# **Scoreboard** Digital Readout Remote Display

# **User's Guide**

# 4"/102 mm digit height Auto Set-up N6+1/1-N-BL





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# 0 – IMPORTANT NOTES

This Manual describes the installation and use of the standard version of the Scoreboard. Any changes to the design and/or failure to follow the advice herein will affect the system performance. Any conformities and approvals are based on standard models correctly installed and grounded.

# DISCLAIMER

This is a third party product successfully used to interface many different instruments. Norsk Display AS will however not give any guarantee for operation on any specific equipment, as we do not control the specifications nor parameter set-up of the connected equipment. The listed instruments have been known to operate correctly for some installations. To verify correct operation, a workbench test should be performed prior to field installation every time.

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DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING, OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Norsk Display AS reserves the right to make refinements or changes without notice

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## **1 - INTRODUCTION**

The 100mm Scoreboard series offers a highly legible readout for weight scales, process indication and any other numeric value generated by an electronic instrument. The automatic designator legend and internal lighting makes it an exceptional add-on for a scale.

**NOTE!** Automatic Mode is made for continuous data streams (e.g. a new message faster than once per 5 seconds). If your equipment only spuriously outputs data, you may have to use the Scoreboard in Manual Mode. Automatic Mode will speed up installation while Manual Mode is available for a more precise tailoring of Scoreboard behaviour and will handle non-continuous data streams.

#### Included in the Box

A standard shipment includes the following items:

- Scoreboard with integral universal power supply
- Mounting bracket with 2 ea M6x20 thumb screws
- Plastic bag containing a ferrite bead and 2 spare M4x10 screws for the back cover.
- User's Guide (this leaflet)

Options are:

- Junction box (ND#1028)
- IR Remote Control (ND#6077)
- Designator label (for non-standard marking)

## **Specifications**

Enclosure Environmental Protection Front Weight Cable Glands Connection Data Connection Power Power input Operating/(Storing) temperature 1,5 mm stainless steel *IP-65 (NEMA 4X)* 4 mm glass or Polycarbonate net 5,5 kg 3xPG11 max  $\emptyset$ 10mm cable diameter Max  $\emptyset$ 10 mm cable for data: AWG25-AWG20 (0,14-0,5 mm<sup>2</sup>) Max  $\emptyset$ 10 mm cable for power: : AWG24-AWG14 (0,2-1,5 mm<sup>2</sup>) Universal input 100VAC to 240VAC 50/60Hz max 12W -35°C ~ +45°C / (-40°C ~ +70°C) -31°F ~ +113°F / (-40°F ~ +158°F)

Serial Interface Card

Communication speed Databits Parity Standard electrical interfaces 300 to 38,400 baud 7 or 8 None, even or odd 20 mA current loop, passive input and output fully isolated RS-232 input fully isolated RS-422 input non-isolated RS-485 input or output non-isolated

#### Dimension

Dimensions shown in metric millimeters



## **Standards Compliance**

**NOTE** All approvals and certificates are based on correct mounting, grounding and connections. Any deviation may result in unexpected performance of the system

The following European compliance standards apply for the Scoreboard:

Standards	Result
EN 50081-1:1992	Pass
EN 50082-2:1994	Pass
Canadian and US approvals:	
UL-508	Listed
UL50	Listed
Environmental Type 4X	
UL Listed for Safety	E-232349

# 2 - INSTALLATION AND SERVICING

# **WARNING!** This equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and with the potential hazards involved. Failure to observe these precautions can result in bodily injury and/or property damage.

#### WARNING! Main disconnect shall be provided by installer.

The Scoreboard is designed for unprotected outdoor use. Nevertheless you should try and locate it to avoid dirt, excessive water and other harmful materials falling on or around the enclosure. Dust and other residue on the front will affect readability.

#### Preparation

If this is your first time installing a Scoreboard, we recommend connecting the equipment on a workbench before installing it in the field. Read this manual carefully before installing the Scoreboard and make sure to follow the list of operations:

- Check that the instrument to be interfaced has the correct signalling.
- Check for auto-detectable message format (Appendix A).
- Check the power supply for correct rating of voltage and current.
- If used with equipment not supporting the automatic designator display, a fixed designator label could be placed on the trailing right hand side. Make sure the temperature is above 10°C and that the surface is clean when applying the label. Any good quality label could be used.

#### **Mechanical Considerations**

Mechanical mounting requires Torx screwdriver (Tx-20) and a fixed wrench for the cable glands plus any additional devices to fix the mounting bracket to the wall, ceiling, shelf or pole.

The Scoreboard is built to withstand severe environment conditions. To ensure years of trouble free operation, however, avoid mounting to oscillating constructions like large machines and take into account the force of any wind gust that could occur. In hostile environments, metal parts will corrode if not treated with wax or other suitable surface treatment.

