U127 series has a number of variants. U1270 is the most common model. U1272/3 have two serial ports. U1272 has two transducer inputs. U1274 is battery operated. The similar U1275/6 are not described here.

The calibration is arranged in two parts. Analog calibration means coarse adjustment by switches of gain, offset, filter, baudrate etc. Digital calibration is a software procedure with a calibration sequence, where fine calibration is made and a great number of functions can be chosen. These are stored in an EEPROM.

CALIBRATION SWITCH CSw.

The switch CSw is situated behind the rear panel. When CSw is moved on, the value from the internal Analog to Digital converter is displayed (AD mode). The range is between ±60,000. When CSw is on, the calibration sequence may be checked and changed.

ANALOG CALIBRATION.

The rear panel and the shield, covering the input amplifier, must be removed.

In order to leave range for zero tracking, the AD–value for zero must be at least +512 units. Full scale can be maximum +58112 units which means, there are 2400 units left for zero tracking and 3 increments overrange. Negative values can not be used. Note that the internal resolution is higher due to mean value calculation.

The display shows:

AD-converter value.	LED indication.	Full scale or zero.
More than 58112	All six LEDs on	Not allowed
512 to 58112	No LED on	Allowed values
Less than 512	All six LEDs on	Not allowed
Less than 0	All six LEDs and minus sign on	Not allowed

Full scale sensitivity.

S2(5):	S3:3	S3:2	S3:1	on
- - - 4 5 6	0.118	0.138	0.158	mV/V
- - - 4 5 -	0.191	0.223	0.255	mV/V
- - - 4 - 6	0.210	0.245	0.280	mV/V
- - - - 5 6	0.213	0.248	0.283	mV/V
- - 3 4 5 -	0.309	0.361	0.413	mV/V
- - - - 5 -	0.347	0.405	0.463	mV/V
- - - 4 - -	0.362	0.422	0.482	mV/V
- - - - - 6	0.415	0.484	0.553	mV/V
- - 3 4 - -	0.501	0.584	0.667	mV/V
- - 3 - 5 -	0.549	0.640	0.731	mV/V
- - - - - -	0.740	0.863	0.986	mV/V
- 2 - 4 - -	0.809	0.944	1.079	mV/V
- - 3 - - -	0.945	1.102	1.259	mV/V
- 2 - - - -	1.307	1.525	1.743	mV/V
1 - - - - -	2.122	2.476	2.830	mV/V

Offset.

S1(4):	on	
- - - - - -	0.000	mV/V
1 - - - - 6	0.054	mV/V
1 - - - - -	0,091	mV/V
- 2 - - - 6	0.143	mV/V
- 2 - - - -	0.237	mV/V
- - 3 - - 6	0.378	mV/V
- - 3 - - -	0.582	mV/V
- - - 4 - -	1.025	mV/V

It is possible to add further sensitivity dependent offset with S1(5) on.

S2(5):4 must be off, but the sensitivity is according to on.

S2(5):2 on	0.786	mV/V
S2(5):3 on	1.135	mV/V

Component number for elder U1274 versions in parenthesis ().

Analog filter.

Switch S3:	4,5	4	5	6	-	on
Time constant	39	58	81	110	249	ms

As option there is a steep 6th order switched low pass filter U1288, which is very effective, when the signal is unstable due to mechanical oscillation in the load, load cell or base. The rise time to a stable measurement decreases markedly, and 0.5 sec (6 measurements) is not unusual with a standard, undamped, small load cell.

The cutoff frequency ($f = 1/t2\pi$) are set according to the table. W16 and R5 are placed on the digital board of U1270/2/3. At delivery f = 6 c/s, R5 is 20k and R11 is not inserted.

Recommended values for R5 are seen above. High values influence on the cutoff frequency, and low values give switching frequency interference.

Optional 6th order low pass filter.

f c/s	t ms	J12	S3 on			W16(17) c/s	R11(41) kohm	R5 kohm
24.0	6.6	1:1(p1-6)	4	5	-	2404	-	6 - 25
12.0	13.3	1:2(p2-5)	-	5	-	2404	-	12 - 50
6.0	26.5	1:4(p3-4)	-	-	6	2404	-	25 - 100
3.0	53.1	1:1(p1-6)	-	-	-	300	80 ± 1%	50 - 200
1.5	106.1	1:2(p2-5)	-	-	-	300	160 ± 1%	100 - 400
0.8	212.2	1:4(p3-4)	-	-	-	300	320 ± 1%	200 - 800

The Baud rate is set with the switch on the digital board.

At delivery 1200 baud is set. Do not use higher baud rates then necessary. To work properly at high speed and high capacitive loads, the serial outputs must be loaded with 3 to 5mA.

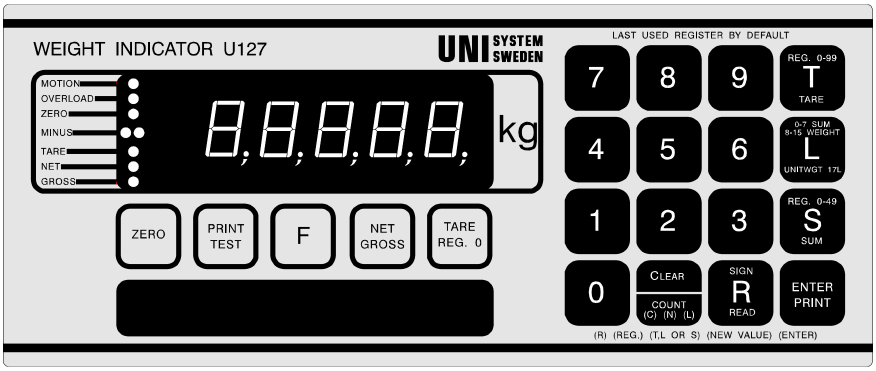
E.g.: At 5V, 1k < Rload < 1.7k. At 12V, 2.4k < Rload < 4k.

