Application Note for Using the Operator Station HE500TIU050 / 10X / 11X / 20X / 3XX with the Eurotherm 631/635/637 Series Servo Drives

1.0. Protocol File Name

HE500TIU050 = No Currently Supported
HE500TIU1xx = Eurot635_R?.1xx
HE500TIU2xx = Eurot635_R?.2xx
(The "?" = the TIU firmware revision)

2.0. Configuring the Operator Station

To verify the Automated Equipment type the Operator Station is setup for, watch the screen of the Operator Station on power up. The first screen message details the setup of the Operator Station. To configure the Operator Station for particular Automated Equipment, select the Automated Equipment in the Communication Settings from the Configure menu in *CBREEZE* software. Select the appropriate Manufacturer and the appropriate Remote Equipment Model.   Then from the File menu select Update Protocol, the appropriate file name will appear in the file name field. The programmer may need to point to the correct folder name/location. If further information is required see the manual or *CBREEZE* help on update/change protocol.

3.0. Protocol Revisions

Version 1.00 Supports master only operation to the slave Servo Drive using the EASY Protocol.

4.0. Serial Port Configuration

The link settings of 19200 baud, eight data bits and even parity with no handshaking and RS232 Communications are default in the terminal.
Communications is via the COM1 (RS232) (X15) or COM2 (RS422) of the servo.

5.0. Node Number

Inverter Axis Number (network Address) are required only when connected to COM2.

6.0. Parameter Specification

Data is accessed in several different ways with the Servo Drive :
Write Only Registers/Commands/Parameters. As these are write only, when embedded on the display it will always display as "0". However, if edited the value entered will be transferred to the Servo.
Some Write Only Commands do not involve data at all here the action of editing and accepting (with the enter key) cause the command to be sent.

As some data is only readable in a table form an offset into the table has to be specified. If one parameter is edited the whole table is read, the appropriate parameter is modified and then the whole table is written.

Some commands allow multiple tables to be accessed in this case the table and the offsets must be specified in the form "TTT.OO". Where the table is "TTT" and the offset is "OO".

Some register types are only accessible if the Drive is disabled see the tables below. If attempts are made to write to these registers when the drive is enabled the data field on the display will show *****. This will remain until a different menu page is selected.

The tables below show how the data can be accessed :

6.1. Data Access

Disable – Disables the Servo Drive.

This is a Write only command. "0" will always be displayed and any form of editing of this register type and accepting will issue the command.

Activate – Enables the Servo Drive.

This is a Write only command. "0" will always be displayed and any form of editing of this register type and accepting will issue the command.

Reset – Reset the Servo Drive.

This is a Write only command. "0" will always be displayed and any form of editing of this register type and accepting will issue the command. This command will only work and be successful if the Drive is **enabled**.

EEPROM – Stores the Servo Drives Parameters in EEPROM.

This is a Write only command. "0" will always be displayed and any form of editing of this register type and accepting will issue the command. This command will only work and be successful if the Drive is **Disabled**.

Diagnostic Information

This is a read only command any attempt to write will cause a comms failure.

Location	Size	Description
0	16 Bit	Error Word (see manual for details)
1	16 Bit	Status Word (see manual for details)
2	16 Bit	Operating Mode Low Byte / Input Definition High Byte
3	16 Bit	Actual Speed at Scaling 1
4	16 Bit	Input State Low Byte / Output State High Byte
5	32 Bit	Actual position
6	32 Bit	Reserved

BIAS Diagnostic Information

This is a read only command except for Offset 0 any attempt to write to any others will cause a comms failure.

Location	Size	Description
0	16 Bit	BIAS Execution pointer
1	16 Bit	PLC execution pointer
2	16 Bit	Block Number at Strobe
3	16 Bit	BIAS Stack
4	16 Bit	Wait Time
5	16 Bit	BIAS status (see manual for details)
6	16 Bit	PLC status (see manual for details)
7	16 Bit	PLC stack
8	32 Bit	Actual position 1
9	32 Bit	Actual position 2
10	32 Bit	Actual Position 3 (CAN bus absolute encoder)
11	32 Bit	Reserved

Variables

The drive requires firmware version 4.18 or greater to be able to write to the variables.

