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4040 COMMUNICATION MODULE

BIN communication in a 4x40 system

Applies for:

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1) CONTENTS

2) INTRODUCTION

2.1 Introduction

This document describes the use of a 4040 communication module from Eilersen Electric, when it is equipped with the program listed on the front page, and installed in a 4x40 system unit along with a MCE4015 loadcell interface module.

The 4x40 system unit is connected to X loadcells (1-4). With the program specified on the front page, the 4040 communication module is capable of transferring weight data from the connected loadcells on an RS485 channel using a binary protocol.

By use of DIP switches it is possible to select the resolution (0,1 gram or 1 gram) by which the weight is represented.

By use of DIP switches it is possible to configure the averaging period to 10, 50, 100 or 200 ms.

By use of DIP switches it is possible to include one of 15 different FIR filters, that will be used to filter the loadcell signal(s).

The 4040 communication module will be connected to an external device using a 9 pole Sub-D connecter in the front panel of the system unit. The external device will typically be a PC, that is connected through a RS485 to USB converter.

3) DATA EXCHANGE

3.1 BIN Mode (Binary Mode)

The 4x40 system will communicate with the following specifications:

Specification:	RS485 (2-wire)
Baudrate:	115200 bps
Data bits:	8
Parity:	None
Stop bits:	1
Protocol:	Master-Slave BIN protocol as described below

3.1.1 Polled/Continuous operation

The 4x40 system unit can be set to either Polled or Continuous operation. This is done using Sw1.4 as described later.

In Polled operation the 4040 module operates as described in the next chapter; i.e. it only transmits its weight response telegram when it receives a weight request telegram from its RS485 master.

In Continuous operation the 4040 module automatically transmits its weight response telegram upon completion of every averaging period; i.e. the 4040 module does not need to receive a weight request telegram from its RS485 master.

Note: If the 4040 module is placed in Continuous operation the RS485 master should not perform any transmissions in order to avoid conflicts on the RS485 bus.

3.1.2 BIN Protocol Format

The 4x40 system unit communicates with the external equipment using a master-slave binary protocol where the 4x40 system unit acts as a slave.

The 4x40 system unit is capable of receiving a weight request telegram with the following format:

W

The weight request telegram contains:

W is a 'W' character (ASCII 57h).

When the 4x40 system unit receives a weight request telegram, a weight response telegram is transmitted from the 4x40 system unit as an acknowledge. The weight response telegram has the following format depending on the number of loadcells connected:

1 loadcell connected:

<STX> <SS$_1$> <WWWW$_1$> <BCC> <ETX>

2 loadcells connected:

<STX> <SS$_1$> <WWWW$_1$> <SS$_2$> <WWWW$_2$> <BCC> <ETX>

3 loadcells connected:

<STX> <SS$_1$> <WWWW$_1$> <SS$_2$> <WWWW$_2$> <SS$_3$> <WWWW$_3$> <BCC> <ETX>

4 loadcells connected:

<STX> <SS$_1$> <WWWW$_1$> <SS$_2$> <WWWW$_2$> <SS$_3$> <WWWW$_3$> <SS$_4$> <WWWW$_4$> <BCC> <ETX>

The weight response telegrams contains:

<STX>	STX character (ASCII 02h).
SS$_x$	Status value for loadcell(x). The value is a 2 byte (one word – 16 bit unsigned integer) binary number with MSB first indicating the status code of loadcell(x).
WWWW$_x$	Weight value for loadcell(x). The value is a 4 byte (one double word – 32 bit signed integer) binary number with MSB first indicating the current weight signal in the selected resolution for loadcell(x). The value is the result of the latest completed averaging.
<BCC>	Checksum.
<ETX>	ETX character (ASCII 03h).

The checksum is calculated by logical XOR of all preceding characters in the telegram including the STX character; i.e. the BCC itself and the ETX character are not included.

3.1.3 Loadcell status codes

The following loadcell status codes are possible. If more than one error condition is present the status codes are OR'ed together.