If normal RS232 output is wanted, serial transmitter U13252 can be used.

Baud rate.

U1270/2/3		U1274		
S1:1 on	4800 baud	S7:1 on	4800 baud	Serial output 1
S1:3 on	2400 baud	S7:2 on	2400 baud	–"–
S1:5 on	1200 baud	S7:3 on	1200 baud	–"–
S1:7 on	300 baud	S7:4 on	300 baud	–"–
S1:2 on	4800 baud	–	–	Serial output 2
S1:4 on	2400 baud	–	–	–"–
S1:6 on	1200 baud	–	–	–"–
S1:8 on	300 baud	–	–	–"–

DIGITAL CALIBRATION.



In the following {} represents a push on the indicated button.
Cs means calibration step (from 0 to 44) in the calibration sequence.

{ZERO}	AD converter value is displayed (AD–mode).
{L}	In AD mode, the whole calibration sequence is printed. Space is printed as F. ASCII (printer) output must have been chosen in Cs6 or 13.
{T}	Steps forward one position in the calibration sequence. In AD mode, {x} {y} {T} jumps to Csxy.
{S}	Steps back one position in the calibration sequence.
{C}	The value is inverted when setting mean value motion and zero track limits (Cs24 to 26). 1/NN is displayed as -NN.
{NET/GROSS}	When pushed after {T}, Cs39 to 44, substep 3, the max mean value of the present AD–converter value is shown. Accept by {T} or {S}. ({ENTER} before 1990). Switches between the two transducers in AD–mode (after {ZERO}).
{PRINT/TEST}	When pushed after {T}, Cs39 to 44, substep 3, a AD-converter value is calculated from the two preceding calibration steps. This method is very useful, when no full scale calibration weight is available. Accept by {T} or {S} ({ENTER} before 1990). In AD–mode (after {ZERO}) the calibration values are stored in the EEPROM. When ----- is displayed, CSw must be moved off, and then the instrument starts to work in normal weighing mode.
{TARE}	When pushed after {T}, Cs39 to 44, substep 3, a AD-value may manually be entered. Accept by {T} or {S} ({ENTER} before 1990).
{ENTER}	Must be used after {NET/GROSS}, {PRINT/TEST} and {TARE} to enter the new AD–value in programs before 1990. Print command.

{ZERO}&{PRINT/TEST} simultaneously at power on sets preset values or 0 in the calibration sequence when calibration switch CSw is on.
When any normally blanked digit in the calibration sequence is on, the memory must be cleared.

TWO TRANSDUCER CALIBRATION.

There are two complete calibration sequences, one for each transducer. When the EEPROM is new, calibrate the first transducer, store, switch CSw off and then on again, switch transducers by {N/G} and calibrate the second one. Else the instrument may lock up. When transducer 2 is selected, the far right decimal point is on.
If the decimal point has different position, transducer 2 shall be the bigger one.
The output signal for full scale shall not differ to much.

CALIBRATION SEQUENCE.

The display shows XX NN, where XX is Cs(Calibration step) 00 to 38 and NN is chosen function number.
In Cs0 to 19, 0 ≤ NN ≤ 15. In Cs20 to 38, 0 ≤ NN ≤ 99.
=number cannot be combined with any other =number at the same Cs.
+number can be combined with any other +number and one =number.
Add all +numbers and the =number, to get the NN to enter in the Cs.

Display		Functions, are described in B01040 or else noted.
00	+1	With battery backup (U1270/2/3/4). (Preset to 1).
	+2	{F} {n} 249≤n≤252 works (Only for test).
	+4	{ZERO}, no mean value is made (Only for test). {ZERO}&{N/G}, switch between AD value and weight (Only for test).
	+8	Calibration may be temporary changed in weighing mode by {F} {9} {7}.
01	=0	Single value outside mean value band has no influence on mean value, i.e. a more stable display. Entering 6 digit and {ENTER} stores the number in 24L and prints the number and the weight.
	+1	All values are used. This gives faster response.
	+2	6 digit and {ENTER} stores the number in 24L, prints number but not weight.
	+4	Only {ZERO}, {PRINT/TEST}, {N/G} and {TARE} works.
02	=0	Tare, net and gross indication.
	=1	Net and limit indication according to Cs3.
	=2	Net and range indication according to Cs5:+2 and +10.
	+4	Synchronous output 1 for U1266, U1278 and U1378. Described in B01290.
	+8	Synchronous output 2 for U1285. Described in B01290.
03	=0	Outputs on J1 are 8L to 15L (Compared with weight & change each 3.33ms). Limit indicators on the display (Cs2:1)refer to reg. 8L and 9L. Setpoints 8L to 15L are compared without mean value (fast).
	=1	Outputs on J1 are 0L to 7L (Compared with sum registers 0 to 7). Limit indicators on the display (Cs2:1) refer to reg. 0L and 1L.
	=2	Outputs on J1 are 0L to 3L (Sum) and 8L to 11L (Weight). Limit indicators on the display (Cs2:1) refer to reg. 8L and 9L.
	=3	Outputs on J1 are 0L to 3L (Sum) and 8L to 11L (Weight). Limit indicators on the display (Cs2:1) refer to reg. 0L and 1L.
	+4	Peak value indication. Described in B01040.

