

# WEIGHING INDICATOR

AD-4316

INSTRUCTION MANUAL



**AND** *Mercury*

A&D MERCURY PTY. LTD.  
32 DEW ST. THEBARTON, S.A. 5031  
TEL.(08) 352 3033 FAX.(08) 352 7409

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## A. SPECIFICATIONS

### 1. ANALOG INPUT & A/D CONVERSION

1)	Input sensitivity .....	0.6 $\mu$ V/d $\rightarrow$ 36 $\mu$ V/d*
2)	Zero adjustment range .....	0.35mV $\rightarrow$ 22.5mV
3)	Loadcell excitation .....	12VDC $\pm$ 5%, 280mA (max) voltage sensing incorporated
4)	Temperature coefficient .....	(span) $\pm$ 5ppm/ $^{\circ}$ C of rdg. (zero) $\pm$ (0.3 $\mu$ V + 0.005% of initial zero offset voltage)/ $^{\circ}$ C
5)	Non-linearity .....	0.01% of f. s. or less
6)	Input noise .....	$\pm$ 0.3 $\mu$ V peak to peak
7)	Input impedance .....	10M $\Omega$ or more
8)	Overload tolerance .....	$\pm$ 70V or more
9)	A/D conversion method .....	3 phase, true integrating dual-slope type
10)	A/D resolution .....	40,000 counts
11)	A/D conversion rate .....	approx. 20 times/second (50msec/conversion)
12)	A/D preparation .....	Optically isolated

\*"d" means "minimum division" or "graduation"

### 2. DIGITAL SECTION

1)	Weight display .....	High intensity 7-segment cobalt-blue fluorescent
	Display height .....	12mm (1/2")
	Max. display .....	+500000 $\rightarrow$ -100000
	Under zero indication .....	"-" sign
2)	Annunciators .....	LED (green)
	"ZERO" .....	Center of zero (0 $\pm$ 0.25d)
	"MD" .....	Motion Detection
	"GROSS" .....	Gross mode
	"NET" .....	Net mode
	"kg" .....	kg unit
3)	Keys .....	Polyurethane sheet type.
	"ON/OFF" .....	Activates display & functions.
	"ZERO" .....	Zeros display, only effective when not-in-motion (stable).
	"TARE" .....	Acquire tare when not-in- motion, change to NET mode and display zero.
	"GROSS/NET" .....	Change mode from GROSS to NET and vice versa.
4)	Dip-switch programming (switches behind the front metal panel cover).	
	Power frequency .....	60Hz, 50Hz
	Motion detection .....	3d/0.4sec., 1d/0.4sec.
	Zero track .....	0.5d, 1.0d, 1.5d/1sec., 2sec.
	Decimal point .....	Displays to 1, 2 or 3 decimal places.
	Display update rate .....	4 times/sec., 20 times/sec.
	Min. division .....	x1, x2, x5, x10, x20, x50
	Max. scale capacity (display value) .....	2000, 2500, 3000, 4000, 5000, 6000, 10000, 15000, 20000, 25000, 30000, 40000, 50000, 60000, 80000, 99990.
	This value has no relation to decimal point position or min. display.	

- 5 Rear Panel  
 Loadcell input ..... 7-pin connector.  
 Terminal input ..... "ZERO", "TARE" & "GROSS/NET"  
 commands by external  
 switch to TTL input.  
 Slide switch ..... Mode 1/Mode 2 selection.

### 3. GENERAL

- 1) Power requirements ..... 100, 115, 220, 240V AC  
 +10%, -15%, 50/60Hz.  
 2) Net weight ..... Approx. 3kg (6.6lb)  
 3) Operating temperature ..... -10°C → +40°C (14°F → 104°F)  
 4) Maximum humidity ..... 95% (non-condensing)  
 5) Physical dimensions ..... 210 (W) x 253 (D) x 89 (H) mm  
 8.27" x 9.96" x 3.5"  
 6) Panel cut-out size ..... 199 (W) x 84.5 (H) mm (+0.5)  
 7.84" x 3.33" (+0.02"-0")  
 7) Battery back-up ..... 30 days or more without AC  
 power.

### 4. OPTIONS

*N. B. Option-01 and Option-04 may not be installed at the same time as they occupy the same space in AD-4316. Likewise it is not possible to connect simultaneously Option-02 & 03, or Option-05 & 06 (unless 05 via 06), as they require the same connectors.*

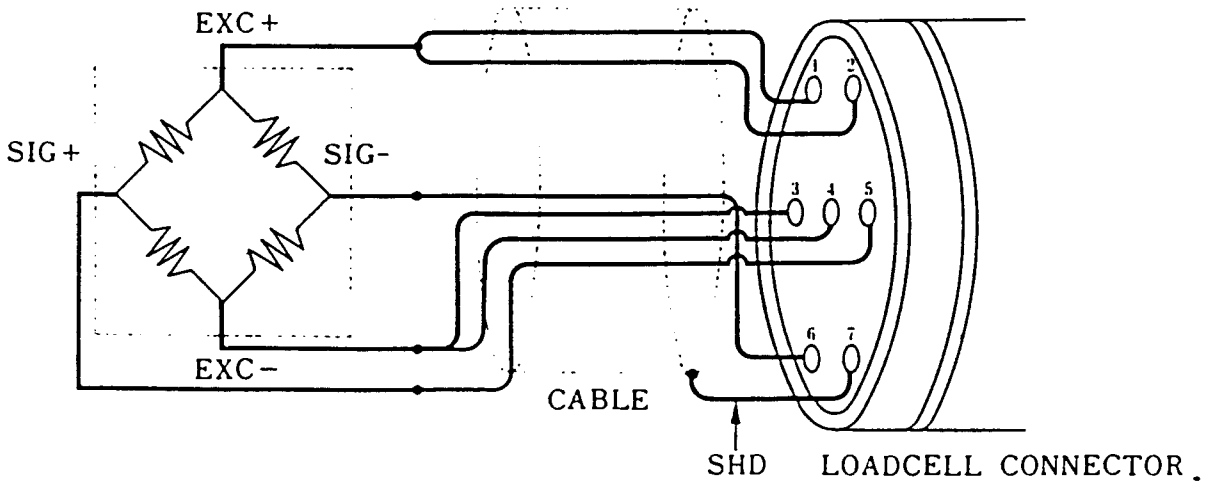
- Option-01 ..... Parallel BCD (binary-coded-decimal) output (DATA OUT)  
 Output data: weight, Net/Gross, MD, decimal point,  
 kg, data valid trigger, print trigger, overload.
- Option-02 ..... Setpoint Interface.  
 Six groups of push-button thumbwheels can be  
 directly connected to the rear connector to provide  
 control of filling and batching operations. Outputs for  
 dual cut-off relays and other relays are available  
 through rear terminals.
- Option-03 ..... Thumbwheel Tare (5 digits)  
 A group of 5 push-button thumbwheels is installed on  
 a replacement AD-4316 front metal panel cover.
- Option-04 ..... Serial Interface  
 2 types of serial interface are available with this option:-  
 1) EIA-RS-232C, with or without handshake.  
 2) 20mA current loop (passive).  
 Baud rate & format are identical to RS-232C.
- Option-05 ..... Setpoint Unit  
 Independent unit in separate metal casing. The unit can  
 be directly interfaced to AD-4316 with Option-02 via an  
 attached cable and connector. Final Weight (Target),  
 Free Fall, Preliminary Weight (cut-off point), High/Low  
 Limit & Zero Band are set by thumbwheels.
- Option-06 ..... Multi-Setpoint Unit (Compact Type)  
 Smaller version of above with some different features.  
 Several may be linked together to control, for example,  
 multiple ingredient batching operations.

## B. LOADCELL CONNECTION

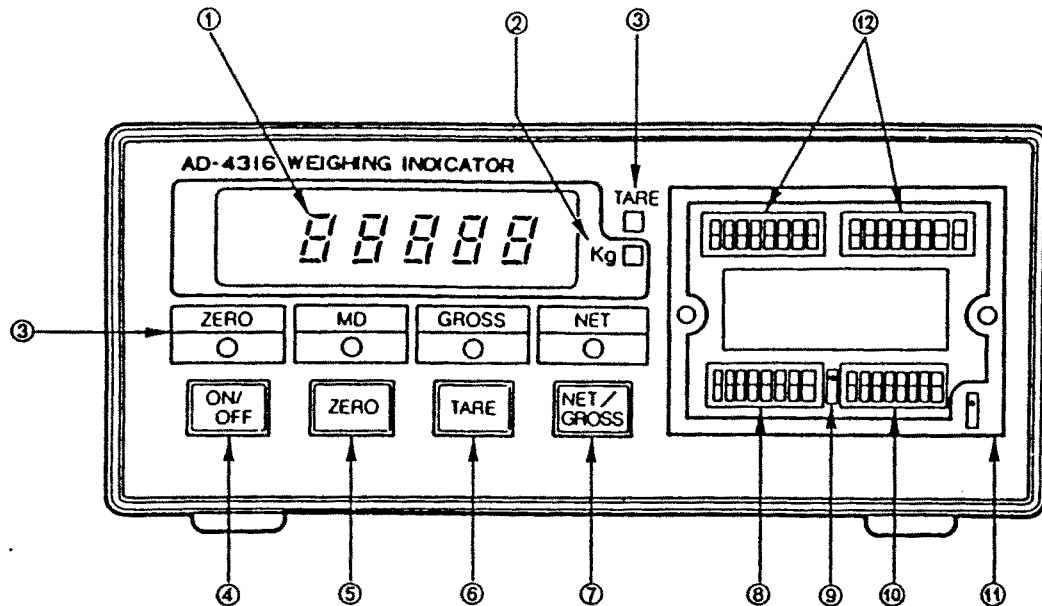
A loadcell connector (NJC-207-RF) is supplied with AD-4316; pin designation is as follows:-

Pin No.	Signal
1	EXCITATION + (EXC+)
2	SENSE + (SEN+)
3	SENSE - (SEN-)
4	EXCITATION - (EXC-)
5	SIGNAL + (SIG+)
6	SIGNAL - (SIG-)
7	SHIELD (SHD)

\* When a four (4) wire connection is required, pins 1 + 2 and pins 3 + 4 should be independently linked by jumper leads.