Location	Size	Description
0.00	32 Bit	Variable Group 0 No. 0
0.01	32 Bit	Variable Group 0 No. 1
0.02	32 Bit	Variable Group 0 No. 2
..	..	..
0.15	32 Bit	Variable Group 0 No. 15
1.00	32 Bit	Variable Group 1 No. 0
1.01	32 Bit	Variable Group 1 No. 1
..	..	..
1.15	32 Bit	Variable Group 1 No. 15
..	..	..
15.15	32 Bit	Variable Group 15 No. 15

Flags

Flags are single bit types. If one bit is read it will be stored in the least significant bit of the TIUs word. If several are read they are packed 16 into each TIU word. The drive requires firmware version 4.18 or greater to be able to write to the flags.

Location	Size	Description
0.00	1 Bit	Flag Group 0 No. 0
0.01	1 Bit	Flag Group 0 No. 1
0.02	1 Bit	Flag Group 0 No. 1
..	..	..
0.63	1 Bit	Flag Group 0 No. 63
1.00	1 Bit	Flag Group 1 No. 0
1.01	1 Bit	Flag Group 1 No. 1
..	..	..
1.63	1 Bit	Flag Group 1 No. 63
..	..	..
3.63	1 Bit	Flag Group 3 No. 63

Start Position Set

This Write only command activates the position block. For this to work the drive must be in positioning regulation mode and be active. The position blocks must be set before this can be used. The drive requires firmware version 4.12 or greater.

Location	Size	Description
0	16 Bit	Positioning block (0-9)

Serial Speed Setpoint

This Write only command activates the given value as a speed setpoint. For this to work the drive must be in speed control without analogous set point value mode. The drive requires firmware version 4.18 or greater.

Location	Size	Description
0	16 Bit	Speed setpoint in rpm (+/- 4000)

Motor Rated Current

In order to write this command the drive must be in disabled. The drive requires firmware version 4.12 or greater.

Location	Size	Description
0	16 Bit	Rated motor current (value = rated current * $\sqrt{2}$ * 100

Configuration Parameters

This command will only work and be successful if the Drive is Disabled.

Location	Size	Description
0	8 Bit	Network Axis number used for COM2 (1 to 255) (station number/node id) Only written if connected to COM1 (X15).
1	16 Bit	Configuration word (see manual for details)
2	16 Bit	Operating Mode Low byte (0 to 5) / Input Definition High Byte
3	16 Bit	Rated Motor Current * 100 * $\sqrt{2}$
4	16 Bit	Pole Pair number (1-6)
5	16 Bit	EMC/100 min^{-1} in Volts
6	16 Bit	Motor inductance in $^1/_{10}$ mH
7	16 Bit	Motor resistance in $^1/_{10}$ Ohm
8	16 Bit	I^2t-monitoring ti me of the motor in seconds
9	16 Bit	NTC-resistance T1 in Ohm
10	16 Bit	NTC-resistance T2 in Ohm
11	16 Bit	PTC-resistance in Ohm
12	16 Bit	Regulator disabled deceleration value (0-3)
13	16 Bit	Ucc-low threshhold in Volts
14	16 Bit	Ucc-ballast threshold in Volts
15	16 Bit	Ballast resistance in $^1/_{10}$ Ohm
16	16 Bit	Ballast Power in Watts

Speed Controller Parameters

Location	Size	Description
0	16 Bit	List place P-component
1	16 Bit	List place I-component
2	16 Bit	Maximum current in 3.125% steps
3	16 Bit	Setpoint zero window in 1.22 mV steps
4	16 Bit	Setpoint integrator in 10 rpm/s
5	16 Bit	Speed setpoint norming in 0.1 rpm
6	16 Bit	Current setpoint norming 0.001 ampere
7	16 Bit	Nominal measuring point 1 in rpm
8	16 Bit	Nominal measuring point 1 in 0.01 ampere
9	16 Bit	Nominal external current limiting in 0.01 Volt
10	16 Bit	Setpoint offset correction value in 1.22 mV steps

Current Controller Parameters

Location	Size	Description
0	16 Bit	List place P-component
1	16 Bit	List place I-component
2	16 Bit	Reserved

3	16 Bit	Reserved
4	16 Bit	Reserved
5	16 Bit	Reserved
6	16 Bit	Offset resolver position
7	16 Bit	Ucc overvoltage threshold in Volts
8	16 Bit	Reserved