CODE (Hex)	CAUSE
0001	*Reserved for future use*
0002	*Reserved for future use*
0004	*Reserved for future use*
0008	*Reserved for future use*
0010	*Reserved for future use*
0020	*Reserved for future use*
0040	**No answer from loadcell** Bad connection between loadcell and 4040C?
0080	*Reserved for future use*
0100	*Reserved for future use*
0200	*Reserved for future use*
0400	*Reserved for future use*
0800	**No loadcell answer** Bad connection between loadcell and 4040C?
1000	*Reserved for future use*
2000	*Reserved for future use*
4000	*Reserved for future use*
8000	*Reserved for future use*

3.2 Filtering

By use of DIP-switches it is possible to include one of 15 different FIR filters, that will be used to filter the loadcell signals. Thus it is possible, to send the unfiltered loadcell signals achieved over each averaging/sample period (Tavg) through one of the following FIR filters, before the results are transmitted on the RS485 channel:

Sw 1.1	Sw 1.2	Sw 1.3	Sw 1.4	No	Taps				Frequency [Hz]				Damping [dB]			
					Tavg 10	Tavg 50	Tavg 100	Tavg 200	Tavg 10	Tavg 50	Tavg 100	Tavg 200	Tavg 10	Tavg 50	Tavg 100	Tavg 200
OFF	OFF	OFF	OFF	0	-	-	-	-	-	-	-	-	-	-	-	-
ON	OFF	OFF	OFF	1	7	7	7	7	24	4.8	2.4	1.2	-60	-60	-60	-60
OFF	ON	OFF	OFF	2	9	9	9	9	20	4.0	2.0	1.0	-60	-60	-60	-60
ON	ON	OFF	OFF	3	9	9	9	9	24	4.8	2.4	1.2	-80	-80	-80	-80
OFF	OFF	ON	OFF	4	12	12	12	12	16	3.2	1.6	0.8	-60	-60	-60	-60
ON	OFF	ON	OFF	5	12	12	12	12	20	4.0	2.0	1.0	-80	-80	-80	-80
OFF	ON	ON	OFF	6	15	15	15	15	16	3.2	1.6	0.8	-80	-80	-80	-80
ON	ON	ON	OFF	7	17	17	17	17	12	2.4	1.2	0.6	-60	-60	-60	-60
OFF	OFF	OFF	ON	8	21	21	21	21	12	2.4	1.2	0.6	-80	-80	-80	-80
ON	OFF	OFF	ON	9	25	25	25	25	8	1.6	0.8	0.4	-60	-60	-60	-60
OFF	ON	OFF	ON	10	32	32	32	32	8	1.6	0.8	0.4	-80	-80	-80	-80
ON	ON	OFF	ON	11	32	50	50	50	8	0.8	0.4	0.2	-80	-60	-60	-60
OFF	OFF	ON	ON	12	32	50	64	64	8	0.8	0.4	0.2	-80	-60	-80	-80
ON	OFF	ON	ON	13	32	50	67	67	8	0.8	0.3	0.15	-80	-60	-60	-60
OFF	ON	ON	ON	14	32	50	67	85	8	0.8	0.3	0.15	-80	-60	-60	-80
ON	ON	ON	ON	15	32	50	67	100	8	0.8	0.3	0.10	-80	-60	-60	-60

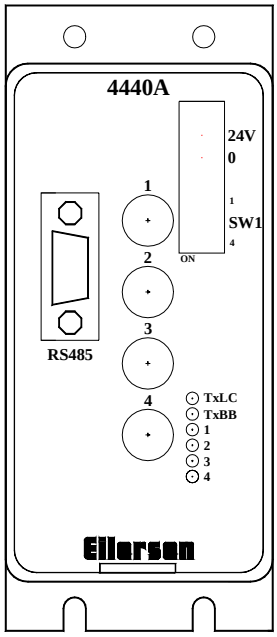
NOTE: - With all four switches OFF, no filtering is performed.

- Tavg is indicated in ms.

4) HARDWARE DESCRIPTION

4.1 4X40 overview

The following figure is an overview of a 4x40 system unit with 4 loadcell connections (i.e. a 4440 system unit):



4.2 4X40 front panel description

This chapter describes the connections, DIP-switch settings and lamp indications that are available on the front panel of the 4x40 system unit.

4.2.1 Connection of power

The 4x40 system unit is powered by applying +24VDC on the green two pole connector (J3) as specified on the front panel of the 4x40 system unit. This powers the entire 4x40 system unit including the loadcells.

NOTE: If the loadcells are to be placed inside an EX area, then the 4x40 system unit itself **MUST** be placed outside the EX area, and the 4x40 system unit **MUST** be supplied as follows:

1) The 2 pole connector (J3), located to the right above the 4 pole DIP-switch block, **MUST** be powered by a 4051A power supply (+24VDC ATEX approved) from Eilersen Electric.