## C. PANEL DESCRIPTION



- 1 DISPLAY PANEL  
Weight data or checking routine may be displayed.
- 2 UNIT ANNUNCIATOR  
Indicates weight unit (kg).
- 3 CONDITION ANNUNCIATORS  

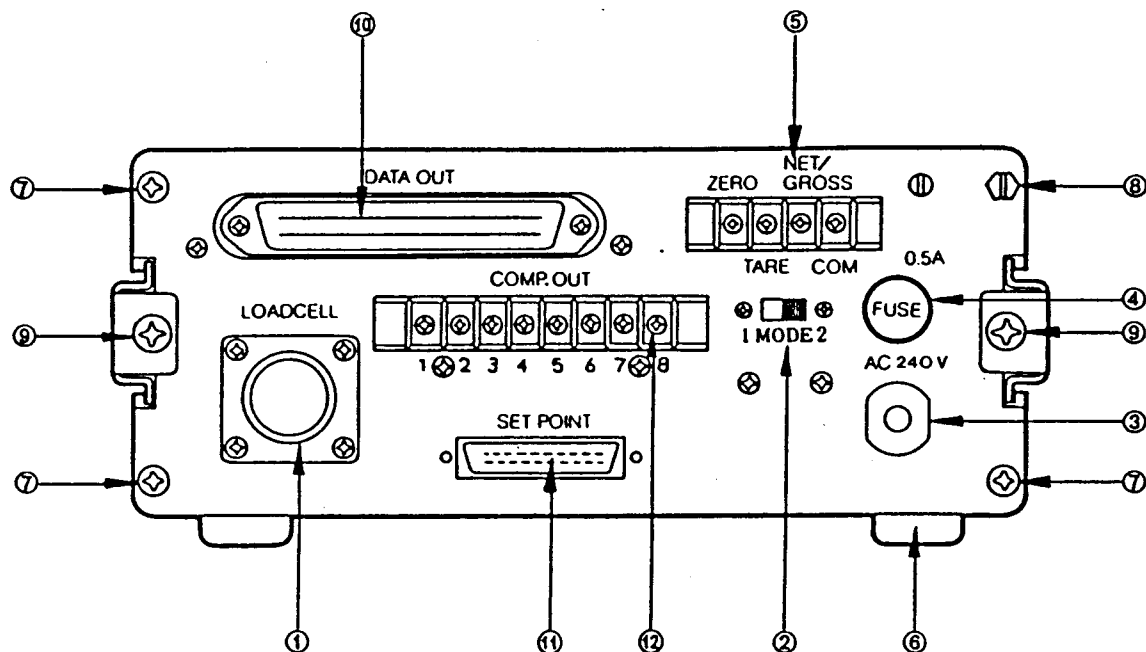
ZERO... Center of zero	MD .... Motion Detector
GROSS.. Gross mode	NET.... Net mode
	TARE... Tare value stored
- 4 ON/OFF BUTTON  
This button only switches the display on and off, not the power supply.
- 5 ZERO BUTTON  
The weight display will zero when this button is pressed *iff* the offset from the initially calibrated zero is within  $\pm 2\%$  of the maximum capacity programmed and *iff* motion is not detected.
- 6 TARE BUTTON  
This button changes the mode to NET, zeros the display and stores the subtracted TARE weight in memory *iff* motion is not detected. Maximum Tare value is 99990 regardless of the decimal point position (if any); this is the maximum display value which can be stored as TARE when in GROSS mode.
- 7 NET/GROSS BUTTON  
This button switches mode, annunciators and display alternately between Net and Gross.

\* *iff* = if and only if

DIP-SWITCHES ARE LOCATED BEHIND THE METAL PANEL COVER

- 8 COARSE SPAN DIP-SWITCH (SW 1)
- 9 FINE SPAN POTENTIOMETER (VR 3)
- 10 COARSE ZERO DIP-SWITCH (SW 2)
- 11 FINE ZERO POTENTIOMETER (VR 4)
- 12 PROGRAM DIP-SWITCH (SW 3, SW 4)

### REAR PANEL DESCRIPTION

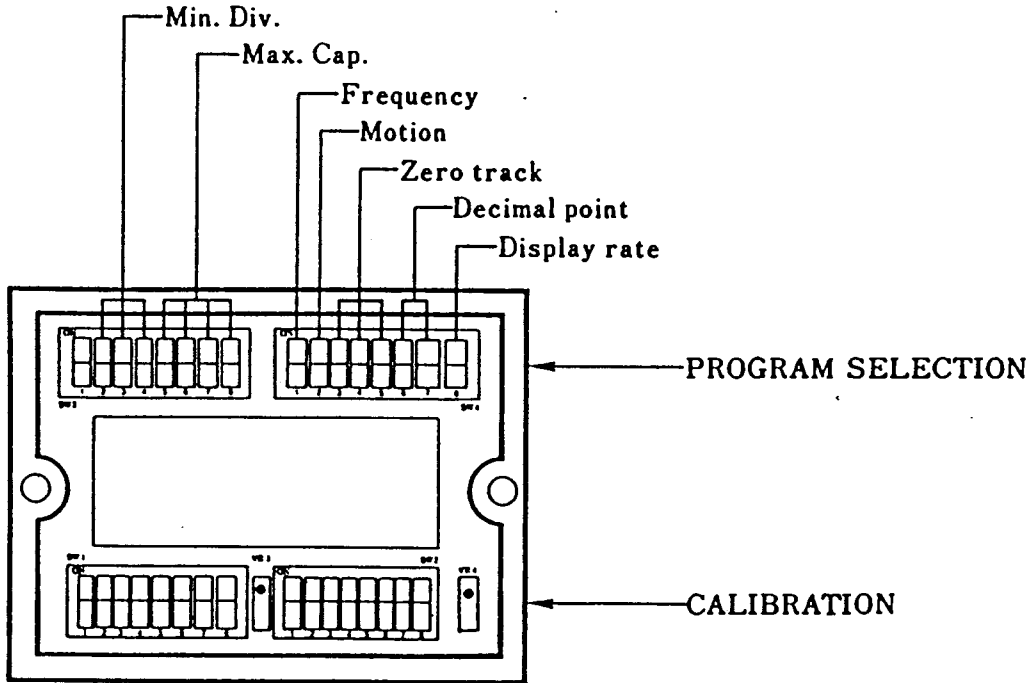


1-9 BASIC UNIT  
10-12 OPTIONS

- 1 LOADCELL CONNECTOR
- 2 MODE SELECTION SWITCH (for self-checking routine select Mode 2)
- 3 POWER CABLE
- 4 SCREW TYPE FUSE HOLDER
- 5 REMOTE CONTROL TERMINALS  
Zero, Net/Gross & Tare may be remotely controlled via switches "making" with common, "COM".
- 6 RUBBER FOOT  
These feet should be removed if the unit is to be panel mounted.
- 7 SCREWS
- 8 HEX-BOLT (designed to be wire sealed)
- 9 PANEL MOUNT FASTENER
- 10 OUTPUT CONNECTOR (in this diagram OP-01, OP-04 is different)
- 11 SETPOINT CONNECTOR (OP-02)
- 12 RELAY OUTPUT TERMINAL (OP-02)

## D. PROGRAM SELECTION

The dip-switches for programming AD-4316 are located behind the front metal panel cover directly above the calibration dip-switches (see Panel Description), they are labeled SW 3 & SW 4. Minimum Division, Maximum Capacity, Power Frequency, Motion Detection, Zero Track, Decimal Point and Display Rate may all be set via these dip-switches. The panel cover has been designed (like the case) for wire sealing in order to prevent security problems.



### MINIMUM DIVISION (d)

This function bears no relation to any (if any) decimal point location.

SEGMENT NUMBER OF SW3			MINIMUM DIVISION (d)
2	3	4	
OFF	OFF	OFF	N. A.
ON	OFF	OFF	N. A.
OFF	ON	OFF	x 1
ON	ON	OFF	x 2
OFF	OFF	ON	x 5
ON	OFF	ON	x10
OFF	ON	ON	x20
ON	ON	ON	x50



2 MAXIMUM CAPACITY

Segments 5, 6, 7 & 8 of SW 3

- \* Display will blank to indicate OVERLOAD if the Gross Weight value is in excess by more than 9d over the maximum capacity selected.
- \* Maximum capacity bears no relation to decimal point location.
- \* When changing these dip-switch settings with the display on, activate the display ON/OFF button twice (OFF then ON again) in order to store the new program setting.

