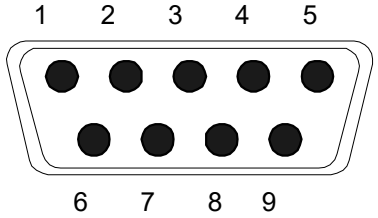
TVD, TVD-D Protocol Manual

1. RS-232 connector (9pin D type connector)



Pin2	RXD	Input	Receving data
Pin3	TXD	output	Transmission data
Pin5	GND		Signal ground

Scale computer
Pin2----------pin3
Pin3----------pin2
Pin5----------pin5

2. Specification

RS-232 output of weighing data
ASCII Code
600~9600bps selectable
8N1/7E1 selectable

3. P CONT

S	T	,	G	S	,	-/␣							k	g	,	CR	LF
H1			H2			WEIGHT							W.U				

H1=HEADER1: ST=STABLE, US=UNSTABLE
H2=HEADER2: GS=GROSS, NT=NET
W.U=WEIGHT UNIT
TERMINATOR= CR LF

4. Toledo

W = 57 <STX> = 02 <CR> = 0D ? = 3F

Register	Scale	Action
W---------->		The register requests the weight from the scale.
	<---- <STX> X1X2X3X4X5 <CR>	***If (Weight ≠ 0) && (Weight > 0) && (Weight <= Capacity + 9 divisions) && (Weight is Stable) then:*** The scale transmits the weight in 7 bytes where <STX> is the first byte, X1 is the 2nd byte and represents the MSD (Most Significant Digit) of the weight value, etc, X5 is the 6th byte and represents the LSD (Least Significant Digit) of the weight, and <CR> is the 7th and final byte. In this protocol the register decides the decimal place and units (lb or kg.) Must use leading zeros whenever necessary.
	<---- <STX> ? Y1 <CR>	***Else:*** The scale transmits a status response in 4 bytes where <STX> is the first byte, 3F is the 2nd byte, Y1 is the 3rd byte and represents the status byte, and <CR> is the 4th and final byte. ***End if***

Status Byte Definition:

Definition	Hex	ASCII Text	Binary
Motion	Y1 = 61	a	01100001
Scale at ZERO	Y1 = 70	p	01110000
Weight < 0	Y1 = 64	d	01100100
Weight > Capacity	Y1 = 62	b	01100010
Weight < 0 & Motion	Y1 = 65	e	01100101
Weight > Capacity & Motion	Y1 = 63	c	01100011

Status Byte Formation

Bit	Description	
Bit 7 (MSB)	Parity Bit.	
Bit 6	(Not used.)	**Always = 1**.
Bit 5	Net Weight Bit.	**Gross = 0**, Net = 1.
Bit 4	Zero Bit.	Zero = 1, Not Zero = 0.
Bit 3	Outside Zero Range Bit.	**Within = 0**, Outside = 1.
Bit 2	Negative Weight Bit.	Negative = 1, Non-Negative = 0.
Bit 1	Overload Bit.	Overload = 1, Non-Overload = 0.
Bit 0 (LSB)	Motion Bit.	Motion = 1, Stable = 0.

Example 1:

If weight is 21.30 lb and the scale is stable, it will transmit the following 7 bytes:

02	30	32	31	33	30	0D
<STX>	0	2	1	3	0	<CR>

Example 2:

If weight is unstable, it will transmit the following 4 bytes:

02	3F	61	0D

<STX>	?	a	<CR>

Exceptions: If Weight = 12345.6 then X1X2X3X4X5X6 = 123456

5. NCI-ECR

W = 57 <CR> = 0D <LF> = 0A L = 4C B = 42 K = 4B G = 47 S = 53 <ETX> = 03 . = 2E

Register	Scale	Action
W----------> <CR>---------->		The register requests the weight from the scale by sending a W followed by a <CR>.
	<--<LF> X1X2X3X4X5X6U1U2 <CR>	<LF> S1S2S3 <CR> <ETX> The scale always responds to a valid request. The scale transmits the weight in 16 bytes where:

<LF> is the first byte.

X1 to X6 are bytes 2 thru 7 and represent the weight value including the decimal point. Therefore, a weight of 3.02 will be 003.02 = X1 to X6, or a weight of 3.002 will be 03.002 = X1 to X6.

