



E-Series

Serial Communications

Manual

Part Number 4201-206 Revision D

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NOTE

This manual is intended to be a supplement to the *E-Series AC Flux Vector Drive Technical Manual - Part Number 4201-180*.

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AC Motor Control Products can dramatically improve your process control, productivity and energy efficiency, but only if they are working correctly.

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To further support our products and customers, we run a series of comprehensive training programs focusing on self maintenance and application advice. These are available on-site and at our Head Office.

REVISION HISTORY

Date:	Revision:	Description:
June 1997	A	Created and issued
October 1998	B	Updated for Rev 2.0 software
January 2000	C	Updated
February 2003	D	Update addresses for Rev 4.0 software

IMPORTANT NOTES

SAFETY WARNINGS:

- It is the installer's responsibility to ensure the configuration and installation of the Variable Speed Drive (VSD) meets the requirements of any site specific, local and national electrical regulations.
- The VSD operates from HIGH VOLTAGE, HIGH ENERGY ELECTRICAL SUPPLIES. Stored charge is present after switch off.
- Due to the high leakage currents inherent to AC drives, earth connection of both the motor and the VSD is essential before connection to the supply. The VSD must be permanently connected to the supply.
- For safety reasons, normal operation of the VSD requires front covers/doors to be in place and secured closed.
- Do not attempt to isolate the motor while the VSD is running.
- Some parameter settings may cause the VSD to start automatically after power failure.
- Motor overspeed operation may be limited by mechanical constraints.

RELIABILITY WARNINGS:

- Always screen control wiring.
- Ensure that the VSD is not mounted in an adverse environment.

ENVIRONMENTAL WARNINGS:

- Corrosive vapours or gases may interfere with the correct operation of electronic equipment. These compounds may include fumigants such as methyl bromide, or gases such as sulphur dioxide, hydrogen sulphide or chlorine derivatives.

Please consult the manufacturer if there are any doubts about the environmental conditions this equipment may be operating in or subjected to.
- The IP rating refers to dust and water ingress and not corrosive gases. PDL products are designed and manufactured to pollution degree 1 or 2 which do not cover corrosive vapours or gases.

SERVICING WARNINGS:

- Service only by qualified personnel.
- Always isolate and allow to discharge before servicing.
- Never replace ceramic fuses with glass types.
- Always wear safety glasses when operating with the cover removed.
- The VSD contains static sensitive printed circuit boards. Use static safe procedures when handling these boards.
- Never work on live equipment alone.
- Observe all recommended practices.

NOTES:

- This manual and the screen list contained within this document relate to Elite Series software version **3.8**. Refer to Screen Z2 for the software version of your Elite Series.
- It is the responsibility of the end user/purchaser to ensure that operators understand how to use this equipment safely. Please read this manual thoroughly.
- The latest revision of this manual is available from our web-site **www.pdlelectronics.com**

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SPECIFICATIONS

HARDWARE: RS232

Physical link	– Three wire, optically isolated, half duplex, single ended RS232
Terminals	T41 – RS232 receive line T42 – RS232 transmit line T40 – 0V signal
Output signal levels	– Logic '1' $\leq 6.5V$ with respect to 0V – Logic '0' $\geq 6.5V$ with respect to 0V
Input Signal Levels	– Logic '1' $< +0.8V$ – Logic '0' $> +2.4V \pm 30V$ maximum
Maximum line loading	– 2500pF, 3k Ω
Isolation	– $\pm 50Vdc$ from ground
Modbus monitored inputs	– Seven switch inputs 2 Programmable Analogue Inputs 0-10V/ $\pm 10V/4-20mA/0-20mA$
Modbus controlled outputs	– Three relay outputs 2 Programmable Analogue Outputs 0-10V/ $\pm 10V/4-20mA/0-20mA$
Maximum number of Elites on RS232 Link	– 1
Maximum cable length	– 15 metres

HARDWARE: RS485

Physical link	– Two wire, optically isolated, half duplex, differential mode RS485
Terminals	T38 – RS485 A (negative) T39 – RS485 B (positive) T40 – Isolated 0V shield
Output signal levels	– Logic '1' = +5V differential – Logic '0' = -5V differential
Input signal levels	– Logic '1' = +5V differential – Logic '0' = -5V differential
Isolation	– $\pm 50Vdc$ from ground
Modbus monitored inputs	– Seven switch inputs 2 Programmable Analogue Inputs 0-10V/ $\pm 10V/4-20mA/0-20mA$
Modbus controlled outputs	– Three relay outputs 2 Programmable Analogue Outputs 0-10V/ $\pm 10V/4-20mA/0-20mA$
Maximum number of Elites on RS485 Link	– 240
Maximum cable length	– 1000 metres

SOFTWARE:

Communication protocol	– Industry standard Modbus protocol
Transmission mode	– Remote terminal unit (RTU) framing
Error detection	– CRC-16 (cyclic redundancy check)
Baud rate	– User selected – OFF/1200/4800/9600 baud
Data length	– 8 bit binary + parity Optional
Parity	– Select Even, Odd, None
Stop bits	– 1
Elite address range	– 240 individual addresses (1–240) – 15 group broadcast addresses (241–255) – 1 global broadcast address (0)
Response time	– Minimum 3.5 character times to maximum 100ms
Supported Modbus Functions	– 3 Read Holding Register – 16 Force Multiple Registers
Supported Modbus Exception Codes	– 1 Illegal Function – 2 Illegal Data Address – 3 Illegal Data Value – 6 Busy, Rejected Message – 7 NAK - Negative Acknowledge

1 INTRODUCTION

The Elite contains built-in Serial Communications circuitry, allowing the Elite to be physically linked onto a Modbus communications network. The two Serial Communications standards available in the Elite are RS232 and RS485.

The RS485 network has a multi-drop capability, allowing up to 240 slave units (Microdrive, Microvector and the Elite and Xtravert Series) to be linked to the one Modbus master controller. The RS232 system permits the connection of one unit only on a line.

The Elite acts as a slave peripheral when connected on a Modbus system. This means that the Elite does not initiate Modbus messages - this duty is done by a Modbus master.

The Elite can be controlled and/or monitored as a slave unit from a host computer (or PLC) Modbus master at a remote location.

All the controls, parameters, and modes available on the Elite are available by using the Modbus Serial communications. For example the Modbus master can start and stop the motor, control its speed, monitor the estimated motor temperature and the status of the drive.

In addition to the functions available via the keyboard of the Elite, the Modbus master can monitor and control a process by using the Elite control board inputs and outputs. Both digital and analogue I/O are accessible to the Modbus master at a remote location.

The Elite serial communications uses the hardware standard RS232 and RS485 for the physical link (i.e. the wiring connection) and the industry standard Modbus protocol for the communications protocol (i.e. the message syntax and error detection).

2 SERIAL COMMUNICATIONS - WIRING AND COMMISSIONING

2.1 WIRING

STEP 1: FRONT COVER REMOVAL

Remove the front cover for access to the gland plate and the terminals.

STEP 2: ELITE RS232 WIRING

Wire the RS232 terminal connections as shown in fig. 2.1 into the RS232 system. Bring the wiring into the enclosure through the gland plate and install the glands to maintain IP54 integrity.

STEP 3: ELITE RS485 WIRING

Wire the RS485 terminal connections as shown in fig. 2.2 into the RS485 system. Bring the wiring into the enclosure through the gland plate and install the glands to maintain IP54 integrity.

Should the Modbus master not have RS485 I/O capability, an RS232 port with an RS232/RS485 converter can be used to interface into the RS485 Modbus system. Refer appendix A for more information on RS232/RS485 conversion.

Note 1: Because the EIA RS232 standard does not define a high impedance power “OFF” state, multiple drivers and receivers are not allowed on the same communication line.

Note 2: Because the EIA RS232 standard is susceptible to electrical interference and has a relatively low maximum line capacitance, the maximum cable length should not exceed 15 metres.

Note 3: For typical connection diagrams refer appendix C.

STEP 4: FRONT COVER REPLACEMENT

Replace the front cover using the reverse process of Step 1.

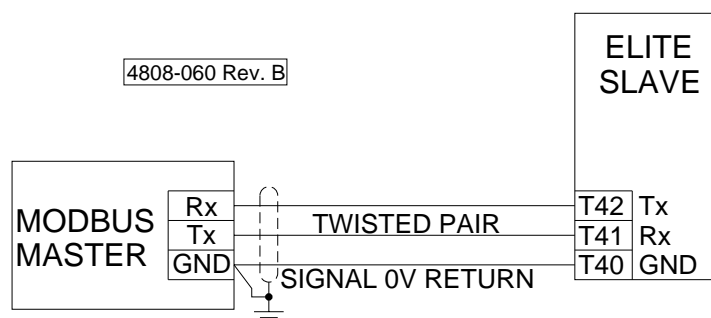


Fig. 2.1: Elite RS232 Modbus System Wiring Configuration

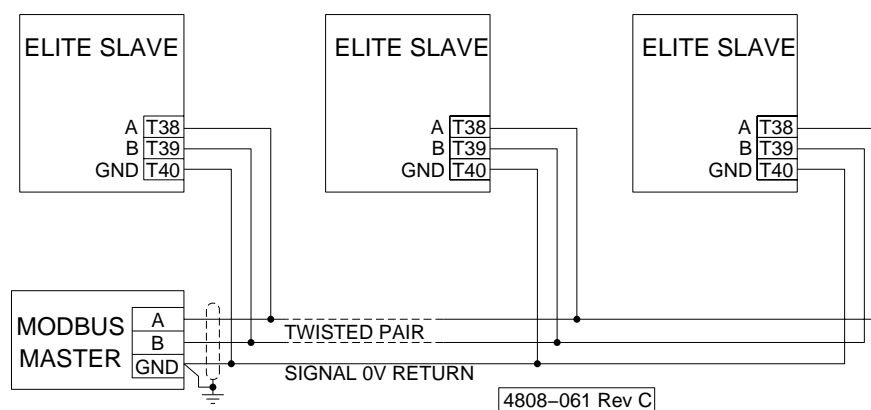


Fig. 2.2: Elite RS485 Modbus System Wiring Configuration

2.2 COMMISSIONING

STEP 1: ELITE OPERATION CHECK

Switch on power to the Elite and confirm that the Elite operates normally, displaying the status line and the control line A4.

STEP 2: SETTING THE COMMISSION MODE ON THE ELITE

To commission the Elite for Serial Communications, the Elite must be set to commission mode. Select Screen Group Z and set Screen **Z COMMISSION=Y**.

STEP 3: SETTING THE COMMUNICATION ADDRESS

Select Screen H3a and set the Modbus Serial Communications Address (1-240). The address selected must be unique for each Elite connected on the RS485 Modbus system. Record the selected value for the communication address in the Commissioning Configuration Record - refer Elite Series Technical Manual (PDL Part No. 4201-180).

STEP 4: SETTING THE COMMUNICATION BAUD RATE

Select Screen H3b and set the Modbus Serial Communications Baud Rate (OFF/1200/4800/9600). The baud rate selected must match that of the Modbus master for communication to occur. The selection OFF disables the Elite serial communications. Record the selected value for the communication baud rate in the Commissioning Configuration Record - refer Elite Series Technical Manual (PDL Part No. 4201-180).

STEP 5: SETTING THE COMMUNICATION PARITY SELECTION

Select Screen H3c and set the Modbus Parity Selection (Even, Odd, None). The Parity Selected must match that of the Modbus master for communication to occur. Record the selected value for the communication Parity in the Commissioning Configuration Record - refer Elite Series Technical Manual (PDL Part No. 4201-180).

STEP 6: SETTING THE COMMUNICATION TIMEOUT SELECTION

Select Screen H2 and set the Modbus Serial Communications Timeout (OFF/1s/5s/25s). Select a timeout period which exceeds the time between valid serial communication data transfers. Record the selected value for the communication timeout in the Commissioning Configuration Record - refer Elite Series Technical Manual (PDL Part No. 4201-180).

STEP 7: APPLICATION SPECIFIC COMMISSIONING

Further commissioning of the Elite will depend upon the particular serial communication application.

STEP 8: RE-ENABLING RESTRICTED SECURITY ACCESS

When all further commissioning is completed, set Screen **Z COMMISSION=N** to prevent unauthorised modification of the Elite settings.

Serial Communication commissioning is now complete.

3 SUPPORTED MODBUS FUNCTIONS

3.1 INTRODUCTION

The Elite serial communications protocol adheres completely to the industry standard Modbus protocol. The Elite supports a subset of the complete Modbus function set, listed in fig. 3.1.

FUNCTION	DESCRIPTION
3	Read Multiple Holding Register
6	Force Single Holding Register
8	Diagnostics
16	Force Multiple Holding Register

Fig. 3.1: Modbus Functions Supported by the Elite

Modbus Function 3, 6 and 16 refer to Holding Registers with addresses of the form 4XXXX. All data address references are made relative to the first address of the particular Modbus Function. In the case of Functions 3, 6 and 16, the first address is 40001(decimal), and this would be referenced as 00000.

An example Modbus Function 3 query message is shown in fig. 3.2, and a typical response message is given in fig. 3.3. A fuller explanation of the message contents is given in section 3.2.

All word length (2 byte) variables are transmitted with the most significant byte first. The holding register contents are transmitted in a 16-bit format with the most significant byte first. Where appropriate, negative numbers will be transmitted in “two’s complement” format. If more than one register is requested, the lowest addressed register is transmitted first and the other holding registers will follow in sequential order.

3.2 MODBUS FUNCTION 3 - READ MULTIPLE HOLDING REGISTERS

This function allows a Modbus master to acquire the contents of a holding register from the addressed slave unit. This function will only access the individually addressed Elite and does not support global broadcast or group broadcast addressing modes.

The Elite implementation of this function allows up to 16 holding registers to be read in one message. All registers can be read through Function 3.

An example Modbus Query message showing the format of the Read Multiple Holding Registers is shown in fig. 3.2.

The example shown in fig. 3.2. reads from an Elite whose Modbus system address is 10(decimal), 0A(hexadecimal). As the data addresses use relative addressing (refer section 3.1) the starting address is relative to 40001. This example reads the value of holding registers 40091 to 40093, so the starting address relative to 40001 is 90(decimal), 005A(hexadecimal).

Modbus System Address	Modbus Function Code	Data Address Star (40091)	Number of Holding Registers (=3)	CRC
0AH	03H	00H 5AH	00H 03H	24H A3H

Fig. 3.2: Example Modbus Message using RTU Framing

A typical response to the example Function 3 Query shown in fig. 3.2 is shown in fig. 3.3.

The data byte count is the number of data bytes following in the message. This is computed as two bytes per register, giving a byte count of six.

The data returned is interpreted as follows. The Data Address 40093 is the motor current and has a value of $(100\% \times 3841/8192) = 46.9\%$ of the rated drive current (2.5A, so motor current is $0.46 \times 2.5 = 1.16\text{A}$). The Data Address 40092 is the rated bus voltage and has a value of 326V. The Data Address 40091 is the motor torque and has a value of $(100\% \times 257/8192) = 3.1\%$ of the rated torque.

Modbus System Address	Modbus Function Code	Byte Count	Data (40091) (=257)	Data(40092) (=7743)	Data(40093) (=3841)	CRC
0AH	03H	06H	01H 01H	1EH 3FH	0FH 01H	9CH 40H

Fig. 3.3: Example Modbus Message Response using RTU Framing

The CRC value is calculated from all the bytes in the response including the Modbus system address, Modbus function code, the data address start, number of holding registers, the byte count and the data bytes. The method used for calculating the CRC value is discussed in appendix B.5. The data byte count is the number of data bytes in the response message - 3 word length registers, each of 2 bytes gives 6 bytes of data.

When an error has occurred (e.g. by trying to read from a non-existent register), the Elite returns an exception response containing an exception code indicating the type of error. Refer to appendix B.6 for the exception response format and an explanation of the exception codes.

3.3 MODBUS FUNCTION 6 - FORCE SINGLE HOLDING REGISTER

This function allows a Modbus master to control the value of a single holding register in the addressed slave unit. Any holding register which is not read-only may be forced to a new value. Since the Elite will still have control over the value in each holding register the value may still be modified by the Elite after being set by the Modbus master.

This function supports individual addressing as well as global broadcast and group broadcast addressing modes. Global broadcast and group broadcast addressing modes are discussed in more detail in section 4.2 and section 5.3.

An example Modbus message showing the format of the Force Single Holding Register is shown in fig. 3.4

Modbus System Address	Modbus Function Code	Data Address	Data	CRC
0AH	06H	00H 02H	00H 032H	ECH 07H

Fig. 3.4: Function 6 Force Single Holding Register

This example sets the Motor frequency parameter (Screen N3) to 50Hz. The register address is 40003 (offset from 40001 is 0002) and the data is 0032H which is equivalent to 50decimal.

The reply from a Function 6 message is either an echo of the request or an exception response. Details of the exception response message can be found in appendix B.

3.4 MODBUS FUNCTION 8 - DIAGNOSTICS

Modbus Function 8 is a diagnostics function. The only sub-code that should be used is sub-code 0 which is "return query data".

An example of a Modbus 8 message is shown in fig. 3.5.

Modbus System Address	Modbus Function Code	Modbus Subfunction Code	Data	CRC
0AH	08H	00H 00H	12H 34H	ECH 07H

Fig. 3.5: Example of a Modbus Function 8 Diagnostics Message

The reply to Modbus Function 8 is an echo of the message.

3.5 MODBUS FUNCTION 16 - FORCE MULTIPLE HOLDING REGISTERS

This function allows a Modbus master to control the value of a number of holding registers in the addressed slave unit. Any holding register which is not read-only may be forced to a new value. Since the Elite will still have control over the value in each of the holding registers, the value may still be modified by the Elite after being set by the Modbus master.

The Elite implementation of this function allows up to 16 holding registers to be forced in one message.

This function supports individual addressing as well global broadcast and group broadcast addressing modes. Global broadcast and group addressing modes are discussed in more detail in section 4.2 and section 5.3.

An example Modbus Query message showing the format of the Force Multiple Holding Registers is shown in fig. 3.6.

The example shown in fig. 3.6 writes to an Elite whose Modbus system address is 10(decimal) 0A(hexadecimal). The data address 40001 is the rated (nameplate) motor current and is modified to $(100\% \times 1.5A / 2.5A) = 60\%$ of drive rated (nameplate current), so the actual value is $(0.6 \times 8192) = 4915$ (decimal), or 1333(hexadecimal). The data address 40002 is the rated (nameplate) motor voltage and is modified to 400V(decimal), 190(hexadecimal).