## **Power Supply**

The Scoreboard has a universal input power supply built-in. Make sure you terminate the power lines and safety ground correctly according to the labels. Safety ground is directly connected to the enclosure through the power supply. Do not touch any part of the power supply card as there may be residual high voltages even when power has been removed. See Appendix F for technical information.

#### Connection

Power and data cables are terminated according to the labels inside the compartment on the back side of the Scoreboard. The normal procedure for connecting the cables is described in the following points. The Scoreboard behaviour depends on proper grounding of both safety and signal ground. See Appendix F for more details on the Display Controller.

#### WARNING! Make sure power is switched off during installation.

- 1. Relax the cable glands carefully to make any cable loose fit.
- 2. Use the Torx Tx-20 to remove the M4x10 (4 off). Take care to protect the neoprene gasket fitted to the lid.
- 3. The data cable should be routed through the upper cable gland, making sure the shield is terminated correctly. Look at Figure 2.1 and the internal sticker for correct stripping of the data cable. Only the active signal lines needs to be terminated on the Controller Card, typically two to four conductors. The ferrite bead is vital for EMC and must be mounted with all conductors going one loop through the bead. Cable shield must be connected to earth to ensure effective shielding. For routing signal to an adjacent display, use the middle gland. Do NOT tighten the glands until finished.

- 4. The power cable is routed through the lower cable gland. Each conductor is dismantled 7 mm. Connect all 3 power connections at 0.5-0.6 Nm, paying close attention to safety ground.
- 5. Any alterations to the Controller Card Switch Array should be performed before applying power to the system. See Figure 2.3 for more information.
- 6. Remount the lid by attaching the screws (4 off). Tighten firmly (1-2 Nm) to ensure correct sealing.
- 7. The cable glands are carefully tightened to prevent water ingress.
- 8. Double check glands and the four screws to hold the lid water tight.







Figure 2.2 Cable Terminations

WARNING! Correct grounding is vital for both safety and Scoreboard behaviour. Installations without correct grounding of power will pose life-threatening hazard. EMC and over-voltage protection circuits rely on a short conducting lead to ground and a ferrite to suppress incoming high-frequency noise. You will have to select the electrical interface to be used for each installation. The standard Controller has the following connections:



Fig. 2.3 Overview of Input Connections



#### **Protocol Selection**

By default, the display will automatically detect communication speed (baud rate) and message format. This will allow most users to "plug and play". There are methods for permanently storing the setup, and there are ways to manually search for the correct message format. See <u>Appendix B</u> for details.

Note that at high baudrates and high message frequency, some protocols could cause flicker and/or error messages. Reducing the communication speed should improve stability when such problems occur.

An optional IR Remote Control is available to manually set operational parameters. See <u>Appendix C</u> for details regarding this feature.

## **Dip-switch Setting**



Figure 2.3 Factory Default Dip-Switch Settings

Auto-switch set to ON (default) will let the Scoreboard determine communication speed and message format automatically at each power cycling and/or reset.

By switching AUTO from ON to OFF while power is on will save the current set-up, thus force the Scoreboard to use the current baud rate and protocol selection.

Auto-switch set to OFF means that the predefined baudrate, parity and message format will be employed.

The dip-switch ADR0 to ADR3 determines the Scoreboard Address ranging from 0 (ADR0:3 set to OFF) to 15 (ADR0:3 set to ON). Address 0 (factory default) means that the Scoreboard has no specific address. Setting the address will affect the Automatic Protocol Mode (dip-switch marked AUTO) as only protocols defined as *Addressed Protocols* will be considered.

The **pushbutton marked TEST** will allow you to enter a visual communication test mode when activated during power-up. During normal Scoreboard operation, it serves as a *Step-Through-Protocols* switch. See Appendix B and Appendix D for further details.

## Fault Finding

When the display refuses to operate correctly, there are a number of diagnostic tasks to perform. You may find our <u>Appendix D</u> a valuable source for hints and tricks.

# 3 – SCOREBOARD BEHAVIOUR

This chapter describes the power-up sequence for the Scoreboard in a way that will enable you to determine some of the basic operating modes. For field service and as a guide for the Installer, this chapter should be carefully read to allow a broader understanding of Scoreboard operation.