03	+8	Setpoints 8L to 15L are compared with display (mean value).
04	=0	Multiple range change (Cs5:+2, +10) down is made only at zero indication.
	+1	Unload to zero range before new tare.
	+2	Unload to zero range before new print.
	+4	Unload to zero range before new sum.
	+8	Multiple range change (Cs5:+2, +10) is always made.
05	=0	1 transducer. Zero range +3.1, -0.8%.
	+1	2 transducers. Capacity of transducer 1 ≤ 2.
	+2	Dual range. Increment (Cs16) change: 1 to 2, 5 to 10 or 10 to 20 at 50%. 2 to 5 or 20 to 50 at 40%. The percentage (%) is calculated n the net or gross (full scale) value according to Cs4:+8.
	+4	Zero range ±0.8%.
	+10	Triple range. Increment (Cs16) change: 1 to 2 at 20% and 2 to 5 at 40%. 2 to 5 at 20% and 5 to 10 at 50%. 5 to 10 at 25% and 10 to 20 at 50%. 10 to 20 at 20% and 20 to 50 at 40%. The percentage (%) is calculated n the net or gross (full scale) value according to Cs4:+8.
06	=0	Output 2. Display and mode indicators.
	=1	Display (peak for Cs3:+4) in ASCII output. For printer. (Preset)
	=2	Programmable continuous serial output of display. Described in B00920.
	=3	Display in ASCII. Print number reg. 59S. For printer.
	=4	Weight BCD value in ASCII every measurement cycle. No mean value.
	=5	Display in ASCII Net & gross. For printer.
	=6	AD value in ASCII every measurement cycle. No mean value.
	=7	Display in ASCII Net & gross. Print number reg. 59S. For printer.
	=8	Output 1. Display, tare and mode indicators.
	=10	Output 3. Display, tare, setpoints, mode indicators, 16 bits DA–value.
	=15	No output.
		NOTE! Cs6 refers to the 15p D–sub in U1272/3. Signal designation is 1.
		If printer output is chosen at both Cs6 and 13, only 6 is used. Described in B01140.
07	=0	8 bits, odd parity, 1 stop bit.
	=1	8 bits, no parity, 1 stop bit. (Preset).
	=2	8 bits, no parity, 2 stop bits.
	=3	8 bits, even parity, 1 stop bit.
	=4	7 bits, odd parity, 1 stop bit.
	=5	7 bits, even parity, 1 stop bit.
	=6	7 bits, odd parity, 2 stop bits.
	=7	7 bits, even parity, 2 stop bits.
	+8	Serial input. Described in B01050.
08	=0	Swedish text.
	+1	Print in double width (Some printers). ASCII 14 (SO) is sent out.
	+2	Mostly no normal printer output. Used with e.g. Cs11:3 or for high speed.
	+4	English text.
	+8	Print output only if addressed according to Cs27. Described in B01050
09	=0	Display every 4 measurement cycle.
	=1	Display every measurement cycle.
	=2	Display & output (Cs6&13, 13=0, 2 or 10), every 4 measurement cycle.
	=3	Display & output (Cs6&13, 13=0, 2 or 10), every 16 measurement cycle.
10	=0	Fast zero tracking. 16 successive measurements within ±1/2 unit.
	+1	500ms delay after LF or CR for some printers with line buffer only.
	=2	Normal zero tracking. 32 successive measurements within ±1/2 unit.
	=4	Slow zero tracking. 64 successive measurements within ±1/2 unit.
11	=1	Vehicle program. Described in B00640.
	=2	Automatic adding program. Described in B00650.
	=3	Programmable serial output. (Label program.) Described in B00900.
	=4	Option. Continuous bulkweighing. Described in B00770.
	=6	Timer for printing. Described in B00970.
	=7	Axle measurement. Described in B00680.
12		Not used.
13	=0	Output 2. Display and mode indicators.
	=1	Display (peak for Cs3:+4) in ASCII output. For printer. (Preset)
	=2	Programmable continuous serial output of display. Described in B00920.
	=3	Display in ASCII. Print number reg. 59S. For printer.
	=4	Weight BCD value in ASCII every measurement cycle. No mean value.
	=5	Display in ASCII Net & gross. For printer.
	=6	AD value in ASCII every measurement cycle. No mean value.
	=7	Display in ASCII Net & gross. Print number reg. 59S. For printer.
	=8	Output 1. Display, tare and mode indicators.
	=10	Output 3. Display, tare, setpoints, mode indicators, 16 bits DA–value.
	=11	Protocol 4. Bidirectional. Cs07:+8 is not needed.
	=15	No output.
		NOTE! Cs13 refers to the 25p D–sub. Signal designation is 2.
		If non–printer output is chosen in both Cs6 and 13, only 13 is used. Described in B01140.
14	=0-15	"Linefeeds" (CR = ASCII 13 (hex 0D)) between printings. (Preset to 1).
15	=0	x x x x x No decimal point.
	=1	x x x x x .
	=2	x x x x . x
	=3	x x x . x x
	=4	x x . x x x (Preset).
	=5	x . x x x x
16	=1–5	Increment (division) 1 to 5. (Preset to 1).