Modbus System Address	Modbus Function Code	Data Address Start (40001)	Number of Registers (=2)	Byte Count	Data (40001) (=4915)	Data(40002) (=400)	CRC
0AH	10H	00H 00H	00H 02H	04H	013H 33H	01H 90H	23H FCH

Fig. 3.6: Function 16 - Force Multiple Holding Registers

A typical response to the example Function 16 Query shown in fig. 3.6 is shown in fig. 3.7.

The response contains the address of the first holding register and the number of registers modified.

Modbus System Address	Modbus Function Code	Data Address Start (40001)	Number of Registers (=2)	CRC
0AH	10H	00H 00H	00H 02H	40H B3H

Fig. 3.7: Function 16 Response - Force Multiple Holding Registers Response

3.6 SAVING PARAMETERS TO NON-VOLATILE MEMORY

It should be noted that a value modified over a Modbus message will not be stored in non-volatile memory (EEPROM); the value will be lost when the Elite is powered down. A separate message must be sent that causes a value to be saved in EEPROM.

An example Modbus Query showing the format of a message to cause a rated name plate current to be saved to EEPROM is shown in fig. 3.8.

Modbus System Address	Modbus function Code	Data Address= 40885	Number of Registers	Byte count	Data = 40001	CRC
0AH	10H	03H 74H	00 01H	02H	9CH 41H	45H E4H

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Fig. 3.8: Example of message that causes rated name plate current to be saved to EEPROM

The CRC value is calculated from all the bytes in the response including the Modbus system address, Modbus function code, the data bytes and the data byte count. The method used for calculating the CRC value is discussed in appendix B.5. The data byte count is the number of data bytes in the response message - 2 word length registers, each of 2 bytes gives 4 bytes of data.

When an error has occurred (e.g. by trying to write to a read-only register), the Elite returns an exception response containing an exception code indicating the type of error. Refer to appendix B.6 for the exception response format and an explanation of the exception codes.

3.7 ELITE BROADCAST ADDRESSING MODES

3.7.1 GLOBAL BROADCAST ADDRESSING MODE

The global broadcast addressing mode allows all the drives connected on a Modbus system to be accessible together.

The Modbus function that supports global broadcast addressing modes is:

- Function 6 – Force Single Holding Register
- Function 16 – Force Multiple Holding Registers

To access all the drives on a Modbus system the Modbus address of zero (0) is used. When this address is used, all slaves on the Modbus system respond to the transmitted message but do not issue a response.

3.7.2 GROUP BROADCAST ADDRESSING MODE

The group broadcast addressing mode allows groups of drives connected on a Modbus system to be accessible together.

The Modbus function that supports group broadcast addressing modes is:

- Function 6 – Force Single Holding Register
- Function 16 – Force Multiple Holding Registers

To access groups of drives on a Modbus system a special system of addressing is used. To group particular drives together, their individual addresses are selected to form that group.

The addresses required to form a Elite group can be selected from fig. 3.9. There are 240 individual addresses numbered (1..240) consisting of 15 groups of 16 drives each. Each group of drives has a group broadcast address (241-255) and a global broadcast address of zero (0). To determine if a group address should be recognised refer to fig. 3.9. When this group broadcast address is used, all slaves within the selected group on the Modbus system respond to the transmitted function but do not issue a response.

Group	Individual Address	Group Address	Global Address
Group 1	1..16	241	0
Group 2	17..32	242	0
Group 3	33..48	243	0
Group 4	49..64	244	0
Group 5	65..80	245	0
Group 6	81..96	246	0
Group 7	97..112	247	0
Group 8	113..128	248	0
Group 9	129..144	249	0
Group 10	145..160	250	0
Group 11	161..176	251	0
Group 12	177..192	252	0
Group 13	193..208	253	0
Group 14	209..224	254	0
Group 15	225..240	255	0

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Fig. 3.9: Elite Modbus Communications Group Addresses

4 ELITE DATA REGISTERS

4.1 ELITE HOLDING REGISTERS

Section 4.2 summarises the accessible Elite holding registers in Modbus data address order. Section 4.3 cross-references the parameters as they appear on the Elite screens, to Elite holding registers. A more detailed explanation of each holding register is given in section 4.4. The Modbus system designer should refer to the Elite Series Technical Manual (PDL Part No. 4201-180) for more information.

Note: Modbus Function 3 allows up to 16 registers to be read at once.

Modbus Function 16 allows up to 16 registers to be written to at once.

4.2 SHORT-FORM MODBUS REGISTER DETAILS BY MODBUS ADDRESS

Address	Screen	Description	Scaled Range,Units	Unscaled Range
40001	N1	Rated (nameplate) motor current	20..150%	1638..12288
40002	N2	Rated (nameplate) motor volts	0..999Vac	0..999
40003	N3	Rated (nameplate) motor frequency	0..400Hz	0..400
40004	N4	Rated (nameplate) motor power	0..650kW	0..65000
40005	N6	Motor cooling at zero speed	20..100%/OFF	1638..8273
40006	N5	Rated (nameplate) motor speed	0..24000rpm	0..24000
40007	N8	Pulse per revolution of tacho encoder	0..8191ppr	0..8191
40008	X2	Autotune motor	0..1	0..1
40009	-	Motor power multiplier ***	1,100	"1,100"
40010	L8	Regeneration limit	0..250%	0..20480
40011	L2	Minimum speed	-250%..Max Limit	-20480..Max Limit
40012	L3	Maximum speed	Min Limit..+250%	Min Limit..+20480
40013	L6	Speed limit timeout	0..25s,INFINITE	0..26000
40014	L4	Minimum torque	-250%..Max Limit	-20480..Max Limit
40015	L5	Maximum torque	Min Limit..+250%	Min Limit..+20480
40016	L7	Torque limit timeout	0..25s,INFINITE	0..26000
40017	X4c	Starting torque (boost) adjustment	0..+250%	0..20480
40018	L9	Current limit	25..+150%	2048..12288
40019	X4d	Start band	0..100%	0..8192
40020	D1	Time constant of dynamic brake resistor	0..250s	0..250
40021	D2	Duty rating of dynamic brake resistor	OFF,1..100%	0..8192
40022	-	Enable Torque limits	0..1	0..1
40023	X4i	Open loop vector gain kua	0..99%	0..8110
40024	X4j	Open loop vector gain kub	0..99%	0..8110
40025	L13	Ground current limit	0..100%	0..8192
40026	S12	Brake release time	0..5s	0..5000
40027	S13	Pre torque	-250..+250%	-20480..+20480
40030	H3a	Modbus serial comms address	1..240	1..240
40031	H3b	Modbus serial comms baud-rate	0..3	0..3
40032	H2	Modbus serial comms timeout period	0..3	0..3
40033	-	Disable serial writes	0..1	0..1
40034	H3c	Modbus parity selection	Even,Odd,None	0..2
40040	-	Acceleration rate reference	0.02..1300%/s	1..65000
40041	-	Deceleration rate reference	0.02..1300%/s	1..65000
40042	R6	Decel. rate used when stopping	0.02..1300%/s	1..65000
40043	R7	Speed filter time constant	0-60s/(100%/s) x1000	0..60000
40044	R8	Torque filter time constant	0..10s	0..10000
40049	L14	Min speed stop enable	0..1	0..1
40050	S6	Off delay time	0..25s, INFINITE	0..26000
40051	S5	Start delay time	0..1s	0..1000
40052	-	Stop mode in use	0..5	0..5
40053	S7	Mains power loss response	0..1	0..1
40054	S10	Stop timeout time	OFF,1..3600s	0..36000
40056	S8	Level of dc current used for braking	0..150%	0..12288
40057	S1	V/Hz starting mode	0..2	0..2
40058	S9	DC holding voltage in V/Hz mode	0..25%	0..2048

40059	S10	DC heating current	OFF/1..40%	0..2457
40060	X3e	Field weakening point	50..100%	4096..8192
40061	X3a	Main inductance	40..800%	3276..65535
40062	X3b	Stator resistance	0..15%	0..1228
40063	X3c	Rotor resistance	0..15%	0..1228
40064	X3d	Total leakage	0..20%	0..1638
40066	X5g	Current PI loop proportional gain	0..100%	0..8192
40067	X5h	Current PI loop integral gain	0..100%	0..8192
40068	X4g	Rotor speed PID loop integral gain	0..999%	0..4096
40069	X4h	Rotor speed PID loop derivative gain	0..999%	0..4096
40070	X4f	Rotor speed PID loop proportional gain	0..300%	0..24576
40071	X5i	Rotor speed PID filter constant	3..100%	245..8192
40072	X5e	Modulation type	0..1	0..1
40073	X5f	Modulation frequency	AUTO,4000..16000Hz	3999..16000
40074	X4k	Inertia	1..10	1..10
40079	Y2	Initialise	NO,USER,MOTOR,ALL	0..3
40080	-	Host reset control	0..1	0..1
40081	-	Host stop control	0..1	0..1
40082	-	Host start control	0..1	0..1
40083	-	Host trip control	0..1	0..1
40084	-	Speed / Torque Mode reference	0..1	0..1
40085	l1	Local start stop and reset control	0..3	0..3
40088	A3	Local speed reference	-250..+250%	-20480..+20480
40089	Status Line	Status, overload, speed/torque indication ***	0..255	0..255
40090	Status Line, A5	Motor speed ***	-400..+400%	-32768..+32767
40091	Status Line	Motor torque ***	-400..+400%	-32768..+32767
40092	A8	DC bus voltage ***	0..800%	0..65535
40093	A6	Current output ***	0..800%	0..65535
40094	-	Tacho calculated rotor speed***	-32768..+32767	-32768..+32767
40095	F	Current fault status ***	0..255	0..255
40096	A6	Output Frequency ***	-400..+400%	-32768..+32767
40097	A8	Vdc_filt ***	0..900V	0..28800
40098	A5	Power output ***	-400..+400%	-32768..+32767
40099	A8	Voltage output ***	0..800%	0..65535
40100	A7	Estimated motor temperature ***	0..800%	0..65535
40101	A7	Estimated inverter temperature ***	0..800%	0..65535
40102	-	Estimated dynamic brake resistor temp. ***	0..800%	0..65535
40103	-	Heatsink temperature ***	-50..100	-50..100
40104	-	Internal temperature ***	-50..100	-50..100
40105	-	Peak heatsink temperature	-50..100	-50..100
40106	-	Fibre enable	0..1	0..1
40107	l8c	Fibre optic control mode select	0..5	0..5
40108	-	Fibre reference input ***	-400..+400%	-32768..+32767
40110	-	Fibre reference output ***	-400..+400%	-32768..+32767
40113	l8d	Fibre optic communication timeout	0..3	0..3
40114	Z11	Fibre optic input value***	-400..+400%	-32768..+32767
40116	l8a	Fibre optic input low setpoint	-400..+400%	-32768..+32767
40117	l8b	Fibre optic input high setpoint	-400..+400%	-32768..+32767
40120	Z3	Analogue input 1 value***	-400..+400%	-32768..+32767
40121	Z4	Analogue input 2 value***	-400..+400%	-32768..+32767
40122	Z5	Analogue output 1 value***	-400..+400%	-32768..+32767
40123	Z6	Analogue output 2 value***	-400..+400%	-32768..+32767
40124	-	Analogue input 1+2 value ***	-400..+400%	-32768..+32767
40125	l6b	Analogue input 1 low setpoint	-400..+400%	-32768..+32767
40126	l6c	Analogue input 1 high setpoint	-400..+400%	-32768..+32767
40127	l6e	Analogue input 2 low setpoint	-400..+400%	-32768..+32767
40128	l6f	Analogue input 2 high setpoint	-400..+400%	-32768..+32767
40129	O1c	Analogue output 1 low setpoint	-400..+400%	-32768..+32767
40130	O1d	Analogue output 1 high setpoint	-400..+400%	-32768..+32767
40131	O1g	Analogue output 2 low setpoint	-400..+400%	-32768..+32767
40132	O1h	Analogue output 2 high setpoint	-400..+400%	-32768..+32767
40133	l6g	Zero band for analogue input sources	0..1	0..1
40134	l6a,Z3	Analogue input 1 format	0..3	0..3

40135	I6d,Z4	Analogue input 2 format	0..3	0..3
40136	O1b,Z5	Analogue output 1 format	0..3	0..3
40137	O1f,Z6	Analogue output 2 format	0..3	0..3
40138	I7b	Multi-function input logical inversion	0..1	0..1
40139	N9	Encoder type select	0..1	0..1
40140	Z2	Software version***	0..25.5	0..255
40141	Z2	Hardware version***	0..25.5	0..255
40142	-	Minimum software version ***	0..25.5	0..255
40143	-	Maximum software version ***	0..25.5	0..255
40144	Z2a	Serial number ***	0..9999999	0..9999999
40150	Y1	Screen list select	0..254	0..254
40151	Y3	Current Vysta configuration select	0..255	0..255
40152	Y3	Number of Vysta configurations***	0..255	0..255
40153	-	Error code returned by Vysta block ***	0..255	0..255
40154	-	Vysta speed ***	0..+100%	0..8192
40161	A4	Reference speed ***	-400..+400%	-32768..+32767
40162	A4	Reference torque ***	-400..+400%	-32768..+32767
40163	-	Speed command ***	-400..+400%	-32768..+32767
40170	Z7	Status of Multifunction input 1 ***	0..1	0..1
40171	Z7	Status of Multifunction input 2 ***	0..1	0..1
40172	Z7	Status of Multifunction input 3 ***	0..1	0..1
40173	Z7	Status of Multifunction input 4 ***	0..1	0..1
40174	Z7	Status of Multifunction input 5 ***	0..1	0..1
40175	Z7	Status of Multifunction input 6 ***	0..1	0..1
40176	-	Status of Multifunction I/P 7 / Ext.Trip ***	0..1	0..1
40183	-	Elite run command	0..1	0..1
40190	L10	Skip Speed 1	-250..+250%	-20480..+20480
40191	L11	Skip Speed 2	-250..+250%	-20480..+20480
40192	L12	Skip Bandwidth	0..20%	0..1638
40194	A6a	U phase current ***	0..250%	0..20480
40195	A6a	V phase current ***	0..250%	0..20480
40196	A6a	W phase current ***	0..250%	0..20480
40200	F6	Clear Fault History	0..1	0..1
40201	F1	Fault History 1 ***	0..255	0..255
40202	F2	Fault History 2 ***	0..255	0..255
40203	F3	Fault History 3 ***	0..255	0..255
40204	F4	Fault History 4 ***	0..255	0..255
40205	F5	Fault History 5 ***	0..255	0..255
40210	X4a	Dynaflux minimum flux level	40..100%	3276..8192
40211	X4b	Select torque boost mode	0..2	0..2
40212	X5a	Current limit slip value	0..10%,OFF	0..901
40213	X5b	Voltage limit slip value	0..20%	0..1638
40214	X5c	No-load damping	0..20%	0..1638
40215	X5d	Slip compensation enable	0..1	0..1
40220	P6	Process control error signal ***	-400..+400%	-32768..+32767
40221	-	Process control enable ***	0..1	0..1
40222	-	Process control reference value ***	-400..+400%	-32768..+32767
40223	-	Process control feedback value ***	-400..+400%	-32768..+32767
40224	P1	Process control reference source select	0..7	0..7
40225	P2	Process control feedback source select	0..7	0..7
40226	P3	Process control gain factor	0.01..10.0	1..1000
40227	P4	Process control integration time	0.1..1000s/INF	10..10010
40228	P5	Process control differential factor	0..250s	0..2500
40229	P7	Process control invert	0..1	0..1
40230	Z2	Inverter rated voltage volts ***	400,690Vac	400,690
40231	Z2	Inverter rated current ***	0..6553amps	0..65535
40240	H4a	DeviceNet mac ID	0..63	0..63
40241	H4b	DeviceNet baud rate	125,250,500	0..2
40242	H4c	DeviceNet assembly input instance	70..101	0..9
40243	H4d	DeviceNet assembly output instance	20..100	0..7
40244	H4e	DeviceNet control select	0..2	0..2
40245	H4f	DeviceNet reference select	0..2	0..2
40250	-	Energy kwh ***	0..999999	0..999999

40255	-	Hours on ***	0.65535	0.65535
40256	-	Seconds on ***	0.3599	0.3599
40257	-	Hours run ***	0.65535	0.65535
40258	-	Seconds run ***	0.3599	0.3599
40301	-	Vysta 1	-400..+400%	-32768..+32767
40302	-	Vysta 2	-400..+400%	-32768..+32767
40303	-	Vysta 3	-400..+400%	-32768..+32767
40304	-	Vysta 4	-400..+400%	-32768..+32767
40305	-	Vysta 5	-400..+400%	-32768..+32767
40306	-	Vysta 6	-400..+400%	-32768..+32767
40307	-	Vysta 7	-400..+400%	-32768..+32767
40308	-	Vysta 8	-400..+400%	-32768..+32767
40309	-	Vysta 9	-400..+400%	-32768..+32767
40310	-	Vysta 10	-400..+400%	-32768..+32767
40311	-	Vysta 11	-400..+400%	-32768..+32767
40312	-	Vysta 12	-400..+400%	-32768..+32767
40313	-	Vysta 13	-400..+400%	-32768..+32767
40314	-	Vysta 14	-400..+400%	-32768..+32767
40315	-	Vysta 15	-400..+400%	-32768..+32767
40316	-	Vysta 16	-400..+400%	-32768..+32767
40317	-	Vysta 17	-400..+400%	-32768..+32767
40318	-	Vysta 18	-400..+400%	-32768..+32767
40319	-	Vysta 19	-400..+400%	-32768..+32767
40320	-	Vysta 20	-400..+400%	-32768..+32767
40321	-	Vysta 21	-400..+400%	-32768..+32767
40322	-	Vysta 22	-400..+400%	-32768..+32767
40323	-	Vysta 23	-400..+400%	-32768..+32767
40324	-	Vysta 24	-400..+400%	-32768..+32767
40325	-	Vysta 25	-400..+400%	-32768..+32767
40326	-	Vysta 26	-400..+400%	-32768..+32767
40327	-	Vysta 27	-400..+400%	-32768..+32767
40328	-	Vysta 28	-400..+400%	-32768..+32767
40329	-	Vysta 29	-400..+400%	-32768..+32767
40330	-	Vysta 30	-400..+400%	-32768..+32767
40331	-	Status 2nd line	0..1	0..1
40613	-	Drive identification code ***	0.65535	-
40885	-	EEPROM Address	40001..49999	40001..49999
41001	I7c	Multi-function input 1 select	0..19	0..19
41002	I7d	Multi-function input 2 select	0..19	0..19
41003	I7e	Multi-function input 3 select	0..19	0..19
41004	I7f	Multi-function input 4 select	0..19	0..19
41005	I7g	Multi-function input 5 select	0..19	0..19
41006	I7h	Multi-function input 6 select	0..19	0..19
41007	I7a	Multi-function input mode select	0.5	0.5
41010	C2	Comparator 1 ""ON"" setpoint	-250..+250%	-20480..+20480
41011	C3	Comparator 1 ""OFF"" setpoint	-250..+250%	-20480..+20480
41012	C1	Comparator 1 source select	0..18	0..18
41013	-	Comparator 1 output ***	0..1	0..1
41014	I2	Speed reference source select	0.8	0.8
41015	I3	Torque reference source select	0.8	0.8
41016	I4	Alt. speed reference source select	0.8	0.8
41017	I5	Alt. torque reference source select	0.8	0.8
41019	-	Multi-reference select ***	0.255	0.255
41020	M1	Multi-reference 1 setpoint	-400..+400%	-32768..+32767
41021	M2	Multi-reference 2 setpoint	-400..+400%	-32768..+32767
41022	M3	Multi-reference 3 setpoint	-400..+400%	-32768..+32767
41023	M4	Multi-reference 4 setpoint	-400..+400%	-32768..+32767
41024	M5	Multi-reference 5 setpoint	-400..+400%	-32768..+32767
41025	M6	Multi-reference 6 setpoint	-400..+400%	-32768..+32767

