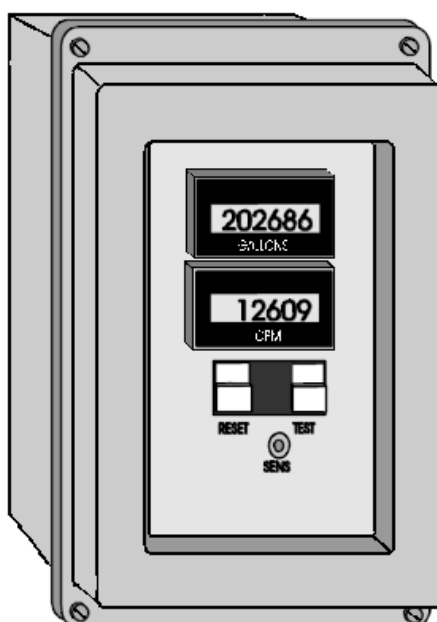


Model 45

Digital Flow Totalizer/Rate Indicator

USER'S MANUAL



HP-232
August 1995

HOFFER
Flow Controls

Perfecting Measurement™

107 Kitty Hawk Lane • P.O. Box 2145 • Elizabeth City, NC 27909
1-800-628-4584 • (252) 331-1997 • Fax (252) 331-2886
www.hofferflow.com email: info@hofferflow.com

Notice

HOFFER FLOW CONTROLS, INC. MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

This manual has been provided as an aid in installing, connecting, calibrating, operating, and servicing this unit. Every precaution for accuracy has been taken in the preparation of this manual; however, HOFFER FLOW CONTROLS, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that may result from the use of the products in accordance with information contained in the manual.

HOFFER FLOW CONTROLS' policy is to provide a user manual for each item supplied. Therefore, all applicable user manuals should be examined before attempting to install or otherwise connect a number of related subsystems.

During installation, care must be taken to select the correct interconnecting wiring drawing. The choice of an incorrect connection drawing may result in damage to the system and/or one of the components.

Please review the complete model number of each item to be connected and locate the appropriate manual(s) and/or drawing(s). Identify all model numbers exactly before making any connections. A number of options and accessories may be added to the main instrument, which are not shown on the basic user wiring. Consult the appropriate option or accessory user manual before connecting it to the system. In many cases, a system wiring drawing is available and may be requested from HOFFER FLOW CONTROLS.

This document contains proprietary information, which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of HOFFER FLOW CONTROLS, INC.

HOFFER FLOW CONTROLS' policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering. The information contained in this document is subject to change without notice.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the Hoffer Flow Controls Customer Service Department, telephone number (252) 331-1997 or 1-800-628-4584. BEFORE RETURNING ANY PRODUCT(S) TO HOFFER FLOW CONTROLS, PURCHASER MUST OBTAIN A RETURNED MATERIAL AUTHORIZATION (RMA) NUMBER FROM HOFFER FLOW CONTROLS' CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned RMA number should then be marked on the outside of the return package and on any correspondence.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS OR CALIBRATIONS, consult HOFFER FLOW CONTROLS for current repair/calibration charges. Have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

LIMITED WARRANTY

HOFFER FLOW CONTROLS, INC. ("HFC") warrants HFC's products ("goods") described in the specifications incorporated in this manual to be free from defects in material and workmanship under normal use and service, but only if such goods have been properly selected for the service intended, properly installed and properly operated and maintained. This warranty shall extend for a period of one (1) year from the date of delivery to the original purchaser (or eighteen (18) months if the delivery to the original purchaser occurred outside the continental United States). This warranty is extended only to the original purchaser ("Purchaser"). *Purchaser's sole and exclusive remedy is the repair and/or replacement of nonconforming goods as provided in the following paragraphs.*

In the event Purchaser believes the goods are defective, the goods must be returned to HFC, transportation prepaid by Purchaser, within twelve (12) months after delivery of goods (or eighteen (18) months for goods delivered outside the continental United States) for inspection by HFC. If HFC's inspection determines that the workmanship or materials are defective, the goods will be either repaired or replaced, at HFC's sole determination, free of additional charge, and the goods will be returned, transportation paid by HFC, using the lowest cost transportation available.