U1 to U2 are bytes 8 & 9 and represent the unit. For pounds U1 = 4C = “L” and U2 = 42 = “B”; for kilos U1 = 4B = “K” and U2 = 47 = “G”.

<CR> is the 10th byte.

<LF> is the 11th byte.

S1 is the 12th byte and is always S1 = 53 = “S”.

S2 to S3 are the 13th & 14th bytes. They form the status word.

<CR> is the 15th byte.

<ETX> is the 16th byte.

Status Word Definition:

Definition	Hex	ASCII String S2S3
OK (Stable)	S2 = 30, S3 = 30	“00”
Motion	S2 = 31, S3 = 30	“10”
Scale at ZERO	S2 = 32, S3 = 30	“20”
Weight < 0	S2 = 30, S3 = 31	“01”
Weight > Capacity	S2 = 30, S3 = 32	“02”
Motion & Weight < 0*	S2 = 31, S3 = 30	“11”
Motion & Weight > Capacity*	S2 = 31, S3 = 30	“12”

Note*: Whenever the Weight > Max Capacity + 9 divisions then the scale must transmit a “zero” weight value. This is 0.00 or 0.000 or whatever the “zero” weight needs to be for that scale’s capacity/resolution/unit setting.

Bit	S2 Bit Description	S3 Bit Description
7 (MSB)	Parity Bit.	Parity Bit.
6	(Not used) Always = 0.	(Not used) Always = 0.
5	(Not used) Always = 1.	(Not used) Always = 1.
4	(Not used) Always = 1.	(Not used) Always = 1.
3	(Not used) Always = 0.	(Not used) Always = 0.
2	(Not used) Always = 0.	(Not used) Always = 0.
1	Zero Bit: Zero = 1, Non-Zero = 0.	Overload Bit: Overload = 1, Non-Overload = 0.
0 (LSB)	Motion Bit: Motion = 1, Stable = 0.	Negative Weight Bit: Negative = 1, Non-Negative = 0

Example:

If weight is 21.30 lb and the scale is **Stable**, it will transmit the following 16 bytes:

0A	30	32	31	2E	33	30	4C	42	0D	0A	53	30	30	0D	03
<LF>	0	2	1	.	3	0	L	B	<CR>	<LF>	S	0	0	<CR>	<ETX>

6. NCI-General

W = 57 <CR> = 0D <LF> = 0A L = 4C B = 42 K = 4B G = 47 <ETX> = 03 . = 2E

Register	Scale	Action
W----------> <CR---------->		The register requests the weight from the scale by sending a W followed by a <CR>.
	<--<LF> X1X2X3X4X5X6U1U2 <CR>	<LF> S1S2 <CR> <ETX> The scale always responds to a valid request. The scale transmits the weight in 15 bytes where:

<LF> is the first byte.

X1 to X6 are bytes 2 thru 7 and represent the weight value including the decimal point. Therefore, a weight of 3.02 will be 003.02 = X1 to X6, or a weight of 3.002 will be 03.002 = X1 to X6.

U1 to U2 are bytes 8 & 9 and represent the unit. For pounds U1 = 4C = “L” and U2 = 42 = “B”; for kilos U1 = 4B = “K” and U2 = 47 = “G”.

<CR> is the 10th byte.

<LF> is the 11th byte.

S1 to S2 are the 12th & 13th bytes. They form the status word.

<CR> is the 14th byte.

<ETX> is the 15th byte.

Status Word Definition:

Definition	Hex	ASCII String S2S3
OK (Stable)	S2 = 30, S3 = 30	“00”
Motion	S2 = 31, S3 = 30	“10”
Scale at ZERO	S2 = 32, S3 = 30	“20”
Weight < 0	S2 = 30, S3 = 31	“01”
Weight > Capacity*	S2 = 30, S3 = 32	“02”
Motion & Weight < 0	S2 = 31, S3 = 30	“11”
Motion & Weight > Capacity*	S2 = 31, S3 = 30	“12”

Note*: Whenever the Weight > **Max Capacity + 9 divisions** then the scale must transmit a “zero” weight value. This is 0.00 or 0.000 or whatever the “zero” weight needs to be for that scale’s capacity / resolution / unit setting.

