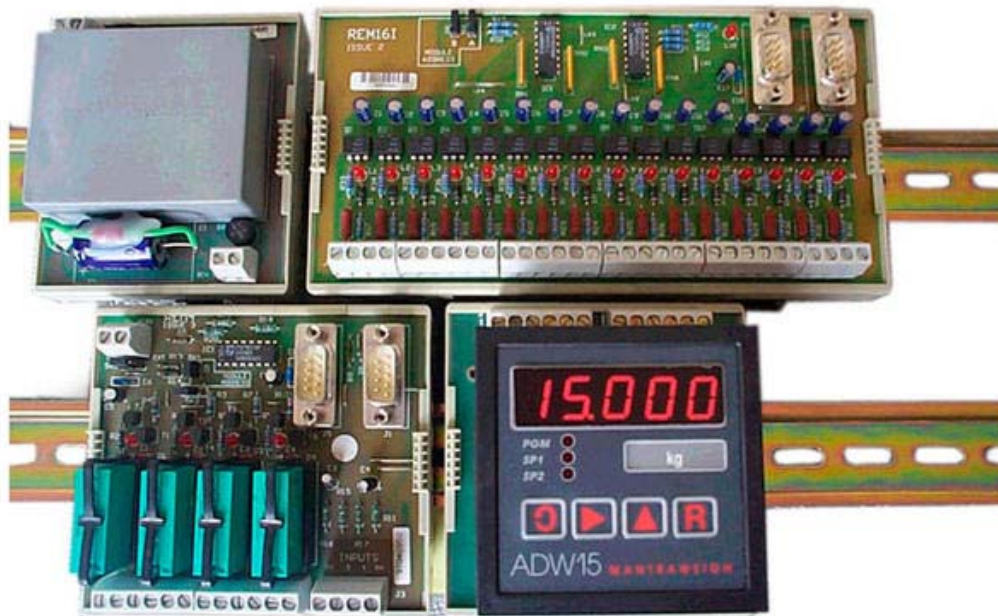




Procter & Chester Measurements

USER MANUAL

(April 2014)



ADW-FFW

Weighing Indicator/Controller for Fast Fill Operating

APPROVED DISTRIBUTORS OF:

ME mantracourt

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Strain Gauge Instrumentation ADW-FFW Fast Fill by Weight

Features

Fast & accurate fill control

Fast 10mS update input

Fast & slow feeds

System speed optimisation

Auto tare

Auto calibration

Auto 'In Flight' compensation

'Weight' complete output

Stand alone or control with PLC

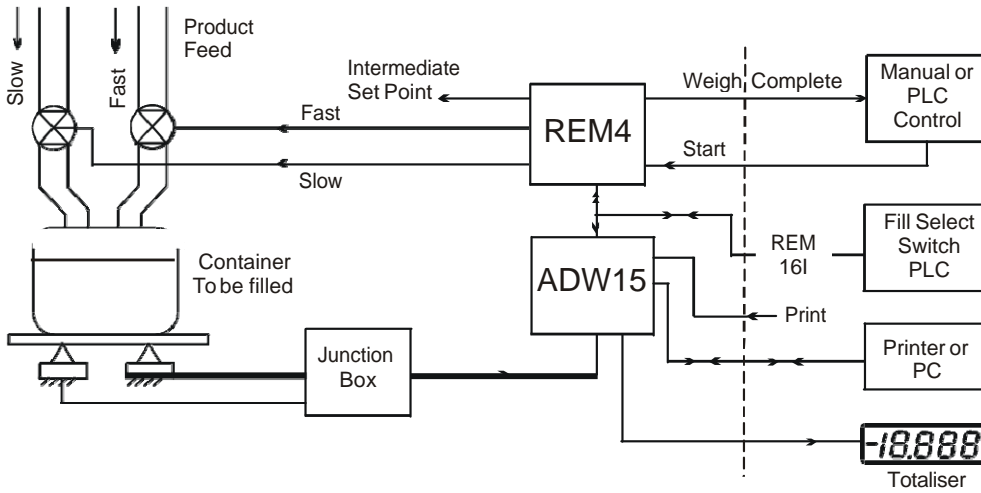
Options for :-

Printer Communications

10 x Fill Selections switching

Totaliser Output

Fast Filler Application



Application

To control high speed, high accuracy filling by weight. Either in a stand alone mode or in conjunction with a PLC.