#### **Power-up sequence**

888888	When power is supplied to the Scoreboard, all segments on the display surface will be activated for a few seconds and then deactivated for a short period of time. During this sequence, most segment failures can be manually detected.	
08. 06A	Software version number is displayed as e.g. "08.06A" and this number must be communicated to your supplier in the event of a failure along with the Scoreboard serial number.	
A: 00	The Scoreboard address is displayed as "A:00". If address is not 00, only specific addressed protocols/message formats are recognised in the automatic protocol mode. Select an address by the internal array switch 'Adr0' through 'Adr3'.	
P: Auto	By default, the Scoreboard is in the automatic mode defined by an internal dipswitch 'Auto'. The display will then briefly report " $P:Auto$ " to indicate that it will try to find a suitable protocol setting. In manual mode, the forced protocol setting is displayed as e.g. " $P:21$ " or whatever protocol number predefined. See <u>Appendix A</u> for a list of supported message formats, instruments and protocol numbers.	
CA	When auto-baud-rate is enabled, the Scoreboard should display "CA" while trying to determine the communication speed. It will do so until a number of bits have been detected, which could be a barely noticeable moment. After setting the communication speed, the parity scheme is empirically determined. If no data is found, it will stay in this mode until data is received.	
C: 9600	Indication of the selected baud-rate will be presented as e.g. "C:9600" if set to 9600 bits/s. You may force the baud-rate to stick to your preference in manual mode by using the IR Remote Control.	
PF PA	When automatic protocol detection is selected, the Scoreboard will display "PF" as it is fetching the data before entering the protocol analysis indicated by "PA". These messages should only appear for a split second while the Scoreboard decides the correct protocol scheme to use. If no valid protocol is found it will loop through the initial sequence repeatedly.	
	When initialisation is done, display is blanked with all decimal points activated. This indicates that the Scoreboard awaits incoming data.	
FE	Communication lines are continuously controlled to check correct operation. If automatic baudrate detection is active, the parity bit and framing errors will be supervised. When a considerable percentage of characters received fail these tests, the Framing Error "FE" message will be displayed and a new analysis performed.	

In normal operation, communication check is performed continuously to detect bitrate and parity errors. When baudrate is set to Auto the Scoreboard will adjust to a change. It may however be necessary to recycle power when changing the communication speed and/or parity scheme.

To permanently store the detected parameters, the switch array position marked 'Auto' should be set to off (Manual Mode) while correct operation is verified. Check correct installation by recycling power to the Scoreboard after switching to Manual Mode.

## Factory Default Set-up

Most users will be able to use the Scoreboard directly out-of-the-box due to the default **Automatic Mode** defined by the 'Auto' switch on the Controller Card. Note however that correct operation requires the Scoreboard to receive data continuously, making the COM LED blink. Polarity of the data cable is equally important. Scoreboard Address is set to 0 by the ADR0 through ADR3 switches set to OFF on the Controller Card. Setting any of these to ON will inhibit all non-addressed protocols.

#### Time-out

If no sensible activity is logged within approximately 4 minutes, the Scoreboard will reset itself. This is done to avoid possible lock-ups and failures in the connected equipment. This is entitled 'Long TimeOut' and is not programmable. Some customer defined protocols (e.g. P:20) have this timeout disabled.

In addition, there is a 'Short TimeOut' used to blank the display after 6-9 seconds if no new, valid data has been received. This 'Short TimeOut' is programmable through the IR Remote Control for most protocols.

## APPENDIX A – SUPPORTED PROTOCOLS AND INSTRUMENTS

The Scoreboard has been designed to interface various instruments, PCs, PLS/PLU and other equipment with a serial data interface. The list below contains some instruments and protocols/message formats known to be working in customer applications. Equipment not listed is likely to be supported through the standard protocol or by the programmable P:00 protocol (See Appendix E for details).

New items are added each month and Norsk Display AS has a very generous policy of adapting new protocols for free, provided it is made a part of the standard product.

Note that at high baudrates and high message frequency, some protocols could cause flicker and/or error messages.

Contact your dealer or Norsk Display AS directly for updated information.

Protocols marked with an double asterisk (\*\*) requires the Scoreboard Address Array Switch to be set.