Bit	S1 Bit Description	S2 Bit Description
7 (MSB)	Parity Bit.	Parity Bit.
6	(Not used) Always = 0.	(Not used) Always = 0.
5	(Not used) Always = 1.	(Not used) Always = 1.
4	(Not used) Always = 1.	(Not used) Always = 1.
3	(Not used) Always = 0.	(Not used) Always = 0.
2	(Not used) Always = 0.	(Not used) Always = 0.
1	Zero Bit: Zero = 1, Non-Zero = 0.	Overload Bit: Overload = 1, Non-Overload = 0.
0 (LSB)	Motion Bit: Motion = 1, Stable = 0.	Negative Weight Bit: Negative = 1, Non-Negative = 0.

Example:

If weight is 11.300 kg and the scale is Stable, it will transmit the following 15 bytes:

0A	31	31	2E	33	30	30	4B	47	0D	0A	30	30	0D	03
<LF>	1	1	.	3	0	0	K	G	<CR>	<LF>	0	0	<CR>	<ETX>

7. TEC

<ENQ> = 05, <ACK> = 06, <NAK> = 15, <BEL> = 07, <DC1> = 11, <DC2> = 12, <STX> = 02, <ETX> = 03, <DEL> = 7F, <NUL> = 00

Register	Scale	Action
<ENQ>---------->		1) The register establishes communications by sending <ENQ>.

	<----------<ACK>
	<----------<BEL>
		2) If (Weight is stable) then
		The scale will transmit <ACK>.
		Else
		The scale will transmit <BEL>.
		Go back to step 1.
		End If

<DC2>---------->		3) The register requests the weight by sending <DC2>.
	<----------<STX> <----------<ID> <----------<W5> <----------<W4> <----------<W3> <----------<W2> <----------<W1> <----------<BCC> <----------<ETX>	4) Scale will transmit the following 9 bytes: Start of text. Identification byte defined bellow. MSD (Most significant digit) of weight data. 2nd MSD (Most significant digit) of weight data. 3rd MSD (Most significant digit) of weight data. 4th MSD (Most significant digit) of weight data. LSD (Least significant digit) of weight data. Block check character defined below. End of text.

<ACK>---------->		5) If (Register verified data correctly) then
		The register will transmit <ACK>.
		Go back to step 1.
		Else
		Go back to step 1.
		End If

Identifier Byte Definition

<ID>	ASCII Text	Description

7F	<DEL>	If (Weight < 0) OR (Weight > Max Capacity + 9 divisions) then <ID> = 7F
		W5 = W4 = W3 = W2 = W1 = 30; however, W1 or W5 can be <NUL> sometimes (see below.)
		Else
		Follow the <ID> codes below.
		End If

41	A	Not Used
42	B	Not Used
43	C	Not Used
44	D	Not Used
45	E	For 120 lb or 300 lb scales with 2 decimal places: Format 0.00 lb
46	F	Not Used
47	G	For 600 lb or 120 kg or 300 kg or 60 kg scales.

<BCC> Definition

The BCC character is formed by performing an XOR operation on the following 6 bytes: <ID>, W5, W4, W3, W2, and W1

<BCC> = <ID> XOR W5 XOR W4 XOR W3 XOR W2 XOR W1

See the examples below for the formation of the BCC character.

Example 1: If weight is 250.05 lb, you are using a 300 x 0.05 lb scale, the scale is **Stable**, and F16 = Even, it will transmit the following 9 bytes:

02	45	32	35	30	30	35	77	03
<STX>	<ID>	2	5	0	0	5	<BCC>	<ETX>

Example 2:

If weight is 39.55 lb, you are using a 300 x 0.01 lb scale, the scale is Stable, and F16 = Even, it will transmit the following 9 bytes:

02	45	0	33	39	35	35	4F	03
<STX>	<ID>	<NUL>	3	9	5	5	<BCC>	<ETX>

Example 3:

If weight is -5.01 lb, you are using a 300 x 0.05 lb scale, the scale is Stable, and F16 = Even, it will transmit the following 9 bytes:

02	7F	30	30	30	30	30	4F	03
<STX>	<ID>	0	0	0	0	0	<BCC>	<ETX>

8. EASY WEIGH

R = 52 <STX> = 02 <CR> = 0D R = 52 L = 4C B = 42 K = 4B G = 47 . = 2E F = 46 W = 57 Z = 5A <DC1> = 11 <DC2> = 12 <DC3> = 13 <DC4> = 14 S = 53 <EOT> = 04

Register	Scale	Action
R---------->		The register requests the Raw A/D Counts from the scale.
	<---- <STX> X1X2X3X4X5X6 <CR>	The scale transmits the Raw A/D Counts in 8 bytes where <STX> is the first byte, X1 is the 2nd byte and represents the MSD (Most Significant Digit) of the data, etc, X6 is the 7th byte and represents the LSD (Least Significant Digit) of the data, and <CR> is the 8th and final byte.