16	=0	Means increment 10 (printed A). Displayed low half 8.
	=7	Means increment 20 (printed B). Displayed high half 8.
	=9	Means increment 50 (printed D). Displayed -.
17	=2-6	Number of calibration points, Cs39 to 44. (Preset to 2).
18	=0	No motion after 2 successive measurements within motion band.
	+1	First (left) digit is always blanked.
	=2	No motion after 2 successive measurements within motion band during 3 measurement.
	=4	No motion after 2 successive measurements within motion band during 4 measurement.
	=6	No motion after 2 successive measurements within motion band during 5 measurement.
	=8	No motion after 2 successive measurements within motion band during 9 measurement.
	=10	No motion after 2 successive measurements within motion band during 17 measurement.
	=12	No motion after 2 successive measurements within motion band during 33 measurement.
	=14	No motion after 2 successive measurements within motion band during 65 measurement.
19	=0	Last digit is blanked at motion. No printing at motion.
	+1	The display is not blanked at motion. (Preset to 3).
	+2	Printing when motion disappears.
	+4	Watchdog disabled.
	+8	The display is locked up to 12 measurements and then blanked at motion.
20	=0	No mean value.
	=1	Mean value on up to 2 measurements.
	=2	Mean value on up to 4 measurements.
	=3	Mean value on up to 8 measurements.
	=4	Mean value on up to 16 measurements.
	=5	Mean value on up to 32 measurements.
	=6	Mean value on up to 64 measurements. (Preset).
	=7	Mean value on 64 measurements, no mean value limit.
21		Not used.
22	=0-99	Spaces (SP = ASCII 32 (hex 20)) from left margin at printing.
23		Not used.
24	=0	No mean value.
	=1-99	Increments (Cs16). ± Mean value limit, within which mean value is calculated. {C} switches to 1/NN, which is displayed -NN. (Preset to 1).
25	=1-99	Increments (Cs16). ± Motion limit, within which motion is not indicated. {C} switches to 1/NN, which is displayed -NN. (Preset to 1).
26	=0	No zero tracking is performed.
	=1-99	Increments (Cs16). ± Zero tracking limit, within which tracking is performed. {C} switches to 1/NN, which is displayed -NN. (Preset to 1).
27	=1–99	Address number for the serial input. NN=0 means no address.
28	=0	Serial output 3 (C6:10, Cs13:10) and synchronous output 2 (Cs2:8). The binary (DA) value refers to display value.
	+1	Binary (DA) value refers to gross value.
	+2	Zero display corresponds to 20% (4mA DA value).
	+8	Printer output according to Cs6 is added to serial output 3 Cs13:10.
29		Not used.
30	+1	Mean derivative of the 4 last measurements with weight factors of 12/32, 10/32, 7/32 and 3/32. This is used to calculate the activation point of time for the setpoints 8L to 15L.
31	+1	Serial input from Denver scales for g/unit calculation, Cs7:+8.
32		Not used.
33	=0	Autotare with negative sign always works.
	+1	No autotare with negative weight in gross mode. (Preset).
	+2	Tare and release of tare every second time in zero range. Holland.
34	=0	Starting up sequence 15 seconds.
	=1	Starting up sequence 75 seconds.
	=2	Starting up sequence 150 seconds.
	=3	Starting up sequence 300 seconds.
35	+4	Setpoints 8L - 15L are compared with the gross value.
36		Not used.
37		Checksum. Decimal value of 2 hex digits. Entered at storage in EEPROM.
38	+2	Zero functions, under- & overrange disabled for non weighing applications.
	+4	Zero tracking also when the instrument is tared.

Cs39 to 44 consists each of three substeps. Do never forget to enter the number of used steps in Cs17.

39	Calibration point 1 (Zero)	Substep 1. Step number.
40	Calibration point 2	Substep 2. Wanted weight on scale.
41	Calibration point 3	Substep 3. Corresponding AD-converter value in BCD.
42	Calibration point 4	(Cs 39, substep 3 preset to 512.)
43	Calibration point 5	(Cs 40, substep 2 preset to 10000.)
44	Calibration point 6	(Cs 40, substep 3 preset to 58112.)

Calibration in order of functions.

Asynchronous serial output for printer. B01140.

00	=0	Entering 6 digit and {ENTER} stores the number in 24L and prints the number and the weight.
	+2	6 digit and {ENTER} stores the number in 24L, prints number but not weight.
04	+2	Unload to zero range before new print.
06	=1	Display in ASCII output. Peak for Cs3:+4. (Preset)
or	=3	Display in ASCII. Print number reg. 59S.
13	=5	Display in ASCII Net & gross.
	=7	Display in ASCII Net & gross. Print number reg. 59S.

	=15	No output.
		NOTE! Cs6 refers to the 15p D–sub in U1272/3/5/6. Signal designation is 1.
		NOTE! Cs13 refers to the 25p D–sub. Signal designation is 2.
07	=0	8 bits, odd parity, 1 stop bit.
	=1	8 bits, no parity, 1 stop bit. (Preset).
	=2	8 bits, no parity, 2 stop bits.
	=3	8 bits, even parity, 1 stop bit.
	=4	7 bits, odd parity, 1 stop bit.
	=5	7 bits, even parity, 1 stop bit.
	=6	7 bits, odd parity, 2 stop bits.
	=7	7 bits, even parity, 2 stop bits.
08	=0	Swedish text.
	+1	Print in double width (Some printers). ASCII 14 (SO) is sent out.
	+2	Mostly no normal printer output. Used with e.g. Cs11:3 or for high speed.
	+4	English text.
10	+1	500ms delay after LF or CR for some printers with line buffer only.
11	=3	Programmable serial output. (Label program). B00900.
	=6	Timer for printing. B00970.
14	=0-15	"Linefeeds" (CR = ASCII 13 (hex 0D)) between printings. (Preset to 1).
19	=0	No printing at motion.
	+2	Printing when motion disappears.
22	=0-99	Spaces (SP = ASCII 32 (hex 20)) from left margin at printing.
28	+8	Printer output according to Cs6 is added to serial output 3 Cs13:10.

