ETHERNET INTERFACE FOR OJ1436

This document applies to OJ1436 software version 1.3.x

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1 Introduction

1.1 Overview

The Ethernet interface is one of the network communication options available for the OJ1436 *smart* Belt Weigher Indicator.

It will be factory fitted if ordered at the same time as the indicator. Alternatively, it can be supplied in kit form to be fitted to an existing indicator.

The Ethernet interface provides the facility to connect the OJ1436 to Ethernet networks for communication with host systems using either the Modbus TCP or SABus protocol.

This manual provides details of how to install the interface board, configure the network settings and then communicate with the OJ1436 using one of the supported protocols.

For further information relating to the general operation of the indicator refer to the OJ1436 *smart* Belt Weigher Indicator user manual.

2 Installation

2.1 Ethernet Interface Board

If the Ethernet interface has been supplied in kit form to be fitted to an existing indicator follow the installation instructions below.

Note: Anti-static precautions should be taken when handling the circuit boards.

1. Power off.
2. Unplug all rear connectors.
3. Remove the 4 x 6mm screws located in the corners of the rear panel and then remove the rear panel.
4. Note the slots in which the main circuit board is located (ready for refitting). Grip one of the green connectors and slide out the main board together with the additional interface board.

Refer to the installation diagram overleaf in conjunction with instructions 5 and 6.

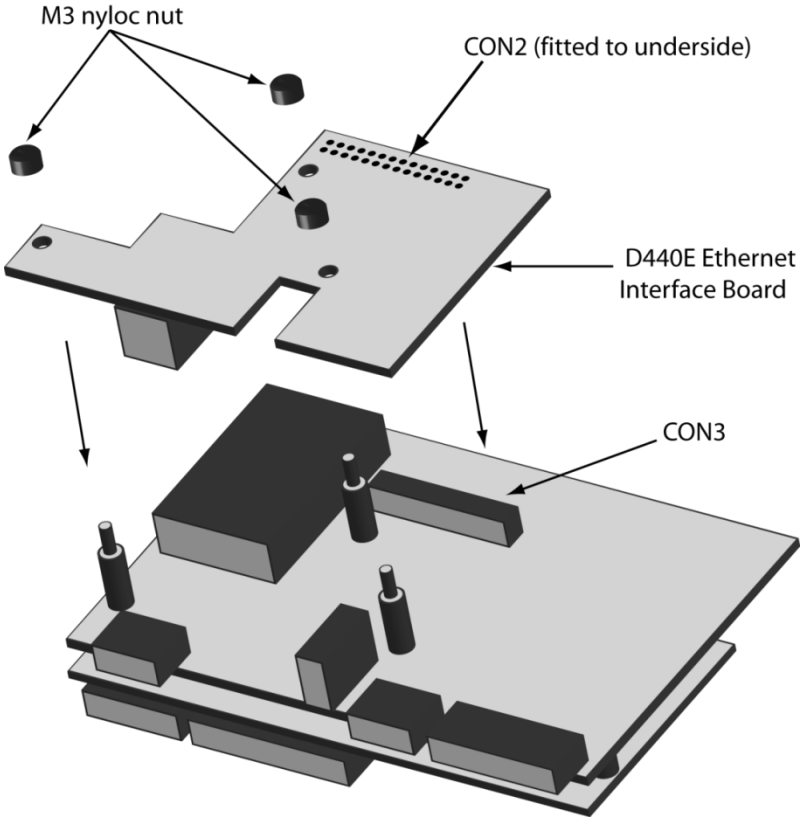
5. Carefully align the D440E Ethernet interface board connector CON2 with connector CON3 on the indicators main board and gently push down to seat the interface board in the main board connector.
6. Use the M3 nyloc nuts provided in the kit to secure the interface board to the threaded spacers on the indicators main board.
7. Refit the circuit boards into the correct slots previously noted and gently push them in until the connector on the leading edge locates with its mate on the front circuit board. Push fully home only when this connector is aligned.
8. Fit the replacement rear panel provided in the kit using the original screws.
9. Refit all rear connectors.

2.1.1 Kit Contents

The supplied kit contains the following items.