Operation

On receipt of the start fill signal weightment is autotared, and the relay contacts for fast and slow speed are closed. The system is optimised by a routine to ensure that, fast feed is held as long as possible. In-flight compensation is applied to the slow feed and automatically adjusted to minimise final error.

When preset values are reached, contacts turn off the fast and slow feeds.

The 'weight' complete signal is given when within pre selected setting values and time, Auto Tare will take place only when the value falls within the preset auto tare band.

Specifications & Order Codes

Operating Instructions for Fast Fill Weighing Systems ADW-FFW

Mnemonics Available

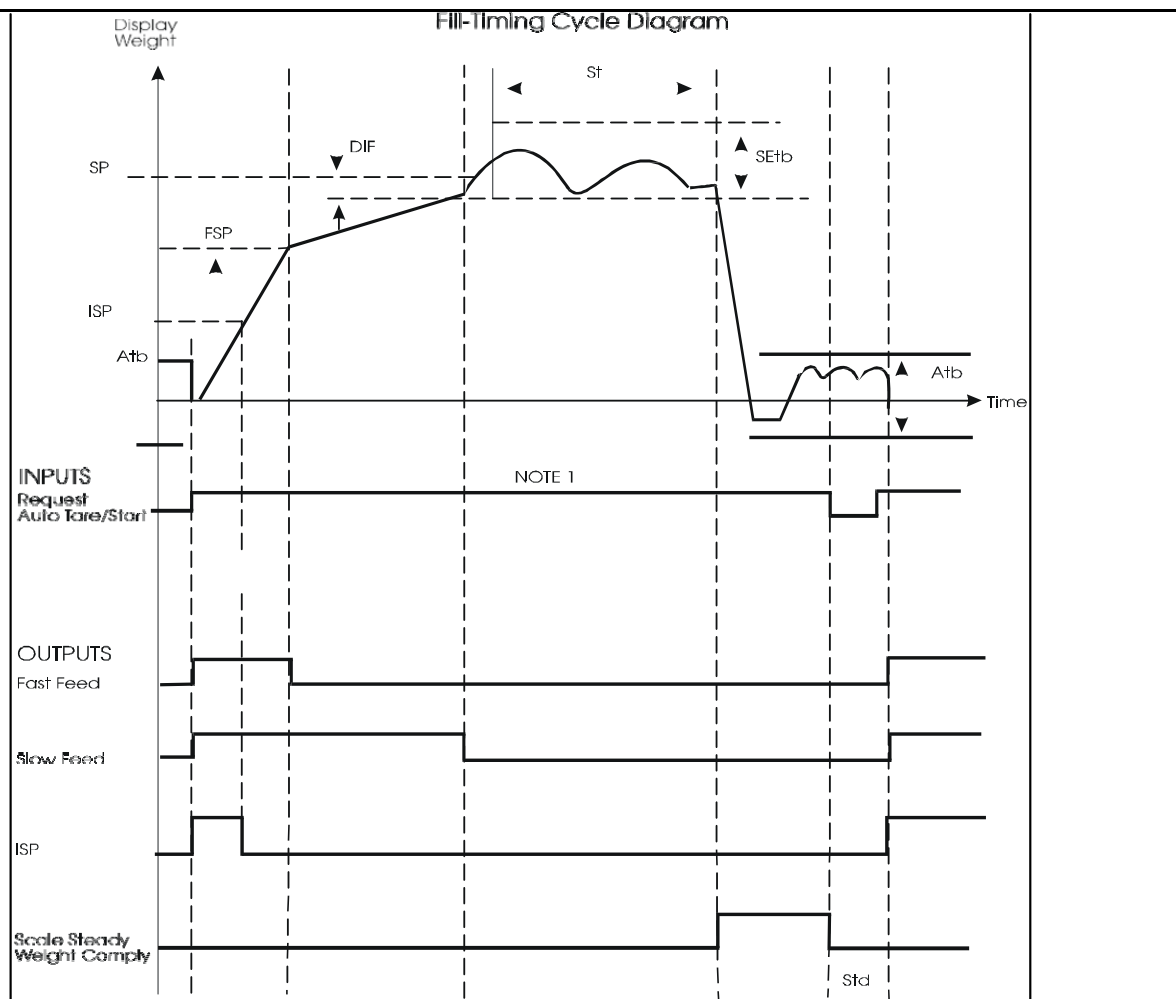
Code	Value	Display Range	Description
rEC	-	1 to 10	Current fill selectable (recipe) if available
Pass	-	1111 as standard	Password (customer select as optional extra)

tsp	Eng terms	± 19,999	Target Set Point
diF	"	± 19,999	Default In Flight (on slow feed)
	"		
FSP		0 to 19,999	Fast Feed Set Point
ot	"	0.0 to 25.5	Optimization Time (target slow feed)
	"		
	seconds		