Example:

If the Raw A/D counts are 22,130 counts then it will transmit the following 8 bytes:

02	30	32	32	31	33	30	0D
<STX>	0	2	2	1	3	0	<CR>

Register	Scale	Action
<DC1>---------->		The register requests the CZP data from the scale. This is the Raw A/D counts with no load on the scale.
	<---- <STX> X1X2X3X4X5X6 <CR>	The scale transmits the CZP in 8 bytes where <STX> is the first byte, X1 is the 2nd byte and represents the MSD (Most Significant Digit) of the data, etc, X6 is the 7th byte and represents the LSD (Least Significant Digit) of the data, and <CR> is the 8th and final byte.

Example:

If the CZP is 2,542 counts then it will transmit the following 8 bytes:

02	30	30	32	35	34	32	0D
<STX>	0	0	2	5	4	2	<CR>

Register	Scale	Action
<DC2>---------->		The register requests the CSP data from the scale. This is the Calibrated Span Point of the scale and is expressed as the Raw A/D counts with the full capacity load on the scale. The CSP should not be Zero Adjusted.
	<---- <STX> X1X2X3X4X5X6 <CR>	The scale transmits the CSP in 8 bytes where <STX> is the first byte, X1 is the 2nd byte and represents the MSD (Most Significant Digit) of the data, etc, X6 is the 7th byte and represents the LSD (Least Significant Digit) of the data, and <CR> is the 8th and final byte.

Example:

If the CSP is 202,542 counts then it will transmit the following 8 bytes:

02	32	30	32	35	34	32	0D
<STX>	2	0	2	5	4	2	<CR>

9. CAS PD-2/SW-RS TYPE0 INTERFACE

→ Most P.O.S Systems, POS/ECRs and some TEC P.O.S Systems

1) PROTOCOL.

External device Scale

<ENQ>----------> initiate communication

<---------- <ACK>: acknowledge the request of weight data

<DC2>----------> request of weight data

……inquiry

<----------<STX>: start transmission

<----------<ID>: scale type identifier

<----------<W5>: weight data

<----------<W4>: weight data

<----------<W3>: weight data

<----------<W2>: weight data

<----------<W1>: weight data

<----------<BCC>: block check character

<----------<ETX>: end transmission

2) Scale type identifier

2kg→G(47H)	5lb→K(48H)
5kg→H(48H)	10lb→L(4CH)
6kg→C(43H)	15lb→F(46H)
10kg→I(49H)	20lb→M(4DH)
15kg→A(41H)	30lb→D(44H)
20kg→J(4AH)	50lb→N(4EH)
25kg→P(50H)	60lb→E(45H)
30kg→B(42H)	
60kg→O(4FH)	

3) Block Check Character

<BCC> has all data bytes except <STX> and <ETX> through exclusive OR(XOR).

Parity Bit : Even

Data Byte : STX><ID><W5><W4><W3><W2><W1><BCC><ETX>

Response time: Typ. 50ms, Max. 150ms

10. CAS PD-2/SW-RS TYPE2 INTERFACE

Discontinue RS-232C Interface → SHARP ER-AXXX, ER-A450T, New SANYO ECRs using RS-232C, TOLEDO 3213 etc

1) Protocol

POS/ECR scale

<W>---------->

<---------- response

<STX> xxxxx<CR>: weight data (lb, oz, g, kg)

Error message: <STX>?<Status byte><CR>

2) Detail description

Status byte

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
parity bit	Always 1	NA	zero	NA	minus	overload	motion

W : 57H (ASCII code)

STX : 02H (ASCII code)

CR : ODH (ASCII code)