41026	M7	Multi-reference 7 setpoint	-400..+400%	-32768..+32767
41027	O2a	Relay 1 source select	0..23	0..23
41028	O2c	Relay 2 source select	0..23	0..23
41029	O2e	Relay 3 source select	0..23	0..23
41030	O2b	Invert the logic of Relay 1	0..1	0..1
41031	O2d	Invert the logic of Relay 2	0..1	0..1
41032	O2f	Invert the logic of Relay 3	0..1	0..1
41033	O1a	Analogue output 1 source selection	0..19	0..19
41034	O1e	Analogue output 2 source selection	0..19	0..19
41039	O3a	Fibre optic output source select	0..19	0..19
41041	A2	Keyboard torque reference	-250..+250%	-20480..+20480
41042	A1	Keyboard speed/torque mode select	0..1	0..1
41043	R1	Acceleration rate	0.02..1300%/s	1..65000
41044	R2	Deceleration rate	0.02..1300%/s	1..65000
41045	R3	Alternative acceleration rate	0.02..1300%/s	1..65000
41046	R4	Alternative deceleration rate	0.02..1300%/s	1..65000
41047	R5	Break speed for alt. accel/decel	0..250%	0..20480
41048	S2	Usual stopping mode	0..5	0..5
41049	S4	Alternative stopping mode	0..5	0..5
41062	-	Motorised potentiometer ***	-400..+400%	-32768..+32767
41090	Status Line	Inverter and Motor overload warning ***	0..3	0..3
41091	X1	Control mode select	0..2	0..2
41110	C5	Comparator 2 "ON" setpoint	-250..+250%	-20480..+20480
41111	C6	Comparator 2 "OFF" setpoint	-250..+250%	-20480..+20480
41112	C4	Comparator 2 source select	0..18	0..18
41113	-	Comparator 2 output ***	0..1	0..1
41114	-	Window comparator output ***	0..1	0..1

Note *** indicates that this parameter is a read only parameter.

Fig. 4.1: Elite Modbus Register Details

4.3 SHORT-FORM MODBUS REGISTER DETAILS ORDERED BY SCREEN

Screen	Address	Description	Scaled Range,Units	Unscaled Range
-	40009	Motor power multiplier ***	1,100	1,100
-	40022	Enable Torque limits	0..1	0..1
-	40033	Disable serial writes	0..1	0..1
-	40040	Acceleration rate reference	0.02..1300%/s	1..65000
-	40041	Deceleration rate reference	0.02..1300%/s	1..65000
-	40052	Stop mode in use	0..5	0..5
-	40080	Host reset control	0..1	0..1
-	40081	Host stop control	0..1	0..1
-	40082	Host start control	0..1	0..1
-	40083	Host trip control	0..1	0..1
-	40084	Speed / Torque Mode reference	0..1	0..1
-	40094	Tacho calculated rotor speed***	-32768..+32767	-32768..+32767
-	40102	Estimated dynamic brake resistor temp. ***	0..800%	0..65535
-	40103	Heatsink temperature ***	-50..100	-50..100
-	40104	Internal temperature ***	-50..100	-50..100
-	40105	Peak heatsink temperature	-50..100	-50..100
-	40106	Fibre enable	0..1	0..1
-	40108	Fibre reference input ***	-400..+400%	-32768..+32767
-	40110	Fibre reference output ***	-400..+400%	-32768..+32767
-	40124	Analogue input 1+2 value ***	-400..+400%	-32768..+32767
-	40142	Minimum software version ***	0..25.5	0..255
-	40143	Maximum software version ***	0..25.5	0..255
-	40153	Error code returned by Vysta block ***	0..255	0..255
-	40154	Vysta speed ***	0..+100%	0..8192
-	40163	Speed command ***	-400..+400%	-32768..+32767
-	40176	Status of Multifunction I/P 7 / Ext.Trip ***	0..1	0..1
-	40183	Elite run command	0..1	0..1
-	40221	Process control enable ***	0..1	0..1
-	40222	Process control reference value ***	-400..+400%	-32768..+32767
-	40223	Process control feedback value ***	-400..+400%	-32768..+32767
-	40250	Energy kwh ***	0..999999	0..999999
-	40255	Hours on ***	0..65535	0..65535
-	40256	Seconds on ***	0..3599	0..3599
-	40257	Hours run ***	0..65535	0..65535
-	40258	Seconds run ***	0..3599	0..3599
-	40301	Vysta 1	-400..+400%	-32768..+32767
-	40302	Vysta 2	-400..+400%	-32768..+32767
-	40303	Vysta 3	-400..+400%	-32768..+32767
-	40304	Vysta 4	-400..+400%	-32768..+32767
-	40305	Vysta 5	-400..+400%	-32768..+32767
-	40306	Vysta 6	-400..+400%	-32768..+32767
-	40307	Vysta 7	-400..+400%	-32768..+32767
-	40308	Vysta 8	-400..+400%	-32768..+32767
-	40309	Vysta 9	-400..+400%	-32768..+32767
-	40310	Vysta 10	-400..+400%	-32768..+32767
-	40311	Vysta 11	-400..+400%	-32768..+32767
-	40312	Vysta 12	-400..+400%	-32768..+32767
-	40313	Vysta 13	-400..+400%	-32768..+32767
-	40314	Vysta 14	-400..+400%	-32768..+32767
-	40315	Vysta 15	-400..+400%	-32768..+32767
-	40316	Vysta 16	-400..+400%	-32768..+32767
-	40317	Vysta 17	-400..+400%	-32768..+32767
-	40318	Vysta 18	-400..+400%	-32768..+32767
-	40319	Vysta 19	-400..+400%	-32768..+32767
-	40320	Vysta 20	-400..+400%	-32768..+32767
-	40321	Vysta 21	-400..+400%	-32768..+32767
-	40322	Vysta 22	-400..+400%	-32768..+32767
-	40323	Vysta 23	-400..+400%	-32768..+32767
-	40324	Vysta 24	-400..+400%	-32768..+32767
-	40325	Vysta 25	-400..+400%	-32768..+32767

-	40326	Vysta 26	-400..+400%	-32768..+32767
-	40327	Vysta 27	-400..+400%	-32768..+32767
-	40328	Vysta 28	-400..+400%	-32768..+32767
-	40329	Vysta 29	-400..+400%	-32768..+32767
-	40330	Vysta 30	-400..+400%	-32768..+32767
-	40331	Status 2nd line	0..1	0..1
-	40613	Drive identification code ***	0..65535	-
-	40885	EEPROM Address	40001..49999	40001..49999
-	41013	Comparator 1 output ***	0..1	0..1
-	41019	Multi-reference select ***	0..255	0..255
-	41062	Motorised potentiometer ***	-400..+400%	-32768..+32767
-	41113	Comparator 2 output ***	0..1	0..1
-	41114	Window comparator output ***	0..1	0..1
A1	41042	Keyboard speed/torque mode select	0..1	0..1
A2	41041	Keyboard torque reference	-250..+250%	-20480..+20480
A3	40088	Local speed reference	-250..+250%	-20480..+20480
A4	40161	Reference speed ***	-400..+400%	-32768..+32767
A4	40162	Reference torque ***	-400..+400%	-32768..+32767
A5	40098	Power output ***	-400..+400%	-32768..+32767
A6	40093	Current output ***	0..800%	0..65535
A6	40096	Output Frequency ***	-400..+400%	-32768..+32767
A6a	40194	U phase current ***	0..250%	0..20480
A6a	40195	V phase current ***	0..250%	0..20480
A6a	40196	W phase current ***	0..250%	0..20480
A7	40100	Estimated motor temperature ***	0..800%	0..65535
A7	40101	Estimated inverter temperature ***	0..800%	0..65535
A8	40092	DC bus voltage ***	0..800%	0..65535
A8	40097	Vdc_filt ***	0..900V	0..28800
A8	40099	Voltage output ***	0..800%	0..65535
C1	41012	Comparator 1 source select	0..18	0..18
C2	41010	Comparator 1 "ON" setpoint	-250..+250%	-20480..+20480
C3	41011	Comparator 1 "OFF" setpoint	-250..+250%	-20480..+20480
C4	41112	Comparator 2 source select	0..18	0..18
C5	41110	Comparator 2 "ON" setpoint	-250..+250%	-20480..+20480
C6	41111	Comparator 2 "OFF" setpoint	-250..+250%	-20480..+20480
D1	40020	Time constant of dynamic brake resistor	0..250s	0..250
D2	40021	Duty rating of dynamic brake resistor	"OFF,1..100%"	0.8192
F	40095	Current fault status ***	0..255	0..255
F1	40201	Fault History 1 ***	0..255	0..255
F2	40202	Fault History 2 ***	0..255	0..255
F3	40203	Fault History 3 ***	0..255	0..255
F4	40204	Fault History 4 ***	0..255	0..255
F5	40205	Fault History 5 ***	0..255	0..255
F6	40200	Clear Fault History	0..1	0..1
H2	40032	Modbus serial comms timeout period	0..3	0..3
H3a	40030	Modbus serial comms address	1..240	1..240
H3b	40031	Modbus serial comms baud-rate	0..3	0..3
H3c	40034	Modbus parity selection	Even,Odd,None	0..2
H4a	40240	DeviceNet mac ID	0..63	0..63
H4b	40241	DeviceNet baud rate	125,250,500	0..2
H4c	40242	DeviceNet assembly input instance	70..101	0..9
H4d	40243	DeviceNet assembly output instance	20..100	0..7
H4e	40244	DeviceNet control select	0..2	0..2
H4f	40245	DeviceNet reference select	0..2	0..2
I1	40085	Local start stop and reset control	0..3	0..3
I2	41014	Speed reference source select	0..8	0..8
I3	41015	Torque reference source select	0..8	0..8
I4	41016	Alt. speed reference source select	0..8	0..8
I5	41017	Alt. torque reference source select	0..8	0..8
I6a,Z3	40134	Analogue input 1 format	0..3	0..3
I6b	40125	Analogue input 1 low setpoint	-400..+400%	-32768..+32767
I6c	40126	Analogue input 1 high setpoint	-400..+400%	-32768..+32767
I6d,Z4	40135	Analogue input 2 format	0..3	0..3

I6e	40127	Analogue input 2 low setpoint	-400..+400%	-32768..+32767
I6f	40128	Analogue input 2 high setpoint	-400..+400%	-32768..+32767
I6g	40133	Zero band for analogue input sources	0..1	0..1
I7a	41007	Multi-function input mode select	0..5	0..5
I7b	40138	Multi-function input logical inversion	0..1	0..1
I7c	41001	Multi-function input 1 select	0..19	0..19
I7d	41002	Multi-function input 2 select	0..19	0..19
I7e	41003	Multi-function input 3 select	0..19	0..19
I7f	41004	Multi-function input 4 select	0..19	0..19
I7g	41005	Multi-function input 5 select	0..19	0..19
I7h	41006	Multi-function input 6 select	0..19	0..19
I8a	40116	Fibre optic input low setpoint	-400..+400%	-32768..+32767
I8b	40117	Fibre optic input high setpoint	-400..+400%	-32768..+32767
I8c	40107	Fibre optic control mode select	0..5	0..5
I8d	40113	Fibre optic communication timeout	0..3	0..3
L10	40190	Skip Speed 1	-250..+250%	-20480..+20480
L11	40191	Skip Speed 2	-250..+250%	-20480..+20480
L12	40192	Skip Bandwidth	0..20%	0..1638
L13	40025	Ground current limit	0..100%	0..8192
L14	40049	Min speed stop enable	0..1	0..1
L2	40011	Minimum speed	-250%..Max Limit	-20480..Max Limit
L3	40012	Maximum speed	Min Limit..+250%	Min Limit..+20480
L4	40014	Minimum torque	-250%..Max Limit	-20480..Max Limit
L5	40015	Maximum torque	Min Limit..+250%	Min Limit..+20480
L6	40013	Speed limit timeout	0..25s,INFINITE	0..26000
L7	40016	Torque limit timeout	0..25s,INFINITE	0..26000
L8	40010	Regeneration limit	0..250%	0..20480
L9	40018	Current limit	25..+150%	2048..12288
M1	41020	Multi-reference 1 setpoint	-400..+400%	-32768..+32767
M2	41021	Multi-reference 2 setpoint	-400..+400%	-32768..+32767
M3	41022	Multi-reference 3 setpoint	-400..+400%	-32768..+32767
M4	41023	Multi-reference 4 setpoint	-400..+400%	-32768..+32767
M5	41024	Multi-reference 5 setpoint	-400..+400%	-32768..+32767
M6	41025	Multi-reference 6 setpoint	-400..+400%	-32768..+32767
M7	41026	Multi-reference 7 setpoint	-400..+400%	-32768..+32767
N1	40001	Rated (nameplate) motor current	20..150%	1638..12288
N2	40002	Rated (nameplate) motor volts	0..999Vac	0..999
N3	40003	Rated (nameplate) motor frequency	0..400Hz	0..400
N4	40004	Rated (nameplate) motor power	0..650kW	0..65000
N5	40006	Rated (nameplate) motor speed	0..2400rpm	0..24000
N6	40005	Motor cooling at zero speed	20..100%/OFF	1638..8273
N8	40007	Pulse per revolution of tach encoder	0..8191ppr	0..8191
N9	40139	Encoder type select	0..1	0..1
O1a	41033	Analogue output 1 source selection	0..19	0..19
O1b,Z5	40136	Analogue output 1 format	0..3	0..3
O1c	40129	Analogue output 1 low setpoint	-400..+400%	-32768..+32767
O1d	40130	Analogue output 1 high setpoint	-400..+400%	-32768..+32767
O1e	41034	Analogue output 2 source selection	0..19	0..19
O1f,Z6	40137	Analogue output 2 format	0..3	0..3
O1g	40131	Analogue output 2 low setpoint	-400..+400%	-32768..+32767
O1h	40132	Analogue output 2 high setpoint	-400..+400%	-32768..+32767
O2a	41027	Relay 1 source select	0..23	0..23
O2b	41030	Invert the logic of Relay 1	0..1	0..1
O2c	41028	Relay 2 source select	0..23	0..23
O2d	41031	Invert the logic of Relay 2	0..1	0..1
O2e	41029	Relay 3 source select	0..23	0..23
O2f	41032	Invert the logic of Relay 3	0..1	0..1
O3a	41039	Fibre optic output source select	0..19	0..19
P1	40224	Process control reference source select	0..7	0..7
P2	40225	Process control feedback source select	0..7	0..7
P3	40226	Process control gain factor	0.01..10.0	1..1000
P4	40227	Process control integration time	0.1..1000s/INF	10..10010
P5	40228	Process control differential factor	0..250s	0..2500