Manufacturer	Auto or	Protocol	Software	Manufacturer	Auto or	Protocol	Software
& Model type	Manual	number	version	& Model type	Manual	number	version
$\rightarrow A \& D$ INSTRUMENTS				→Mettler-Toledo			
AD-4326/27	М	P25		Toledo Continuous	Α	P21	
→ALGE TIMING				8624/MultiCont2	Α	P22	**
→ <i>AMBER</i>				8617/MultiCont1	Α	P23	**
WI-3, WI-6, WI-10	М	P44		(ID series	A/M	P24)	
->ANALOGIC				SICS	Α	P28	08.16
ITG 3030 Nova DP	Α	P39	08.14B	Simple ASCII format	A/M	P20	
→Avery-Berkel				Winbridge	M	P27	
L05 M				→Molen Weight			
WG-4	Α	P32		Simple format	M	P47	
WG-4 Inverted	М	P33		→NORSK DISPLAY			
Standard string #3	Α	P34		Standard	Α	P20	
L115/117/215/217	Α	P20		Addressed	Α	P20	**
L130	Α	P34		Demo	M	P54P57	
L210	М	P30		Counter	М	P60	
Loadstar XL18	Α	P20		$\rightarrow$ Philips (see GLOBAL)			
$\rightarrow$ Berkel – see Avery				$\rightarrow PIVOTEX$			
$\rightarrow$ CARDINAL				Standard Consolidated	l A	P41	
748 Continuous	Α	P45		→Precia Molen			
→Consolidated Contro	LS			Type 1 9 byte	Α	P47	
Standard	Α	P41		M5	М	Р	
→DORAN				M7	М	Р	
→EILON ENGINEERING				$\rightarrow$ RAUTE PRECISION			
Standard	М	P10		WB-900	М	P10	
$\rightarrow$ Electroscale				$\rightarrow$ Rice Lake Weighing Sy	STEM		
→ <i>ELPELSA</i>				Standard	Α	P41	
$\rightarrow$ FAGERBERG				$\rightarrow$ SALTER			
Standard		P50		→SARTORIUS			
→ <i>FAIRBANKS</i>				SBI 16 & 22 bytes	Α	P59	08.17
$\rightarrow$ Flex-Weigh				$\rightarrow$ SCHENCK			
$\rightarrow$ FLINTAB				→S-E-G			
47-04 standard	A/M	P40		StandardCounter	М	P60	
47-10 standard	A/M	P40		System T3-360	М	P37	08.14
$\rightarrow$ GARVENS				$\rightarrow$ SOEHNLE			
STD Format 2	М	P20		Waage 2710 long	М	Р	
$\rightarrow$ GASSNER				Waage 2710 short	М	Р	
DMA 02 Junior	Α	P42		→Systek, Germany			
$\rightarrow$ GLOBAL/PHILIPS				→Thurman Scale			
PR 1577 mode	М	P26		465 Indicator	Α	P41	
PR 1720 mode	М	P26		→ <i>TRAYVOU</i>			
PR 1628	М	P26		T6000 Indicator	Α	P71	
$\rightarrow$ GSE SCALE SYSTEMS				TY20 Indicator	M	Р	
Model 350, 550	М	P51		TY50 Indicator	М	Р	
→HAENNI				$\rightarrow$ True Time			
Standard	М	P53/P07		$\rightarrow$ UNI Systemer			
$\rightarrow$ Hardy				Standard	M	P00	
$\rightarrow$ LASER MIKE				$\rightarrow$ Weigh-Tronix			
Model 940	М	P58/P07		WI-130	M	Р	
→Leon Engineering				→Welwaarts			
LDS 5204-06 continuo	ous A	P70		$\rightarrow$ WENGLOR			
→MANTRA ELECTRONICS				YT/XT_XVT distance	М	Р	
Task 120	Μ	P52		AW01 distance process	sor M	Р	
→MAREL				*			
M-2000	М	P5C/5D/51	3				
→Masstron	see Mett	ler-Toledo					

\*\* Denotes an addressed protocol, requiring the address of the Scoreboard to be set to non-zero.

As Norsk Display AS does not control the behaviour of these instruments, no guarantee could be given for correct operation in your specific system.

## Protocol Description for Norsk Display Standard (P:20)

A standard protocol is defined to allow the user to quickly interface the Scoreboard to any programmable equipment. The support is basically limited to numeric values as the Scoreboard Display Controller will disregard text.

<**STX**>*data*<**CR**> will display *data* right-adjusted. A minus (hyphen) sign and decimal points will be displayed if present in the *data* string.

To enable addressing of the displays, the Address Dipswitch must be set to an address other than 0, and the following telegram will be interpreted by the Scoreboard only when the address field is 00 (broadcast) or matches the dipswitch-programmed address '01' to '0F'.

Note that non-addressed Scoreboards (Address dipswitches set to 0) will display <u>all</u> messages disregarding the content of any address field.

#### <STX><SOH>AA<STX>data<CR>

Note that the Address field **AA** could range from '00' to 'FF', but the Scoreboard is limited to address '01' through '0F'.

<STX> = ASCII 02hex <SOH> = ASCII 01hex <CR> = ASCII 0Dhex AA field = ASCII representation of address '00' means ASCII 30hex twice, 'FF' is ASCII 46hex twice. Data field = ASCII characters 0..9 plus sign and decimal points (punctuation mark and comma are treated equal).

Consult factory for more information on the message format.

## APPENDIX B – MANUAL SEARCH FOR DIRECTLY SUPPORTED PROTOCOLS

#### NOTE! THESE FUNCTIONS ARE NOT YET FULLY IMPLEMENTED. THE FUNCTIONAL DESCRIPTION IS INCLUDED ONLY AS A GUIDE, AND MAY CHANGE IN THE ACTUAL IMPLEMENTATION.