Position Controller Parameters

Location	Size	Description
0	16 Bit	Nominal speed at scaling 1
1	16 Bit	Acceleration at scaling 2
2	16 Bit	Deceleration at scaling 2
3	16 Bit	"Position Reached" - window at incr.
4	16 Bit	P-component
5	16 Bit	I-component
6	16 Bit	Reserved

Position Set

Location	Size	Description	
0.00	8 Bit	Operating Mode	(Set 0)
0.01	16 Bit	Nominal Speed at scaling 1	(Set 0)
0.02	16 Bit	Acceleration at scaling 2	(Set 0)
0.03	16 Bit	Deceleration at scaling 2	(Set 0)
0.04	16 Bit	"Position Reached" - window at incr.	(Set 0)
0.05	32 Bit	Nominal position in increments	(Set 0)
..	..	..	
9.00	8 Bit	Operating Mode	(Set 9)
0.01	16 Bit	Nominal Speed at scaling 1	(Set 9)
0.02	16 Bit	Acceleration at scaling 2	(Set 9)
0.03	16 Bit	Deceleration at scaling 2	(Set 9)
0.04	16 Bit	"Position Reached" - window at incr.	(Set 9)
0.05	32 Bit	Nominal position in increments	(Set 9)

Cam Profile

Profile setup for profiles 0 to 15

Location	Size	Description
0.00	16 Bit	Reserved for EASYRIDER Low byte / number of correction (always 0) High byte
0.01	16 Bit	Number of profile points (PP)
0.02	16 Bit	Address of first profile point (STS)
0.03	16 Bit	Reserved
0.04	16 Bit	Correction value 1. Stage (always 0)

0.05	16 Bit	Correction value 2. Stage (always 0)
0.06	16 Bit	Correction value 3. Stage (always 0)
0.07	16 Bit	Correction value 4. Stage (always 0)
0.08	16 Bit	Correction value 5. Stage (always 0)
0.09	16 Bit	Correction value 6. Stage (always 0)
0.10	16 Bit	Correction value 7. Stage (always 0)
0.11	16 Bit	Correction value 8. Stage (always 0)
0.12	16 Bit	Correction value 9. Stage (always 0)
0.13	16 Bit	Correction value 10. Stage (always 0)
0.14	32 Bit	Master stroke (MT)
0.15	32 Bit	Slave stroke (ST)
0.16	32 Bit	Reserved
0.17	32 Bit	Reserved
0.18	32 Bit	Reserved
0.19	32 Bit	Reserved
0.20	32 Bit	Syncro mode (identification of calculated profile; 255 for user defined) (TY) Low byte
0.21	32 Bit	Reserved
0.22	32 Bit	Reserved
..	..	..
15.13	16 Bit	Correction value 10. Stage (always 0)
15.14	32 Bit	Master stroke (MT)
15.15	32 Bit	Slave stroke (ST)
15.16	32 Bit	Reserved
15.17	32 Bit	Reserved
15.18	32 Bit	Reserved
15.19	32 Bit	Reserved
15.20	32 Bit	Syncro mode (identification of calculated profile; 255 for user defined) (TY) Low byte
15.21	32 Bit	Reserved
15.22	32 Bit	Reserved

Profile Point Block

Profile Point setup for profile Points 0 to 255

Location	Size	Description
0.00	8 Bit	Profile Block 0 point 0
0.01	8 Bit	Profile Block 0 point 1
0.02	8 Bit	Profile Block 0 point 2
0.03	8 Bit	Profile Block 0 point 3
0.04	8 Bit	Profile Block 0 point 4
0.05	8 Bit	Profile Block 0 point 5
0.06	8 Bit	Profile Block 0 point 6
0.07	8 Bit	Profile Block 0 point 7
..	..	..

255.01	8 Bit	Profile Block 255 point 1
255.02	8 Bit	Profile Block 255 point 2
255.03	8 Bit	Profile Block 255 point 3
255.04	8 Bit	Profile Block 255 point 4
255.05	8 Bit	Profile Block 255 point 5
255.06	8 Bit	Profile Block 255 point 6
255.07	8 Bit	Profile Block 255 point 7

I/O Definition

| Location	Size	Description
0	8 Bit	Definition I X10.2
1	8 Bit	Definition I X10.4
2	8 Bit	Definition I X10.11
3	8 Bit	Definition I X10.14
4	8 Bit	Definition I X10.15
5	8 Bit	Definition I X10.24
6	8 Bit	Definition I X10.25
7	8 Bit	Definition O X10.12
8	8 Bit	Definition O X10.13
9	8 Bit	Definition O X10.20
10	8 Bit	Definition O X10.23