Asynchronous serial input. B01050.

07	+8	Serial input.
08	+8	Print output only if addressed according to Cs27.
27	=1–99	Address number for the serial input. NN=0 means no address.
31	+1	Serial input from Denver scales for g/unit calculation, Cs7:+8.

Asynchronous serial outputs, continuously sent out. B01140

06	=0	Output 2. Display and mode indicators.
or	=2	Programmable continuous serial output of display. B00920.
13	=4	Weight BCD value in ASCII every measurement cycle. No mean value.
	=6	AD value in ASCII every measurement cycle. No mean value.
	=8	Output 1. Display, tare and mode indicators.
	=10	Output 3. Display, tare, setpoints, mode indicators, 16 bits DA–value.
	=11	Protocol 4. Bidirectional. Cs07:+8 is not needed.
	=15	No output.
		Cs6 refers to the 15p D–sub in U1272/3/5/6. Signal designation is 1.
		Cs13 refers to the 25p D–sub. Signal designation is 2.
07	-"-	Same as for printer output.
09	=2	Display & output (Cs6&13, 13=0, 2 or 10), every 4 measurement cycle.
	=3	Display & output (Cs6&13, 13=0, 2 or 10), every 16 measurement cycle.
28	=0	Serial output 3 (C6:10, Cs13:10). The binary (DA) value refers to display value.
	+1	Binary (DA) value refers to gross value.
	+2	Zero display corresponds to 20% (4mA DA value).
28	+8	Printer output according to Cs6 is added to serial output 3 Cs13:10.

Synchronous output.

02	+4	Synchronous output 1 for U1266, U1278 and U1378. B01290.
	+8	Synchronous output 2 for U1285. B01290.
28	=0	Synchronous output 2. The binary (DA) value refers to display value.
	+1	Binary (DA) value refers to gross value.
	+2	Zero display corresponds to 20% (4mA DA value).

Setpoints outputs.

03	=0	Outputs on J1 are 8L to 15L (Compared with weight & change each 3.33ms).
		Limit indicators on the display (Cs2:1)refer to reg. 8L and 9L.
		Setpoints 8L to 15L are compared without mean value (fast).
	=1	Outputs on J1 are 0L to 7L (Compared with sum registers 0 to 7).
		Limit indicators on the display (Cs2:1) refer to reg. 0L and 1L.
03	=2	Outputs on J1 are 0L to 3L (Sum) and 8L to 11L (Weight).
		Limit indicators on the display (Cs2:1) refer to reg. 8L and 9L.
	=3	Outputs on J1 are 0L to 3L (Sum) and 8L to 11L (Weight).
		Limit indicators on the display (Cs2:1) refer to reg. 0L and 1L.
	+8	Setpoints 8L to 15L are compared with display (mean value).
30	+1	Mean derivative of the 4 last measurements with weight factors of 12/32, 10/32, 7/32 and 3/32. This is used to calculate the activation point of time for the setpoints 8L to 15L.
35	+4	Setpoints 8L - 15L are compared with the gross value.

Motion functions.

18	=0	No motion after 2 successive measurements within motion band.
	=2	No motion after 2 successive measurements within motion band during 3 measurement.
	=4	No motion after 2 successive measurements within motion band during 4 measurement.
	=6	No motion after 2 successive measurements within motion band during 5 measurement.
	=8	No motion after 2 successive measurements within motion band during 9 measurement.
18	=10	No motion after 2 successive measurements within motion band during 17 measurement.
	=12	No motion after 2 successive measurements within motion band during 33 measurement.
	=14	No motion after 2 successive measurements within motion band during 65 measurement.

19 =0 Last digit is blanked at motion. No printing at motion.
+1 The display is not blanked at motion. (Preset to 3).
+2 Printing when motion disappears.
+8 The display is locked up to 12 measurements and then blanked at motion.
25 =1-99 Increments (Cs16). ± Motion limit, within which motion is not indicated.
{C} switches to 1/NN, which is displayed -NN. (Preset to 1).

Mean value.
01 =0 Single value outside mean value band has no influence on mean value, i.e. a more stable display.
+1 All values are used. This gives faster response.
20 =0 No mean value.
=1 Mean value on up to 2 measurements.
=2 Mean value on up to 4 measurements.
=3 Mean value on up to 8 measurements.
=4 Mean value on up to 16 measurements.
=5 Mean value on up to 32 measurements.
=6 Mean value on up to 64 measurements. (Preset).
=7 Mean value on 64 measurements, no mean value limit.
24 =0 No mean value.
=1-99 Increments (Cs16). ± Mean value limit, within which mean value is calculated.
{C} switches to 1/NN, which is displayed -NN. (Preset to 1).

Zero functions.
04 =0 Multiple range change (Cs5:+2, +10) down is made only at zero indication.
+1 Unload to zero range before new tare.
+2 Unload to zero range before new print.
+4 Unload to zero range before new sum.
+8 Multiple range change (Cs5:+2, +10) is always made.
05 =0 Zero range +3.1, -0.8%.
+4 Zero range ±0.8%.
10 =0 Fast zero tracking. 16 successive measurements within ±1/2 unit.
=2 Normal zero tracking. 32 successive measurements within ±1/2 unit.
=4 Slow zero tracking. 64 successive measurements within ±1/2 unit.
26 =0 No zero tracking is performed.
=1-99 Increments (Cs16). ± Zero tracking limit, within which tracking is performed.
{C} switches to 1/NN, which is displayed -NN. (Preset to 1).
38 +2 Zero functions, under- & overrange disabled for non weighing applications.
+4 Zero tracking also when the instrument is tared.