- D440E Ethernet interface board
- 3 x M3 nyloc nuts
- Replacement rear panel

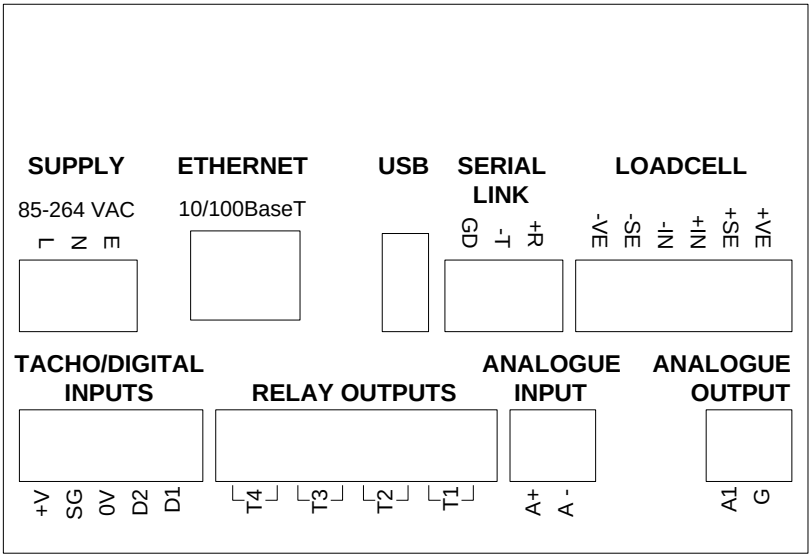
2.1.2 Installation Diagram



D440E Ethernet Interface Board Installation

2.2 Connection Layout

An RJ45 socket on the rear of the unit provides the Ethernet network connection, as shown below.



3 Configuration

Once the Ethernet interface has been installed the network configuration should be performed as detailed below.

The network configuration settings are accessed by operating:

MENU → Configuration → Interfaces → Network

Parameter	Range	Factory Setting
Network Interface This should be set to **Ethernet** to match the installed network interface option.	None / Ethernet / EtherNet/IP / Profibus DP / DeviceNet	None
Protocol The communication protocol used to transfer data between the OJ1436 and a host system.	SABus / Modbus TCP	Modbus TCP
Use DHCP Determines whether the OJ1436 requests the network settings below from a DHCP server i.e. Use DHCP = Yes, or uses the settings configured by the user i.e. Use DHCP = No. See section 3.1 for further details.	Yes / No	No
IP Address The IP address of the OJ1436 on the local Ethernet network. If Use DHCP = Yes this will be the IP address assigned by the DHCP server. If Use DHCP = No this will be the static IP address configured by the user.	-	192. 168. 127. 254
Subnet Mask The local Ethernet network Subnet Mask. If Use DHCP = Yes this will be the Subnet Mask assigned by the DHCP server.	-	255. 255. 255. 0
Gateway The local Ethernet network Gateway. If Use DHCP = Yes this will be the Gateway assigned by the DHCP server.	-	255. 255. 255. 255

3.1 Dynamic Host Configuration Protocol (DHCP)

If DHCP is enabled, by setting the Use DHCP parameter to Yes, the OJ1436 will request the IP Address, Subnet Mask and Gateway from the DHCP server.

Therefore, the IP Address could change each time it is assigned by the DHCP server.

Whenever the Use DHCP configuration is changed to enable DHCP the hour glass is displayed temporarily on the network configuration screen whilst the Ethernet interface is reset in preparation for this mode of operation.

The values assigned by the DHCP server will be displayed within the network configuration parameters.

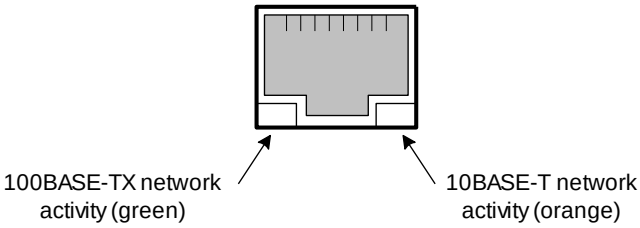
If the OJ1436 is unable to communicate with the DHCP server the following default values will be displayed within the network configuration parameters.

IP Address	: 192.168.127.254
Subnet Mask	: 255.255.255.0
Gateway	: 255.255.255.255

If DHCP is disabled, by setting the Use DHCP parameter to No, the IP Address, Subnet Mask and Gateway should be configured manually through the network configuration parameters.

3.2 Network Activity

When viewed from the rear of the enclosure, the function of the Ethernet connector LEDs are as shown below.



The LEDs will light steady when a link is established and will flicker to show activity.

4 Communication Protocol

The OJ1436 supports network communication to a host PC or PLC using either the Modbus TCP or SABus protocol.

4.1 Modbus TCP

The OJ1436 can be configured for network communication to a host PC or PLC using the Modbus TCP protocol by setting the Network Protocol parameter to Modbus TCP, as defined in section 3.

TCP port number 502 is used for data transfer.

4.1.1 Function Codes Supported

Function Code	Description
0x01	**READ COILS** Used to read the Belt Status bit.
0x03	**READ HOLDING REGISTERS** Used for flow rates, totals, weights, error code, etc..
0x05	**WRITE SINGLE COIL** Used to set the "Clear Total", "Clear Flow Time" or “Start Dynamic Tare” bits to perform the appropriate action. These flags are auto-cancelling after the action has been performed.
0x2B	**ENCAPSULATED INTERFACE TRANSPORT** Used with MEI Type 14 to read the device identification object.