BIAS PROGRAM

Allows access to the BIAS Program ONLY when the drive is disabled. Only Set numbers 0 to 655 are available at present.

| Location	Size	Description
0.00	8 Bit	BIAS Set Number 0 – BIAS Command Code
0.01	8 Bit	BIAS Set Number 0 – BIAS Command data byte 1
0.02	8 Bit	BIAS Set Number 0 – BIAS Command data byte 2
0.03	8 Bit	BIAS Set Number 0 – BIAS Command data byte 3
0.04	8 Bit	BIAS Set Number 0 – BIAS Command data byte 4
0.05	8 Bit	BIAS Set Number 0 – BIAS Command data byte 5
0.06	8 Bit	BIAS Set Number 0 – BIAS Command data byte 6
0.07	8 Bit	BIAS Set Number 0 – BIAS Command data byte 7
..	..	..
655.00	8 Bit	BIAS Set Number 655 – BIAS Command Code
655.01	8 Bit	BIAS Set Number 655 – BIAS Command data byte 1
655.02	8 Bit	BIAS Set Number 655 – BIAS Command data byte 2
655.03	8 Bit	BIAS Set Number 655 – BIAS Command data byte 3
655.04	8 Bit	BIAS Set Number 655 – BIAS Command data byte 4
655.05	8 Bit	BIAS Set Number 655 – BIAS Command data byte 5
655.06	8 Bit	BIAS Set Number 655 – BIAS Command data byte 6
655.07	8 Bit	BIAS Set Number 655 – BIAS Command data byte 7

7.0. Connection details to Eurotherm 631, 635, and 637 Series Servo Drives
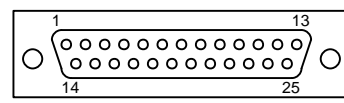
13-Pin Screw Terminal Block
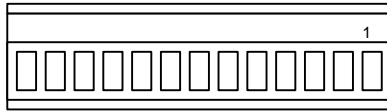
TIU100, TIU110

8-Pin Screw Terminal
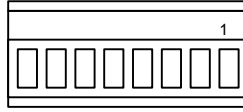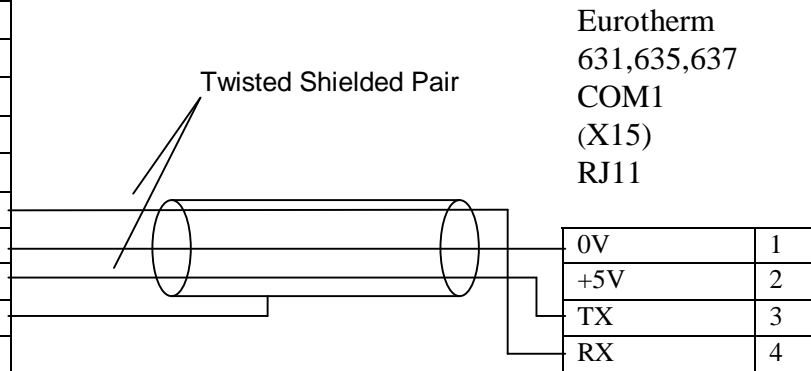
TIU050, 101, 102, 103, 111, 112, 113, 201, 202, 203

25-Pin D-Type Male

TIU300, 301, 302, 303, 304, 310, 311, 312, 313, 314, 320, 321, 322, 323, 324

RS232 Connection

TIU Type Signal Name	13-Pin	8-Pin	25-Pin
+5V	1		
TX 485/422+	2	1	12
TX 485/422-	3	2	13
RX 485/422+	4	3	24
RX 485/422-	5	4	25
TX RS232	6	5	2
Signal GND	7	6	7
RX RS232	8	7	3
Frame Gnd	13	8	1
RTS RS232	-	-	4
CTS RS232	-	-	5
RTS 485/422+	-	-	14
RTS 485/422-	-	-	17
CTS 485/422-	-	-	18
CTS 485/422+	-	-	19

Twisted Shielded Pair

Eurotherm 631,635,637 COM1 (X15) RJ11

0V	1
+5V	2
TX	3
RX	4

Do not connect to unlisted pins.

Recommended cable : Beldon 9503, twisted multipair, screened.
Connect the screens together at the shield / Earth pin of the PLC