Display.
02 =0 Tare, net and gross indication.
=1 Net and limit indication according to Cs3.
=2 Net and range indication according to Cs5:+2 and +10.
09 =0 Display every 4 measurement cycle.
=1 Display every measurement cycle.
=2 Display & output (Cs6&13, 13=0, 2 or 10), every 4 measurement cycle.
=3 Display & output (Cs6&13, 13=0, 2 or 10), every 16 measurement cycle.
18 +1 First (left) digit is always blanked.
34 =0 Starting up sequence 15 seconds..
=1 Starting up sequence 75 seconds.
=2 Starting up sequence 150 seconds.
=3 Starting up sequence 300 seconds.

Other functions.
01 +4 Only {ZERO}, {PRINT/TEST}, {N/G} and {TARE} works.
03 +4 Peak value indication. B01040.
11 =1 Vehicle program. B00640.
=2 Automatic adding program. B00650.
=4 Option. Continuous bulkweighing. B00770.
=7 Axle measurement. B00680.
19 +4 Watchdog disabled.
33 =0 Autotare with negative sign always works.
+1 No autotare with negative weight in gross mode. (Preset).
+2 Tare and release of tare every second time in zero range. Holland.

Calibration.
00 +8 Calibration may be temporary changed in weighing mode by {F} {9} {7}.
05 =0 1 transducer.
+1 2 transducers. Capacity of transducer 1 ≤ 2.
+2 Dual range. Increment (Cs16) change: 1 to 2, 5 to 10 or 10 to 20 at 50%. 2 to 5 or 20 to 50 at 40%.
The percentage (%) is calculated n the net or gross (full scale) value according to Cs4:+8.
+10 Triple range. Increment (Cs16) change: 1 to 2 at 20% and 2 to 5 at 40%. 2 to 5 at 20% and 5 to 10 at 50%. 5 to 10 at 25% and 10 to 20 at 50%. 10 to 20 at 20% and 20 to 50 at 40%.
The percentage (%) is calculated n the net or gross (full scale) value according to Cs4:+8.
15 =0 x x x x x No decimal point.
=1 x x x x x .
=2 x x x x . x
=3 x x x . x x
=4 x x . x x x (Preset).
=5 x . x x x x

16	=1–5	Increment (division) 1 to 5. (Preset to 1).
	=0	Means increment 10 (printed A). Displayed low half 8.
	=7	Means increment 20 (printed B). Displayed high half 8.
	=9	Means increment 50 (printed D). Displayed -.
17	=2-6	Number of calibration points, Cs39 to 44. (Preset to 2).

Cs39 to 44 consists each of three substeps. Do never forget to enter the number of used steps in Cs17.

39 Calibration point 1 (Zero)	Substep 1. Step number.
40 Calibration point 2	Substep 2. Wanted weight on scale.
41 Calibration point 3	Substep 3. Corresponding AD-converter value in BCD.
42 Calibration point 4	(Cs 39, substep 3 preset to 512.)
43 Calibration point 5	(Cs 40, substep 2 preset to 10000.)
44 Calibration point 6	(Cs 40, substep 3 preset to 58112.)

COMMENTS ON THE CALIBRATION STEPS. See also B01040.

Cs0 0, 2 etc. No battery backup. All registers are set to zero at power on. The calibration zero is chosen.
+8. Calibration values up to Cs39 may be temporary changed. The values are lost at power off.
Cs1 +2. In this way more 6 digit numbers may be entered before each printing.
+4. The function of the other 17 keys are inhibited, except in calibration mode.
Cs2 +1. Net and gross indicators works as setpoint indicators according to Cs3.
Cs3 The 8 outputs on J1 are compared with the weight, sum registers 0 to 8 or 4 outputs are compared with weight and 4 with sum register 0 to 7.
+8. Normally the setpoints are compared direct with the AD–converter values, but with this choice, they are compared with the mean value.
Cs4 The unload conditions prevents double operation of the tare, print or sum functions.
+8. Multiple range change always made, not allowed according to OIML R76-1.
Cs5 Be sure to use N = 0, 2 etc for calibration with one transducer. Note that transducer 2 is indicated by far right decimal point on.
Capacity of transducer 1 must be less than 2 with respect to decimal point or full scale value. Otherwise the unit weight transformation in counting mode does not work properly.
Cs6 Serial output on the 15p D–sub in U1272 and U1273. Use Cs6:15 for other instruments. See B01140.
Cs7 Use 8 bits if possible.
Cs8 More information in B01140.
Double with is activated by ASCII 14 (SO) in the beginning of each line.
+8. Commanded printing is only sent when addressed on the serial input according to the value in Cs27.
Cs9 Determines the speed of the display and serial outputs.
Cs10 Speed of zero tracking.
Cs11 Special and optional programs.
Cs13 Serial output on the standard 25p D–sub. More information in B01140.
Cs17 Enter the number of used calibration points in Cs39 to 44.
Cs18 If a stable value is very important use 3 equal measurements, otherwise 2.
For special applications, test time up to 65 measurement can be chosen.
+1. Only 4 digits are used. The far left digit is blanked.
Cs19 The far right digit may be blanked at motion.
Commanded printing may be inhibited at motion, or the command is executed when motion disappears.
+8. The display is freezed up to one second during motion and then blanked, according to OIML R76-1.
Cs20 Normally use maximum mean value, 64 measurements.
Cs24 For normal stable conditions, use a value equal to the total number of increments divided by 3000.
Cs25 Use 0.5 to 1 times the mean value limit.
Cs26 OIML R76-1. Zero tracking ≤ 1/2 increment. For automatic zero setting Cs10:4 must be chosen.
Cs27 Normally used only when the serial interface is common for more instruments. Else N=0.
Cs33 Autotare below zero is not allowed according to OIML. Use +1.
Cs34 Eliminates incorrect values due to warm up effects up to 5 minutes according to OIML.
Cs38 Zero tracking is allowed in new OIML, when the instrument is tared.
Cs39 The first calibration point for scales i 0, and thus substep 2 is 00000. When used for level measurement with displacement body, the first calibration point is the highest level. In this and other cases when Cs39, substep 2 is not zero, all zero functions are inhibited, Cs38:+2.