P6	40220	Process control error signal ***	-400..+400%	-32768..+32767
P7	40229	Process control invert	0..1	0..1
R1	41043	Acceleration rate	0.02..1300%/s	1..65000
R2	41044	Deceleration rate	0.02..1300%/s	1..65000
R3	41045	Alternative acceleration rate	0.02..1300%/s	1..65000
R4	41046	Alternative deceleration rate	0.02..1300%/s	1..65000
R5	41047	Break speed for alt. accel/decel	0..250%	0..20480
R6	40042	Decel. rate used when stopping	0.02..1300%/s	1..65000
R7	40043	Speed filter time constant	0-60s/(100%/s) x1000	0..60000
R8	40044	Torque filter time constant	0..10s	0..10000
S1	40057	V/Hz starting mode	0..2	0..2
S10	40054	Stop timeout time	OFF,1..3600s	0..36000
S10	40059	DC heating current	OFF/1..40%	0..2457
S12	40026	Brake release time	0..5s	0..5000
S13	40027	Pre torque	-250..+250%	-20480..+20480
S2	41048	Usual stopping mode	0..5	0..5
S4	41049	Alternative stopping mode	0..5	0..5
S5	40051	Start delay time	0..1s	0..1000
S6	40050	Off delay time	0..25s, INFINITE	0..26000
S7	40053	Mains power loss response	0..1	0..1
S8	40056	Level of dc current used for braking	0..150%	0..12288
S9	40058	DC holding voltage in V/Hz mode	0..25%	0..2048
Status Line	40089	Status, overload, speed/torque indication ***	0..255	0..255
Status Line	40091	Motor torque ***	-400..+400%	-32768..+32767
Status Line	41090	Inverter and Motor overload warning ***	0..3	0..3
Status Line,A5	40090	Motor speed ***	-400..+400%	-32768..+32767
X1	41091	Control mode select	0..2	0..2
X2	40008	Autotune motor	0..1	0..1
X3a	40061	Main inductance	40..800%	3276..65535
X3b	40062	Stator resistance	0..15%	0..1228
X3c	40063	Rotor resistance	0..15%	0..1228
X3d	40064	Total leakage	0..20%	0..1638
X3e	40060	Field weakening point	50..100%	4096..8192
X4a	40210	Dynaflux minimum flux level	40..100%	3276..8192
X4b	40211	Select torque boost mode	0..2	0..2
X4c	40017	Starting torque (boost) adjustment	0..+250%	0..20480
X4d	40019	Start band	0..100%	0..8192
X4f	40070	Rotor speed PID loop proportional gain	0..300%	0..24576
X4g	40068	Rotor speed PID loop integral gain	0..999%	0..4096
X4h	40069	Rotor speed PID loop derivative gain	0..999%	0..4096
X4i	40023	Open loop vector gain kua	0..99%	0..8110
X4j	40024	Open loop vector gain kub	0..99%	0..8110
X4k	40074	Inertia	1..10	1..10
X5a	40212	Current limit slip value	0..10%,OFF	0..901
X5b	40213	Voltage limit slip value	0..20%	0..1638
X5c	40214	No-load damping	0..20%	0..1638
X5d	40215	Slip compensation enable	0..1	0..1
X5e	40072	Modulation type	0..1	0..1
X5f	40073	Modulation frequency	AUTO,4000..16000Hz	3999..16000
X5g	40066	Current PI loop proportional gain	0..100%	0..8192
X5h	40067	Current PI loop integral gain	0..100%	0..8192
X5i	40071	Rotor speed PID filter constant	3..100%	245..8192
Y1	40150	Screen list select	0..254	0..254
Y2	40079	Initialise	NO,USER,MOTOR,ALL	0..3
Y3	40151	Current Vysta configuration select	0..255	0..255
Y3	40152	Number of Vysta configurations***	0..255	0..255
Z11	40114	Fibre optic input value***	-400..+400%	-32768..+32767
Z2	40140	Software version***	0..25.5	0..255
Z2	40141	Hardware version***	0..25.5	0..255
Z2	40230	Inverter rated voltage volts ***	400,690Vac	400,690
Z2	40231	Inverter rated current ***	0..6553amps	0..65535
Z2a	40144	Serial number ***	0..9999999	0..9999999
Z3	40120	Analogue input 1 value***	-400..+400%	-32768..+32767

Z4	40121	Analogue input 2 value***	-400..+400%	-32676..+32767
Z5	40122	Analogue output 1 value***	-400..+400%	-32676..+32767
Z6	40123	Analogue output 2 value***	-400..+400%	-32676..+32767
Z7	40170	Status of Multifunction input 1 ***	0..1	0..1
Z7	40171	Status of Multifunction input 2 ***	0..1	0..1
Z7	40172	Status of Multifunction input 3 ***	0..1	0..1
Z7	40173	Status of Multifunction input 4 ***	0..1	0..1
Z7	40174	Status of Multifunction input 5 ***	0..1	0..1
Z7	40175	Status of Multifunction input 6 ***	0..1	0..1

Note *** indicates that this parameter is a read only parameter.

Fig. 4.2: Elite Modbus Screen Details

4.4 EXTENDED MODBUS REGISTER DESCRIPTIONS

DESCRIPTION: RATED (NAMEPLATE) MOTOR CURRENT

Data Address: 40001 User Name: Motor Current
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 20..150% Scaled Range: 1638..12288
 Unit * Scale: %, Note: 100% = 8192 (*Base is: Rated drive current i.e.. 2.5 Amps*)
 Refer Elite Screen: N1

DESCRIPTION: RATED (NAMEPLATE) MOTOR VOLTS

Data Address: 40002 User Name: Motor Volts
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..999Vac Scaled Range: 0..999
 Unit * Scale: Volts
 Refer Elite Screen: N2

DESCRIPTION: RATED (NAMEPLATE) MOTOR FREQUENCY

Data Address: 40003 User Name: Motor Frequency
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..400Hz Scaled Range: 0..400
 Unit * Scale: Hz
 Refer Elite Screen: N3

DESCRIPTION: RATED (NAMEPLATE) MOTOR POWER

Data Address: 40004 User Name: Motor Power
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..650kW Scaled Range: 0..65000
 Unit * Scale: kW * 100 *Register 40009
 Refer Elite Screen: N4

Notes: *The scaling includes the Motor power multiplier (40009) to allow powers greater than 650kW*

DESCRIPTION: MOTOR COOLING AT ZERO SPEED

Data Address: 40005 User Name: Motor Cooling
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 20..100%, OFF Scaled Range: 1638..8273
 Unit * Scale: %, Note: 100% = 8192
 Refer Elite Screen: N6
Special Values: 101%=OFF 8273 = OFF, Disable motor thermal model

DESCRIPTION: RATED (NAMEPLATE) MOTOR SPEED

Data Address: 40006 User Name: Motor Speed
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..24000
 Unit * Scale: rpm
 Refer Elite Screen: N5

DESCRIPTION: PULSE PER REVOLUTION OF TACHO ENCODER

Data Address: 40007 User Name: Encoder PPR
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..8191
 Unit * Scale: ppr
 Refer Elite Screen: N8

DESCRIPTION: AUTOTUNE MOTOR

Data Address: 40008 User Name: Autotune
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: X2

Notes: Request to autotune the motor can only be requested when the Elite is OFF and no stop active

Special Values: 0 = N
 1 = Y Autotune motor

DESCRIPTION: MOTOR POWER MULTIPLIER
 Data Address: 40009 User Name: Motor Power Mult
 Data Type: Read only Save to EEPROM: No
 Range: 1,100
 Unit * Scale: none
 Refer Elite Screen: none
 Notes: Scales the motor power variable (40004) to allow powers greater than 650kW

DESCRIPTION: REGENERATION LIMIT
 Data Address: 40010 User Name: Regeneration Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..250% Scaled Range: 0..20480
 Unit * Scale: %, Note: 100% = 8192 (Base is: Rated power of motor (screen N4))
 Refer Elite Screen: L8

DESCRIPTION: MINIMUM SPEED
 Data Address: 40011 User Name: Min Speed Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..Max Speed Limit Scaled Range: -20480..Max Speed Limit
 Unit * Scale: %, Note: 100% = 8192 (Base is: Rated synchronous speed of motor in rpm)
 Refer Elite Screen: L2
 Notes: Valid values are from -250% to Max Speed Limit.

DESCRIPTION: MAXIMUM SPEED
 Data Address: 40012 User Name: Max Speed Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: Min Speed Limit..+250 Scaled Range: Min Speed Limit..+20480
 Unit * Scale: %, Note: 100% = 8192 (Base is: Rated synchronous speed of motor in rpm)
 Refer Elite Screen: L3
 Notes: Valid values are from Min Speed Limit to +250%.

DESCRIPTION: SPEED LIMIT TIMEOUT
 Data Address: 40013 User Name: Speed Limit Timeout
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..25s,INFINITE Scaled Range: 0..26000
 Unit * Scale: s x 1000
 Refer Elite Screen: L6
 Special Values: 26 = INF 26000 = Infinite timeout

DESCRIPTION: MINIMUM TORQUE
 Data Address: 40014 User Name: Min Torque Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..Max Torque Limit Scaled Range: -20480..Max Torque Limit
 Unit * Scale: %, Note: 100% = 8192 (Base is: Rated output torque of motor)
 Refer Elite Screen: L4
 Notes: Valid values are from -250% to Max Torque Limit.

DESCRIPTION: MAXIMUM TORQUE
 Data Address: 40015 User Name: Max Torque Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: Min Torque Limit..+250 Scaled Range: Min Torque Limit..+20480
 Unit * Scale: %, Note: 100% = 8192 (Base is: Rated output Torque of motor)
 Refer Elite Screen: L5
 Notes: Valid values are from Min Speed Torque to +250%.

DESCRIPTION: TORQUE LIMIT TIMEOUT
 Data Address: 40016 User Name: Torque Limit Timeout
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..25s,INFINITE Scaled Range: 0..26000
 Unit * Scale: s x 1000
 Refer Elite Screen: L7
 Special Values: 26 = INF 26000 = Infinite timeout

DESCRIPTION: STARTING TORQUE (BOOST) ADJUSTMENT

Data Address: 40017 User Name: Start Torque
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..250% Scaled Range: 0..20480
 Unit * Scale: %, Note: 100% = 8192
 Refer Elite Screen: X4c
 Notes: Only used in V/Hz and Open Loop Vector control types

DESCRIPTION: CURRENT LIMIT

Data Address: 40018 User Name: Current Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 25..150% Scaled Range: 2048..12288
 Unit * Scale: %, Note: 100% = 8192 (*Base is: Rated drive current i.e.. 2.5 Amps*)
 Refer Elite Screen: L9

DESCRIPTION: TIME CONSTANT OF DYNAMIC BRAKE RESISTOR

Data Address: 40020 User Name: DB Time
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..100s Scaled Range: 0..100
 Unit * Scale: s
 Refer Elite Screen: D1

DESCRIPTION: DUTY RATING OF DYNAMIC BRAKE RESISTOR

Data Address: 40021 User Name: DB Duty
 Data Type: Read/Write Save to EEPROM: Yes
 Range: OFF,1..100% Scaled Range: 0..8192
 Unit * Scale: %, Note: 100% = 8192
 Refer Elite Screen: D2
 Special Values: 0 = OFF, Disable dynamic brake resistor thermal model

DESCRIPTION: ENABLE TORQUE LIMITS

Data Address: 40022 User Name: Enable Tq Limits
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: none
 Notes: This flag enables the torque limits (Elite Screens L4 and L5) in V/Hz mode. This flag has no effect in open or closed loop vector. For this mode to work correctly Screen L4 must be less than 0 and Screen L5 must be greater than 0.

DESCRIPTION: OPEN LOOP VECTOR GAIN KUA

Data Address: 40023 User Name: Flux Boost Low
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..99% Scaled Range: 0..8110
 Unit * Scale: %, Note: 100% = 8192
 Refer Elite Screen: X4i

DESCRIPTION: OPEN LOOP VECTOR GAIN KUB

Data Address: 40024 User Name: Flux Boost High
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..99% Scaled Range: 0..8110
 Unit * Scale: %, Note: 100% = 8192
 Refer Elite Screen: X4j

DESCRIPTION: GROUND CURRENT LIMIT

Data Address: 40025 User Name: Ground Current Limit
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..100% Scaled Range: 0..8192
 Unit * Scale: %, Note: 100% = 8192 (*Base is: Rated drive current i.e.. 2.5 Amps*)
 Refer Elite Screen: L13

DESCRIPTION: BRAKE RELEASE TIME

Data Address: 40026 User Name: Brake Release Time
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..5s Scaled Range: 0..5000
 Unit * Scale: s * 1000
 Refer Elite Screen: S12

DESCRIPTION: PRE TORQUE

Data Address:	40027	User Name:	Pre Torque
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-250%..+250%	Scaled Range:	-20480..+20480
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated output Torque of motor)</i>	
Refer Elite Screen:	S13		

DESCRIPTION: MODBUS SYSTEM SERIAL COMMS ADDRESS

Data Address:	40030	User Name:	Comms Address
Data Type:	Read/Write	Save to EEPROM:	No
Range:	1..240		
Unit * Scale:	none		
Refer Elite Screen:	H3a		

Notes: Ensure there is only one device in a Modbus system with the selected communications address. Refer to Appendix B.2 for more information on the communications address.

DESCRIPTION: MODBUS SYSTEM SERIAL COMMS BAUDRATE

Data Address:	40031	User Name:	Baud Rate
Data Type:	Read/Write	Save to EEPROM:	No
Range:	0..3		
Unit * Scale:	none		
Refer Elite Screen:	H3b		

Notes: Must match the baud rate of the Modbus master

Special Values:	0 = 2400	2400 baud
	1 = 4800	4800 baud
	2 = 9600	9600 baud
	3 = OFF	Disables serial comms
	4 = 1200	1200 baud

DESCRIPTION: MODBUS SYSTEM SERIAL COMMS TIMEOUT PERIOD

Data Address:	40032	User Name:	Comms Timeout
Data Type:	Read/Write	Save to EEPROM:	No
Range:	0..3		
Unit * Scale:	none		
Refer Elite Screen:	H2		

Special Values:	0 = 1s	1 second timeout
	1 = 5s	5 second timeout
	2 = 25s	25 second timeout
	3 = OFF	No timeout

DESCRIPTION: DISABLE SERIAL WRITES

Data Address:	40033	User Name:	
Data Type:	Read/Write	Save to EEPROM:	No
Range:	0..1		
Unit * Scale:	none		
Refer Elite Screen:	I7c-h 17 - Local/Remote		

Special Values:	0 = writes allowed
	1 = writes disabled

Notes: In automatic control systems it is often desirable to be able to switch to a local control mode for maintenance or direct operator control.

In manual operation the operator expects that he has full control of the drive, this can not be guaranteed if a serial communication option is fitted since all registers are available via the serial interface and may be altered.

The Disable serial writes register prevents all writes during Local operation thus ensuring the operator has Full Control.

DESCRIPTION: MODBUS PARITY SELECTION

Data Address:	40034	User Name:	
Data Type:	Read/Write	Save to EEPROM:	No
Range:	0..2		
Unit * Scale:	none		
Refer Elite Screen:	H3c		

Special Values:	0 = EVEN	Even Parity Bit
	1 = ODD	Odd Parity Bit
	2 = NONE	No Parity Bit

Notes: Must match the Parity of the Modbus Master.

DESCRIPTION:	ACCELERATION RATE REFERENCE		
Data Address:	40040	User Name:	Ref Accel Rate
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	% / s*50		
Refer Elite Screen:	-		
Notes:	Currently selected acceleration rate.		
DESCRIPTION:	DECELERATION RATE REFERENCE		
Data Address:	40041	User Name:	Ref Decel Rate
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	% / s*50		
Refer Elite Screen:	-		
Notes:	Currently selected deceleration rate.		
DESCRIPTION:	DECELERATION (STOPPING) RATE USED WHEN STOPPING		
Data Address:	40042	User Name:	Stop Rate Decel
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	%/s * 50		
Refer Elite Screen:	R6		
DESCRIPTION:	SPEED FILTER TIME CONSTANT		
Data Address:	40043	User Name:	Speed Filter Time
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..60s	Scaled Range:	0..60000
Unit * Scale:	s/(100%/s)*1000		
Refer Elite Screen:	R7		
DESCRIPTION:	TORQUE FILTER TIME CONSTANT		
Data Address:	40044	User Name:	Torque Filter Time
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..10s	Scaled Range:	0..10000
Unit * Scale:	s * 1000		
Refer Elite Screen:	R8		
DESCRIPTION:	MINIMUM SPEED STOP ENABLE		
Data Address:	40049	User Name:	Stop on Min Speed
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..1		
Unit * Scale:	none		
Refer Elite Screen:	L14		
Special Values:	0 = N	Elite runs at minimum speed	
	1 = Y	Elite stops if reference is below minimum speed	
DESCRIPTION:	OFF DELAY TIME		
Data Address:	40050	User Name:	Off Delay Time
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..25s, INFINITE	Scaled Range:	0..26000
Unit * Scale:	s * 1000		
Refer Elite Screen:	S6		
Special Values:	26000 = INF	Motor magnetising flux maintained indefinitely	
DESCRIPTION:	START DELAY TIME		
Data Address:	40051	User Name:	Start Delay Time
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..1s	Scaled Range:	0..1000
Unit * Scale:	s * 1000		
Refer Elite Screen:	S5		

DESCRIPTION: STOP MODE REFERENCE
 Data Address: 40052 User Name: Ref Stop Mode
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..5
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = NORMAL Normal stop
 1 = RAMP Ramp stop
 2 = SPIN Spin stop
 3 = STOP R Stop-rate stop
 4 = OFF Off-stop
 5 = DC BRK DC braking

DESCRIPTION: MAINS POWER LOSS RESPONSE
 Data Address: 40053 User Name: Low Voltage Trip
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: S7
 Special Values: 0 = N Disable trip on Low Bus Volts
 1 = Y Trip on Low BusVolts

DESCRIPTION: STOP TIME-OUT TIME
 Data Address: 40054 User Name: Stop Timeout Time
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..3600s Scaled Range: 0..36000
 Unit * Scale: s * 10
 Refer Elite Screen: S5
 Special Values: 0 = OFF Disable stop time-out trips

DESCRIPTION: LEVEL OF DC CURRENT USED FOR BRAKING
 Data Address: 40056 User Name: DC Brake Level
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..150% Scaled Range: 0..12288
 Unit * Scale: % Note 100% = 8192 (Base is motor rated current)
 Refer Elite Screen: S8

DESCRIPTION: V/Hz STARTING MODE
 Data Address: 40057 User Name: Ref Start Mode
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..2
 Unit * Scale: none
 Refer Elite Screen: S1
 Special Values: 0 = NORMAL Normal start
 1 = SPIN Spin start
 2 = KICK Kick start

DESCRIPTION: LEVEL OF DC HOLDING VOLTAGE USED FOR V/Hz MODE
 Data Address: 40058 User Name: DC Hold Level
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..25% Scaled Range: 0..2048
 Unit * Scale: % Note 100%=8192
 Refer Elite Screen: S9

DESCRIPTION: LEVEL OF DC CURRENT USED FOR MOTOR HEATING
 Data Address: 40059 User Name: DC Heat Level
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..30% Scaled Range: 0..2457
 Unit * Scale: % Note 100%=8192
 Refer Elite Screen: S10
 Special Values: 0 = OFF No motor heating required.