Above selected for current fill (recipe).

IFS	-	0 - 25	Number of In Flight error samples
IFP	%	0 - 100	In Flight Gain adjustment
OtP	%	0 - 100	Gain of Fast Feed Set Point
SEtb	Eng terms	± 19,999	Settle band for scale steady
St	Seconds	0 - 25.5	Scale steady settle time
Std	Seconds	0-25.5	Start delay for start contact to Fast & Slow feed output energising
POdF	Division	0-19999	Divides totalised pulse output by value set
POd	m Seconds	1-255	Pulse output duration, sets the mark/space ratio of pulse output

Atb	Eng terms	0-19,999	Auto Tare Band
ISP	"	± 19999	Intermediate Set point
CALL	"	± 19,999	Low Calibration value
CALH	"	± 19,999	High Calibration value
dA	"	0 to 7	Display Averaging + Display freeze at weightment complete (7 = 10mS update)
	"	8 to 31	Display Averaging with no Display freeze function on weightment complete
	-	16 or Greater	Sets a NON Latching Intermediate Set Point
dP		0 to 5	Decimal Point position
CP		0 to 129	Comms Protocol
	-	0 - 127 Printer	
	-	128 MANTRABUS	
	-	129 ASCII	
SDST/Lab		0 - 254	Selects serial device station number or label type for printer
Ln	-	0 - 19,999	Log number for printer
rS	-	0 - 255	Set Display resolution



NOTE : If the 'START' input is released before filling is complete, the fill cycle is aborted

Supplement To be Read in Conjunction with ADW15 User Manual

Brief Description

Hardware is based on ADW15 with fast update (10.5mS per conversion), A/D convertor and 4 relay outputs for fast feed, slow feed, control and 2 additional outputs and inputs for status indication and control, normally for use with a PLC.

NOTE: J3 uses a volt free contact.

Operational Outline

There are 2 outputs, one is for fast feed, and the 2nd for slow feed. In order to optimise the fill time, there is a system optimisation routine to ensure fast feed is held as long as possible.

There is In Flight Compensation applied to the slow feed. This is automatically adjusted to minimise final error. Auto tare check function to ensure weigh scale is clean and not drifting.

Recipes (Using Optional Rem16I)

Up to 10 recipes can be set and stored in a non volatile memory using a one of 10 position rotary switch for a recipe selection and ADW keypad to set the following individual parameters for each recipe.

Mnemonic	Description
(tSP)	Target set point in engineering units
(DIF)	Default In Flight compensation value set in engineering units. This value is the initial value at which the slow feed drops out in respect to the set point
(FSP)	Fast feed set point. This value is the initial value at which the fast feed drops out.
(OT)	Optimisation time set in seconds. This value is the target slow feed time.

All other user programmable data is common to all recipes.

(Operation of recipe select switch during a fill cycle will not cause recipe to change until completion of that cycle.)

There is a keypad check of recipe number in use. This is achieved by one press of the scroll button giving the mnemonic (rEC) followed by the current recipe number. This operation can be carried out by the operator at any time without having to enter the password. All other keypad operation required password entry first.

Recipe data is stored in EEPROM, pre set values are always used on power up. Default In Flight and default optimisation band will be automatically changed during operation by controller calculations. These updated values can be checked during operation. Storage can be achieved by pressing the b button while viewing, this will then update the current displayed value to EEPROM.

Scale Steady/Weight Complete (No Motion Condition)

A contact output is given when a scale steady state is achieved. This is determined by checking, after slow feed relay has turned off, for a display reading to stay within a preset settling band (SEtB) for the preset scale steady time (St). If the error band is exceeded during the preset time, the timer is re-started, the current value logged and the future values checked against this over the time period, If none of the measured values exceed the settle band value during this time, then the scale steady/weightment complete relay signal is given. Once this signal has been issued, the settled value is held on the display until either the a key is pressed, or the 'Start Fill' signal is lost.