MINIMUM CALIBRATION.

When using the preset values (after {ZERO}&{PRINT/TEST} at power on), at least the following have to be checked: Cs15, 16, 17 and 39 up to 44 depending on Cs17.

CHANGE OF THE TEXT.

All texts are in the beginning of the EPROM and may be changed with an EPROM programmer. All separate words or strings are separated by | (ASCII 124). The number of characters may not be exceeded. We recommend the program Norton Utility to make the change in our .ROM file.
The checksum at the end of the EPROM must be changed, or the checksum test disabled by changing address hex FFE5 from FF to 00.

MEASURING TIME.

AD conversion speed may be changed from 12.5 to 3.125 per second by:
Change clock. Cut W8 and strap W1. U1272 put in C24. U1274 put in C39. Minimum 330nF polypropylen.

PROBLEMS TO CONSIDER AT THE INSTALLATION.

BATTERY BACKUP.

With battery backup all registers, the label text data (see B00900) and the continuous programmable serial output data (see B00920) are saved, when the power is lost. The battery is of rechargeable type. At normal temperature the memory is not lost for half a year, but at higher temperature, the storage time is decreasing rapidly. In order to charge the battery, we therefore recommend to use the instrument at least every second month to be sure, that the memory is not lost. Minimum time needed for complete recharge is 24 hours.

When changing instruments, old values may be stored e.g. zero, and they prevent the instrument from displaying proper values. Reset by {F} {2} {5} {3} {ENTER}.

MAINS VOLTAGE.

The power inputs on U1270/2/3 have a filter. Under very bad conditions an external noise protection transformer may be of use, but normally interference is entered from other sources.

The protective ground must always be connected. Do not let the instrument share power with other heavy equipment, but use separate cables from the distribution box. A separate grounding of the case is recommended,

Separate battery operated instruments ought to have shielded battery cable, with the shield connected at both ends, on the instrument side at an external screw.

The instrument shall be left with power on, especially at low temperature, high humidity or outdoor.

Change to 110 V: W3 is cut off. W1 and W2 are strapped.

TRANSDUCER CONNECTION.

NOTE! The transducer signal inputs are easily damaged by over voltage and must not be touched. The transducer shall always be connected, when the instrument power is on, else the input amplifier may be destroyed.

Shielded cables must be used, to J8 preferably double shielded, with twisted, shielded pairs. The shields must always be connected at both ends. It is normally NOT done inside the transducer. The cable hoods must be of metal or metallized and connected to the shield at the cable clamp. Filter D-sub, especially J8, improves the immunity against strong radio frequency signals. Heavy electrostatic discharge may happen, when weighing big containers, trucks, plastic material or cases, especially when moving and in winter time. In this case, a separate ground cable, 2.5 to 10mm^2, must be drawn parallel with the transducer cable to a screw on the instrument case. In older instruments there is no metal plate between the connector and the panel and the shield is preferably connected to a screw in the case. A metal tape between the rear and bottom panel improves the protection.

Connections between cables must be done in a grounded metal box, only used for this purpose. The isolation must be of first class, new and clean material. The joints shall be close together, especially the + and - signal, and preferably soldered. Interference from electromagnetic fields and thermal gradients is hence avoided.

Sense and excitation shall have separate wires. They are normally connected in the load cell. When the sense wires are missing in the transducer cable, this connection must be made at the cable end.

Up to 10 load cells (4 for U1274/6) may be connected in parallel. The individual cables to each transducer shall have the same length (as short as possible), and the sense must be connected to the common point.

U1272 has two transducer inputs, but the sense is common for both. Long cables will increase the temperature drift due to the TC (Temperature Coefficient) of the copper resistance in the cables. Thus, in case of cable resistance more than 1 ohm for one load cell, temperature effects must be considered.

When there are humidity problems, the box must be filled with some compound. Clean beeswax is recommended. It has excellent electrical properties and is easy to remove with heat.

When non symmetrical temperature compensated load cells are used, the compensating resistor must be in the + branch. This means that the voltage from signal to + excitation is higher than to – excitation. If this is not the case, all load cell wire polarities must be changed.

In Ex zones, the PE (Protective Earth) wire must be used as shield connection, preferably winded round the transducer cable ,as the shield must not be connected at the transducer side according to regulations.

The measuring zero ($0V_A$ and $0V_D$) in the instrument may only be connected to the ground at one point. At delivery, this is made inside the instrument at W4 in the power supply. but may be changed. If an external connection is wanted, W4 must be cut off in order to avoid interference.