4.1.2 Bits (coils)

Coil Number	Address	Description
1	0x00	**Clear Total**. This bit is write-only.
2	0x01	**Clear Flow Time**. This bit is write-only.
3	0x02	**Start Dynamic Tare**. This bit is write-only.
4	0x03	**Belt Status**. This bit is read only.

4.1.3 Holding Registers

Register Number	Address	Description
1 – 2	0x00, 0x01	**Flow Rate**. This value is a 32-bit floating point number and therefore register addresses 0x00 and 0x01 together form the value. Address 0x00 contains the most significant 2 bytes.
3 – 4	0x02, 0x03	**Resettable Total**. This value is a 32-bit floating point number and therefore register addresses 0x02 and 0x03 together form the value. Address 0x02 contains the most significant 2 bytes.
5 – 6	0x04, 0x05	**Non-resettable Total**. This value is a 32-bit floating point number and therefore register addresses 0x04 and 0x05 together form the value. Address 0x04 contains the most significant 2 bytes.
7 – 8	0x06, 0x07	**Material Weight**. This value is a 32-bit floating point number and therefore register addresses 0x06 and 0x07 together form the value. Address 0x06 contains the most significant 2 bytes.
9 – 10	0x08, 0x09	**Load Cell Weight**. This value is a 32-bit floating point number and therefore register addresses 0x08 and 0x09 together form the value. Address 0x08 contains the most significant 2 bytes.
11 – 12	0x0A, 0x0B	**Belt Load**. This value is a 32-bit floating point number and therefore register addresses 0x0A and 0x0B together form the value. Address 0x0A contains the most significant 2 bytes.
13 – 14	0x0C, 0x0D	**Flow Time**. This is the current flow time in seconds. This value is a 32-bit integer and therefore register addresses 0x0C and 0x0D together for the value. Address 0x0C contains the most significant 2 bytes.

Register Number	Address	Description
15 – 16	0x0E, 0x0F	**Belt Run Time**. This is the current belt run time in seconds. This value is a 32-bit integer and therefore register addresses 0x0E and 0x0F together for the value. Address 0x0E contains the most significant 2 bytes.
17 – 18	0x10, 0x11	**Tacho Frequency**. This value is a 32-bit floating point number and therefore register addresses 0x10 and 0x11 together form the value. Address 0x10 contains the most significant 2 bytes.
19 – 20	0x12, 0x13	**Belt Speed**. This value is a 32-bit floating point number and therefore register addresses 0x12 and 0x13 together form the value. Address 0x12 contains the most significant 2 bytes.
21	0x14	**Error code**. The current error code will be cleared after this register is read. See section 11.2 of the OJ1436 user manual for a list of error codes.
22 – 23	0x15, 0x16	**Load Cell Signal.** This is the current load cell signal in millivolts (mV). This value is a 32-bit floating point number and therefore register addresses 0x15 and 0x16 together form the value. Address 0x15 contains the most significant 2 bytes.
24 – 25	0x17, 0x18	**Inclinometer Angle**. This value is a 32-bit floating point number and therefore register addresses 0x17 and 0x18 together form the value. Address 0x17 contains the most significant 2 bytes.

4.1.4 Identification Object

The Basic Device Identification is implemented and is available as a stream and as individual objects.

Object ID	Description
0x00	Vendor name.
0x01	Product code / model number.
0x02	Software revision.

4.1.5 Exception Codes

The following exception codes may be returned by the OJ1436.

Code	Description
01	Illegal Function. The function code is not supported.
02	Illegal Data Address. The address of the register or the combination of address + number of registers is invalid.
03	Illegal Data Value. The value specified in the request is invalid, e.g. the data length is incorrect.

4.2 SABus

The OJ1436 can be configured for network communication to a host PC or PLC using the SABus protocol by setting the Network Protocol parameter to SABus, as defined in section 3.

TCP port number 4001 is used for data transfer.

4.2.1 Protocol Definition

The SABus communication protocol uses ASCII character messages of the following format:

! 00 CC nnnnnn [CR]

Where:

!	:	Delimiter character
00	:	2 digit station address, fixed as 00.
CC	:	2 letters representing the command
n to nnnnnnnnn	:	1 to 9 digits representing the data value associated with the command (if required). The value is scaled by the appropriate decimal place setting as no decimal place character is transmitted.
[CR]	:	Carriage return

Note : The number of digits is fixed for a given command. If an error is present then then the unit will return the error command and data instead of the command and data requested, as shown below.

Example of a request by the host for the current flow rate.