Response time: Typ. 50ms, Max. 150ms

3) samples

Weight : 12.34 lb

POS/ECR scale

W<57H>---------->

<---------- <02H><30H><30H><31H><32H><33H><34H><0DH>: ASCII

STX 0 0 1 2 3 4 CR

Weight : 423.5 oz

POS/ECR scale

W<57H>---------->

<---------- <02H><30H><30H><34H><32H><33H><35H><0DH>: ASCII

STX 0 0 4 2 3 5 CR

11. CAS PD-2/SW-RS TYPE4 INTERFACE

→ CRS, NCR2170 and Many other ECRs, Most P.O.S Software / 9600 Baud rate, 7 Data bit, Even Parity, 1Stop bit

1) protocol

<W>---------->

<CR>---------->

**********inquiry

<----------<LF>xx.xxxlb<CR>

<----------<LF>S b1 b2<CR><ETX>

**********lb CASE

<----------<LF>xx.xxxkg<CR>

<----------<LF>S b1 b2<CR><ETX>

*response time: typ. 50ms, max 150ms

2) status byte

Bit7	Parity bit	Parity bit
Bit6		0
Bit5	1 (always 1)	1 (always 1)
Bit4	1 (always 1)	1 (always 1)
Bit3		0
Bit2		0
Bit1	1 = scale at zero 0 = not at zero	1 = over capacity 0 = not cover capacity
Bit0	1 = scale in motion 0 = stable	1 = under capacity 0 = not under capacity

Simplified status codes

B1	B2	Status definition
ASCII code	ASCII code	
0(30H)	0(30H)	OK
1(31H)	0(30H)	Motion
2(32H)	0(30H)	Scale at zero
0(30H)	1(31H)	Under capacity
0(30H)	2(32H)	Over capacity

12. CAS PD-2/SW-RS TYPE5 INTERFACE

→ NCI Genral, SAMSUNG SPS-300, ER-900, Most P.O.S Software / 9600 Baud rate, 7 Data bit, Even Parity, 1Stop bit

1) protocol

<W>---------->

<CR>---------->

**********inquiry

<----------<LF>xx.xxxLB<CR>

<----------<LF> b1 b2<CR><ETX>

**********lb CASE

<----------<LF>xx.xxxKG<CR>

<----------<LF>S b1 b2<CR><ETX>

▸Response time: Typ. 50ms, Max. 150ms

2) status byte

Bit7	Parity bit	Parity bit
Bit6		0
Bit5	1 (always 1)	1 (always 1)
Bit4	1 (always 1)	1 (always 1)
Bit3		0
Bit2		0
Bit1	1 = scale at zero 0 = not at zero	1 = over capacity 0 = not cover capacity
Bit0	1 = scale in motion 0 = stable	1 = under capacity 0 = not under capacity

Simplified status codes

B1	B2	Status definition
ASCII code	ASCII code	
0(30H)	0(30H)	OK
1(31H)	0(30H)	Motion
2(32H)	0(30H)	Scale at zero
0(30H)	1(31H)	Under capacity
0(30H)	2(32H)	Over capacity

Weigh data decimal point (type 4, 5)

kg	position	lb	position	oz	position
2kg	x.xxx	5lb	x.xxx	80oz	xx.xx
5kg	x.xxx	10lb	xx.xxx	160oz	xxx.x
10kg	xx.xxx	20lb	xx.xx	400oz	xxx.x
20kg	xx.xx	50lb	xx.xx	800oz	xxx.x
30kg	xx.xx	60lb	xx.xx	1000oz	xxxx.x

13. CAS PD-2/SW-RS TYPE6 INTERFACE

→ SAMSUNG ER-670, ER-5100, SPS-520, Most P.O.S Software / 9600 Baud rate, 8 Data bit, Non Parity, 1Stop bit

1) protocol

external device scale

<ENQ>----------> initiate communication

<---------- <ACK> acknowledge the request of weight data

<DC1>----------> DC1: for all weight data

<---------- <ACK> acknowledge the request of weight data

▸ Response time: Typ. 50ms, Max. 150ms

2) detail description

SOH	STX	SIGN	W4	W3	(2EH)	W2	W1	W0	UN1	UN0	BCC	ETX	EOT
Command DA	TA BLOCK											command	

Remark

- STA : a weighing status of the scale: scale is stable →"S", not stable → "U"
- SIGN : sign of the weight data: zero and positive weight → " " , negative weight →"-" , over load → "F"
- w5 through w0 → weight data, but all "F" when the scale is put on over load.
- un1 through un0 → unit of weight (lb, oz, g, kg)
- bcc : block check character