DESCRIPTION: FIELD WEAKENING POINT
 Data Address: 40060 User Name: Field Weaken
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 50..100% Scaled Range: 4096..8192
 Unit * Scale: % Note 100% = 8192
 Refer Elite Screen: X3e

DESCRIPTION:	MAIN INDUCTANCE		
Data Address:	40061	User Name:	Lm
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	40..800%	Scaled Range:	3276..65535
Unit * Scale:	% Note 100% = 8192	<i>(Base is: base ohms)</i>	
Refer Elite Screen:	X3a		
DESCRIPTION:	STATOR RESISTANCE		
Data Address:	40062	User Name:	Rs
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..15%	Scaled Range:	0..122
Unit * Scale:	% Note 100% = 8192	<i>(Base is: base ohms)</i>	
Refer Elite Screen:	X3b		
DESCRIPTION:	ROTOR RESISTANCE		
Data Address:	40063	User Name:	Rr
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..15%	Scaled Range:	0..122
Unit * Scale:	% Note 100% = 8192	<i>(Base is: base ohms)</i>	
Refer Elite Screen:	X3c		
DESCRIPTION:	TOTAL LEAKAGE		
Data Address:	40064	User Name:	Sigma
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..20%	Scaled Range:	0..1638
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X3d		
DESCRIPTION:	CURRENT PI LOOP PROPORTIONAL GAIN		
Data Address:	40066	User Name:	Kp I
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..100%	Scaled Range:	0..8192
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X5g		
DESCRIPTION:	CURRENT PI LOOP INTEGRAL GAIN		
Data Address:	40067	User Name:	Ki I
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..100%	Scaled Range:	0..8192
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X5h		
DESCRIPTION:	ROTOR SPEED PID LOOP INTEGRAL GAIN		
Data Address:	40068	User Name:	Ki w
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..1600%	Scaled Range:	0..4096
Unit * Scale:	% Note 100%=256		
Refer Elite Screen:	X4g		
DESCRIPTION:	ROTOR SPEED PID LOOP DERIVATIVE GAIN		
Data Address:	40069	User Name:	Kd w
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..1600%	Scaled Range:	0..4096
Unit * Scale:	% Note 100%=256		
Refer Elite Screen:	X4h		
DESCRIPTION:	ROTOR SPEED PID LOOP PROPORTIONAL GAIN		
Data Address:	40070	User Name:	Kp w
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..300%	Scaled Range:	0..24576
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X4f		
DESCRIPTION:	ROTOR SPEED PID FILTER CONSTANT		
Data Address:	40071	User Name:	Kf w
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	3..100%	Scaled Range:	245..8192
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X5i		

DESCRIPTION: MODULATION TYPE
 Data Address: 40072 User Name: Whisper Wave
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: X5f
 Special Values: 0 = NB Narrowband
 1 = WW Whisper Wave

DESCRIPTION: MODULATION FREQUENCY
 Data Address: 40073 User Name: Switching Frequency
 Data Type: Read/Write Save to EEPROM: Yes
 Range: AUTO,4000..16000 Scaled Range: 3999..16000
 Unit * Scale: Hz
 Refer Elite Screen: X5e
 Special Values: 3999= AUTO Automatic switching frequency selection

DESCRIPTION: INERTIA
 Data Address: 40074 User Name: Inertia
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 1..10 Scaled Range: 1..10
 Unit * Scale: none
 Refer Elite Screen: X4k

DESCRIPTION: INITIALISE
 Data Address: 40079 User Name: Initialise
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..3 Scaled Range: 0..3
 Refer Elite Screen: Y2
 Special Values: 0 = NO no initialising
 1 = USER initialise user variables
 2 = MOTOR initialise motor variables
 3 = ALL initialise all variables

DESCRIPTION: HOST RESET CONTROL
 Data Address: 40080 User Name: Host Reset
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Notes: Elite always resets this value to 0, set to 1 to reset fault.

DESCRIPTION: HOST STOP CONTROL
 Data Address: 40081 User Name: Host Stop
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = Host stop not active
 1 = Host stop active
 Notes: Setting Host Start will clear Host Stop. Host Stop is also cleared on a fault or after 5 seconds if no comms timeout selected.

DESCRIPTION: HOST START CONTROL
 Data Address: 40082 User Name: Host Start
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = Host start not active
 1 = Host start active
 Notes: Setting Host Stop will clear Host Start. Host Start is also cleared on a fault or after 5 seconds if no comms timeout selected.

DESCRIPTION: HOST TRIP CONTROL

Data Address: 40083 User Name: Host Trip
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = Host trip not active
 1 = Host trip active

DESCRIPTION: SPEED / TORQUE MODE REFERENCE

Data Address: 40084 User Name: Ref Speed/Torque
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = SPEED MODE
 1 = TORQUE MODE

DESCRIPTION: LOCAL START STOP AND RESET CONTROL

Data Address: 40085 User Name: Local Start Stop
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..3
 Unit * Scale: none
 Refer Elite Screen: I1
 Special Values: 0 = NONE No local control
 1 = RESET ONLY Reset only
 2 = STOP-RESET Stop-Reset
 3 = START/STOP-RST Start/Stop-Reset

DESCRIPTION: LOCAL SPEED REFERENCE

Data Address: 40088 User Name: KB Speed
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: -20480..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated synchronous speed of motor in rpm*)
 Refer Elite Screen: A3

DESCRIPTION: STATUS, OVERLOAD, SPEED AND TORQUE INDICATION

Data Address: 40089 User Name: Status display
 Data Type: Read only Save to EEPROM: No
 Range: 0..128
 Unit * Scale: none
 Refer Elite Screen: Status Line
 Special Values: 0 = OFF Drive off
 1 = RUN Drive running
 2 = RUN Drive running
 3 = RUN Drive running
 4 = STP Drive stopped
 5 = SPG Drive stopping
 6 = ILT Drive current limiting
 7 = VLT Drive voltage limiting
 8 = SLT Drive speed limiting
 9 = TLT Drive torque limiting
 10 = INC Drive inching
 11 = RDY Drive ready
 12 = ATU Autotuning motor
 13 = SPG Drive stopping
 21- = F1-Fxx Drive has tripped on fault displayed

DESCRIPTION: MOTOR SPEED

Data Address: 40090 User Name: O/P Speed
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated synchronous speed of motor in rpm*)
 Refer Elite Screen: Status Line, A5

DESCRIPTION: MOTOR TORQUE

Data Address:	40091	User Name:	O/P Torque
Data Type:	Read only	Save to EEPROM:	No
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192		(Base is: Rated output Torque of motor)
Refer Elite Screen:	Status Line		

DESCRIPTION: DC BUS VOLTAGE

Data Address:	40092	User Name:	DC Bus Voltage
Data Type:	Read only	Save to EEPROM:	No
Range:	0..800%	Scaled Range:	0..65535
Unit * Scale:	% Note 100% = 8192		(Base is: Motor voltage * sqrt(2))
Refer Elite Screen:	A8		

DESCRIPTION: CURRENT OUTPUT

Data Address:	40093	User Name:	O/P Current
Data Type:	Read only	Save to EEPROM:	No
Range:	0..800%	Scaled Range:	0..65535
Unit * Scale:	% (Base is: rated drive current i.e. 2.5Amps)		
Refer Elite Screen:	A6		

DESCRIPTION: TACHO CALCULATED ROTOR SPEED

Data Address:	40094	User Name:	Encoder Speed
Data Type:	Read only	Save to EEPROM:	No
Range:	-32768..+32767		
Unit * Scale:	% Note 100% = 8192		(Base is: Rated synchronous speed of motor in rpm)
Refer Elite Screen:	-		

DESCRIPTION: CURRENT FAULT STATUS

Data Address:	40095	User Name:	Fault State
Data Type:	Read only	Save to EEPROM:	No
Range:	0..39	Scaled Range:	0..39
Unit * Scale:	none		
Refer Elite Screen:	F, F1..F6		

Special Values:

0	= No Faults
1	= Low DC bus voltage
2	= High DC bus voltage
3	= High DC bus voltage timeout
4	= Input supply phase voltage imbalance
5	= Software download fault
6	= EEPROM fault
7	= Current limit fault
8	= +ve U-phase IGBT desaturation
9	= +ve V-phase IGBT desaturation
10	= +ve W-phase IGBT desaturation
11	= -ve U-phase IGBT desaturation
12	= -ve V-phase IGBT desaturation
13	= -ve W-phase IGBT desaturation
14	= -ve phase IGBT desaturation (on smaller Elites)
15	= Inverter thermal model overload trip
16	= Motor thermal model overload trip
17	= Dynamic brake resistor thermal model overload trip
18	= EEPROM reading fault (cleared from screen Y2)
19	= Zero nameplate parameter detected
20	= Inconsistent nameplate parameters detected
21	= Excessive current flow to ground
22	= External/PTC trip
23	= Excessive heatsink temperature trip
24	= Excessive internal temperature trip
25	= Host computer generated trip
26	= Time since last serial comms exceeds timeout period
27	= Time since last F/O comms exceeds T/O period
28	= Maximum output speed exceeded
29	= Torque limit timeout
30	= Speed limit timeout

- 31 = Calibration fault
- 32 = Software timeout fault
- 33 = Low voltage dc supply fault
- 34 = Vysta generated trip
- 35 = Elite display disconnected
- 36 = Undetermined fault detected by EPLD
- 37 = Watchdog trip
- 38 = No Vysta configuration loaded
- 39 = Trip detected on fibre-optic control network
- 40 = Hardware current limit has been active too much
- 41 = Drive has not stopped after being told to do so
- 42 = Open loop vector low flux fault
- 43 = MASTER U+ desat fault - drive 1
- 44 = MASTER U- desat fault - drive 1
- 45 = MASTER V+ desat fault - drive 1
- 46 = MASTER V- desat fault - drive 1
- 47 = MASTER W+ desat fault - drive 1
- 48 = MASTER W- desat fault - drive 1
- 49 = SLAVE U+ desat fault - drive 2
- 50 = SLAVE U- desat fault - drive 2
- 51 = SLAVE V+ desat fault - drive 2
- 52 = SLAVE V- desat fault - drive 2
- 53 = SLAVE W+ desat fault - drive 2
- 54 = SLAVE W- desat fault - drive 2
- 55 = Drive 1 overcurrent trip (MASTER)
- 56 = Drive 2 overcurrent trip SLAVE
- 57 = Parallel drive card reports Master/Slave Desat fault
- 58 = Parallel drives current imbalance
- 59 = Parallel drives HS over temperature
- 60 = Parallel drives dc bus over voltage
- 61 = Parallel drive PCB EPLD programming fault
- 62 = Parallel drive card wiring fault
- 63 = Parallel drive card watch dog timer fault
- 64 = Parallel drive card E2PROM fault
- 65 = Parallel drive card PSU fault
- 66 = Parallel drive card data corrupt
- 67 = Parallel drive card calibration fault
- 68 = Parallel drive card software ver fault
- 69 = Parallel drive card PCB temperature fault
- 70 = Parallel drive card, DC bus fuse failure
- 71 = Bardac driveweb controller board watchdog trip
- 72 = Bardac driveweb board present and Vysta program with blocks detected

DESCRIPTION:

Data Address: 40096
 Data Type: Read only Save to EEPROM: No
 Range: -250..+250% Scaled Range: -20480..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated frequency of motor (screen N3)*)
 Refer Elite Screen: A6

FREQUENCY OUTPUT**DESCRIPTION:**

Data Address: 40097 User Name: DC Bus Voltage
 Data Type: Read only Save to EEPROM: No
 Range: 0..900V Scaled Range: 0..28800
 Unit * Scale: Volts*32
 Refer Elite Screen: A8

DC BUS VOLTAGE**DESCRIPTION:**

Data Address: 40098 User Name: Power Out
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated power of motor (screen N4)*)
 Refer Elite Screen: A5

POWER OUTPUT

DESCRIPTION: VOLTAGE OUTPUT

Data Address:	40099	User Name:	O/P Voltage
Data Type:	Read only	Save to EEPROM:	No
Range:	0..800%	Scaled Range:	0..65535
Unit * Scale:	% Note 100% = 8192	<i>(Base is: peak phase voltage i.e., V_{Line})</i>	
Refer Elite Screen:	A8		

DESCRIPTION: ESTIMATED MOTOR TEMPERATURE

Data Address:	40100	User Name:	Motor Temperature
Data Type:	Read only	Save to EEPROM:	No
Range:	0..800%	Scaled Range:	0..65535
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated motor temperature)</i>	
Refer Elite Screen:	A7		

DESCRIPTION: ESTIMATED INVERTER TEMPERATURE

Data Address:	40101	User Name:	Inverter Temperature
Data Type:	Read only	Save to EEPROM:	No
Range:	0..800%	Scaled Range:	0..65535
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated inverter temperature)</i>	
Refer Elite Screen:	A7		

DESCRIPTION: ESTIMATED DYNAMIC BRAKE RESISTOR TEMPERATURE

Data Address:	40102	User Name:	DB Temperature
Data Type:	Read only	Save to EEPROM:	No
Range:	0..800%	Scaled Range:	0..65535
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated dynamic brake resistor temperature)</i>	
Refer Elite Screen:	-		

DESCRIPTION: HEATSINK TEMPERATURE

Data Address:	40103	User Name:	Heatsink Temperature
Data Type:	Read only	Save to EEPROM:	No
Range:	-50..+100 °C	Scaled Range:	-50..+100
Unit * Scale:	Degrees C		
Refer Elite Screen:	A7a		

DESCRIPTION: INTERNAL TEMPERATURE

Data Address:	40104	User Name:	Internal Temperature
Data Type:	Read only	Save to EEPROM:	No
Range:	-50..+100 °C	Scaled Range:	-50..+100
Unit * Scale:	Degrees C		
Refer Elite Screen:	A7a		

DESCRIPTION: PEAK HEATSINK TEMPERATURE

Data Address:	40105	User Name:	Heatsink Temperature
Data Type:	Read only	Save to EEPROM:	No
Range:	-50..+100 °C	Scaled Range:	-50..+100
Unit * Scale:	Degrees C		
Refer Elite Screen:	-		

DESCRIPTION: ENABLE/DISABLE FIBRE-OPTIC COMMUNICATION

Data Address:	40106	User Name:	Fibre Enable
Data Type:	Read/Write	Save to EEPROM:	No
Range:	0..1		
Unit * Scale:	none		
Refer Elite Screen:	-		

DESCRIPTION: FIBRE OPTIC CONTROL MODE SELECT

Data Address:	40107	User Name:	Fibre Mode
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..5		
Unit * Scale:	none		
Refer Elite Screen:	I8c		

Notes: Fibre Mode can only be modified when the Elite is OFF. Used to select the way the Elite responds to the control word circulating on the fibre-optic control network. Refer General Application Note PDL Document No. 4216-045 for a full explanation.

Special Values:	0 = NO CONTROL	No response to fibre-optic control
	1 = MASTER	Overall control of the fibre-optic network
	2 = SLAVE	Full slave control

- 3 = SLAVE TRIP Slave control with trip/reset control only
 4 = SLAVE RUN Slave control with run control only
 5 = SLAVE RUN-STP Slave control with run control and stop on local trip

DESCRIPTION: FIBRE REFERENCE INPUT
 Data Address: 40108 User Name: Fibre I/P Pin
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated Motor Speed or Torque*)
 Refer Elite Screen: -

DESCRIPTION: FIBRE REFERENCE OUTPUT
 Data Address: 40110 User Name: Fibre O/P Pin
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated Motor Speed or Torque*)
 Refer Elite Screen: -

DESCRIPTION: FIBRE OPTIC COMMUNICATION TIMEOUT
 Data Address: 40113 User Name: Fibre Timeout
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..3
 Unit * Scale: none
 Refer Elite Screen: I8d
 Notes: Fibre Timeout can only be modified when the Elite is OFF.
 Special Values: 0 = 1s 1 second timeout
 1 = 5s 5 second timeout
 2 = 25s 25 second timeout
 3 = OFF Disable timeout

DESCRIPTION: FIBRE OPTIC INPUT VALUE
 Data Address: 40114 User Name: Fibre I/P
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated Motor Speed or Torque*)
 Refer Elite Screen: Z11

DESCRIPTION: FIBRE OPTIC INPUT LOW SETPOINT
 Data Address: 40116 User Name: Fibre I/P Lo
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated Motor Speed or Torque*)
 Refer Elite Screen: I8a

DESCRIPTION: FIBRE OPTIC INPUT HIGH SETPOINT
 Data Address: 40117 User Name: Fibre I/P Hi
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated Motor Speed or Torque*)
 Refer Elite Screen: I8b

DESCRIPTION: ANALOGUE INPUT 1 VALUE
 Data Address: 40120 User Name: Analogue I/P 1
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: Z3

DESCRIPTION: ANALOGUE INPUT 2 VALUE
 Data Address: 40121 User Name: Analogue I/P 2
 Data Type: Read only Save to EEPROM: No
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: Z4

DESCRIPTION:	ANALOGUE OUTPUT 1 VALUE		
Data Address:	40122	User Name:	Analogue O/P 1
Data Type:	Read only	Save to EEPROM:	No
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	Z5		
DESCRIPTION:	ANALOGUE OUTPUT 2 VALUE		
Data Address:	40123	User Name:	Analogue O/P 2
Data Type:	Read only	Save to EEPROM:	No
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	Z6		
DESCRIPTION:	ANALOGUE INPUT 1+2 VALUE		
Data Address:	40124	User Name:	Analogue I/P 1+2
Data Type:	Read only	Save to EEPROM:	No
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	-		
DESCRIPTION:	ANALOGUE INPUT 1 LOW SETPOINT		
Data Address:	40125	User Name:	Analogue I/P 1 Lo
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	I6b		
DESCRIPTION:	ANALOGUE INPUT 1 HIGH SETPOINT		
Data Address:	40126	User Name:	Analogue I/P 1 Hi
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	I6c		
DESCRIPTION:	ANALOGUE INPUT 2 LOW SETPOINT		
Data Address:	40127	User Name:	Analogue I/P 2 Lo
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	I6e		
DESCRIPTION:	ANALOGUE INPUT 2 HIGH SETPOINT		
Data Address:	40128	User Name:	Analogue I/P 2 Hi
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	I6f		
DESCRIPTION:	ANALOGUE OUTPUT 1 LOW SETPOINT		
Data Address:	40129	User Name:	Analogue O/P 1 Lo
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	O1c		
DESCRIPTION:	ANALOGUE OUTPUT 1 HIGH SETPOINT		
Data Address:	40130	User Name:	Analogue O/P 1 Hi
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	O1d		
DESCRIPTION:	ANALOGUE OUTPUT 2 LOW SETPOINT		
Data Address:	40131	User Name:	Analogue O/P 2 Lo
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: That of source selected)</i>	
Refer Elite Screen:	O1g		

DESCRIPTION: ANALOGUE OUTPUT 2 HIGH SETPOINT
 Data Address: 40132 User Name: Analogue O/P 2 Hi
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: 01h

DESCRIPTION: ZERO BAND OF ±2% FOR ANALOGUE INPUT SOURCES
 Data Address: 40133 User Name: Zero Band
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: I6g
 Special Values: 0 = N
 1 = Y Zero band for analogue sources selected