4.2.2 Connection of loadcells

The loadcells must be connected to the available BNC connectors in the front panel of the 4x40 system unit. The loadcells are connected starting with the connector marked 1 and continuing onwards in rising order. Thus if three loadcells are to be connected, they should be connected to the BNC connectors marked 1, 2 and 3.

4.2.3 SW1 settings

The front panel of the 4x40 system unit is equipped with a 4 pole DIP switch block named SW1. Please note that unless stated otherwise, these switches are **ONLY** read during power-on. These switches are mounted on the 4040 communication module, and their functionality is as follows:

SWITCH	FUNCTION
Sw1.1-Sw1.4	**Filtering** Used to select the desired filter as described in an earlier chapter. Note that these switches are read during operation.

4.2.4 Light Emitting Diodes (LEDs)

The front panel of the 4x40 system unit is equipped with a number of status lamps (light emitting diodes). The lamps that are mounted on the 4040 communication module have the following functionality:

LED	FUNCTION
TxLC (Yellow)	**4040 communication with loadcells** Lit when communicating with the connected loadcells.
TxBB (Right – Green)	**4040 communication (external)** Lit when communicating externally.
1 (Red)	**Status for loadcell 1** Lit if the connection to loadcell #1 is broken.
2 (Red)	**Status for loadcell 2** Lit if the connection to loadcell #2 is broken.
3 (Red)	**Status for loadcell 3** Lit if the connection to loadcell #3 is broken.
4 (Red)	**Status for loadcell 4** Lit if the connection to loadcell #4 is broken.

4.2.5 Connection of external device using 9 pole subD connector

The 4040 communication module is connected to an external device through the 9 pole SubD connector (female) in the front panel of the 4x40system unit. This connector has the following connections:

SubD connector, pin no.	Name	Connection
1	B (-)	RS485-B (-)
2	A (+)	RS485-A (+)
3	GND	Gnd
4 (internal wired to pin 9)	-	-
5	I/O	Possible I/O line
6	B (-)	-
7	A (+)	-
8	GND	-
9 (internal wired to pin 4)	-	-

Please notice that in some external systems (especially German) the use (polarity) of A and B is switched. The use of + and – markings are always the same

5) APPENDIX

5.1 4040 communication module

This chapter describes possible connections, DIP-switch settings, jumper settings and LED status lamps that are available internally on the 4040 communication module. These will normally be set from Eilersen Electric and should only be changed in special situations.

5.1.1 SW2 settings

The 4040 communication module is internally equipped with a 8 pole DIP switch block named SW2. Please note that these switches are **ONLY** read during power-on. This DIP switch block has the following function:

Sw2.1	Sw2.2	Sw2.3	Number of loadcells
OFF	OFF	OFF	1
ON	OFF	OFF	1
OFF	ON	OFF	2
ON	ON	OFF	3
OFF	OFF	ON	4
ON	OFF	ON	4
OFF	ON	ON	4
ON	ON	ON	4

Sw2.4	Sw2.5	Averaging period (Tavg)
OFF	OFF	10 ms
ON	OFF	50 ms
OFF	ON	100 ms
ON	ON	200 ms

Sw2.6	Resolution
OFF	1 gram (i.e. 1 equals 1 gram)
ON	0,1 gram (i.e. 1 equals 0,1 gram)

SWITCH	FUNCTION
Sw2.7	*Reserved for future use*

SWITCH	FUNCTION
Sw2.8	**Polled/Continuous operation** OFF: Polled operation (see protocol description) ON: Continuous operation (see protocol description)

5.1.2 Jumper settings

The 4040 communication module is internally equipped with 4 jumpers named P2, P3, P4 and P5. In this system these jumpers must be set as follows:

JUMPER	POSITION
P2	OFF (Loadcell connected to 4040 **NOT** accessible using SEL1)
P3	OFF (Loadcell connected to 4040 **NOT** accessible using SEL6)
P4	OFF (Loadcell connected to 4040 **NOT** accessible using SEL1)
P5	OFF (Loadcell connected to 4040 **NOT** accessible using SEL6)

5.1.3 Light Emitting Diodes (LEDs)

The 4040 communication module is internally equipped with a number of status lamps (light emitting diodes). The lamps have the following functionality:

LED	FUNCTION
D11 (Red)	*Reserved for future use*
D12 (Red)	*Reserved for future use*
D13 (Red)	*Reserved for future use*
D14 (Red)	*Reserved for future use*

5.1.4 JTAG connector

The 4040 communication module is internally equipped with a JTAG connector. The connector (J4) is used exclusively by Eilersen Electric A/S for download of new software.