INTERFACE INPUTS AND OUTPUTS.

These are connections to semiconductor, opto isolators or relays.

Shielded cable must be used, and the shield shall be connected at both ends according to above. Very long shielded cables have a high capacitance, which slows down the signal, but the inductance (may give over voltage peaks) and the resistance normally have no influence.

Check that the specifications of the signals are not exceeded.

The output relays normally feeds external relays or solenoids by help of an external voltage. Use 5 to 24VDC, with protective diodes over all coils, also those not directly connected. Also here shielded cables, connected according to above, suppresses interference. The use of 220VAC normally causes problems.

Always check the specification of the relay, especially with respect to life.

RADIO FREQUENCY INTERFERENCE.

Extensive tests have been done on U127 series with field strength 3V/m up to 1000Mc. With proper connections and precautions, there is no influence.

TEMPERATURE INTERFERENCE.

In spite of excellent temperature compensation in instrument, high and fast temperature changes may cause temporary zero change problems, dependent on thermoelectric voltages. The temperature stability of the instrument is typically at least 10 times better than that of a load cell.

HUMIDITY PROBLEMS.

High humidity during long periods is never good for electronics. Try to get a warm place for the equipment. Never switch off the instrument, as the heating gives a higher temperature and thus lower humidity.

Very IMPORTANT is correct handling of the circuit boards in the instrument at installation. Finger prints must be avoided. Clean gloves of cloth are recommended. The finger prints contains salt, that conducts electric current at high humidity. This may result in instability (jitter) in the display. The only way to cure this, is to clean the board.

When the cable cover is damaged, the humidity is conducted into e.g. the load cell, which may be damaged.

In continuous wet and dirty environment, there is always a higher fault frequency. The optional stainless box U1171 gives an excellent protection (IP66).

CONNECTORS

J8:	Transducer connector. 9p D–sub female. J5 on U1274/6. Also J7 on U1272.
1	+signal.
2	–signal.
3	0 (Analog zero.)
4	+sense.
5	+excitation.
6	Chassis ground.
7	+5 Volt.
8	–sense.
9	–excitation.

NOTE! The transducer (load cell) must always be grounded!
The input amplifier is easily destroyed, when an electrostatic discharge occurs on an ungrounded transducer, with power on the instrument. There is a great risk, when an unmounted load cell is tested separately, as there normally is no internal ground connection. More regarding this above under installation.

For non symmetric load cells, +excitation to signal must be higher than signal to –excitation! If not, change all polarities.

J6:	15p D–sub female. U1272/3.
6	+TD1 Opto isolated output. Transmit Data. On (negative) at rest. <25V, <5mA, Von <1V.
5	–TD1 Return for pin 5.
7	DTR1 Opto isolated input. Data Terminal Ready. Negative polarity not ready. 5–9mA, 825ohm.
13	Opto isolated PRINT/TEST input, negative polarity. 5–9mA, 825ohm in series.
14	Opto isolated TARE input, negative polarity. 5–9mA, 825ohm in series.
15	Common return for pins 7, 13, 14, J1:16 and (J1:24, see below).
4	Ground.
8	0 (Digital zero).
11	+5 Volt.
1	W2 Spare.
2	W3 Spare.
3	W4 Spare.
9	W5 Spare.
10	W6 Spare.
12	W7 Spare.

J1:	25p D-sub male connected to:	Cs3:= 1	0	2,3	
8	PA Output, limit L	7	15	3	Synchronous output type 1. Cs2:+4.
9	PA Output, limit L	6	14	2	Clock for both synchronous outputs.
10	PA Output, limit L	5	13	1	
11	PA Output, limit L	4	12	0	
12	PA Output, limit L	3	11	11	Synchronous output type 2. Cs2:+8.
13	PA Output, limit L	2	10	10	
18	PA Output, limit L	1	9	9	
19	PA Output, limit L	0	8	8	
2	RD2 Opto isolated input. Receive Data. Negative at rest. 5–9mA, 825ohm in series.				
15	+RTS2 Opto isolated output. Ready To Send. On (negative) not ready. <25V, <5mA, Von <1V.				
5	+TX2 Opto isolated output. Transmit Data. On (negative) at rest. <25V, <5mA, Von <1V.				
4	CTS2 (DTR) Opto isolated input. Clear To Send. Negative not ready. 5–9mA, 825ohm in series.				
16	TARE Opto isolated input, negative polarity. 5–9mA, 825ohm in series.				
24	PRINT/TEST Opto isolated input, negative polarity. 5–9mA, 825ohm in series.				
24	U1272 only. PB4 Output for selected transducer. Low is transducer 1.				
1	Common return for pins 2, 4, (16 and 24 when J6 is not inserted).				
14	Common return for pins 5 and 15.				
22	PB Output overrange and buzzer.				
23	PB Output motion.				
7	CA1 Buffered, edge triggered switch for external transducer selection.				
6	CA2				
3	CB1				
25	CB2 Output overrange.				
17	Ground.				
21	0 (Digital zero).				
20	+5 Volt.				

Conditions for non opto isolated PIA signals. Never use voltages higher than the internal +5V or below 0.

Inputs:

PB, CA1, CB1, CB2.		I in max +–10uA.
PA, CA2.	V in = 2.4V	I in min –0.2mA.
	V in = 0.4V	I in max –2.4mA.

Outputs:

PB, CB2.	V out = 1.5V	I out min –1mA, max –10mA.
PB, PA, CA2, CB2.	I out = –0.2mA	V out min 2.4V.
	I out = 3.2mA	V out max 0.6V.