SEGMENT NUMBER OF SW 3				MAXIMUM CAPACITY
5	6	7	8	
ON	ON	ON	ON	2000
OFF	ON	ON	ON	2500
ON	OFF	ON	ON	3000
OFF	OFF	ON	ON	4000
ON	ON	OFF	ON	5000
OFF	ON	OFF	ON	6000
ON	OFF	OFF	ON	10000
OFF	OFF	OFF	ON	15000
ON	ON	ON	OFF	20000
OFF	ON	ON	OFF	25000
ON	OFF	ON	OFF	30000
OFF	OFF	ON	OFF	40000
ON	ON	OFF	OFF	50000
OFF	ON	OFF	OFF	60000
ON	OFF	OFF	OFF	80000
OFF	OFF	OFF	OFF	99990

3 POWER FREQUENCY

Segment number 1 of SW 4

SW 4 No. 1	POWER FREQUENCY
ON	60Hz
OFF	50Hz

This setting synchronises the A/D converter timing in order to provide greater common mode rejection.

4 MOTION DETECTION  
Segment number 2 of SW 4

SW 4 No. 2	MOTION DETECTION
ON	3d/0.4 sec.
OFF	1d/0.4 sec.

5 ZERO TRACK  
Segment numbers 3, 4 & 5 of SW 4

SEGMENT NUMBER OF SW 4			ZERO TRACK
3	4	5	PARAMETER
OFF	OFF	OFF	NO ZERO TRACK
ON	OFF	OFF	NO ZERO TRACK
OFF	ON	OFF	0.5d/1 sec. ⇒
ON	ON	OFF	0.5d/2 sec.
OFF	OFF	ON	1.0d/1 sec.
ON	OFF	ON	1.0d/2 sec.
OFF	ON	ON	1.5d/1 sec.
ON	ON	ON	1.5d/2 sec.

6 DECIMAL POINT  
Segment numbers 6 & 7 of SW 4

SEGMENT No. of SW 4		DECIMAL POINT
6	7	LOCATION
OFF	OFF	NO DECIMAL POINT
ON	OFF	XXXX. X
OFF	ON	XXX. XX
ON	ON	XX. XXX

7 DISPLAY UPDATE RATE  
Segment number 8 of SW 4

SW 4 No. 8	DISPLAY UPDATE
ON	4 times per sec.
OFF	20 times per sec.

\* Output rate (if any) will coincide with the display update rate.

8 EXAMPLE

The following example demonstrates how to program AD-4316 for use with a hypothetical weighing system which has a maximum capacity of 200kg and a minimum division of 0.02kg.

(1) MINIMUM DIVISION (d=0.02kg)

Seg. No:-	2	3	4
SW 3	ON	ON	OFF

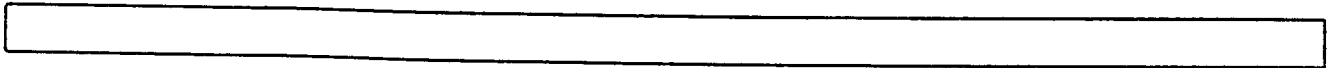
\* With the decimal point disregarded, d=2.

(2) MAXIMUM CAPACITY (20000kg display value)

Seg. No:-	5	6	7	8
SW 3	ON	ON	ON	OFF

(3) DECIMAL POINT (XXX.XX)

Seg. No:-	6	7
SW 4	OFF	ON



NOTE SPACE FOR USER'S OWN PROGRAM EXAMPLE

(1) MINIMUM DIVISION

Seg. No:-	2	3	4
SW 3			

(2) MAXIMUM CAPACITY

Seg. No:-	5	6	7	8
SW 3				

(3) DECIMAL POINT

Seg. No:-	6	7
SW 4		

## E. CALIBRATION

Calibration should be carried out during the initial installation of AD-4316, if any part of the complete weighing system is changed or if any drift is noted.

### 1 PREPARATION

- a) Plug in the power cable.
- b) Press the ON/OFF button to turn the display OFF.
- c) Press the ON/OFF button again while pressing TARE in order to nullify ZERO and TARE memories.

\* During calibration do not use the ZERO and TARE buttons.

### 2 ZERO ADJUSTMENT

The 8 segment dip-switch SW 2 should be used for coarse zero adjustment and the potentiometer VR4 for fine adjustment.

Segment No. 1 has the most offset value and segment No. 8 the least.  
ON=OFFSET and OFF=NO-OFFSET.

#### a) Negative Offset.

When zero adjustment is not possible because the input signal is too low (negative), add a resistor (50K $\Omega$   $\rightarrow$  500K $\Omega$ ) between EXC+ and SIG+ at the loadcell or connector.

#### b) Positive Offset.

When zero adjustment is not possible because the input signal is too high (positive), add a resistor (50K $\Omega$   $\rightarrow$  500K $\Omega$ ) between EXC+ and SIG-.

*N.B. Resistor must be of high quality with the lowest temperature co-efficient characteristics available.*

### 3 SPAN ADJUSTMENT

The 8 segment dip-switch SW 1 should be used for coarse span adjustment and the potentiometer VR3 for fine adjustment.

Segment No. 1 has the highest gain and segment No. 8 the lowest.  
ON=INCREASE GAIN.

\* Do not set all the segments to the ON position.

### 4 LOADCELL AND INPUT SENSITIVITY

The relationship between loadcell & input sensitivity (X) for AD-4316 is as follows:-

Example.....

Loadcell capacity	---	100kg	"A"
Rated output	---	3mV/V	"B"
Max. capacity of scale	---	50kg	"C"
Min. division of scale	---	0.01kg	"d"
Excitation	---	12V	"EXC"
Actual loadcell range used as scale	----	"a" %	
(50kg/100kg) x 100	=	50%	

When a single loadcell without a lever is used, the following formula should apply:

$$"X" = ("a"/100) \cdot "EXC" \cdot "B" \cdot 1000 \cdot ("d"/"C") \mu V$$

System design will be satisfactory if "X" is between 0.6 $\mu$ V and 36 $\mu$ V.

In the example above "X" = 3.6 $\mu$ V.

\* For a scale with a lever and multiple loadcells, lever ratio and number of loadcells should be taken into consideration.

## F. BASIC OPERATION

- 1 DISPLAY BLANK  
The display will blank when the input signal exceeds the maximum capacity set by 9d or 10200d when the input signal has too much negative value.
- 2 ZERO LIMIT  
If zero deviates from the initially calibrated analog zero by more than  $\pm 2\%$  of the maximum capacity set, AD-4316 will not accept a ZERO command; (i. e. zero button, remote terminals and zero track become inoperative).
- 3 COMMANDS THROUGH REAR TERMINALS  
Remote commands through the rear terminals provide identical functions to the front panel buttons. For ZERO and TARE, commands are valid if (and only if) motion is not detected.
- 4 BATTERY BACK-UP  
An internal battery is kept fully charged if AD-4316 is never disconnected from the electricity supply. In the event of a power failure (or temporary interruption) this battery will protect all the volatile memory for up to one month.
- 5 WATCHDOG  
This refers to circuitry which constantly monitors the central processing unit. If a software crash starts to develop because of noise penetration (or for some other reason) WATCHDOG will detect the problem and avert disaster by automatically restarting normal operations within a fraction of a second.
- 6 ON/OFF BUTTON & SELF-CHECKING  
The on/off button is a switch only for the display, not the power supply, it will also initiate the following self-checking routine when the display is turned on *iff* the rear Mode switch is on 2.  
DISPLAY:-
  - (a) 88888, with all LEDs on, this is a display check.
  - (b) d1 xx, and all LEDs off, shows status of SW 3 in hexadecimal notation.
  - (c) d2 xx, --- ditto --- , status of SW 4 in hexadecimal notation (HEX).
  - (d) d3 xx, --- " --- , status of the two least significant digits (LSD).
  - (e) d4 xx, --- " --- , status of the two middle digits (of Op-03)
  - (f) d5 xx, --- " --- , status of the most significant digit (MSD).
  - (g) Cxxxx, ..... with only the unit LED on; Calibration value.
  - (h) xxxxx, ..... Normal weighing.

d3, d4 & d5 show the status of the 5 push button thumbwheels installed on the Op-03 replacement front metal panel cover.

## G. OPTIONS

N. B. It is not possible to install the following options simultaneously: -

(a) Option-01 plus Option-04.

(b) Option-02 plus Option-03.

(c) Option-05 plus Option-06 (unless 05 is connected via 06).

### I. PARALLEL BCD OUTPUT (Option-01)

50 pin connector, TTL level, fan-out 5, positive logic. Pins 2-22-data output.