Prior to returning the goods to HFC, Purchaser must obtain a Returned Material Authorization (RMA) Number from HFC's Customer Service Department within 30 days after discovery of a purported breach of warranty, but no later than the warranty period; otherwise, such claims shall be deemed waived. See the Return Requests/Inquiries Section of this manual.

If HFC's inspection reveals the goods are free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, HFC will notify the purchaser in writing and will deliver the goods back to Purchaser upon (i) receipt of Purchaser's written instructions and (ii) the cost of transportation. If Purchaser does not respond within thirty (30) days after notice from HFC, the goods will be disposed of in HFC's discretion.

HFC does not warrant these goods to meet the requirements of any safety code of any state, municipality, or other jurisdiction, and Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any HFC goods or parts thereof, which have been repaired outside HFC's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with HFC's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such goods.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. HFC SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE RESULTING, DIRECTLY OR INDIRECTLY, FROM THE USE OR LOSS OF USE OF THE GOODS. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, THIS EXCLUSION FROM LIABILITY EMBRACES THE PURCHASER'S EXPENSES FOR DOWNTIME OR FOR MAKING UP DOWNTIME, DAMAGES FOR WHICH THE PURCHASER MAY BE LIABLE TO OTHER PERSONS, DAMAGES TO PROPERTY, AND INJURY TO OR DEATH OF ANY PERSONS. HFC NEITHER ASSUMES NOR AUTHORIZES ANY PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OR USE OF HFC'S GOODS, AND THERE ARE NO ORAL AGREEMENTS OR WARRANTIES COLLATERAL TO OR AFFECTING THE AGREEMENT. *PURCHASER'S SOLE AND EXCLUSIVE REMEDY IS THE REPAIR AND/OR REPLACEMENT OF NONCONFORMING GOODS AS PROVIDED IN THE PRECEDING PARAGRAPHS. HFC SHALL NOT BE LIABLE FOR ANY OTHER DAMAGES WHATSOEVER INCLUDING INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.*

TABLE OF CONTENTS

SECTION	I	INTRODUCTION AND SPECIFICATIONS
SECTION	II	INSTALLATION
SECTION	III	CALIBRATION
SECTION	IV	OPERATION
SECTION	V	MAINTENANCE AND MAIN SCHEMATIC

SECTION I

MODEL 45 ADDENDUM

1. PULSE OUTPUT OPTION IS NOT BATTERY BACKED UP.
ON POWER FAIL UNIT WILL GIVE LOCAL INDICATION ONLY.
2. FOR PULSE OUTPUTS, USER MUST SPECIFY MAXIMUM COUNT SPEED.
IF NOT SPECIFIED, UNIT IS SHIPPED FOR 10KHz COUNT RATE.

MODEL 45 DIGITAL FLOW TOTALIZER/RATE INDICATOR (REV. A 10/85)

The Model 45 is a Remote Flow Totalizer or Rate Indicator, which provides a six digit liquid crystal display for readout in user desired increments. The Model 45 may be integrally mounted on a turbine flowmeter in remote locations.

The Model 45 conditions the low level signal from a turbine flowmeter or other suitable pulse generating transducer, while providing rejection of unwanted noise and spurious signals. A signal threshold control is provided which allows the user to set the input sensitivity above the ambient noise level, thereby eliminating any false readout.

The Model 45 may be configured as a Flow Indicator capable of displaying a resettable Total and a non-resettable Accumulated Total Flow. Also the unit may be configured as a Totalizer with Rate Indication or in any of the above combinations.