Automatic In Flight Compensation

This applies to slow feed set point value and will cut feed off early as determined by the In Flight value set. The starting value will be the default determined by the In Flight value set for that recipe. On the 1st cycle the controller will operate with this and will only make an adjustment when the number of preset In Flight error samples (IFS) have been achieved, . This is calculated by averaging the error over the last number or preset cycles and then multiplying the error by the In Flight gain adjustment (IFP), the result of which is added /subtracted to/from the current default In Flight value.

System Optimisation

The function of this routine to speed up the fill cycle as much as is judged possible. This is achieved by monitoring the time duration of slow fill and using this data along with slow fill optimisation time (OT). A gain adjustment on the optimisation is available using (otP) Optimisation is carried out after every cycle.

Auto Tare

Auto tare will only take place when 'Start Fill' input is present and the resultant auto tare value falls within the preset auto tare band (ATB) with respect to the original auto calibration zero. This prevents large build up of material and traps large strain gauge drift with time which could cause gradual wind up to a very large value. Scale steady/weightment complete output will be dropped off and fast and slow feed relays will be activated to start fill cycle. Whilst the unit is waiting to auto tare, i.e. from the time scale steady has been established until the unit has completed an auto tare. The averaging shall be fixed to a (dA) of 2 (16 readings) irrespective of (dA) value set. The 'Start Fill' input must be maintained throughout the filling operation otherwise the mix will be aborted. The start fill input can be removed after scale steady has been reached.

General

Other functions such as auto calibration, decimal point setting, printer management and communications, keypad function and display are as standard ADW15.

An additional output providing and intermediate set point set by (ISP) is available on relay 3. This functions as and on/off set point.

Input 1 is available for custom specials

Input 2 is used for 'Start Fill' contact

(dA) sets the measurement speed only when the unit is filling the bag. Otherwise, the (dA) of the unit is fixed to 2.

The Strain Gauge Input

The ADW-FFW offers a direct connection to most low level (foil) strain gauge sensors.

The following example is for calibration of a strain gauge.

A 10 volt excitation is provided and it is monitored to compensate for any variation due to supply drift, load regulation or voltage drop in the cable between the sensor and the ADW-FFW.

The maximum supply current is 150mA which allows for the connection of 4 x 350 Ohm strain gauges.

Strain gauge sensitivity is preset via DIL switches to 0.5, 0.8, 1.0, 1.25, 1.5, 2.0, 2.5, 3.5, 5, 10, 20, 50, 100 and 200mV/V. Select the next value higher than the strain gauge output maximum.

SW1 mV/V	1	2	3	4	5	6	7	8
0.5	X	-	-	X	-	X	X	X
0.8	-	X	X	-	-	X	X	X
1.0	-	X	-	X	-	-	X	-
1.25	-	X	-	-	-	-	-	X
1.5	-	-	X	X	X	-	-	-
2.0	-	-	X	-	X	-	-	X
2.5	-	-	X	-	-	-	-	-
3.5	-	-	-	X	X	-	-	-
5.0	-	-	-	X	-	-	-	X
10.0	-	-	-	-	X	-	-	X
20.0	-	-	-	-	-	X	-	X
50.0	-	-	-	-	-	-	X	X
100.0	-	-	-	-	-	-	-	X
200.0	-	-	-	-	-	-	-	-

x = ON - = OFF mV/V nominal full range gain within ±3%

Hardware Configuration

The ADW-FFW is supplied set to ±2.5mV/V maximum output. To check that the strain gauge and application is within this range, apply the following formula:

$$\frac{\text{Maximum load (weight)} \times \text{strain gauge output voltage}}{\text{Strain gauge rated range}}$$

If the resultant figure is ± 2.5 mV/V, or less, then auto calibration is carried out.

If it is greater. Select a higher setting with the DIL switch as necessary.

Before any calibration can be set, it will be necessary to decide upon the calibration values and place the decimal point in the appropriate position. To do this, scroll through the parameters, entering the password as appropriate (as described in Chapter 3), until the decimal point parameter is reached (dP-r). Once the decimal point is set, the auto calibration parameters can be set in real engineering terms.