DESCRIPTION: ANALOGUE INPUT 1 FORMAT
 Data Address: 40134
 User Name: Analogue I/P 1 Mode
 Data Type: Read/Write
 Save to EEPROM: Yes
 Range: 0..3
 Unit * Scale: none
 Refer Elite Screen: I6a,Z3
 Notes: Analogue I/P 1 Mode can only be modified when the Elite is OFF.
 Special Values: 0 = 0-10V 0 to 10 Vdc
 1 = +/-10V -10 to +10 Vdc
 2 = 4-20mA 4 to 20 mA
 3 = 0-20mA 0 to 20 mA

DESCRIPTION: ANALOGUE INPUT 2 FORMAT
 Data Address: 40135
 User Name: Analogue I/P 2 Mode
 Data Type: Read/Write
 Save to EEPROM: Yes
 Range: 0..3
 Unit * Scale: none
 Refer Elite Screen: I6d,Z4
 Notes: Analogue I/P 2 Mode can only be modified when the Elite is OFF.
 Special Values: Refer data address 40134

DESCRIPTION: ANALOGUE OUTPUT 1 FORMAT
 Data Address: 40136 User Name: Analogue O/P 1 Mode
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..3
 Unit * Scale: none
 Refer Elite Screen: O1b,Z5
 Notes: Analogue O/P 1 Mode can only be modified when the Elite is OFF.
 Special Values: 0 = 0-10V 0 to 10 Vdc
 1 = +/-10V -10 to +10 Vdc
 2 = 4-20mA 4 to 20 mA
 3 = 0-20mA 0 to 20 mA

DESCRIPTION: ANALOGUE OUTPUT 2 FORMAT
 Data Address: 40137 User Name: Analogue O/P 2 Mode
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..3
 Unit * Scale: none
 Refer Elite Screen: O1f,Z6
 Notes: Analogue O/P 2 Mode can only be modified when the Elite is OFF.
 Special Values: Refer data address 40136

DESCRIPTION: MULTI-FUNCTION INPUT LOGICAL INVERSION
 Data Address: 40138 User Name: I/P Polarity
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: I7b
 Notes: I/P Polarity can only be modified when the Elite is OFF.
 Special Values: 0 = LOW Active low
 1 = HIGH Active high

DESCRIPTION: ENCODER TYPE SELECT
 Data Address: 40139 User Name: Encoder Type
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: N9
 Notes: Encode Type can only be modified when the Elite is OFF.
 Special Values: 0 = DIFF Differential encoder
 1 = SING Single-ended encoder

DESCRIPTION: SOFTWARE VERSION
 Data Address: 40140 User Name: Software Version
 Data Type: Read only Save to EEPROM: No
 Range: 0..25.5 Scaled Range: 0..255
 Unit * Scale: Version*10
 Refer Elite Screen: Z2

DESCRIPTION: HARDWARE VERSION
 Data Address: 40141 User Name: Hardware Version
 Data Type: Read only Save to EEPROM: No
 Range: 0..25.5 Scaled Range: 0..255
 Unit * Scale: Version*10
 Refer Elite Screen: Z2

DESCRIPTION: MINIMUM SOFTWARE VERSION
 Data Address: 40142 User Name:
 Data Type: Read only Save to EEPROM: No
 Range: 0..25.5 Scaled Range: 0..255
 Unit * Scale: Version*10
 Refer Elite Screen:

DESCRIPTION: MAXIMUM SOFTWARE VERSION
 Data Address: 40143 User Name:
 Data Type: Read only Save to EEPROM: No
 Range: 0..25.5 Scaled Range: 0..255
 Unit * Scale: Version*10
 Refer Elite Screen:

DESCRIPTION: SERIAL NUMBER
 Data Address: 40144/5 User Name:
 Data Type: Read only Save to EEPROM: No
 Range: 0..9999999 Scaled Range: 0..9999999
 Refer Elite Screen: Z2a
 Notes: **This is the serial number of the control board.** This is a long variable and must be read as two registers in the same modbus request.

DESCRIPTION: SCREEN LIST SELECT
 Data Address: 40150 User Name: Screen List
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..255
 Unit * Scale: none
 Refer Elite Screen: Y1
 Special Values: 0 = ENGLISH
 1 = DEUTSCH
 2 = ESPANOL

DESCRIPTION: CURRENT VYSTA CONFIGURATION SELECT

Data Address: 40151 User Name: Program
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..255
 Unit * Scale: none
 Refer Elite Screen: Y3
 Notes: Program can only be selected when the Elite is OFF.

DESCRIPTION: NUMBER OF VYSTA CONFIGURATIONS

Data Address: 40152 User Name: Number of Programs
 Data Type: Read only Save to EEPROM: No
 Range: 0..255
 Unit * Scale: none
 Refer Elite Screen: Y3

DESCRIPTION: ERROR CODE RETURNED BY VYSTA BLOCK

Data Address: 40153 User Name: Block Error
 Data Type: Read only Save to EEPROM: No
 Range: 0..255
 Unit * Scale: none
 Refer Elite Screen: -

DESCRIPTION: VYSTA SPEED

Data Address: 40154 User Name: Vysta speed
 Data Type: Read only Save to EEPROM: No
 Range: 0..+100% Scaled Range: 0..+8192
 Unit * Scale: % Note 100% = 8192
 Refer Elite Screen: -

Notes: This variable gives the current speed of the 4ms loop. This will normally be 100% unless a Vysta program is loading the system.

DESCRIPTION: REFERENCE SPEED

Data Address: 40161 User Name: Ref Speed
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated synchronous speed of motor in rpm*)
 Refer Elite Screen: A4

DESCRIPTION: REFERENCE TORQUE

Data Address: 40162 User Name: Ref Torque
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -400..+400% Scaled Range: -32768..+32767
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated output Torque of motor*)
 Refer Elite Screen: A4

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 1

Data Address: 40170 User Name: Multifunction I/P 1
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 2

Data Address: 40171 User Name: Multifunction I/P 2
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 3
 Data Address: 40172 User Name: Multifunction I/P 3
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 4
 Data Address: 40173 User Name: Multifunction I/P 4
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 5
 Data Address: 40174 User Name: Multifunction I/P 5
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 6
 Data Address: 40175 User Name: Multifunction I/P 6
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: STATUS OF MULTIFUNCTION INPUT 7 / EXTERNAL TRIP
 Data Address: 40176 User Name: External Trip
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: Z7
 Special Values: 0 = O open
 1 = X closed

DESCRIPTION: ELITE RUN COMMAND
 Data Address: 40183 User Name: Run
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = run command not active
 1 = run command active

DESCRIPTION: SKIP SPEED 1
 Data Address: 40190 User Name: Skip Speed 1
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: -20480..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated synchronous speed of motor in rpm*)
 Refer Elite Screen: L10

DESCRIPTION: SKIP SPEED 2
 Data Address: 40191 User Name: Skip Speed 2
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: -20480..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated synchronous speed of motor in rpm*)
 Refer Elite Screen: L11

DESCRIPTION: SKIP BANDWIDTH
 Data Address: 40192 User Name: Skip Bandwidth
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..20% Scaled Range: 0..1638
 Unit * Scale: % Note 100% = 8192 (*Base is: Rated synchronous speed of motor in rpm*)
 Refer Elite Screen: L12

DESCRIPTION: U PHASE CURRENT
 Data Address: 40194 User Name: Iu Current
 Data Type: Read only Save to EEPROM: Yes
 Range: 0..250% Scaled Range: 0..20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Drive Rated Current*)
 Refer Elite Screen: A6a

DESCRIPTION: V PHASE CURRENT
 Data Address: 40195 User Name: Iv Current
 Data Type: Read only Save to EEPROM: Yes
 Range: 0..250% Scaled Range: 0..20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Drive Rated Current*)
 Refer Elite Screen: A6a

DESCRIPTION: W PHASE CURRENT
 Data Address: 40196 User Name: Iw Current
 Data Type: Read only Save to EEPROM: Yes
 Range: 0..250% Scaled Range: 0..20480
 Unit * Scale: % Note 100% = 8192 (*Base is: Drive Rated Current*)
 Refer Elite Screen: A6a

DESCRIPTION: CLEAR FAULT HISTORY
 Data Address: 40200 User Name: Clear Fault History
 Data Type: Read/Write Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: F6
 Special Values: 0 = N
 1 = Y

DESCRIPTION: FAULT HISTORY 1
 Data Address: 40201 User Name: Fault History 1
 Data Type: Read only Save to EEPROM: No
 Range: 0..39
 Unit * Scale: none
 Refer Elite Screen: F1
 Special Values: Refer to data address 40095

DESCRIPTION: FAULT HISTORY 2
 Data Address: 40202 User Name: Fault History 2
 Data Type: Read only Save to EEPROM: No
 Range: 0..39
 Unit * Scale: none
 Refer Elite Screen: F2
 Special Values: Refer to data address 40095

DESCRIPTION: FAULT HISTORY 3
 Data Address: 40203 User Name: Fault History 3
 Data Type: Read only Save to EEPROM: No
 Range: 0..39
 Unit * Scale: none
 Refer Elite Screen: F3
 Special Values: Refer to data address 40095

DESCRIPTION: FAULT HISTORY 4
 Data Address: 40204 User Name: Fault History 4
 Data Type: Read only Save to EEPROM: No
 Range: 0..39
 Unit * Scale: none
 Refer Elite Screen: F4
 Special Values: Refer to data address 40095

DESCRIPTION: FAULT HISTORY 5

Data Address:	40205	User Name:	Fault History 5
Data Type:	Read only	Save to EEPROM:	No
Range:	0..39		
Unit * Scale:	none		
Refer Elite Screen:	F5		
Special Values:	Refer to data address 40095		

DESCRIPTION: DYNAFLUX MINIMUM FLUX LEVEL

Data Address:	40210	User Name:	Min Flux Level
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	40..100%	Scaled Range:	3276..8192
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X4a		

DESCRIPTION: SELECT TORQUE BOOST MODE

Data Address:	40211	User Name:	Autoboost
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..2		
Unit * Scale:	none		
Refer Elite Screen:	X4b		
Special Values:	0 = Fixed voltage boost 1 = Auto voltage boost 2 = Controlled current boost		

DESCRIPTION: CURRENT LIMIT SLIP VALUE

Data Address:	40212	User Name:	Current Limit Slip
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..10%	Scaled Range:	0..901
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X5a		
Special Values:	11% = OFF 901 = OFF, Disable current limit slip		

DESCRIPTION: VOLTAGE LIMIT SLIP VALUE

Data Address:	40213	User Name:	Voltage Limit Slip
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..20%	Scaled Range:	0..1638
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X5b		

DESCRIPTION: NO-LOAD DAMPING

Data Address:	40214	User Name:	Damping
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..20%	Scaled Range:	0..1638
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	X5c		

DESCRIPTION: SLIP COMPENSATION

Data Address:	40215	User Name:	Slip Compensation
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..1	Scaled Range:	0..1
Unit * Scale:	none		
Refer Elite Screen:	X5d		

DESCRIPTION: PROCESS CONTROL ERROR SIGNAL

Data Address:	40220	User Name:	Process Error
Data Type:	Read only	Save to EEPROM:	No
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192		
Refer Elite Screen:	P6		

DESCRIPTION:	PROCESS CONTROL ENABLE		
Data Address:	40221	User Name:	Process Enable
Data Type:	Read only	Save to EEPROM:	No
Range:	0..1		
Unit * Scale:	none		
Refer Elite Screen:	-		
Special Values:	0 = process control not active		
	1 = process control active		
DESCRIPTION:	PROCESS CONTROL REFERENCE VALUE		
Data Address:	40222	User Name:	Process Reference
Data Type:	Read only	Save to EEPROM:	No
Range:	-32768..+32767		
Unit * Scale:	none		
Refer Elite Screen:	-		
DESCRIPTION:	PROCESS CONTROL FEEDBACK VALUE		
Data Address:	40223	User Name:	Process Feedback
Data Type:	Read only	Save to EEPROM:	No
Range:	-32768..+32767		
Unit * Scale:	none		
Refer Elite Screen:	-		
DESCRIPTION:	PROCESS CONTROL REFERENCE SOURCE SELECT		
Data Address:	40224	User Name:	Process Ref Select
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..7		
Unit * Scale:	none		
Refer Elite Screen:	P1		
Special Values:	0 = NULL	No source selected	
	1 = AIN1	Analogue Input 1	
	2 = AIN2	Analogue Input 2	
	3 = AIN1+2	Addition of Analogue Inputs 1 and 2	
	4 = FIBRE	Fibre-optic Input	
	5 = LOCAL	Keyboard	
	6 = MREF	Multi-reference Input	
	7 = MTRPOT	Motorised Potentiometer	
DESCRIPTION:	PROCESS CONTROL FEEDBACK SOURCE SELECT		
Data Address:	40225	User Name:	Process Fb Select
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..7		
Unit * Scale:	none		
Refer Elite Screen:	P2		
Special Values:	0 = NULL	No source selected	
	1 = AIN1	Analogue Input 1	
	2 = AIN2	Analogue Input 2	
	3 = AIN1+2	Addition of Analogue Inputs 1 and 2	
	4 = FIBRE	Fibre-optic Input	
DESCRIPTION:	PROCESS CONTROL GAIN FACTOR		
Data Address:	40226	User Name:	Process Kc
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.01..10	Scaled Range:	1..1000
Unit * Scale:	none		
Refer Elite Screen:	P3		
DESCRIPTION:	PROCESS CONTROL INTEGRATION TIME		
Data Address:	40227	User Name:	Process Ti
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	1..1000s/OFF	Scaled Range:	10..10010
Unit * Scale:	s x 10		
Refer Elite Screen:	P4		
Special Values:	1001= INF	Infinite integration time	

DESCRIPTION: PROCESS CONTROL DIFFERENTIAL FACTOR
 Data Address: 40228 User Name: Process Td
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..250s Scaled Range: 0..2500
 Unit * Scale: s x 10
 Refer Elite Screen: P5

DESCRIPTION: INVERT PROCESS CONTROL
 Data Address: 40229 User Name: Inv Process Kc
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: P7

Notes: This flag inverts the output action of the Process control PID block. In systems where a positive output Speed moves the system towards a positive set point e.g. a tank filling system, then the default No value is used. In systems where a positive output Speed moves the system away from the set point e.g. a tank emptying system, then the system can be inverted.

DESCRIPTION: INVERTER RATED VOLTAGE
 Data Address: 40230 User Name: Drive rated voltage
 Data Type: Read only Save to EEPROM: No
 Range: 400,690
 Unit * Scale: Volts
 Refer Elite Screen: -

DESCRIPTION: INVERTER RATED CURRENT
 Data Address: 40231 User Name: Drive rated current
 Data Type: Read only Save to EEPROM: No
 Range: 0..6553 Scaled Range: 0..65535
 Unit * Scale: Amps x 10
 Refer Elite Screen: -

DESCRIPTION: DEVICENET MAC ID
 Data Address: 40240 User Name: macid
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..63 Scaled Range: 0..63
 Unit * Scale: none
 Refer Elite Screen: H4a

DESCRIPTION: DEVICENET MAC BAUD RATE
 Data Address: 40241 User Name: DNet Baud Rate
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..2 Scaled Range: 0..2
 Unit * Scale: none
 Refer Elite Screen: H4b
 Special Values:
 0 = 125 kbps
 1 = 250 kbps
 2 = 500 kbps

DESCRIPTION: DEVICENET ASSEMBLY INPUT INSTANCE
 Data Address: 40242 User Name: DNet Input Inst
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 70..101 Scaled Range: 0..9
 Unit * Scale: none
 Refer Elite Screen: H4c

DESCRIPTION: DEVICENET ASSEMBLY OUTPUT INSTANCE
 Data Address: 40243 User Name: DNet Output Inst
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 20..100 Scaled Range: 0..7
 Unit * Scale: none
 Refer Elite Screen: H4d

DESCRIPTION: DEVICENET CONTROL SELECT
 Data Address: 40244 User Name: DNet Ctrl Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..2 Scaled Range: 0..2
 Unit * Scale: none
 Refer Elite Screen: H4e
 Special Values: 0 = DeviceNet decides
 1 = DeviceNet Control
 2 = Local Control

DESCRIPTION: DEVICENET REFERENCE SELECT
 Data Address: 40245 User Name: DNet Ref Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..2 Scaled Range: 0..2
 Unit * Scale: none
 Refer Elite Screen: H4f
 Special Values: 0 = DeviceNet decides
 1 = DeviceNet Control
 2 = Local Control

DESCRIPTION: ENERGY
 Data Address: 40250 User Name: Energy Meter
 Data Type: Read only Save to EEPROM: No
 Range: 0..999999 Scaled Range: 0..999999
 Unit * Scale: kwh
 Refer Elite Screen: -
 Notes: This variable is a 4 byte real data type

DESCRIPTION: HOURS ON
 Data Address: 40255 User Name: hours on
 Data Type: Read only Save to EEPROM: No
 Range: 0..32767 Scaled Range: 0..32767
 Unit * Scale: hours
 Refer Elite Screen: -

DESCRIPTION: SECONDS ON
 Data Address: 40256 User Name: seconds on
 Data Type: Read only Save to EEPROM: No
 Range: 0..3599 Scaled Range: 0..3599
 Unit * Scale: seconds
 Refer Elite Screen: -

DESCRIPTION: HOURS RUN
 Data Address: 40257 User Name: hours run
 Data Type: Read only Save to EEPROM: No
 Range: 0..32767 Scaled Range: 0..32767
 Unit * Scale: hours
 Refer Elite Screen: -

DESCRIPTION: SECONDS RUN
 Data Address: 40258 User Name: seconds run
 Data Type: Read only Save to EEPROM: No
 Range: 0..3599 Scaled Range: 0..3599
 Unit * Scale: seconds
 Refer Elite Screen: -

DESCRIPTION: VYSTA VARIABLES
 Data Address: 40301..40330 User Name: Vysta 1..Vysta 30
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -400%..+400% Scaled Range: -32767..+32767
 Unit * Scale: %
 Refer Elite Screen: -

DESCRIPTION: DISPLAY 2ND LINE STATUS
 Data Address: 40331 User Name: status 2nd line
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1 Scaled Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -

DESCRIPTION: DRIVE IDENTIFICATION CODE
 Data Address: 40613 User Name: Drive ID
 Data Type: Read only Save to EEPROM: No
 Range: 0..65535 Scaled Range: -
 Unit * Scale: none
 Refer Elite Screen: -

Note 1: 40613 - Drive Identification Code
 High Byte: 1 = Microdrive 2 = Microflo 3 = Microvector
 4 = Elite Series 5 = Xtravert 6 = RVSx
 7 = Elite Parallel Slave

Low Byte: **400V drives**
 1 = ME-2.5 33 = ME-6.5 65 = ME-10.5
 97 = ME-12 96 = ME-16 64 = ME-18
 128 = ME-22.5 42 = ME-28 34 = ME-31
 66 = ME-38 2 = ME-46 35 = UE-60
 67 = UE-75 129 = UE-90 36 = UE-115
 68 = UE-140 32 = UE-170 69 = UE-210
 98 = UE-250 37 = UE-305 72 = UE-340
 41 = UE-420 38 = UE-480 40 = UE-575
 39 = UE-660 13 = UE-430 29 = UE-475
 30 = UE-530 31 = UE-580 43 = UE-590
 44 = UE-640 45 = UE-730 46 = UE-800
 47 = UE-830 48 = UE-910 49 = UE-1000
 50 = UE-1090 51 = UE-1140 52 = UE-1250

Low Byte: **500V drives**
 17 = ME-2.5 18 = ME-6 19 = ME-9
 20 = ME-11 21 = ME-16 22 = ME-21
 23 = ME-30 24 = ME-35 25 = ME-41
 5 = UE-55 4 = UE-60 6 = UE-68
 5 = UE-75 7 = UE-80 6 = UE-90
 8 = UE-110 7 = UE-115 9 = UE-130
 8 = UE-140 4 = UE-160 27 = UE-160
 79 = UE-170 10 = UE-190 80 = UE-205
 11 = UE-240 81 = UE-250 12 = UE-290
 82 = UE-305 3 = UE-325 26 = UE-325
 83 = UE-370 83 = UE-370 28 = UE-420
 84 = UE-440 14 = UE-440 85 = UE-540
 85 = UE-540 15 = UE-520 86 = UE-620
 16 = UE-600 87 = UE-700 59 = UE-760
 60 = UE-840 61 = UE-930 62 = UE-1025
 63 = UE-1070 70 = UE-1180 71 = UE-1200
 73 = UE-1300

DESCRIPTION: EEPROM ADDRESS
 Data Address: 40885 User Name:
 Data Type: Read only Save to EEPROM: No
 Range: 40001..49999 (excluding 40885)
 Unit * Scale: none
 Refer Elite Screen: -

Notes: The EEPROM address is used to select a variable by its Modbus data address for storage into permanent EEPROM memory. Refer to Section 3.6.