#### (1) CONNECTOR PIN DESIGNATION

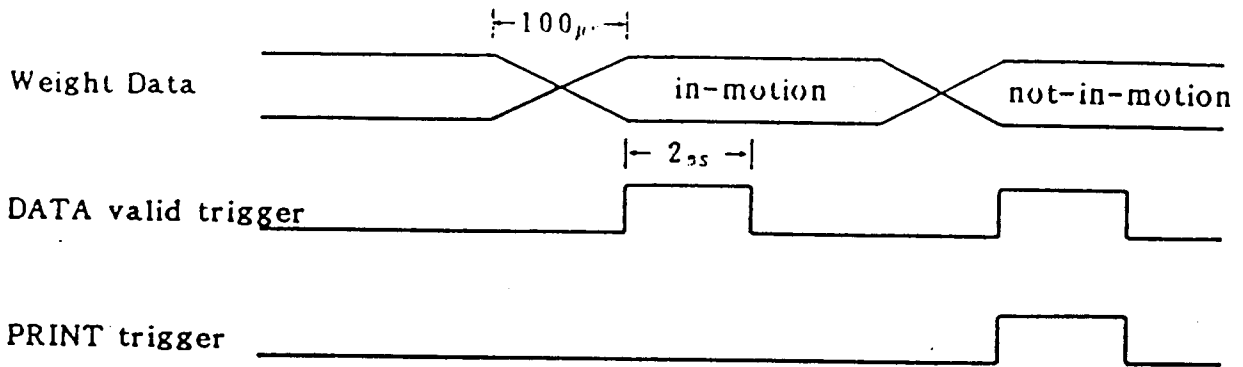
Pin No.	SIGNAL		Pin No.	SIGNAL
1	GROUND		26	Internally used
2	$1 \times 10^0$		27	Hi-NET; Lo-GROSS
3	$2 \times 10^0$		28	Internally used
4	$4 \times 10^0$		29	ditto
5	$8 \times 10^0$		30	ditto
6	$1 \times 10^1$		31	ditto
7	$2 \times 10^1$		32	ditto
8	$4 \times 10^1$		33	Lo-Motion Detected
9	$8 \times 10^1$		34	Lo-kg mode
10	$1 \times 10^2$		35	ditto
11	$2 \times 10^2$		36	ditto
12	$4 \times 10^2$		37	Hi permanently
13	$8 \times 10^2$		38	Lo-kg mode
14	$1 \times 10^3$		39	Hi permanently
15	$2 \times 10^3$		40	Lo permanently
16	$4 \times 10^3$		41	Lo-kg mode
17	$8 \times 10^3$		42	Lo-Negative Polarity
18	$1 \times 10^4$		43	Decimal Point @ $10^0$
19	$2 \times 10^4$		44	Decimal Point @ $10^1$
20	$4 \times 10^4$		45	Decimal Point @ $10^2$
21	$8 \times 10^4$		46	Decimal Point @ $10^3$
22	$1 \times 10^5$		47	OVERLOAD
23	GROUND		48	PRINT TRIGGER*
24	GROUND		49	DATA VALID TRIGGER
25	GROUND		50	HOLD *INPUT

\*Print Trigger pulse is Hi iff data is valid & no motion has been detected.

\*When HOLD input is accepted by TTL or contact closure, display & output go to hold.

\*Standard Accessory . . . . Mating connector (1) 57-30500 (Amphenol)

(2) BCD TIMING



- (3) Standard Accessory  
50 pin connector (1) 57-30500 (Amphenol)

2. SETPOINT INTERFACE (Option-02)

This is an input interface for external thumbwheels (Op-05 & 06). Relay output control and Time Extrapolated Estimation of the true cut-off point become available with this option. In filling operations TEE is automatically activated after the flow is reduced to "dribble" in order to estimate the exact point in time when the flow should be cut completely. In effect this increases the judgement frequency from the A/D conversion rate of 20 times per second, to a far higher extrapolated rate of about 200 times per second.

1) PUSH BUTTON THUMBWHEELS

The following groups of thumbwheel switches can be directly interfaced.

- |                             |                               |
|-----------------------------|-------------------------------|
| (a) Final weight (5 digits) | (b) Free Fall (2 digits)      |
| (c) Preliminary (3 digits)  | (d) Hi Limit (2 digits)       |
| (e) Lo Limit (2 digits)     | (f) Zero band (2 digits) in % |

\* If Min. Div. is  $\geq \times 5$  then (b), (c), (d) & (e) will be multiplied by ten before the Comparator compares the data.

\* The least significant digit of a thumbwheel switch group corresponds to the LSD of the weight display, except for Zero band.

2) SETPOINT CONDITION

Relay closes under the following conditions:-

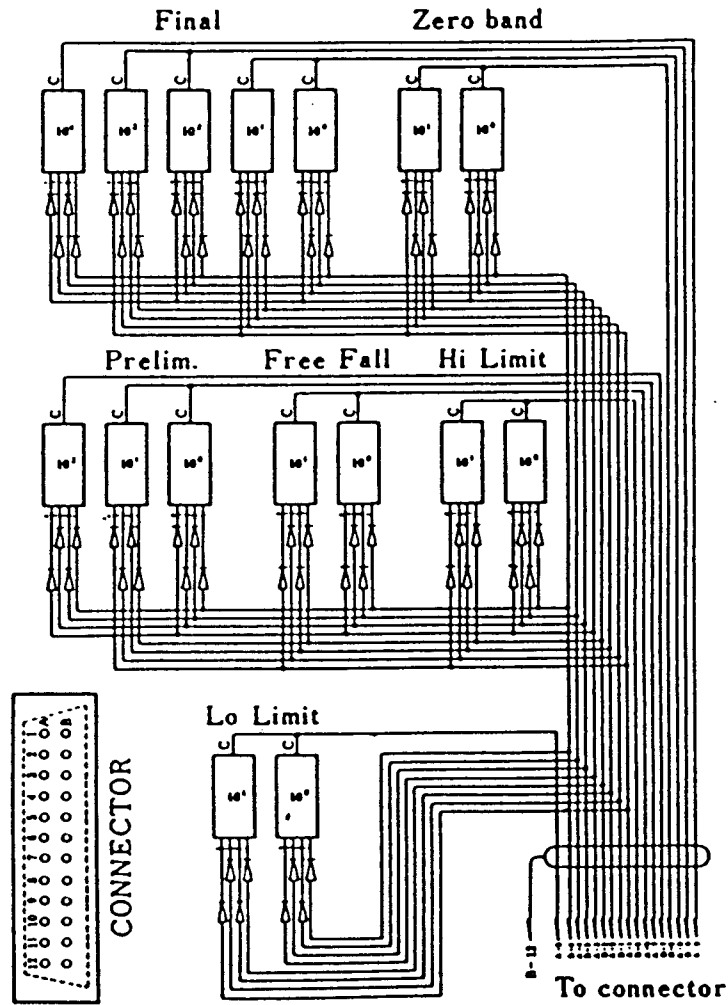
Relay	Condition
Zero band	"Gross Weight" < "Zero band" / 100 x Max. Capacity.
Preliminary	"Displayed Weight" > "Final Weight" - "Preliminary".
Pre-act	"Displayed Weight" > "Final Weight" - "Free Fall".
Hi limit	"Displayed Weight" > "Final Weight" + "Hi limit".
Lo limit	"Displayed Weight" < "Final Weight" - "Lo limit".

※Displayed Weight the value displayed in either the net or gross mode.

3) SETPOINT INPUT PINS

Pin No.	SIGNAL	Pin No.	SIGNAL
A-1	$8 \times 10^1, 8 \times 10^3$	B-1	$4 \times 10^1, 4 \times 10^3$
A-2	$2 \times 10^1, 2 \times 10^3$	B-2	$1 \times 10^1, 1 \times 10^3$
A-3	$8 \times 10^0, 8 \times 10^2, 8 \times 10^4$	B-3	$4 \times 10^0, 4 \times 10^2, 4 \times 10^4$
A-4	$2 \times 10^0, 2 \times 10^2, 2 \times 10^4$	B-4	$1 \times 10^0, 1 \times 10^2, 1 \times 10^4$
A-5	Lo Limit Common	B-5	Hi Limit Common
A-6	Free Fall Common	B-6	Zero Band Common
A-7	Prelim. $10^0, 10^1$ Common	B-7	Prelim. $10^2$ Common
A-8	Final Weight $10^0, 10^4$ Comm	B-8	Final Weight $10^2, 10^3$ Comm
A-9	Final Weight $10^4$ Common	B-9	
A-10		B-10	
A-11		B-11	
A-12		B-12	