Host Sends	OJ1436 Returns
!00FL[CR]	!00FL0000326[CR] Flow Rate = 326
or	!02ER1810[CR] Error condition Out of range load cell signal - negative

4.2.2 Command Definitions

Command	Data	Definition
FL	-999999 - 9999999	**Flow Rate** - kg/h or t/h Returns the current flow rate, scaled by Flow Rate DP e.g. if the flow rate is being displayed as 75.2 t/h then it will be returned as 0000752.
RT	0000000 - 9999999	**Resettable Total** - kg or t Returns the current resettable total, scaled by Resettable Total DP.
NT	0000000 - 9999999	**Non-resettable Total** - kg or t Returns the current non-resettable total, scaled by Non-Resettable Total DP.
DP	0 - 4	**Flow Rate Decimal Place** Returns the Flow Rate DP setting i.e. the flow rate decimal places.
RP	0 - 4	**Resettable Total Decimal Place** Returns the Resettable Total DP setting i.e. the resettable total decimal places.
NP	0 - 4	**Non-Resettable Total Decimal Place** Returns the Non-Resettable DP setting i.e. the non-resettable total decimal places.
SP	0 - 4	**Static Decimal Place** Returns the Static DP setting i.e. static weight decimal places.
BL	-99 - 100	**Belt Load** - % Returns the current Belt Load.
BP	00000 - 99999	**Belt Speed** - metres/second or metres/minute Returns the current Belt Speed multiplied by 100 i.e. scaled to 2 decimal places.
FT	00000000 - 35999999	**Flow Time** - seconds Return the current flow time in seconds.
BT	00000000 - 35999999	**Belt Run Time** - seconds Return the current belt run time in seconds.

Command	Data	Definition
BS	0 or 1	**Belt Status** Indicates the running status of the belt. 0 = stopped, 1 = running
HZ	0000 - 2200	**Tacho Frequency** - Hz Returns the current tacho frequency multiplied by 10 i.e. scaled to 1 decimal place.
MV	000000 - 256000	**Load Cell Signal** – mV (millivolts) Returns the current Load Cell Signal multiplied by 100 i.e. scaled to 2 decimal place.
LS	00000 - 99999	**Load Cell Weight** - kg Returns the current Load Cell Weight, scaled by Static DP.
GR	-9999 - 99999	**Material Weight** - kg Returns the Load Cell Weight with the Tare removed, i.e. the weight of material on the belt, scaled by Static DP.
IA	-999 - 0999	**Inclinometer Angle** - Degrees Returns the current inclinometer angle, in the range -90 to +90 degrees, multiplied by 10 i.e. scaled to 1 decimal place.
ER	0000 - 9999	**Error** Returns the error code as defined by the table in section 11.2 of the OJ1436 user manual.
CT	-	**Clear Total** Sets the resettable total to zero.
CF	-	**Clear Flow Time** Sets the flow time to zero.
DT	-	**Dynamic Tare** Initiates the dynamic tare routine.

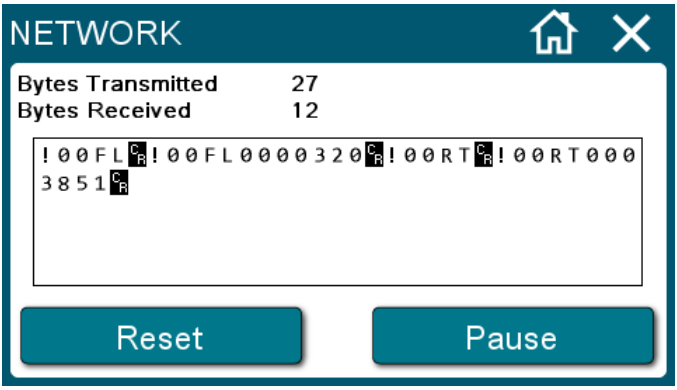
5 Diagnostic Data

The network diagnostic data is accessed by operating:

MENU → Diagnostics → Communications

and then selecting the Network option.

The Network screen provides the facility to monitor the data received and transmitted by the OJ1436, as shown below.



The counters at the top of the screen represent the total number of data bytes transmitted and received.

The data window displays a continuous stream of all transmitted and received data bytes as ASCII characters (control characters are shown as inverted blocks). If configured for Modbus TCP communication the data bytes are shown in hexadecimal number format. Invalid characters are displayed as blank inverted blocks.

Once the data window is full the oldest data will scroll off the top as new data is displayed at the bottom.

The Pause/Resume button allows the displayed data update to be stopped temporarily.

The Reset button will reset the counters and clear the data window.

6 Specification

Ethernet Network

Interface : 10/100Base-T with RJ45 connector.
Protocol : Modbus TCP (port 502) or SABus (port 4001).

Environment

Operating : -20 to +50°C, 20 to 80% RH. Non-condensing.
Storage : -40 to + 80°C.