This option is introduced from the version 08.14 of the software as an alternative route for in-field service. You may also consider the use of an IR Remote Control for a more flexible set-up procedure.

Some protocols supported are not always found by the Scoreboard Auto Detect. To be able to find a correct protocol setting, the Scoreboard is supplied with a combined Test/Step push button on the Controller Card. Under normal operation, this button will step you through every protocol available. To access this function there are some important issues to consider:

- 1. The Scoreboard must be properly connected to power and a data line.
- 2. Make sure the data line is actively sending continuous data strings (COM LED must continuously blink)
- 3. Baud rate must be set to correct value
- 4. The Scoreboard should reside in Manual Mode (DIPswitch marked AUTO is off).

For each push-and-release of the TEST button, the protocol pointer will increase by one and the display will try and comprehend the messages received through the serial line.

Several protocol numbers will normally yield some sort of reading on the display and you need to make sure that the selected protocol actually matches your instrument. Test various events like overload etc. to understand how the Scoreboard reacts.

NOTE that the TEST button also enables communication test when operated at power-up. For more details see Appendix D.

# APPENDIX C – USE OF IR REMOTE CONTROL

To be able to control the behaviour of the Scoreboard in the field, the optional IR Remote Control Unit (ND part no. 6077) may be used. This chapter describes the procedure for successful programming and an overview of parameters that could be altered.

Communication parameters and Scoreboard behaviour could be set by the optional IR Remote Control. All parameters are stored in an on-board EEPROM. The alterable parameters are listed in the table below.

 $\rightarrow$  This particular Scoreboard requires you to loosen or remove the cover on the back of the display before gaining access to the IR link. For safety reasons this must be performed in controlled environment on a lab bench. The effective range of operation for the IR control is at least 8 inches.

 $\rightarrow$ To enable the programming mode, you will have to ensure that the Scoreboard is disconnected from the data line. Most features require Manual Mode (Dipswitch marked AUTO set to OFF) to be active.

 $\rightarrow$ To enter the menu system, press the IR-controls «OPEN» key several times, until the display responds with CodE0. By pressing the programmed 4-digit code (usually 0000), you gain access to the menu. Use arrow keys to traverse and the «YES» key to select. The «NO» key will bring you back to the previous menu item or end the set-up procedure.

Menu Items		Description		
Level0	Level1			
TEST		Enter a sequence of fetch and display of raw data.		
LINE	BAUD	Setting line parameters such as baud rate.		
	DATA	Set the number of data bits. Note that only 8,N or 7,E or 7,O are valid		
	PARITY	Set the parity used by scrolling through the valid selections.		
PROTOCOL		Set the protocol number to use by using arrows.		
SYSTEM	ADDRESS	Set special address. NOTE: Dipswitch address has preference.		
	DP SET	Set fixed decimal point (not in use).		
	DIGITS	Set number of digits on display.		
	SUP 0	Set suppression of leading 0's on/off.		
	SUP B	Set suppression of leading blanks on/off.		
	TIMEOUT	Set short time-out on/off (6 seconds).		
	ECHO	Set communication echo function on/off.		
	STARTC	Set start-of-message byte ASCII value.		
	STOPC	Set end-of-message byte ASCII value.		
	TSUPRES	Set text suppression on/off.		
	IGNORE	Not available.		
	NET	Indicate net value on/off.		
PULSE	RESET	Set the pulse counter reset value by keying in the number.		
	PER COUNT	Set the counting rate per pulse by keying in the number.		
	UP/DOWN	Select up/down counting.		

 $\rightarrow$  When pressing «YES» to make a selection, the currently active value will be displayed.

 $\rightarrow$  Use the arrow keys to roll in the other possible values or type the required parameter number. Press the «YES» key to accept the new choice.

 $\rightarrow$  There is no 'Cancel' key, so please program with care. All new parameters take effect immediately after normal operation is resumed.

 $\rightarrow$  To end the Programming Mode, press the «NO» key repeatedly, until End and Err.11 is displayed. The system will automatically restart. Notes on IR Remote Control Operation Pressing the OPEN key while holding down the SHIFT key will force the program to "END" and automatically restart.

→ When using the IR remote tool, take care that other nearby Scoreboards are protected from the infrared signal, by either shielding the units or removing power from them. The infrared receiver located on the control board inside the Scoreboard may be sensitive to certain frequencies emitted from artificial light sources. If the display is operated with the control board exposed to light sources, the following symptoms may occur: intermittent error code and intermittent restart.

NOTE: Some protocol selections will ignore some of the programmed and stored parameters due to a predetermined behaviour.

# APPENDIX D – FAULT FINDING AND TEST

The Scoreboard has been designed for installation and use in the field and there are a number of functions built into the product to help servicing personnel. This chapter identifies and briefly explains the use of the normal tools available.