4) WIRING DIAGRAM

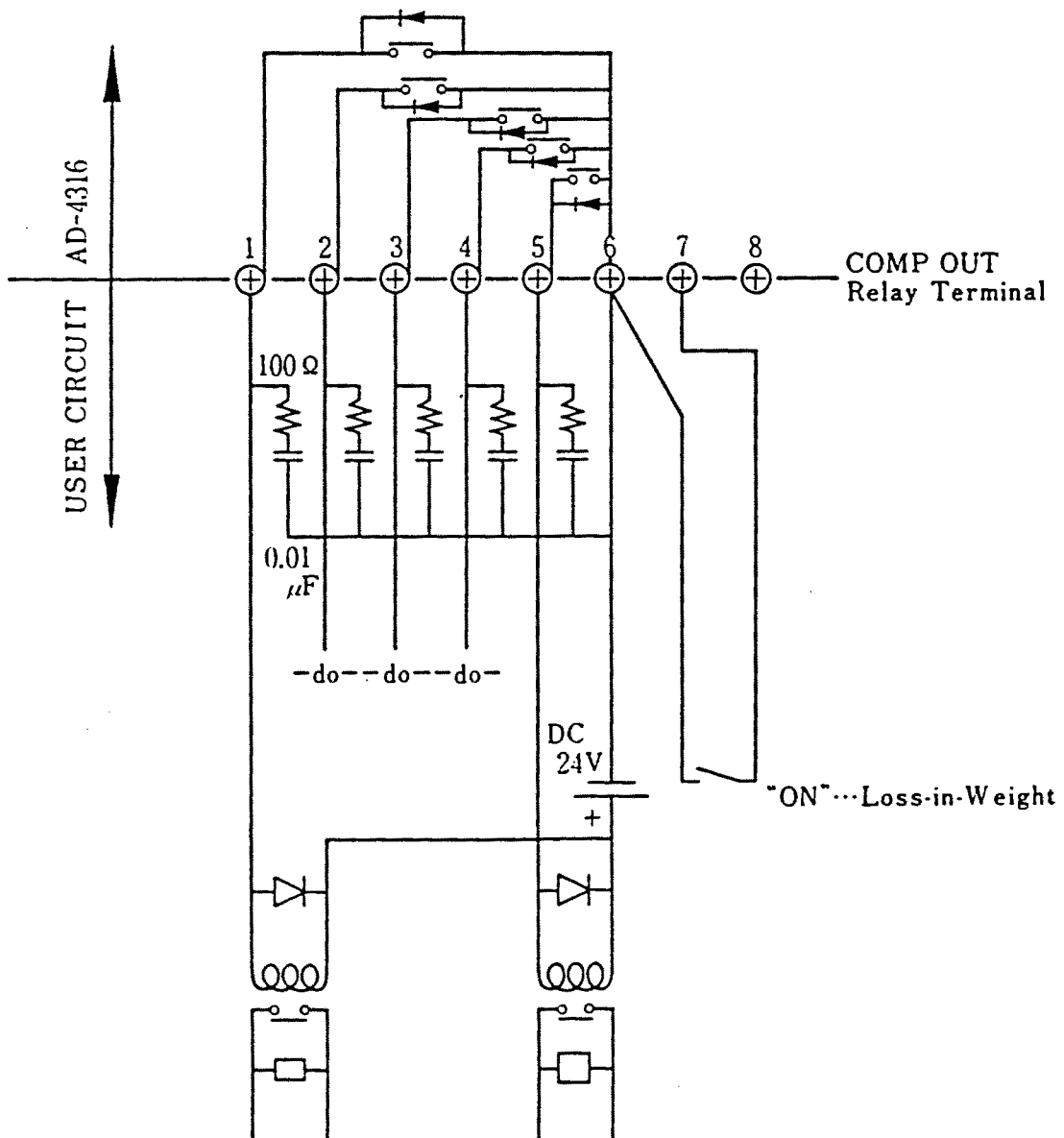




5) RELAY OUTPUT PIN DESIGNATION

Pin No.	SIGNAL (Relay)
1	Lo Limit
2	Hi Limit
3	Pre-act
4	Preliminary
5	Zero band
6	Common
7	Loss-in-weight control (Input)
8	Internally used

\* Output relays (1-5) can accept DC 50V, 100mA max.



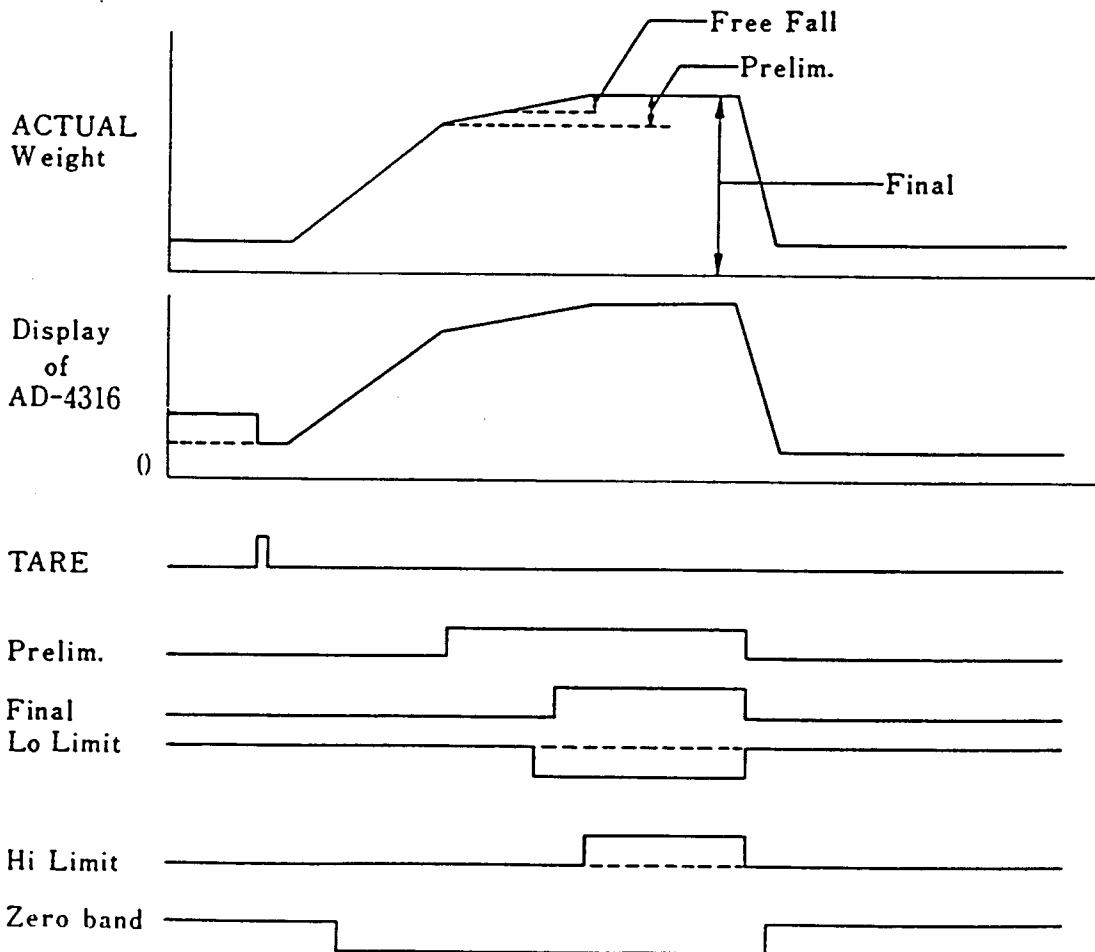
## FUNCTION CHANGES

When Option-02 has been installed the following function changes should be considered: -

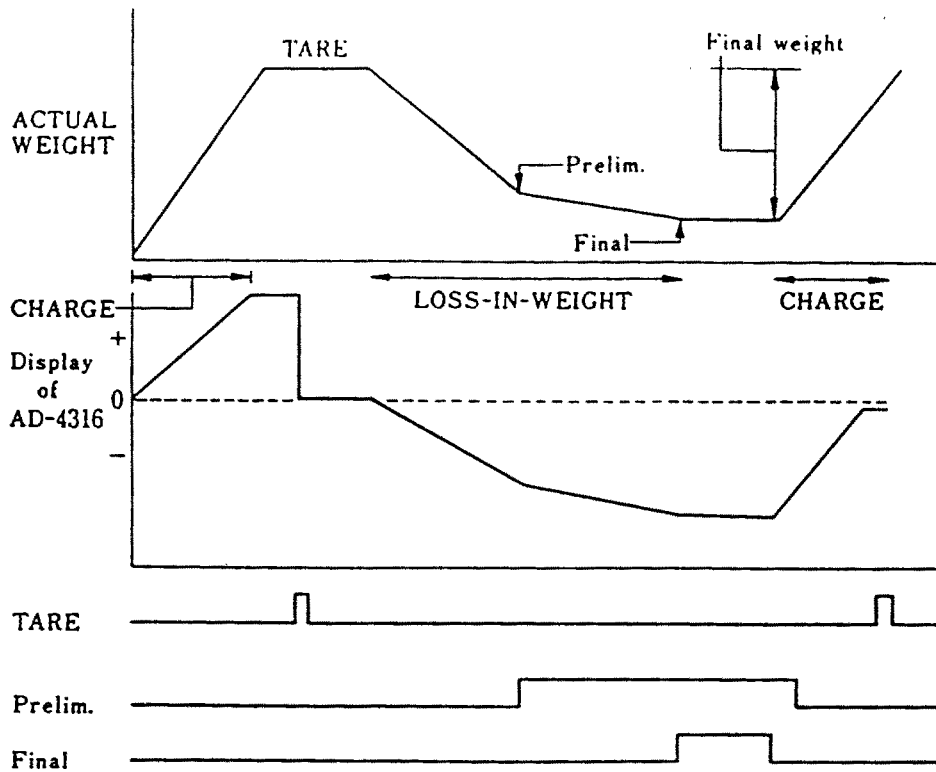
- (a) ZERO and TARE commands will now always be accepted, even if motion has been detected (the load is unstable).
- (b) A NET/GROSS command will now change the mode and display to GROSS only, it will not change the mode from GROSS to NET.
- (c) A TARE command will change the mode to NET and zero the display.
- (d) Mode switch changes function to selection of zero track. Mode 1=ON and Mode 2=OFF. Check Mode is permanently ON.

## 7) TIMING

### NORMAL



LOSS-IN-WEIGHT (Valid only when display is negative)



8) Standard accessory is a single 24 pin connector. FCN 36/J024-A6.

### 3. THUMBWHEEL TARE (Option-03)

A group of five push button thumbwheels (5 digits) is installed on a replacement front metal panel cover with this option and permits the entry of a tare value.

When Minimum Division is anything but 1, the digital switch value will be evaluated as follows:-

Read as: "If  $d=n$  then  $x$  and  $y$  of LSD will be evaluated as....."

Min. Div. No.	LSD No.	EVALUATED No.
(a) 2	0 & 1	0
2	2 & 3	2
2	4 & 5	4
2	6 & 7	6
2	8 & 9	8
(b) 5	0, 1 & 2	0
5	3 to 7	5
5	8 & 9	10
(c) 10	LSD	Not Evaluated.
(d) 20	LSD	Not Evaluated.
20	LSD <sub>1</sub>	As For (a)
(e) 50	LSD	Not Evaluated.
50	LSD <sub>1</sub>	As For (b)

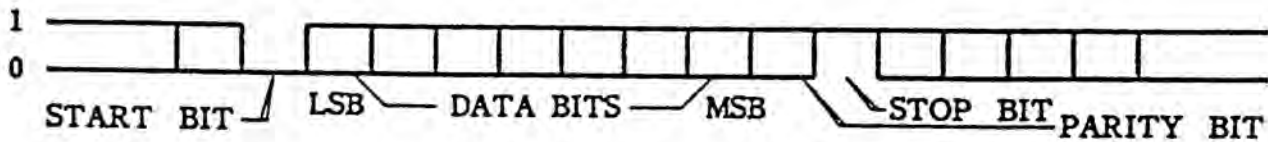
#### 4. SERIAL INTERFACE (Option-04)

EIA-RS-232C and/or passive 20mA Current Loop.