Flow totalization is achieved by passing the pulse train generated by the flow transducer, into a pulse scaling network. The pulse scaling network is composed of the System Factor which multiplies the pulse rate by a preprogrammed number set into the digital rotary switch array. The output of the System factor represents a decimal multiple of the desired flow measurement units.

The pulse train is then fed into the System Factor Multiplier which effectively multiplies the pulse rate by either X1, X.1, X.01, X.001 or X.0001, depending on switch position.

The scaled pulse train is inputted to a drive stage which will increment the totalizer in the desired units of readout.

Rate indication is achieved by use of an internal time base, which generates strobe pulses which will latch and reset the Display. The time base is used in conjunction with the System Factor switches and to provide the required pulse scaling for desired units of flow rate measure.

SPECIFICATIONS

INPUT POWER	Power options include. 110/220 VAC 50/60 Hz user selectable. 8 to 30 VDC at 10mA, reverse polarity protected, input filtered with battery backup.
INPUT SIGNAL	Input filtered, RF and Bandpass filtered. Adjustable trigger level 10 millivolt RMS (minimum) 10Hz to 1000Hz. Over voltage capability 120V RMS (absolute). Input impedance 40 kilo ohm (nominal). Optional Input: Form C contact closure input from relay or other suitable device.
TOTAL/RATE DISPLAYS (LCD)	Type 6 digit liquid crystal display (LCD) Character height 0.35 inches. Viewing area 1.65 X .57 inches Leading zero blanking.
PULSE SCALING CAPABILITY	System factor and System Factor Multiplier provide a cascaded chain of two scaling factors. The System Factor provides scaling factors from X.0000 to X.9999 with four rotary type DIP switches in .0001 increments. The System Factor Multiplier provides additional scaling factors of X1, X.1, X.01, X.001 or X.0001.
TIME BASE FOR RATE	Factory wired for either .6 seconds or 1 second, depending on user application.
OUTPUT CHARACTERISTICS	Pulse Duration factory wired per requirement. OPEN COLLECTOR: type 2N6660 Vmax 60Vdc absolute maximum I _{max} 1.2A _{dc} absolute maximum TTL/CMOS: Logic 1 2.4Vdc @ - .800mA Logic 0 0.4Vdc @ 2.6mA CONTACT CLOSURE: SPDT Form C relay contact closure capable of switching resistive loads of .1 to 3.0 Amps at 28Vdc or 110Vac.

MINIFLOWMETER LINEARIZATION

METHOD	Frequency injection of offset frequency with divide by 5 post scaling
OFFSET FREQUENCY	00.0 to 99.9 Hz.
ENVIRONMENTAL	Operating temperature 0 to 50 C Storage temperature -20 to 60 C Available in NEMA 4 Standard. Explosion proof Class I, Div. I, Group C, D (optional).

CONTROLS AND ADJUSTMENTS

SENSITIVITY	A single turn control used to set the trigger level above the noise level.
SYSTEM FACTOR	A switch array composed of four rotary DIP switches which are used to enter the desired scaling factor. Used in conjunction with the System Factor Multiplier.
SYSTEM FACTOR MULTIPLIER	A DIP switch used to enter the desired System Factor Multiplier. Used in conjunction with system factor switches.
RATE/TOTAL	A DIP switch position used to configure the unit as a rate indicator or totalizer.
TEST	A SPDT spring return switch which when depress inputs a test frequency of 400 Hz into the unit for testing.
RESET	A SPDT spring return switch which is used to reset the totalizer to zero.
FUSE	A circuit protection device located on the main circuit board.
POWER SELECT SWITCH	A DPDT switch which enables the user to select line power of either 110 or 220Vac.
BATTERY TEST	A SPDT spring return switch with a green LED which when depressed will indicate life of battery.