DESCRIPTION: MULTI-FUNCTION INPUT 1 SELECT

Data Address: 41001 User Name: MFI 1 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: I7c
 Notes: MFI 1 Select can only be modified when the Elite is OFF.
 Special Values:

0	= UNUSED	Unused
1	= START	Start
2	= STOP	Stop
3	= ASTOP-RESET	Alternative Stop with Reset
4	= STOP-RESET	Stop-Reset
5	= START/STOP	Start/Stop
6	= STP/STRT-RST	Stop/Start-Reset
7	= RESET	Reset
8	= INCH 1	Inch 1
9	= INCH 2	Inch 2
10	= INV SPEED	Invert Speed Reference
11	= INV TORQUE	Invert Torque Reference
12	= INV TRQ/SPD	Invert Torque/Speed Reference
13	= INV INCH	Invert Inch
14	= ALT ACCEL	Alternative Acceleration/Deceleration Rate
15	= ALT REF	Alternative Reference
16	= SP/TQ MODE	Speed/Torque Mode
17	= LOCAL/REMOTE	Local/Remote
18	= STRT/STP-RST	Start/Stop-Reset
19	= ASTOP	Alternative Stop

DESCRIPTION: MULTI-FUNCTION INPUT 2 SELECT

Data Address: 41002 User Name: MFI 2 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: I7d
 Notes: MFI 2 Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41001.

DESCRIPTION: MULTI-FUNCTION INPUT 3 SELECT

Data Address: 41003 User Name: MFI 3 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: I7e
 Notes: MFI 3 Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41001.

DESCRIPTION: MULTI-FUNCTION INPUT 4 SELECT

Data Address: 41004 User Name: MFI 4 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: I7f
 Notes: MFI 4 Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41001.

DESCRIPTION: MULTI-FUNCTION INPUT 5 SELECT

Data Address: 41005 User Name: MFI 5 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: I7g
 Notes: MFI 5 Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41001.

DESCRIPTION: MULTI-FUNCTION INPUT 6 SELECT
 Data Address: 41006 User Name: MFI 6 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: I7h
 Notes: MFI 6 Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41001.

DESCRIPTION: MULTI-FUNCTION INPUT MODE SELECT
 Data Address: 41007 User Name: I/P Mode
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..5
 Unit * Scale: none
 Refer Elite Screen: I7a
 Notes: I/P Mode can only be modified when the Elite is OFF.
 Special Values: 0 = LOCAL Disable all multi-function inputs
 1 = 3 WIRE Standard 3-wire control
 2 = ALL PROG Each of the multi-function inputs are individually programmable
 3 = MULTIREF 2WRE Multi-reference 2 Wire
 4 = MULTIREF 3WRE Multi-reference 3 Wire
 5 = MOTOR POT Motorised Potentiometer

DESCRIPTION: COMPARATOR 1 "ON" SETPOINT
 Data Address: 41010 User Name: Comp 1 On
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: C1 OFF..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: C2
 Notes: Valid values are from Comp 1 OFF to +250%

DESCRIPTION: COMPARATOR 1 "OFF" SETPOINT
 Data Address: 41011 User Name: Comp 1 Off
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: -20480..C1 ON
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: C3
 Note: Valid values are from -250% to Comp 1 ON

DESCRIPTION: COMPARATOR 1 SOURCE SELECT
 Data Address: 41012 User Name: Comp 1 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: C1
 Notes: Comparator 1 is turned "ON" if source > Comparator 1 "ON" setpoint. Comparator 1 is turned "OFF" if source <= Comparator 1 "OFF" setpoint.
 Special Values: 0 = NULL No source selected
 1 = FULL SCALE 100% of full scale
 2 = OUTPUT CURR Output Current
 3 = OUTPUT VOLTS Output Volts
 4 = BUS VOLTAGE
 5 = MOTOR POWER
 6 = MOTOR SPEED
 7 = MOTOR TORQUE
 8 = REF SPEED
 9 = REF TORQUE
 10 = MOTOR TEMP
 11 = INVERTER TEMP
 12 = AIN1 ECHO
 13 = AIN2 ECHO
 14 = AIN1+2 ECHO
 15 = FIBRE ECHO
 16 = PROCESS REF
 17 = PROCESS FB

18 = PROCESS ERROR

DESCRIPTION:**COMPARATOR 1 OUTPUT**

Data Address: 41013 User Name: Comp 1 Out
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = Below "OFF" level
 1 = Above "ON" level

DESCRIPTION:**SPEED REFERENCE SOURCE SELECT**

Data Address: 41014 User Name: Speed Ref Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..8
 Unit * Scale: none
 Refer Elite Screen: I2
 Notes: Speed Ref Select can only be modified when the Elite is OFF.
 Special Values: 0 = NULL No source selected
 1 = AIN1 Analogue Input 1
 2 = AIN2 Analogue Input 2
 3 = AIN1+2 Addition of Analogue Inputs 1 and 2
 4 = FIBRE Fibre-optic input
 5 = LOCAL Keyboard speed control (refer data register 40088)
 6 = MREF Multi-reference selector
 7 = MTRPOT Motorised potentiometer (refer data address 41062)
 8 = PROCESS Process control output

DESCRIPTION:**TORQUE REFERENCE SOURCE SELECT**

Data Address: 41015 User Name: Torque Ref Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..8
 Unit * Scale: none
 Refer Elite Screen: I3
 Notes: Torque Ref Select can only be modified when the Elite is OFF.
 Special Values: 0 = NULL No source selected
 1 = AIN1 Analogue Input 1
 2 = AIN2 Analogue Input 2
 3 = AIN1+2 Addition of Analogue Inputs 1 and 2
 4 = FIBRE Fibre-optic input
 5 = LOCAL Keyboard torque control (refer data register 41041)
 6 = MREF Multi-reference selector
 7 = MTRPOT Motorised potentiometer (refer data address 41063)
 8 = PROCESS Control Output

DESCRIPTION:**ALTERNATIVE SPEED REFERENCE SOURCE SELECT**

Data Address: 41016 User Name: Alt Speed Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..8
 Unit * Scale: none
 Refer Elite Screen: I4
 Notes: Alt Speed Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41014.

DESCRIPTION:**ALTERNATIVE TORQUE REFERENCE SOURCE SELECT**

Data Address: 41017 User Name: Alt Torque Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..7
 Unit * Scale: none
 Refer Elite Screen: I5
 Notes: Alt Torque Select can only be modified when the Elite is OFF.
 Special Values: Refer data address 41015.

DESCRIPTION:	MULTI-REFERENCE SELECT		
Data Address:	41019	User Name:	Multi Ref Select
Data Type:	Read only	Save to EEPROM:	No
Range:	0..255		
Unit * Scale:	none		
Refer Elite Screen:	-		
DESCRIPTION:	MULTI-REFERENCE 1 SETPOINT		
Data Address:	41020	User Name:	Multi Reference 1
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M1		
DESCRIPTION:	MULTI-REFERENCE 2 SETPOINT		
Data Address:	41021	User Name:	Multi Reference 2
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M2		
DESCRIPTION:	MULTI-REFERENCE 3 SETPOINT		
Data Address:	41022	User Name:	Multi Reference 3
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M3		
DESCRIPTION:	MULTI-REFERENCE 4 SETPOINT		
Data Address:	41023	User Name:	Multi Reference 4
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M4		
DESCRIPTION:	MULTI-REFERENCE 5 SETPOINT		
Data Address:	41024	User Name:	Multi Reference 5
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M5		
DESCRIPTION:	MULTI-REFERENCE 6 SETPOINT		
Data Address:	41025	User Name:	Multi Reference 6
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M6		
DESCRIPTION:	MULTI-REFERENCE 7 SETPOINT		
Data Address:	41026	User Name:	Multi Reference 7
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192	<i>(Base is: Rated Motor Speed or Torque)</i>	
Refer Elite Screen:	M7		
DESCRIPTION:	RELAY 1 SOURCE SELECT		
Data Address:	41027	User Name:	Relay 1 Select
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..23		
Unit * Scale:	none		
Refer Elite Screen:	O2a		
Special Values:	00 = ALWAYS OFF		
	01 = ALWAYS ON		
	02 = NO FAULTS		
	03 = DRIVE FAULT		
	04 = SUPPLY FAULT		
	05 = O/L FAULT		

06 = O/L WARNING
 07 = START
 08 = RUN
 09 = ZERO SPEED
 10 = AT SET SPEED
 11 = TORQUE SIGN
 12 = SPEED SIGN
 13 = TQ REF SIGN
 14 = SP REF SIGN
 15 = SPEED LIMIT
 16 = TORQUE LIMIT
 17 = VOLTAGE LIMIT
 18 = CURRENT LIMIT
 19 = COMPARATOR 1
 20 = COMPARATOR 2
 21 = WINDOW COMP
 22 = BRAKE RELEASE
 23 = VYSTA CONTROL

DESCRIPTION: **RELAY 2 SOURCE SELECT**
 Data Address: 41028 User Name: Relay 2 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..23
 Unit * Scale: none
 Refer Elite Screen: O2c
 Special Values: Refer data address 41027

DESCRIPTION: **RELAY 3 SOURCE SELECT**
 Data Address: 41029 User Name: Relay 3 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..23 Unit * Scale: none
 Refer Elite Screen: O2e
 Special Values: Refer data address 41027

DESCRIPTION: **INVERT THE LOGIC OF RELAY 1**
 Data Address: 41030 User Name: Relay 1 Invert
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: O2b
 Special Values: 0 = N
 1 = Y Relay logic inverted

DESCRIPTION: **INVERT THE LOGIC OF RELAY 2**
 Data Address: 41031 User Name: Relay 2 Invert
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: O2d
 Special Values: 0 = N
 1 = Y Relay logic inverted

DESCRIPTION: **INVERT THE LOGIC OF RELAY 3**
 Data Address: 41032 User Name: Relay 3 Invert
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: O2f
 Special Values: 0 = N
 1 = Y Relay logic inverted

DESCRIPTION: **ANALOGUE OUTPUT 1 SOURCE SELECTION**
 Data Address: 41033 User Name: Analogue O/P 1 Sel
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..19
 Unit * Scale: none
 Refer Elite Screen: O1a

Special Values:

0	=	NULL
1	=	FULL SCALE
2	=	OUTPUT CURR
3	=	OUTPUT VOLTS
4	=	BUS VOLTAGE
5	=	MOTOR POWER
6	=	MOTOR SPEED
7	=	MOTOR TORQUE
8	=	REF SPEED
9	=	REF TORQUE
10	=	MOTOR TEMP
11	=	INVERTER TEMP
12	=	AIN1 ECHO
13	=	AIN2 ECHO
14	=	AIN1+2 ECHO
15	=	FIBRE ECHO
16	=	PROCESS REF
17	=	PROCESS FB
18	=	PROCESS ERROR
19	=	VYSTA CONTROL

DESCRIPTION: ANALOGUE OUTPUT 2 SOURCE SELECTION

Data Address:	41034	User Name:	Analogue O/P 2 Sel
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..19		
Unit * Scale:	none		
Refer Elite Screen:	O1e		
Special Values:	Refer data address 41033		

DESCRIPTION: FIBRE OPTIC OUTPUT SOURCE SELECT

Data Address:	41039	User Name:	Fibre O/P Select
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..19		
Unit * Scale:	none		
Refer Elite Screen:	O3a		
Special Values:	Refer data address 41033		

DESCRIPTION: KEYBOARD TORQUE REFERENCE

Data Address:	41041	User Name:	KB Torque
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	-250..+250%	Scaled Range:	-20480..+20480
Unit * Scale:	% Note 100% = 8192		<i>(Base is: Rated output Torque of motor)</i>
Refer Elite Screen:	A2		

DESCRIPTION: KEYBOARD SPEED/TORQUE MODE SELECT

Data Address:	41042	User Name:	KB Speed/Torque
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..1		
Unit * Scale:	none		
Refer Elite Screen:	A1		
Special Values:	0 = SP	Speed mode	
	1 = TQ	Torque mode	

DESCRIPTION: ACCELERATION RATE

Data Address:	41043	User Name:	Accel Rate
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	%/s * 50		
Refer Elite Screen:	R1		

DESCRIPTION: DECELERATION RATE

Data Address:	41044	User Name:	Decel Rate
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	%/s * 50		
Refer Elite Screen:	R2		

DESCRIPTION:	ALTERNATIVE ACCELERATION RATE		
Data Address:	41045	User Name:	Alt Accel Rate
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	%/s * 50		
Refer Elite Screen:	R3		
DESCRIPTION:	ALTERNATIVE DECELERATION RATE		
Data Address:	41046	User Name:	Alt Decel Rate
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0.02..1300%/s	Scaled Range:	1..65000
Unit * Scale:	%/s * 50		
Refer Elite Screen:	R4		
DESCRIPTION:	BREAK SPEED FOR ALTERNATIVE ACCELERATION/DECELERATION		
Data Address:	41047	User Name:	Break Speed
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..250%	Scaled Range:	0..20480
Unit * Scale:	% Note 100% = 8192 (Base is: Rated synchronous speed of motor in rpm)		
Refer Elite Screen:	R5		
Special Values:	0 = OFF		
DESCRIPTION:	USUAL STOPPING MODE		
Data Address:	41048	User Name:	Stop Mode
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..5		
Unit * Scale:	none		
Refer Elite Screen:	S2		
Special Values:	0 = NORMAL		
	1 = RAMP	Ramp stop	
	2 = SPIN	Spin stop	
	3 = STOP R	Stop-Rate stop	
	4 = OFF	Off-stop	
	5 = DC BRK	DC braking	
DESCRIPTION:	ALTERNATIVE STOPPING MODE		
Data Address:	41049	User Name:	Alt Stop Mode
Data Type:	Read/Write	Save to EEPROM:	Yes
Range:	0..5		
Unit * Scale:	none		
Refer Elite Screen:	S4		
Special Values:	Refer data address 41048		
DESCRIPTION:	MOTORISED POTENTIOMETER		
Data Address:	41062	User Name:	Motorised Pot Speed
Data Type:	Read only	Save to EEPROM:	No
Range:	-400..+400%	Scaled Range:	-32768..+32767
Unit * Scale:	% Note 100% = 8192 (Base is: Rated synchronous speed of motor in rpm)		
Refer Elite Screen:	-		
DESCRIPTION:	INVERTER AND MOTOR OVERLOAD WARNING		
Data Address:	41090	User Name:	Status Overload
Data Type:	Read only	Save to EEPROM:	No
Range:	0..16		
Unit * Scale:	none		
Refer Elite Screen:	Status Line		
Special Values:	0 =	No overload warning	
	1 = i	Inverter overload warning	
	2 = m	Motor overload warning	
	3 = o	Inverter and Motor overload warning	

DESCRIPTION: CONTROL MODE SELECT
 Data Address: 41091 User Name: Control Type
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..2
 Unit * Scale: none
 Refer Elite Screen: X1
 Notes: Control Type can only be selected when the Elite is OFF.
 Special Values: 0 = O/L VECTOR Open loop vector
 1 = C/L VECTOR Closed loop vector
 2 = V/Hz V/Hz

DESCRIPTION: COMPARATOR 2 "ON" SETPOINT
 Data Address: 41110 User Name: Comp 2 On
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: -20480..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: C5
 Notes: Valid values are from Comp 2 Off to +250%.

DESCRIPTION: COMPARATOR 2 "OFF" SETPOINT
 Data Address: 41111 User Name: Comp 2 Off
 Data Type: Read/Write Save to EEPROM: Yes
 Range: -250..+250% Scaled Range: -20480..+20480
 Unit * Scale: % Note 100% = 8192 (*Base is: That of source selected*)
 Refer Elite Screen: C6
 Notes: Valid values are from -250% to Comp 2 ON.