##### a) SIGNAL FORMAT

Data Bit = 7  
 Parity Bit = 1 (EVEN)  
 Stop Bit = 1  
 Code = ASCII

RS-232C	20mA Current Loop
1 = -5V → -15V	= 20mA
0 = +5V → +15V	= 0mA



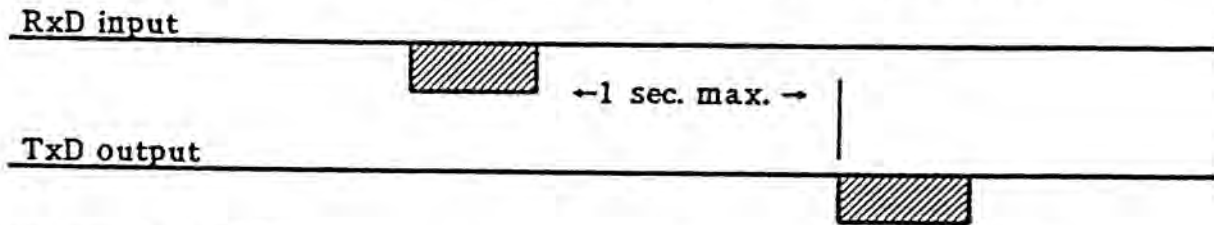
##### b) TRANSMISSION MODE

Transmission mode, stream mode or command mode can be selected by dip-switch.

(i) Command Mode (only available for RS-232C)

In this mode data is transmitted *iff* RxD is received.

'RxD' is (READ) (CR) (LF) (52H 45H 41H 44H 0DH 0AH)



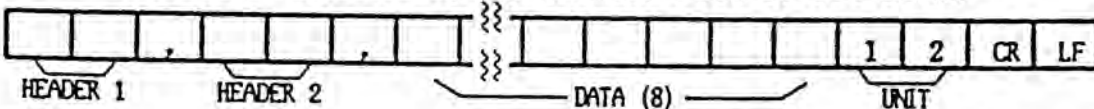
(ii) Stream Mode

This mode is available for both RS-232C and 20mA Current Loop.

In this mode data will be transmitted whenever new data becomes available, without receiving any input.

##### c) DATA FORMAT

Baud rate can be selected by dip-switch; 2400 or 600 baud.



##### HEADER 1

OL=OVERLOAD  
 ST=STABLE (no-motion)  
 US=UN-STABLE

##### HEADER 2

NT=NET MODE  
 GS=GROSS MODE

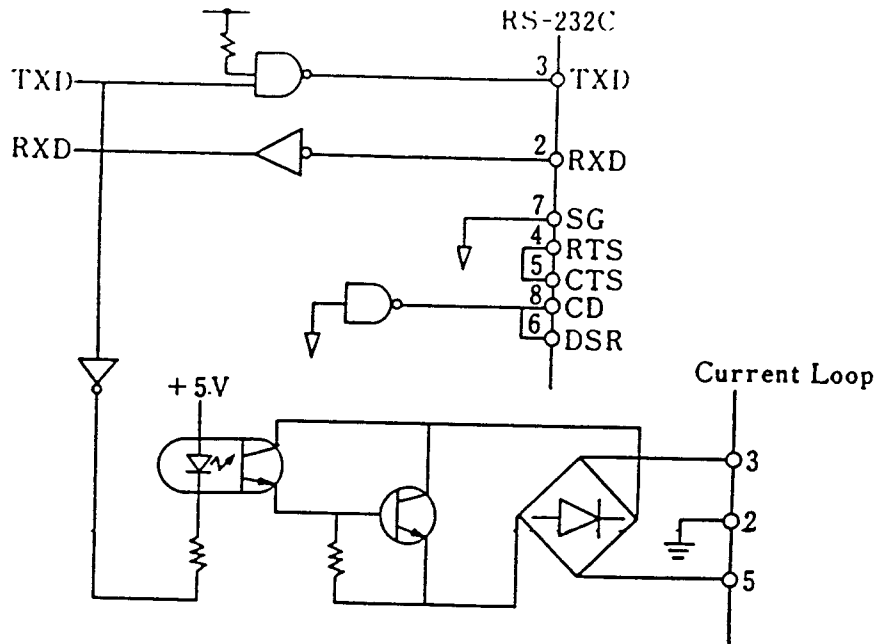
##### WEIGHT DATA TxD by ASC II numerals plus:

Negative sign; - 2D (HEX)  
 Positive sign; + 2B (HEX)  
 Space ; 20 (HEX)  
 Decimal point; . 2E (HEX)

##### UNIT. 1 & 2

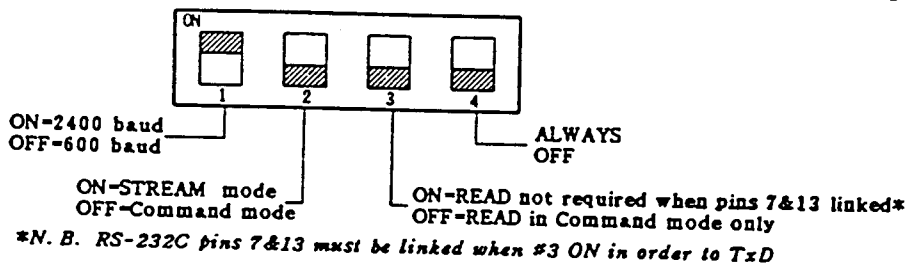
kg=4B (HEX) in 1; 67 (HEX) in 2  
 Space t=20 (HEX) in 1; 74 (HEX) in 2  
 lb=4C (HEX) in 1; 62 (HEX) in 2

### CIRCUIT DIAGRAM



**d) DIP-SWITCH SELECTION**

Mode and baud rate are selected via a 4 segment dip-switch on Option-04.



**e) PIN DESIGNATION (AD-4316=Data Communication Equipment; ←=Input signal & →=Output signal)**

RS-232C	Pin No	SIGNAL	Pin No	SIGNAL	CURRENT LOOP SIGNAL
Frame Ground	1	FG	14	NC	1 Not Connected
Receive Data	2	← RxD	15	NC	2 Frame Ground
Transmit Data	3	→ TxD	16	NC	3 Current Loop
Request-to-Send	4	← RTS	17	NC	4 Not Connected
Clear-to-Send	5	→ CTS	18	NC	5 Current Loop
Data-set-Ready	6	→ DSR	19	NC	6 Not Connected
Signal Ground	7	SG	20	NC	7 Not Connected
Carrier Detect	8	→ CD	21	NC	
Not Connected	9	NC	22	NC	
Not Connected	10	NC	23	NC	
Not Connected	11	NC	24	NC	
Not Connected	12	NC	25	NC	
Receive # 2	13	RxD	XX	XX	

- \* AD-8116 Compact Printer will interface directly to this option.
- \* Standard accessory is a single current loop connector; TCP 0576
- \* An RS-232C connector is not included with this option.

## 5. SETPOINT UNIT (Option-05)

This is an independent unit housed in a separate metal case. It may be directly interfaced to any AD-4316 with Option-02 via an attached cable and connector. This option will also accept external input signals which means that it may be used to control multiple ingredient batching operations after receiving external setpoint information (front panel slide switch must be set to EXT not NORMAL).

Please note that the idea of Free Fall is based upon the concept of solids falling (after the flow has been cut to zero) from a hopper into a weighing container. When liquids are being added to a container, wave propagation must be kept to a minimum to avoid load oscillation. If a submerged filling probe is employed (which may mean zero Free Fall) liquid displacement must be taken into consideration.

### INPUT DATA

setpoint data may be programmed either via the front panel thumbwheels or through the external input facility.

#### Front panel thumbwheels.

Final Weight.....5 digits	Free Fall.....2 digits
Prelim. Weight.....3 digits	Hi Limit.....2 digits
Lo Limit .....2 digits	Zero band.....2 digits

#### External input.

Final Weight.....5 digits	Free Fall.....2 digits
Prelim. Weight.....3 digits	

\* When Option-05 is used in external input mode it must be provided with AC power. (AC power is not necessary for the front panel thumbwheel switches). NORMAL/EXT slide switch must be set to 'EXT'ernal and the rear 'CONT'rol terminals must be shorted, this will disconnect panel control.

## GENERAL SPECIFICATIONS

- Power Requirements: AC 100, 115, 220, 240V $\pm$ 1%, 50/60Hz, 15VA.  
Factory set depending upon the shipping destination & marked on unit.
- Operating Temperature: 14°F $\rightarrow$ 104°F (-10°C $\rightarrow$ +40°C)
- Operating Humidity: 95% or less (non-condensing)
- Net Weight: Approx. 2.2lb (1kg)
- Physical Dimensions: 210 (W) x 206 (D) x 65 (H) mm  
8.3" x 8.1" x 2.6"
- Panel cut-out dimensions: 201 $\pm$ 0.5 (W) x 56 $\pm$ 0.5 (H) mm  
7.91" $\pm$ 0.02 x 2.20" $\pm$ 0.02
- Interface cable: 50cm (20") includes a connector.