Auto Calibration

Connect the strain gauge, switch on the ADW-FFW. The display will light up. Allow a warm up period of 10 minutes before carrying out the procedure as follows;

Press the **[G]** key until PASS appears.

- a) Enter the password using **[▶]** and **[▲]** keys, then press **[G]** key.
- b) Keep pressing the **[G]** key until CALL (Cal Low) appears.
- c) Press the **[▶]** key and check that the program light flashes.*

IMPORTANT NOTE: Always ensure that the programmer indicator flashes, even though the displayed value may not need to change.

Check that the displayed value agrees with the low calibration weight applied to the strain gauge (this may be zero).

If this is not correct, alter the display value by pressing the **[▶]** & **[▲]** keys.

Ensure that the strain gauge is free from disturbance and press the **[G]** key to capture and calibrate the CALL value. CALH (Cal High) now appears on the display.

- e) Press the **[▶]** key and check that the program light flashes.

Apply the known higher value weight.

Check that the displayed value agrees with the high calibration weight applied to the strain gauge.

If this is not correct, alter the display value by pressing the **[▶]** & **[▲]** keys.

Ensure that the strain gauge is free from disturbance and press the **[R]** key. The display will now indicate the strain gauge auto calibrated high value.

Note 1: The Calibration value is not entered into the memory until either the **[G]** key or the **[R]** key is pressed.

Note 2: CALH must always be greater than CALL.

Note 3: Pressing the **[R]** key at any time will return the display to normal operation.

Note 4: For best accuracy and resolution, the calibration weight should be approximately 75% of the strain gauge capacity.

Note 5: For range check before Autocal, set CAL H to 0 and display will be $\pm 2.5\text{mV/V} = \pm 19999$ display.

Note 6: CALH can be set before CALL if required.

Note 7: CALH and CALL can be programmed individually with any time period between provided that **[R]** reset key is pressed to store the value.

Calibration

If calibration is undertaken after power up and before a 'Start Fill' has been issued or after a reset or after the scale steady has been established, then calibration value will be taken with a fixed (dA) of 2 i.e. averaged over 16 A/D readings.

If however, a 'Start Fill' has been issued and the slow feed relay is still on, then the calibration shall be undertaken with the measurement speed set by (dA).

Software Reference - ADW/FFW

Options

An optional pulse output is available at the completion of each weightment, giving 1 pulse for each display digit. This can be divided by the value set in PODF pulse output division factor. This offers the opportunity for the system user to record the total amount of material weighed, in a given period.

This pulse output is a cmos output with a selectable pulse width of between 1 and 255 m seconds. The output is connected across the ADW analogue output terminals AN OP \pm .

Printer

The display value can be printed at any given time, when not in the menu, by pressing the b key, followed with 1 second by the d key.

If the print contact (Reset) is closed during the fill cycle, then on 'weightment complete' the weight obtained for that cycle will be printed. Therefore by connecting the 'Reset' contact to the start contact, an automatic print out of the resultant weight can be achieved.

Amendments to Chapter 7 - ADW15 Manual

ADW/FFW Communications Commands/Mnemonics

Command No.

DEC	HEX	Description	
1	1	REQUEST ALL VARIABLES	(AS ADW15)
2	2	REQUEST DISPLAY DATA	(AS ADW15)
3	3	INHIBITED. RETURNS A 'NAK'	(rEC)
4	4	UPDATE TARGET SET POINT	(TSP)
5	5	UPDATE DEFAULT IN-FLIGHT	(DIF1)
6	6	UPDATE FAST SET POINT	(FSP)
7	7	UPDATE OPTIMISATION TIME	(OT)
8	8	UPDATE IN FLIGHT SAMPLES	(IFS)
9	9	UPDATE IN FLIGHT PERCENT	(IFP)
10	A	UPDATE OPTIMISATION GAIN	(OPT)
11	B	UPDATE SETTLE BAND	(SETB)
12	C	UPDATE SETTLE TIME	(ST)
13	D	UPDATE START RELAY	(Sdt)
14	E	UPDATE PULSE OUTPUT DIVISION FACTOR	(POdF)
15	F	UPDATE PULSE OUTPUT DURATION	(pod)
16	10	UPDATE AUTO TARE BAND	(ATB)
17	11	UPDATE INTERMEDIATE SET POINT	(ISP)
18	12	INHIBITED. RETURNS A 'NAK'	(A/D CALL)
19	13	INHIBITED. RETURNS A 'NAK'	(A/D CALH)
20	14	INHIBITED. RETURNS A 'NAK'	(CALL)
21	15	INHIBITED. RETURNS A 'NAK'	(CALH)
22	16	UPDATE DISPLAY AVERAGING	(DA)
23	17	UPDATE DECIMAL POINT	(DP)
24	18	INHIBITED. RETURNS A 'NAK'	(CP)
25	19	INHIBITED. RETURNS A 'NAK'	(LAB/SDST)
26	1A	INHIBITED. RETURNS A 'NAK'	(LN)
27	1B	UPDATE DISPLAY RESOLUTION (rS)	(RS)
28	1C	EEPROM ENABLE/DISABLE	