First, check the Chapter 2, "Scoreboard Behaviour" to familiar yourself with the normal behaviour of the display.

### **Fault Locator**

In this table, we list some of the more common responses reported with a non-operating Scoreboard. Please read carefully and check out your installation before contacting your supplier.

	Checkpoint	Action if checkpoint fails
1	LED lamps are provided on the Controller Board to indicate the status of both power and the communication line. The PWR LED should emit stable light as the direct current power is applied.	<ul> <li>→Check all connections. Each line must be properly de-isolated and well connected to its terminal block.</li> <li>→Check power supply voltage with and without the Scoreboard attached. The voltage must be direct current (DC) between 8Vdc (no backlight) and 25 VDC.</li> </ul>
2	The Scoreboard should respond with the sequence described in Chapter 2, "Scoreboard Behaviour".	→Check power connection again, and make sure the power source is stable. A battery charger is basically NOT suited for supplying the Scoreboard.
3	The Scoreboard is stuck with the message "CA", meaning that the Scoreboard awaits data to determine communication speed.	<ul> <li>→Check activity on the COM LED on the Controller Card. If the COM LED is 'off ', this indicates that the Scoreboard receives no data.</li> <li>→Check that you use the correct interface.</li> <li>→Check data line and host instrument for correct settings.</li> </ul>
4	The Scoreboard is stuck with the message "PF", meaning that the Scoreboard awaits data to determine the protocol/message format.	<ul> <li>→Check activity on the COM LED on the Controller Card. If the COM LED is 'off ', this indicates that the Scoreboard receives no data.</li> <li>→ Check that you use the correct interface.</li> <li>→Check data line and host instrument for correct settings.</li> <li>If everything seems fine with LED and baud rate, the host protocol may be unknown to the Scoreboard. See pt. 11 for further information.</li> </ul>
5	The Scoreboard is stuck with the message "PA", meaning that the Scoreboard is lost in analysing the protocol/message format.	$\rightarrow$ Try to reset the Scoreboard by cycling the power.
6	The Scoreboard reports blank while all decimal points are activated. The Scoreboard awaits data.	$\rightarrow$ Check the COM LED blinking status. If in manual mode, check for correct polarity of the signal.
7	An "F" appears with regular intervals on the Scoreboard, indicating that a number of communication frame errors occurs.	<ul> <li>→Check the baud rate of the host instrument and the baud rate reported by the Scoreboard.</li> <li>→Check the polarity of the input data signal.</li> </ul>
8	The Scoreboard intermittently resets itself.	If no valid data is received for this particular Scoreboard, it will reset in approximately 4 minutes (Long Timeout period). With valid data received at least every 4 minutes, the display should not reset. If the reset happens more often, the Scoreboard Controller may be faulty.
9	The Scoreboard blanks after 8 seconds.	Most host instruments are continuously transmitting data for the Scoreboard, and to avoid old readings to stay on too long, a Short Timeout is normally enabled. You may turn off the Short Timeout for most protocols, using the IR Remote Control

0 I cannot find the correct protocol to use. The Controller Board has a TEST push button located close to the onboard switch array. By pressing this switch during a power recycling, the Scoreboard will enter a Communication Test. As a number of characters are received, it will display the buffer as "number-data" and you may single-step through the buffer of received characters. This will allow you to see the data presented "as is", giving valuable feedback on the received message format and to check that the message contains			
readable information. This mode could be initiated using the IR Remote Control as well.	10	I cannot find the correct protocol to use.	The Controller Board has a TEST push button located close to the onboard switch array. By pressing this switch during a power recycling, the Scoreboard will enter a Communication Test. As a number of characters are received, it will display the buffer as "number-data" and you may single- step through the buffer of received characters. This will allow you to see the data presented "as is", giving valuable feedback on the received message format and to check that the message contains readable information. This mode could be initiated using the IR Remote Control as well.

#### **Checking Received Data**

For the more advanced user and for improved telephone support, information on the received characters could be displayed as a valuable source to determine operation parameters and message format used by the connected instrument.

Most field problems relate to power supply and communication lines. Without any test equipment, you may visually inspect the status of the Scoreboard to help locating the problem.

On the Scoreboard Controller board inside the Scoreboard, two Light Emitting Diodes (LEDs) will indicate activity. When power supply is verified to be fully operational, the most probable source of your problems is the data cable, connection and message format. To be able to investigate further, you need to be sure that data is continuously sent from the instrument/PC connected.

1. The COM LED on the Scoreboard Controller card MUST be blinking. If not, recheck connections. A: Try to switch polarity.

B: If current loop is used, make sure it is active transmitting – or connect a 20mA source to the data line.

