUE
FC23	(FC22) FORWARD SPEED LIMIT SOURCE
10 %	(FC23) FORWARD SPEED LIMIT
FC25	(FC24) REVERSE SPEED LIMIT SOURCE
10 %	(FC25) REVERSE SPEED LIMIT
FC30	(FC28) DRIVING TORQUE LIMIT SOURCE
3	(FC29) DRIVING TORQUE LIMIT COEFFICIENT
200 %	(FC30) DRIVING TORQUE LIMIT
FC35	(FC33) RE-GENERATING TORQUE LIMIT SOURCE
3	(FC34) RE-GENERATING TORQUE LIMIT COEFFICIENT
200 %	(FC35) RE-GENERATING TORQUE LIMIT

Main Functions:

Ramp — Ramps

5 s (F114) ACCEL TIME 1
5 s (F115) DECEL TIME 1
8 s (F116) ACCEL TIME 2
8 s (F117) DECEL TIME 2
5 s (F277) ACCEL TIME 3
5 s (F278) DECEL TIME 3
8 s (F279) ACCEL TIME 4
8 s (F280) DECEL TIME 4
0 TO 50.00Hz (F119) TIME MODE

Auto-Start — Auto- Restart

FALSE (F213) AFTER REPOWERED
FALSE (F214) AFTER FAULT RESET
60 s (F215) START DELAY TIME
0 (F216) MAX RETRIES
3 s (F217) RESET DELAY TIME

Flycatching — Flycatching

DISABLED (F613) FUNCTION
FROM MAX FREQUENCY (F614) MODE
20 (F615) RATE
60 s (F619) FAULT TIMEOUT
100 (F627) CURRENT LIMITING

DC Braking — Dc Braking

BRAKING THRESHOLD (F611) 0 V
DISABLED (F600) MODE
1 Hz (F601) INITIAL FREQUENCY
10 % (F602) STARTING EFFICIENCY
10 % (F603) STOPPING EFFICIENCY
0.5 s (F604) STARTING TIME
0.5 s (F605) STOPING TIME
80 % (F612) BRAKING DUTY RATIO
TRUE (F622) AUTO DUTY RATIO

Fault History — Fault History

[NEWEST] FAULT 1 (F708) NONE
FREQUENCY 1 (F711) 0 Hz
CURRENT 1 (F712) 0 A
VOLTAGE 1 (F713) 0 V
FAULT 2 (F709) NONE
FREQUENCY 2 (F714) 0 Hz
CURRENT 2 (F715) 0 A
VOLTAGE 2 (F716) 0 V
[OLDEST] FAULT 3 (F710) NONE
FREQUENCY 3 (F717) 0 Hz
CURRENT 3 (F718) 0 A
VOLTAGE 3 (F719) 0 V
OVER CURRENT COUNT (F720) 0
OVER CURRENT 1 COUNT (F739) 0
OVER VOLTAGE COUNT (F721) 0
OVER TEMPERATURE COUNT (F722) 0
OVERLOAD COUNT (F723) 0

Skip Frequencies — Skip Frequencies

0 Hz (F127) FREQUENCY A
0 Hz (F128) WIDTH A
0 Hz (F129) FREQUENCY B
0 Hz (F130) WIDTH B

Parker

AC10 DSE Lite

- Because the scaling values of some block vary we have to rescale the set point into the frequency F113
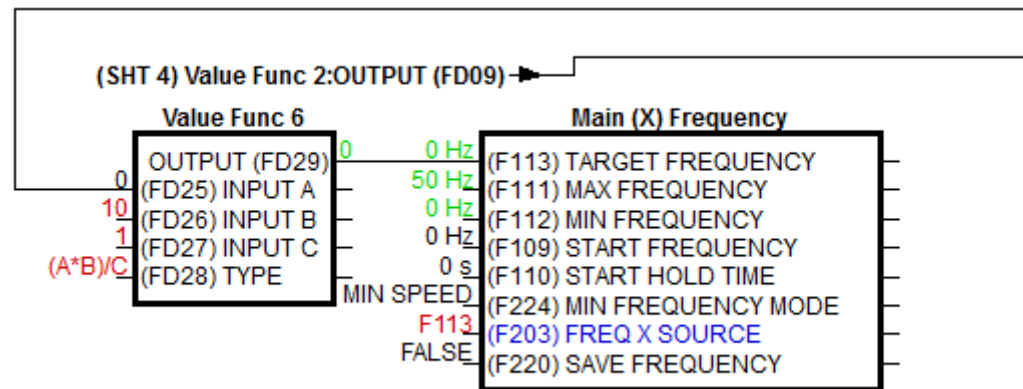
AC10 DSE Lite

All of this seems quite messy and if we went back to this configuration after time we would not easily understand what it was doing

So we need to tidy the configuration and add notes

We can also go online and check the configuration works functionally before connecting any motors
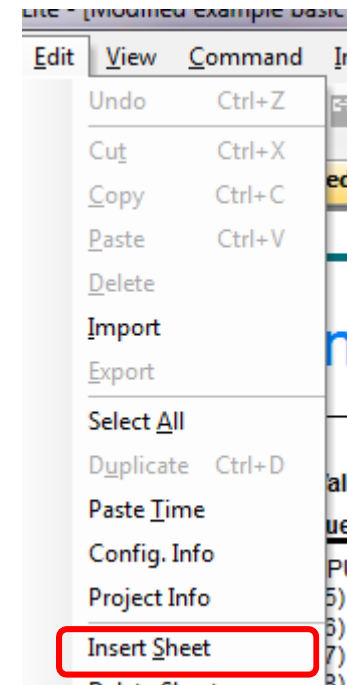
AC10 DSE Lite

Insert a new page

On inserting a new page the

- Move the blocks used

- Add comments

AC10 DSE Lite
Tidy configuration with comments