Response to Command 1 from ADW

Byte

1	Station number	
2, 3	DISPLAY	
4, 5	RECIPE	(REC)
6, 7	TARGET SET POINT	(TSP)
8, 9	DEFAULT IN FLIGHT	(DIF)
10, 11	FASTSET POINT	(FSP)
12, 13	OPTIMISATION TIME	(OT)
14, 15	IN FLIGHT SAMPLES	(IFS)
16, 17	IN FLIGHT PERCENT	(IFP)
18, 19	OPTIMISATION GAIN	(OTP)
20, 21	SETTLE BAND	(SETB)
22, 23	SETTLE TIME	(ST)
24, 25	START DELAY TIME	(Sdt)
26, 27	PULSE OUTPUT DIVISION FACTOR PULSE OUTPUT	(POdF)
28, 29	DURATION	(pod)
30, 31	AUTO TARE BAND	(ATB)
32, 33	INTERMEDIATE SET POINT	(ISP)
34, 35	A/D CAL LOW VALUE	(A/D ACALL)
36, 37	A/D CAL HIGH VALUE	(A/D ACALH)
38, 39	DISPLAY VALUE FOR CAL LOW	(CALL)
40, 41	DISPLAY VALUE FOR CAL HIGH	(CALH)
42, 43	DISPLAY AVERAGING	(DA)
44, 45	DECIMAL POINT	(DP)
46, 47	COMMS PROTOCOL	(CP)
48, 49	STATION NUMBER	(LAB/SDST)
50, 51	SEE PAGE 10, RELAY STATUS RETURNED FROM COMMAND 1 BYTES 48, 49	
52, 53	DISPLAY RESOLUTION	(RS)
54	EEPROM ENABLE/DISABLE FLAG	
55	NULL	
56	EXOR CHECKSUM OF THE ABOVE DATA	

Response to Command 2

Byte

1	Station number
2	DISPLAY READING MSB
3	DISPLAY READING MSB
4	EXOR CHECKSUM OF THE ABOVE DATA

ASCII Format

NOTE - For Operation see ADW15 Manual

Labels	Description
DISP	REQUEST DISPLAY READING
TSP	TARGET SET POINT
DIF	DEFAULT IN FLIGHT
FSP	FAST SET POINT
OT	OPTIMISATION TIME
IFS	IN FLIGHT SAMPLES
IFP	IN FLIGHT PERCENT (GAIN)
OPT	OPTIMISATION PERCENT (GAIN)
SETB	SETTLE BAND
ST	SETTLE TIME
SDT	START DELAY TIME
POdF	PULSE OUTPUT DIVISION FACTOR
ATB	AUTO TARE BAND
ISP	INTERMEDIATE SET POINT
DA	DISPLAY AVERAGES (DA)
DP	DECIMAL POINT (DP)
DROM	ENABLE EEPROM AND READ FROM IT
ERWR	ENABLE EEPROM AND WRITE TO IT

Relay Status Returned From Command 1 Bytes 48, 49

Bit Number	Function
1	FAST RELAY ON
2	SLOW RELAY ON
3	INTERMEDIATE SETPOINT RELAY ON
4	WEIGHTMENT COMPLETE
5	NOT USED
6	NOT USED
7	NOT USED
8	START CONTACT CLOSED