2. You could activate the Communication Test by pressing the TEST pushbutton located on the Scoreboard Controller during recycling of power. This will result in a message FetCH while the Scoreboard gets the data, and then display of the received characters: OO-2O indicating the position (00) and the actual hexadecimal data (20). You need to be able to understand the hex-representation of data or you need to communicate these data to service personnel. By pressing the TEST button, you will be able to see each byte received. The Scoreboard will reset after 4 minutes without TEST button activity.

-OR---

- 3. Use the IR Remote Control to access the 'TEST' selection on the IR menu. By pressing "YES" here, you will enter the Communication Test as described above. The only difference is that it will automatically step through the data for 4 minutes. This will enable you to access this feature without opening the Scoreboard. NOTE: make sure baudrate is set properly before accessing the TEST selection through the IR menu.
- 4. Use the data to evaluate the baud rate and protocol. Contact experienced service personnel for help.

#### **Service Parts**

The Scoreboard Controller is a replaceable unit, and you may also check the availability of updated program EPROM for this controller. Mechanical parts are available on request. The optional IR Remote Control allows customisation of the operational features.

Scoreboard Controller Scoreboard Controller EPROM Universal Power 24V/10W IR Remote Control

ND 5052 ND EPROM/5052 ND 5064 ND 6077 Complete controller with updated EPROM #5/6 Most recent software version. NB! # of digits

#### **Service Information**

After trying to resolve the problem based on the information in this manual and its appendixes, further help could be obtained from your local dealer or directly from Norsk Display AS help-desk or by sending e-mail to: tech@norsk-display.com

## **APPENDIX E – PC PROGRAMMING INTERFACE**

To allow some degree of field programming of the Scoreboard, there are a number of built-in tools you could use to prepare a new instrument to be interfaced. A special protocol number (P:00) is designed to be a flexible interpreter for normal serial text formats. By using the P:00 protocol, you should be able to capture the values transmitted by almost any host instrument.

Using the available free software for Windows<sup>TM</sup> 95/98 from Norsk Display AS, the procedure for tailoring the Scoreboard behaviour is as listed below. Note that you will have to physically access the Controller PCB to permanently store the selection.

- 1. Make sure the controller is in AUTO-mode (factory default).
- 2. Hook the Scoreboard up to a PC and power it up.
- 3. Start the PC-program "NDConfig" or any suitable terminal program:
  - a) Select correct serial port, Scoreboard and instrument type on the PC screen.
  - b) If needed, press the "Read Display"-button and you should have a response from the Scoreboard.
  - c) 'Prog' is displayed on the Scoreboard.
  - d) If the display is able to answer back you will be informed, else press the 'Read Display' button.
  - e) You will now edit the main parameter window.
  - f) Set every parameter to your liking, or pull down the manufacturer list for predefined values.
  - g) Activate 'Prog' button in NDConfig and follow the instructions.
  - h) Check that all parameters are accepted.
- 4. Set the Scoreboard in 'MANUAL' mode (array switch marked "Auto" in OFF position). This will save the settings and force the Scoreboard to using the programmed features.

The Scoreboard behaviour for serial set-up is briefly described to allow parameter changes by using a terminal or to enable OEM customers to produce their own control program.

Programming mode is invoked by sending a continuous '<Esc>P' sequence after power-up. The Scoreboard will respond by displaying 'Prog' and transmitting the string '<lf>OK' using the CL output. This serial data response may be discarded, but will provide a valuable feedback for automated, sequenced programming.

Every command is issued with an allowed response time for feedback; '<lf>OK ' when command is judged valid and '<lf>\*ERR ' for invalid commands. As an additional service, the Scoreboard will display 'Error' if the last processed command contained illegal characters or sequences.

Only capital letters are allowed in commands, while string parameters are processed as-is. Note that every key pressed on a terminal is sent to the Scoreboard, and editing (backspace etc) is not supported.

All commands are terminated by a CR (Carriage Return ASCII 13dec).

Command	Syntax	Description	Valid parameters
			[Default]
Status Request	S	Status request will dump all programmable settings to the serial output.	No parameters.
Communication Speed	C= <number></number>	Sets the communication baudrate.	00(=Auto),300 to 38,400 [00=Auto]
Communication Databits	D= <number></number>	Set number of data bits	7 or 8 [7]
Communication Parity	P= <character></character>	Set parity scheme to be used	N(one), E(ven), O(dd) [E]
Manual Protocol Select	MP= <hexnumber></hexnumber>	Allows you to set the protocol interpreter. Note that only MP=00 will override the switch array Auto- mode setting, while all other protocol numbers will be active only in Manual Mode (Switch array 'Auto' in OFF position).	00 through FF [20] Note the ASCII hex representation! MP=20 represents STX-data-CR message format.
Scoreboard Address	A= <number></number>	Sets the Scoreboard address for some special protocols. Switch array settings override this software setting. Only used for special protocols.	'00' through '99' Address is programmed and reported in decimals.