DESCRIPTION: COMPARATOR 2 SOURCE SELECT
 Data Address: 41112 User Name: Comp 2 Select
 Data Type: Read/Write Save to EEPROM: Yes
 Range: 0..18
 Unit * Scale: none
 Refer Elite Screen: C4
 Notes: Comparator 2 is turned "ON" if source > Comparator 2 "ON" setpoint. Comparator 2 is turned "OFF" if source <= Comparator 2 "OFF" setpoint
 Special Values: Refer data address 41012

DESCRIPTION: COMPARATOR 2 OUTPUT
 Data Address: 41113 User Name: Comp 2 Out
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = Below "OFF" level
 1 = Above "ON" level

DESCRIPTION: WINDOW COMPARATOR OUTPUT
 Data Address: 41114 User Name: Window Comp
 Data Type: Read only Save to EEPROM: No
 Range: 0..1
 Unit * Scale: none
 Refer Elite Screen: -
 Special Values: 0 = Outside window
 1 = Inside window

5 APPLICATION INFORMATION

5.1 EXAMPLE START, STOP AND SPEED CONTROL OF THE ELITE USING THE MODBUS SYSTEM

A typical application for a Modbus system would be to control the reference speed and to start and stop the Elite.

5.1.1 SETTING UP THE ELITE SERIAL COMMUNICATIONS CHANNEL

Screen: H3a COMM ADR= 10

Default: 10

Setting: 10

Note: Must be unique for each device on the Modbus network.

Screen: H3b BAUDRATE=9600

Default: 9600

Setting: 9600 (=2)

Note: Must match the baud rate of the Modbus master.

Screen: H2 COMMS T/O=OFF

Default: OFF

Setting: OFF (=3)

Note: Since we are not writing continuously to the Elite, .

5.1.2 SETTING UP THE ELITE FOR CONTROL OVER THE MODBUS SYSTEM

Screen: I2 REF S=LOCAL

Default: LOCAL

Setting: LOCAL (=5)

Note: Selects the local (Keyboard) speed as the source for the speed reference.

Screen: I7a I/P MODE=0

Default: DISABLED

Setting: DISABLED (=0)

Note: This disables the external start/stop inputs allowing the Modbus master only to have start/stop control.

5.1.3 TYPICAL MODBUS MESSAGE EXCHANGE

The messages sent and received are detailed below

Note: Actual data sent is shown in **bold**.

1. **Set speed reference to 0%**
 Query: 0AH, 10H, 00H, 57H, 00H, 01H, 02H, **00H, 00H**, D8H, 87H
 Response: 0AH, 10H, 00H, 57H, 00H, 01H, B1H, 62H
2. **Set Host start of the Elite**
 Query: 0AH, 10H, 00H, 51H, 00H, 01H, 02H, **00H, 01H**, 19H, 21H
 Response: 0AH, 10H, 00H, 51H, 00H, 01H, 51H, 63H
3. **Clear Host start of the Elite**
 Query: 0AH, 10H, 00H, 51H, 00H, 01H, 02H, **00H, 00H**, D8H, E1H
 Response: 0AH, 10H, 00H, 51H, 00H, 01H, 51H, 63H
 Note: Release the start condition
4. **Read the Elite status**
 Query: 0AH, 03H, 00H, 58H, **00H, 01H**, 04H, A2H
 Response: 0AH, 03H, 00H, 03H, 5DH, 84H
 Note: Assuming the Elite is in RUN state
5. **Set the speed to 100% (for example)**
 Query: 0AH, 10H, 00H, 57H, 00H, 01H, 02H, **20H, 00H**, C1H, 47H
 Response: 0AH, 10H, 00H, 57H, 00H, 01H, B1H, 62H
 Note: 100% transmitted as 8192, (=2000H)
6. **Set host stop of the Elite**
 Query: 0AH, 10H, 00H, 50H, 00H, 01H, 02H, **00H, 01H**, 18H, F0H
 Response: 0AH, 10H, 00H, 50H, 00H, 01H, 00H, A3H
 Note: Stop condition latched until released.

5.2 CONTROL OF THE ELITE INPUTS AND OUTPUTS USING THE MODBUS SYSTEM

A Modbus master has the ability to directly interface with a process through the Elite digital and analogue I/O. Digital input is provided by directly reading the Elite multi-function inputs (40170 to 40176). These inputs are NOT latched and so do not retain any information. Use of these registers might include monitoring some form of sensor switch e.g., a proximity or pressure switch.

Digital output is provided by controlling the Elite three output relays' source selection (41027 to 40129). Uses for these registers might include an output indicator lamp, or valve control relay.

Analogue input is provided by reading the two Elite analogue inputs (40120 and 40121), giving the Modbus master direct input from the analogue lines. If these analogue inputs are not used for reference or feedback then uses for these input registers might include monitoring of pressure, temperature or proximity sensors.

Analogue output is provided by setting the Elite analogue output source selection (analogue outputs 1 and 2 source selections are respectively 41033 and 41034), to FULL SCALE (=1), and controlling the gain by setting the low and high set-points for the analogue output (low and high set-points for analogue outputs 1 and 2 are respectively, 40129, 40130, 40131, 40132). The analogue output levels are linearly interpolated between the low and high set-points. Uses for this might include process controlling or remote indication.

5.3 GLOBAL AND GROUP BROADCASTS USING THE MODBUS SYSTEM

When designing a Modbus system that consists of a number of Elites, the system designer often wishes to simultaneously control more than one drive. This might be to do synchronous starting or frequency adjustment, or emergency stopping of all drives. This can be achieved by using a form of addressing known as global broadcast.

GLOBAL BROADCAST EXAMPLE:

If an application requires the same message to be sent to all drives connected on the Modbus system, a global broadcast can be used to simplify the transmission requirements. The global broadcast allows the Modbus master to send one global broadcast message to all drives instead of individual messages to each drive.

To implement a global broadcast, the global broadcast address (address = 0) is used instead of the individual addresses of the connected Elite. When this global address is used, all slave units on the Modbus system respond to the transmitted message but do not issue a response.

An example transmission of a global broadcast is shown below. This example details a synchronous start to all Elites connected to the Modbus system.

Global broadcast of Elite start –

Sent: 00H, 10H, 00H, 51H, 00H, 01H, 02H, **00H**, **01H**, 67H, 81H

Received: No reply received from broadcasts.

In addition to the global broadcast addressing mode, the Elite will respond to a reduced subset of the global broadcast, known as the group broadcast. This form of addressing allows the Modbus master to control a group of drives simultaneously. Group addressing is very similar in operation to global addressing but uses a unique pre-defined address for each group of Elite connected to the Modbus system. Refer to fig. 3.9 for the pre-defined group broadcast addresses.

GROUP BROADCAST EXAMPLE:

For example, a production plant has two conveyers each with four Elites controlling four motors. All the Elites are connected to a Modbus serial comms system. The Modbus System Designer wishes to control the speed of the conveyers separately yet still have the capability of starting and stopping all Elites synchronously. The simplest way to accomplish this would be to group the Elites from each conveyer into one Modbus group.

Conveyer No. 1: Assign Elite communication addresses of 1, 2, 3, 4

Conveyer No. 2: Assign Elite communication addresses of 17, 18, 19, 20

With this system in place, the Modbus master can start and stop all drives simultaneously by using the global broadcast address (0) while still retaining flexibility to control the speed of each conveyer separately by using the different group broadcast addresses (241 and 242 - refer to fig. 3.9).

APPENDIX A - THE PHYSICAL LINK

The Elite can be physically connected to a twisted pair RS485 multi-drop system. Refer to fig. 2.2 for an example wiring configuration.

If the Modbus master does not have RS485 I/O capabilities, an RS232 port can be substituted but an RS232/RS485 converter must also be used.

The RS485 system used on the Elite has the same twisted pair for receiving (Rx) and transmitting (Tx) - this allows an RS485 system to operate only in half duplex mode. Half duplex mode means that the master controller can transmit and receive data but not simultaneously. To control the flow of information across a half duplex system, there must be some form of flow control to indicate to the slave unit when the master controller is transmitting and receiving. The RS232 control line normally used to do this flow control is the Request-To-Send (RTS) line.

The RTS flow control line is normally present along with the Rx and Tx lines at the RS232 I/O port of the Modbus master. The RTS line must be connected to the RS232/RS485 converter so that the half duplex system can transmit and receive data correctly. In this way, the RS232/RS485 converter is not just a voltage converter but also a full/half duplex converter. For the full/half duplex conversion to work, the Modbus master software must switch the RTS control line at the correct times to control transmitting and receiving over the RS485 half duplex system.

A typical wiring configuration for a Modbus master with RS232 I/O capabilities is shown in fig. A.1. When the Modbus master wishes to transmit, the RTS control line must be asserted "LOW". This enables the transmitter (and normally disables the receiver) of the RS232/RS485 converter. This must be done when sending data to the Elite slave unit.

When the Modbus master wishes to receive a reply back from a Elite slave unit, the RTS control line must be left "HIGH". This enables the receiver (and normally disables the transmitter) of the RS232/RS485 converter.

For an example timing diagram, refer to fig. A.2.

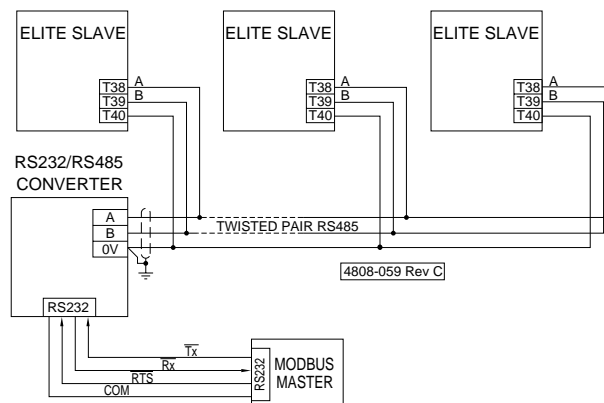


Fig. A.1: RS232/RS485 Wiring Configuration

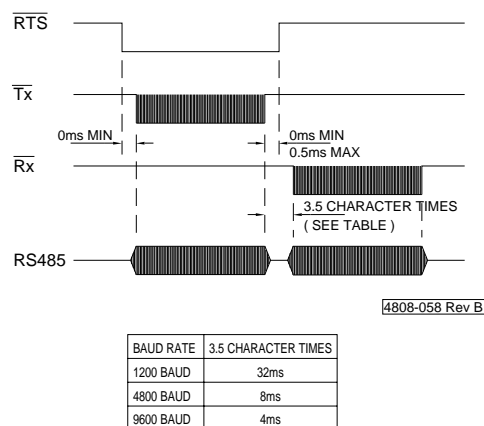


Fig. A.2: Typical RS232/RS485 Conversion Timing Diagram

APPENDIX B - THE MODBUS PROTOCOL

B.1 REMOTE TERMINAL UNIT (RTU) FRAMING

With RTU framing, data is transmitted and received in 8-bit binary sections. Where 16-bit data is to be transmitted it is split into two 8-bit sections, with the most significant byte being transmitted first.

If more than three and a half character times elapse between receiving each byte within a Modbus message, the Elite will flush its data buffer and assume that the next byte received will be a Modbus Address.

The Elite will always wait at least three and a half character times before replying back with an acknowledgement.

B.2 ADDRESS FIELD

The address field of the Modbus message is 8-bits in length allowing the Elite an address range of 1-240 for individual addresses, 241-255 for group broadcast addresses, and zero (0) for the global broadcast address. Each Elite must have a unique Modbus address assigned to it for the master controller to be able to communicate correctly.

All Elite slave units will interpret and execute a group or global broadcast message, but will not respond.

B.3 FUNCTION FIELD

The Modbus function field indicates to the addressed Elite slave unit what function should be performed.

When the slave unit detects that a communication error has occurred, the most significant bit of the function field is set when transmitting back to the master to indicate that other than a normal response has been sent. Refer to appendix B.6 for more information on exception responses.

B.4 DATA FIELD

The data field is used to transmit data to and from the Elite slave units. All data fields are of 16-bits in length (transmitted as two 8-bit bytes - with the most significant byte being transmitted first).

B.5 ERROR CHECK FIELD

The error check field is used by the Modbus master and the Elite slave units to detect transmission errors. To detect transmission errors between the sender and the receiver an error check field is added to the message sent. The error detection system used by the Modbus RTU framing is a cyclic redundancy check (CRC). This is implemented using the CRC-16 polynomial $x^{16} + x^{15} + x^2 + 1$.

The receiver will calculate the CRC error check field over the incoming message and compare it against the one received. On mismatch, the whole message will be discarded. It is not possible to recover faults within the message.

THEORY

The bare message without start/stop or parity bits is considered as one continuous number whose most significant bit is transmitted first. The message is pre-multiplied by 2^{16} (shifted 2 bytes left) and then divided by the polynomial shown above. The quotient is discarded and the 16 bit remainder is appended to the message. The remainder is pre-initialised to 0FFFFH to avoid the case of all zeros being an accepted message.

The receiver does a division with the same polynomial on the message (including the received CRC) and will get a zero remainder if no errors have occurred.

The device used to serialise the data for transmission will send the conventional LSB or right most bit of each character first. In generating the CRC, the first bit transmitted is defined as the MSB of the dividend. For convenience then, and since there are no carries used in arithmetic, let's assume that the MSB is on the right. To be consistent, the bit order of the generating polynomial must be reversed. The MSB is dropped since it affects only the quotient and not the remainder. So the original $x^{16} + x^{15} + x^2 + 1$ represented as 1100000000000101 results in the polynomial 1010 0000 0000 0001 (A001H).

PSEUDO CODE FOR GENERATING A CRC-16

```

CONST ARRAY BUFFER          =    0AH, 03H, 00H, 6DH, 00H, 03H
CONST WORD POLYNOMIAL      =    0A001H    /*X16 = X15 + X2 + 1*/
CONST INTEGER LENGTH       =    6          /*Length of the message here*/

VAR WORD                    CRC16 =    0FFFFH    /*Init. for the CRC Accumulator*/
VAR INTEGER i, j           /*loop variables*/

For i := 1 TO length DO    /*process the data buffer*/
  data := buffer [i] ;    /*get the data byte*/
  FOR j := 1 TO 8 DO      /*process all bits*/
    IF ((data XOR crc16) AND 0001H) = 1) THEN
      crc16 := (crc16 shr 1) XOR POLYNOMIAL
    ELSE
      crc16 := crc16 shr 1
    ENDIF
    Data := Data shr 1    /*get the next data bit*/
  NEXT j                /*bit loop*/
NEXT i                  /*byte loop*/

```

In the above example with the input data (0AH, 03H, 00H, 6DH, 00H, 03H) the CRC-16 will be 6D95H which will be appended to the message as 95H, 6DH. The transmitted message will be 0AH, 03H, 00H, 6DH, 03H, 95H, 6DH.

To check for transmission errors, the receiver calculates the CRC (using the polynomial A001H) over all eight incoming bytes. If the result is not zero, then a transmission error has occurred.

B.6 EXCEPTION CODES

Protocol errors, and data range errors result in the Elite replying back with an exception response message. An exception response consists of the slave address which detected the error, the function code received by the slave unit (with the most significant bit set to indicate an exception response), the error code, and the error check field.

Refer to fig. B.1 for a list of the exception codes and their causes.

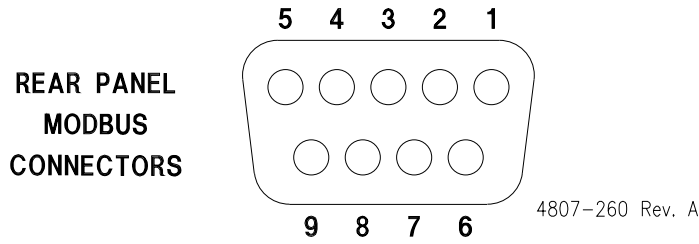
CODE	NAME	CAUSE
01	Illegal Function	The function field received by the slave unit is out of range. The Elite allowable range is Function Codes 3 and 16.
02	Illegal Data Address	The data address received by the slave unit is out of range.
03	Illegal Data Value	The data value received by the slave unit is out of range. If the Elite is not stopped, Modbus Function 16 will return this exception code when trying to modify certain Elite operating modes (40107, 40117, 40135-40139, 41001-41007, 41014-41016).
06	Busy, Reject Message	The slave unit could not complete the required function immediately. Re-transmit again.
07	Negative Acknowledge	The function requested could not be performed.

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Fig. B.1: Modbus Exception Codes

APPENDIX C - TYPICAL CONNECTION DIAGRAMS

Pin out and connections for the 9 pin serial output of IBM compatible PCs.



Pin	Connection	Pin	Connection
1	- CHASSIS GROUND	6	IN DATA SET READY
2	IN RECEIVE DATA	7	OUT REQUEST TO SEND
3	OUT TRANSMIT DATA	8	IN CLEAR TO SEND
4	OUT DATA TERMINAL READY	9	- NOT USED
5	- SIGNAL GROUND		

Fig. C.1: DB9 Connection Pinout

PC CONNECTION LEAD:

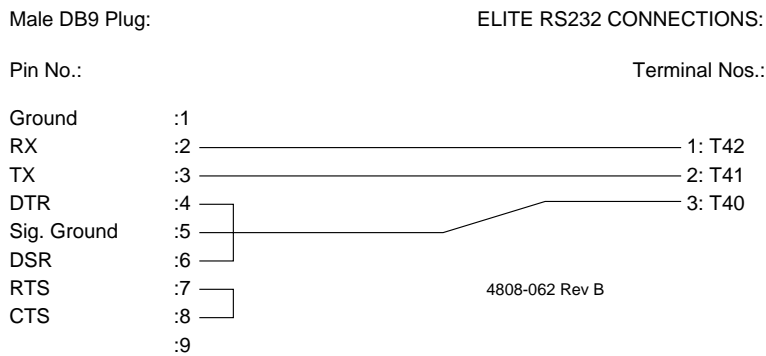


Fig. C.2: DB9/Elite Wiring Connections

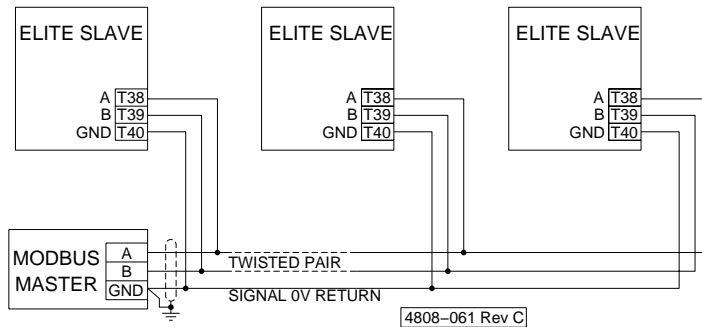


Fig. C.3: RS485 Pin Connection Details

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