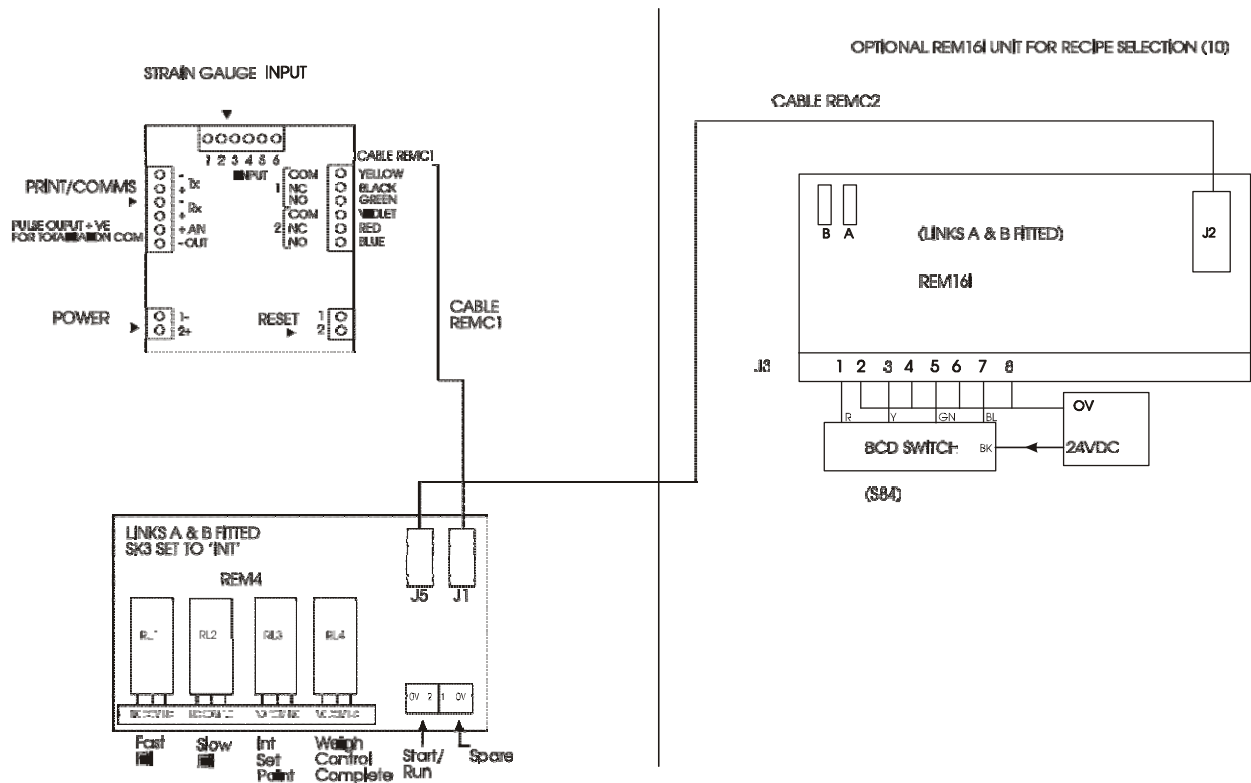
Instrument Setup Record Sheet

Product
Product Code
Serial No
Tag No
Date
Location
Measurement type, range & engineering units
Communication / Baud Rate

FFW	Value
rEC	
PASS	
tSP	
dIF	
FSD	
Ot	
IFS	
IFP	
OtP	
SEtb	
St	
Sdt	
POdF	
POd	
Atb	
SP	
CALL	
CALH	
dA	
dP	
CP	
SdSt or LAb	
Ln	
rS	