#### **GLOBAL INFLUENCE**

TimeOut Period	TO= <number></number>	Number of seconds before display is blanked and protocol interpreter is re-initiated. Note that many protocols have a fixed setting of this timeout.	'0' through '99' [10] '0' disables the timeout. Currently non-zero TO yields a fixed period of approximately 8 secs.
Request String	RS= <string></string>	Request String defines the string or single character to send back to the host instrument e.g. to initiate transmission. The request string is sent 1 sec before timeout. Most protocols do not require a request string to be used.	String, max 10 characters. Use ^ prior to a printable character to denote a CTRL- character. (E.g. ^A means ASCII 00h)

#### **PROTOCOL 00 INFLUENCE ONLY**

Command	Syntax	Description	Valid parameters
Protocol Start	PS= <number></number>	Defines the start character of a valid	'0' to '99' [2=STX]
Protocol End	PE= <number></number>	Defines the end character of a valid	'0' to '99' [13=CR]
Text Ignore	TI= <number></number>	Instructs the Scoreboard to ignore the N first characters in a message	'0' to '99' [0] 0 disables the function
Text Length	TL= <number></number>	Only the value represented in the N first characters (after TI) of the message should be displayed.	'0' to '99' [0] 0 disables the function
Decimal Point	DP= <number></number>	allows you to set a 'fixed' decimal point or multiply the value with 10, 100 or 1000 (adding one, two or three nil's after the received value).	'0' to '9' [0] 0: no modification 1,2,3,4,5: decimals 6,7,8,9: x10,x100,x1000,
Sign Position	SP= <number></number>	Indicates the byte position of the sign (plus or minus). If the sign is represented as a part of the value, this feature is not used. SP=1 means first byte after Protocol Start.	'0' to '99' [0] 0 means inactive
Sign Bit	SB= <number></number>	If negative numbers are represented by a bit set to '1', then this bit position is set.	'0' to '8' [0] 0 means not in use bit 1 (lsb) to bit 8(msb): sign indicator

Typical programming cable for a PC connected via RS-232

 Std. Cable Color
 Scoreboard Signal Name
 Pin No on 9 Pin Dsub
 PC Signal Name

Pink Grey Blue Blue+Red	$V+ - \uparrow$ $V+ - \uparrow$ $V+ - \uparrow$ $V+ RxD - \downarrow$ $I$ $RxD - \downarrow$ $I$	<ul> <li>Connects to +824VDC on external power/battery</li> <li>5 and to 0VDC on external power/battery</li> <li>3 TxD</li> <li>5 GND</li> </ul>
Red	so	Connects to V+ (pink conductor)
Green	+0	2 RxD
Yellow	-0	

## **APPENDIX F – POWER AND CONTROLLER DESCRIPTION**

The standard Scoreboard is equipped with two printed circuit boards (PCB), namely the Display Controller Board and the Universal Power Supply Board. These are field replaceable boards.

#### WARNING! DIS INS FUS

#### DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING, OR REPLACING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

The **Display Controller (ND # 5052)** is a field replaceable part controlling the Scoreboard behaviour. A complete assembly includes an EPROM made specifically for the number of digits on the display. To order correct parts, please include exact information from the Scoreboard labels on the enclosure.



Figure F-1 Simplified Scoreboard Interface Circuitry

The simplified circuit diagram shows some detail applicable when odd communication lines need to be connected. Note in particular the link from RxD+ to I-, normally only used to limit current flow in daisy-chained current loops based on the 24V power supply.

Fiber-link (<40kb) is a non-mounted option. Although not field tested, it should be operable by installing the missing Agilent HFBR-2523. The use of fiber-link should be considered in areas of increased risk for induced voltages.

#### WARNING! Any modifications done to any of the boards will affect the warranty.

The Universal Power Supply (ND# 5064) is a field replaceable board converting normal household line voltages (100-240 VAC) to the required low voltage 24VDC for Scoreboard electronics. During operation, some components may reach temperatures of  $+60^{\circ}$ C and above.

When the temperature of sensor NTC1 rises above +58°C, the output voltage will drop from the rated 24VDC to approximately 14VDC to disable the backlight and reduce internal heat production. This feature enables the Scoreboard to operate at higher temperatures without excessive ageing. When temperature drops, voltage will increase to regain normal operation automatically.

A primary safety fuse is soldered on the board (F1), rated Max T500mA/250V.

#### WARNING! The internal fuse is only to be replaced by authorized personnel.

The Universal Power Supply may be completely disconnected and the Scoreboard powered from an external 24VDC power source. This could be favourable to avoid costly installation of mains power in the field.