3) EXTERNAL INPUT PIN DESIGNATION

Pin No.	SIGNAL	Pin No.	SIGNAL
1	GND	26	1
2	1	27	2
3	2	28	4
4	4	29	8
5	8	30	1
6	1	31	2
7	2	32	4
8	4	33	8
9	8	34	1
10	1	35	2
11	2	36	4
12	4	37	8
13	8	38	1
14	1	39	2
15	2	40	4
16	4	41	8
17	8	42	NC
18	1	43	NC
19	2	44	NC
20	4	45	NC
21	8	46	NC
22	1	47	NC
23	2	48	NC
24	4	49	NC
25	8	50	NC

Pin No.	SIGNAL	Pin No.	SIGNAL
26	1	26	1
27	2	27	2
28	4	28	4
29	8	29	8
30	1	30	1
31	2	31	2
32	4	32	4
33	8	33	8
34	1	34	1
35	2	35	2
36	4	36	4
37	8	37	8
38	1	38	1
39	2	39	2
40	4	40	4
41	8	41	8
42	NC	42	NC
43	NC	43	NC
44	NC	44	NC
45	NC	45	NC
46	NC	46	NC
47	NC	47	NC
48	NC	48	NC
49	NC	49	NC
50	NC	50	NC

INPUT TYPE: RELAY OR OPEN COLLECTOR

## 6. MULTI-SETPOINT UNIT (Option-06)

This option is a compact version of Option-05 with some different features. Like Op-05 this option may be interfaced to any AD-4316/Op-02 via an attached cable and connector but in addition several units may be linked together in a daisy-chain to provide, for example, separate control units for different ingredients in multiple ingredient batching operations. The total number of units which may be linked together depends upon environmental conditions ---- environmental interference will contaminate setpoint data transmission if the daisy-chain is too long.

Each Op-06 unit (unless used alone) requires power at 24VDC and a two wire control line (normally open) from an external sequencer. If a user already owns an Op-05 unit but wishes to change to an Op-06 based system, he may use his Op-05 as the last unit on the daisy-chain.

### 1) INPUT DATA

Setpoint data is programmed via push-button thumbwheels for 'FINAL WEIGHT', 'FREE FALL' and 'PRELIM'inary weight but Hi Limit, Lo Limit and Zero Band are set by means of rotary dip-switches behind the front metal panel cover on Option-06.

#### Front panel thumbwheels.

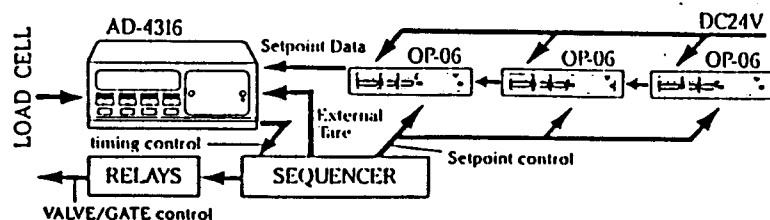
Final Weight.....5 digits	Free Fall.....2 digits
Prelim. Weight .....3 digits	Hi Limit .....2 digits
Lo Limit .....2 digits	Zero band.....2 digits

\* When an individual Op-06 unit has been selected out of a daisy-chain by the sequencer (N/O "CONT" terminal is closed or "made") the SELECT LED on the front panel will be switched on to indicate that this is the unit which has been selected.

### 2) GENERAL SPECIFICATIONS

- Power Requirements: DC 24V±10%
- Operating Temperature: 14°F→104°F (-10°C→+40°C)
- Physical Dimensions: 210 (W) x 117.6 (D) x 45 (H) mm  
8.3" x 4.6" x 1.8"
- Panel cut-out dimensions: 188 $\pm$ 0.0 (W) x 40 $\pm$ 0.0 (H) mm  
7.4 $\pm$ 0.004 x 1.57 $\pm$ 0.004
- Interface cable: 50cm (20") includes a connector.

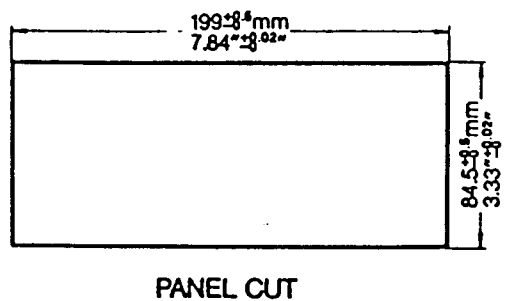
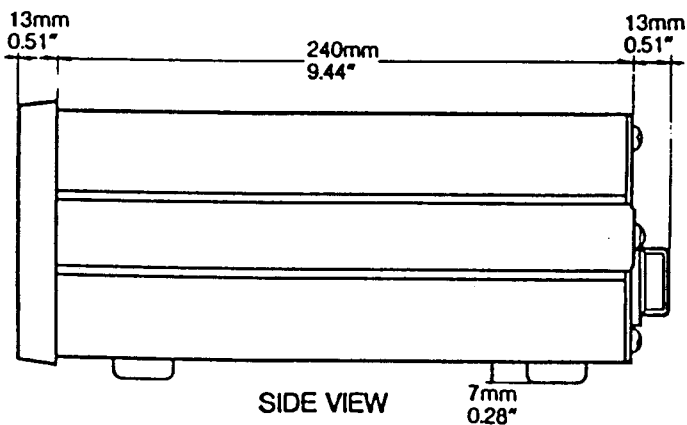
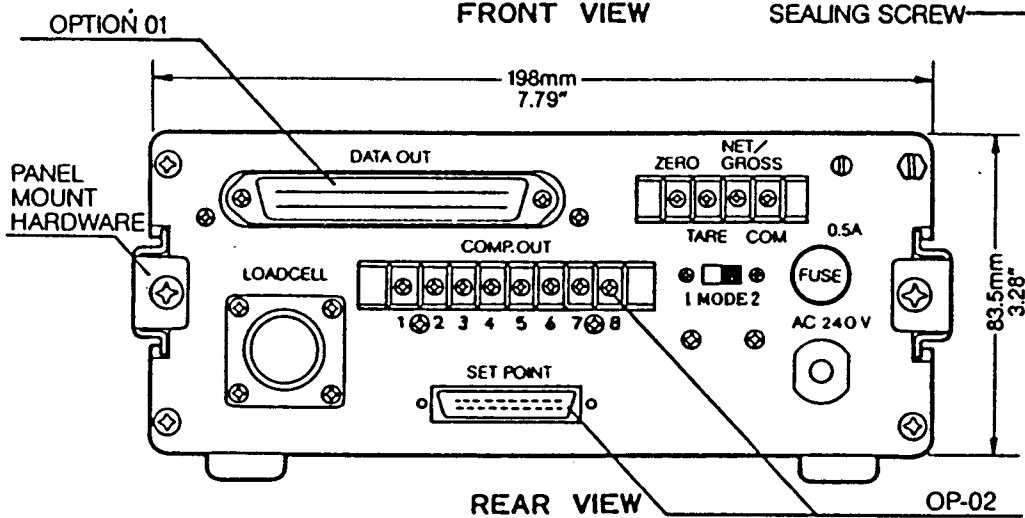
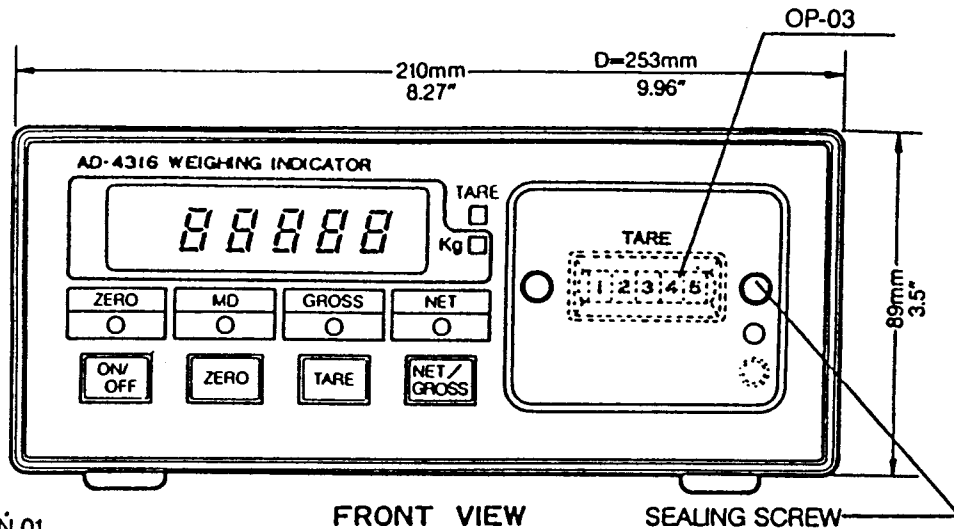
#### APPLICATION DIAGRAM



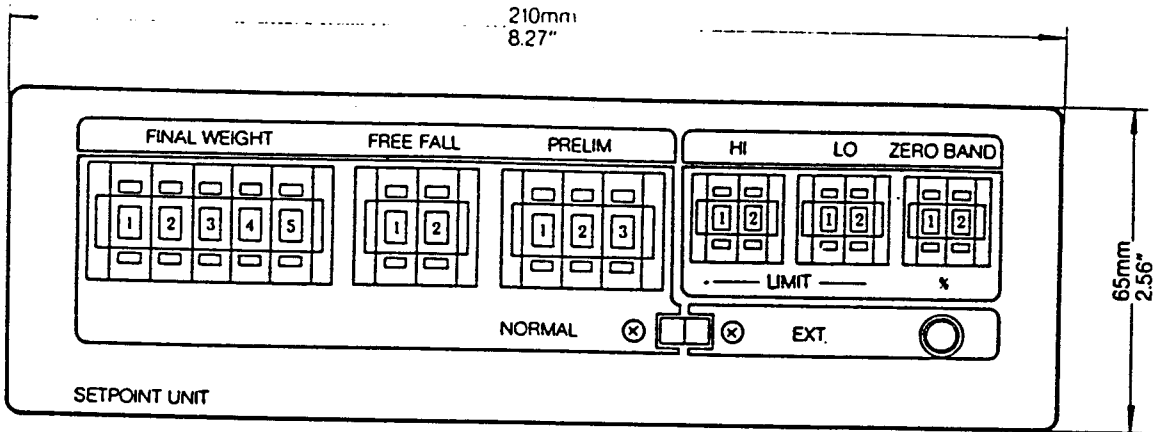
External TARE  
after each  
weighing event.