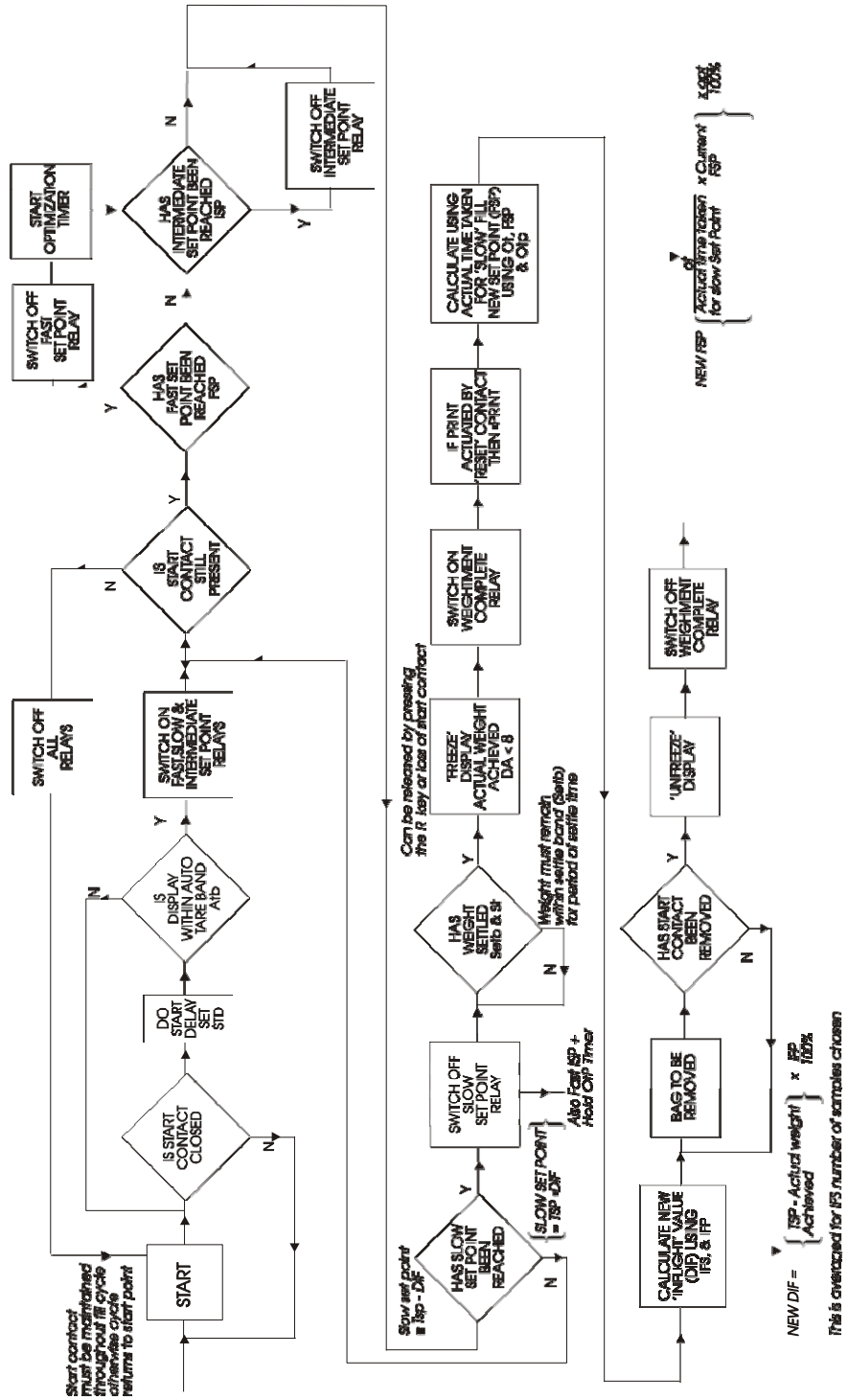
ADW15 - Fast Fill by Weight V3.0

IMPORTANT NOTE: Do NOT connect cables REMC1 and REMC2 with power applied to the ADW15



ADW15-Fast Fill by Weight Procedure

ADW15 - FAST FILL BY WEIGHT PROCEDURE



WARRANTY

All ADW products from Mantracourt Electronics Ltd., ('Mantracourt') are warranted against defective material and workmanship for a period of (3) three years from the date of dispatch.

If the 'Mantracourt' product you purchase appears to have a defect in material or workmanship or fails during normal use within the period, please contact your Distributor, who will assist you in resolving the problem. If it is necessary to return the product to 'Mantracourt' please include a note stating name, company, address, phone number and a detailed description of the problem. Also, please indicate if it is a warranty repair.

The sender is responsible for shipping charges, freight insurance and proper packaging to prevent breakage in transit.

'Mantracourt' warranty does not apply to defects resulting from action of the buyer such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorised modification.

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Any corrective maintenance required after the warranty period should be performed by 'Mantracourt' approved personnel only.



In the interests of continued product development, Mantracourt Electronics Limited reserves the right to alter product specifications without prior notice.