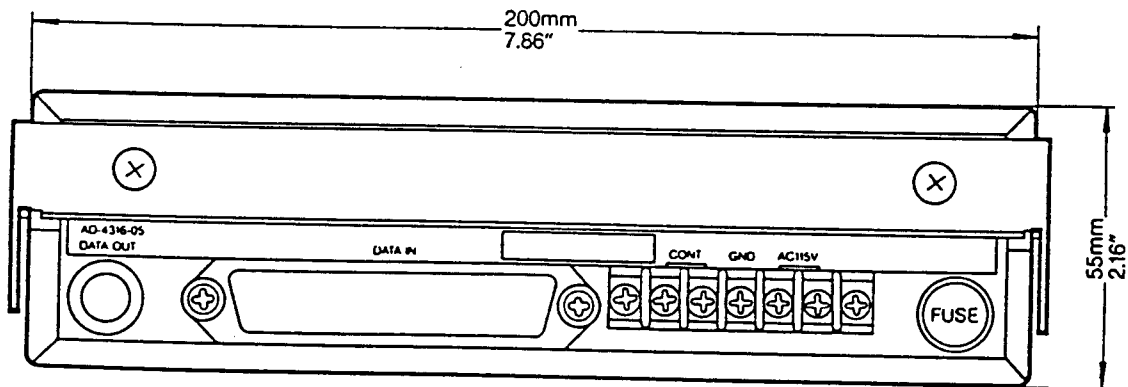
AD-4316 WEIGHING INDICATOR



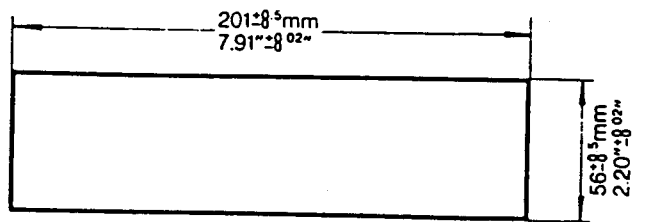
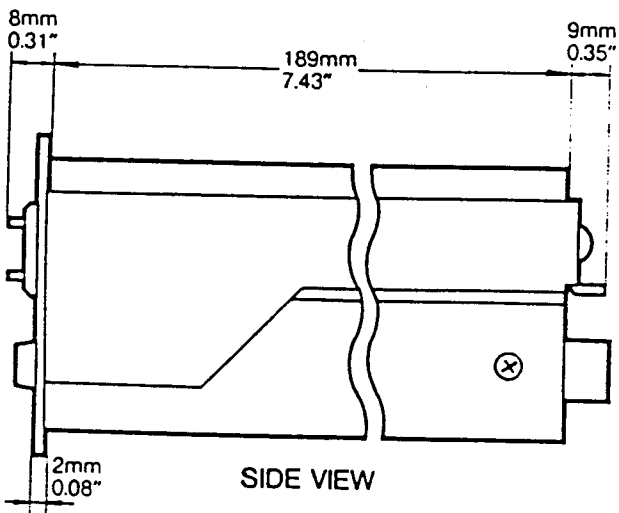
OPTION-05



FRONT VIEW

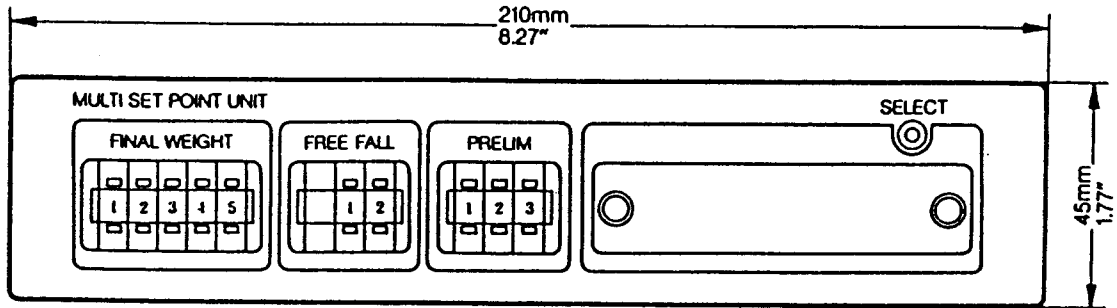


REAR VIEW

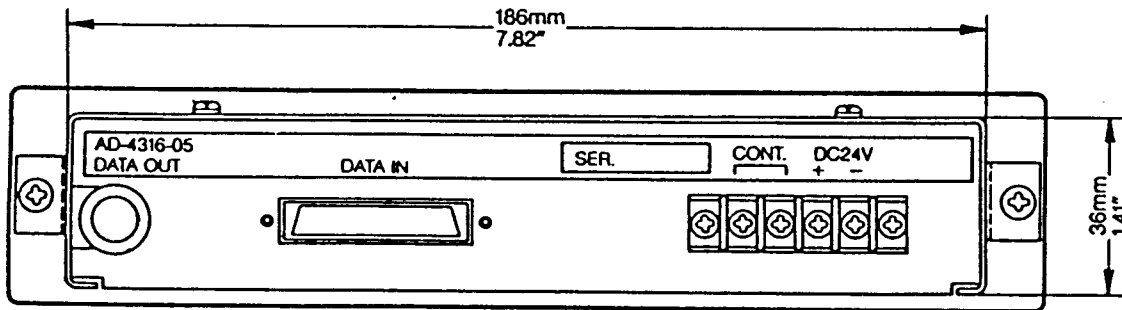


PANEL CUT

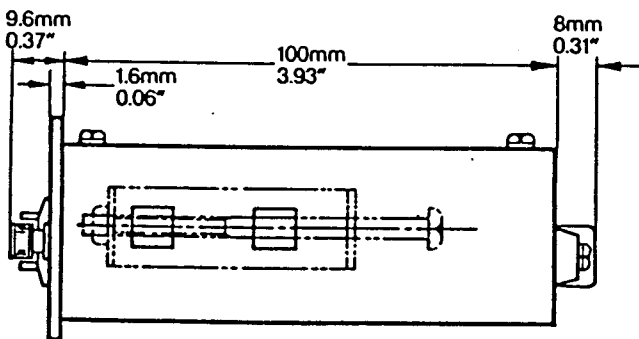
OPTION-06



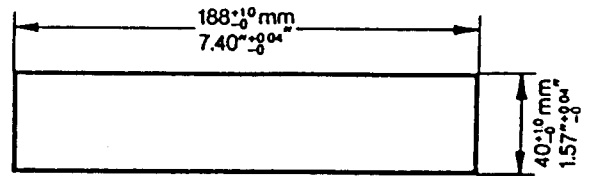
FRONT VIEW



REAR VIEW



SIDE VIEW



PANEL CUT S=1/2

APPENDIX

4316 RESOLUTION:- Resolution is related to Minimum Division & Maximum Capacity. Some of the Max. Capacity settings will not be available on your unit, but read off Max. Capacity against Min. Division to find the resolution. Combinations in the hatched area of the table are invalid and must be avoided.

MIN. DIV. MAX. CAP.	1	2	5	10	20	50
300	1/300					
400	1/400					
500	1/500					
600	1/600	1/300				
800	1/800	1/400				
1,000	1/1000	1/500				
1,200	1/1200	1/600				
1,500	1/1500	1/750	1/300			
2,000	1/2000	1/1000	1/400			
2,500	1/2500	1/1250	1/500			
3,000	1/3000	1/1500	1/600	1/300		
4,000	1/4000	1/2000	1/800	1/400		
5,000	1/5000	1/2500	1/1000	1/500		
6,000	1/6000	1/3000	1/1200	1/600	1/300	
8,000	1/8000	1/4000	1/1600	1/800	1/400	
10,000	1/10000	1/5000	1/2000	1/1000	1/500	
12,000		1/6000	1/2400	1/1200	1/600	
15,000		1/7500	1/3000	1/1500	1/750	1/300
20,000		1/10000	1/4000	1/2000	1/1000	1/400
25,000			1/5000	1/2500	1/1250	1/500
30,000			1/6000	1/3000	1/1500	1/600
40,000			1/8000	1/4000	1/2000	1/800
50,000			1/10000	1/5000	1/2500	1/1000
60,000				1/6000	1/3000	1/1200
80,000				1/8000	1/4000	1/1600
100,000				1/10000	1/5000	1/2000
120,000					1/6000	1/2400
150,000					1/7500	1/3000
200,000					1/10000	1/4000
250,000						1/5000
300,000						1/6000
400,000						1/8000
500,000						1/10000