MINIFLOWMETER LINEARIZATION

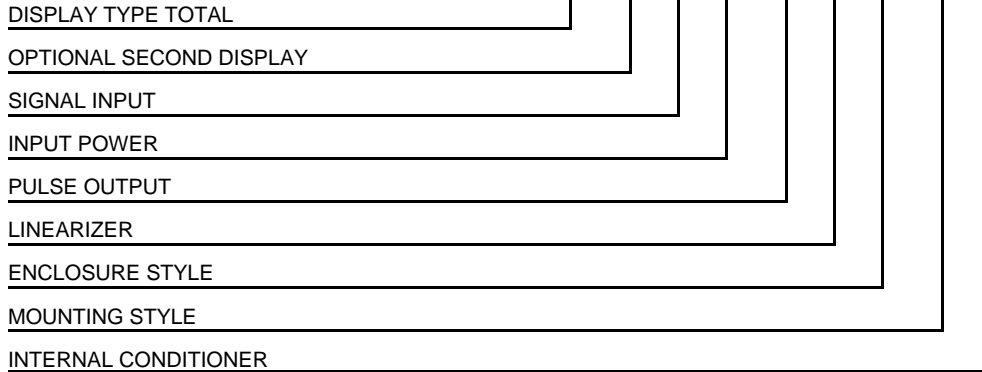
OFFSET FREQUENCY

Three thumbwheel switches on the PCA-93 circuit board used to input the equivalent offset frequency of the miniflow meter, 00.0 to 99.9 Hz.

ORDER INFORMATION

**MODEL 45
DIGITAL FLOW TOTALIZER/RATE INDICATOR (115 VAC AND 10-30 VDC) FOR FIELD INSTALLATION**

MODEL 45-(A)-(B)-(C)-(D)-(E)-(F)-(G)-(H)-(I)



DISPLAY TYPE TOTAL

MODEL 45-(A)-()-()-()-()-()-()-()-()

OPTION (A)

- (E) 6 DIGIT LCD
- (X) NO TOTAL (BLIND)

OPTIONAL SECOND DISPLAY

MODEL 45-()-(B)-()-()-()-()-()-()-()

OPTION (B)

- (E) 6 DIGIT LCD ACCUMULATOR WITH INTERNAL RESET
- (R) 6 DIGIT LCD RATE DISPLAY

SIGNAL INPUT

MODEL 45-()-()-(C)-()-()-()-()-()-()

OPTION (C)

- (1) PULSE INPUT (FOR MAGNETIC, TTL/CMOS OR A/C SQUARE WAVE)
- (2) CONTACT CLOSURE

INPUT POWER

MODEL 45-()-()-()-(D)-()-()-()-()-()

OPTION (D)

- (1) 115 VAC 50/60 HZ
- (2) 220 VAC 50/60 HZ
- (4) 10-30 VDC EXTERNAL

NOTE: WHEN INTERNAL BATTERY POWER REQUIRED, USE MODEL 46.

PULSE OUTPUT

MODEL 45-()-()-()-()-(E)-()-()-()-()

OPTION (E)

- (1) OPEN COLLECTOR SUITABLE FOR OPTO ISOLATOR DRIVE*
- (2) TTL/CMOS PULSE*
- (3) RELAY CONTACT CLOSURE*
- (4) MERCURY/WETTED RELAY

*NOTES: 1A. PULSE OUTPUT OPTION IS NOT BATTERY BACKED UP. ON POWER FAIL UNIT WILL GIVE LOCAL INDICATION ONLY.
1B. FOR PULSE OUTPUTS, USER MUST SPECIFY MAXIMUM COUNT SPEED. IF NOT SPECIFIED, UNIT IS SHIPPED FOR 10 KHZ COUNT RATE.

LINEARIZER

MODEL 45-()-()-()-()-()-()-()-()-()-()

OPTION (F)

(L) LINEARIZER (REQUIRED FOR MINI-FLOW)

ENCLOSURE STYLE

MODEL 45-()-()-()-()-()-()-()-()-()-()

OPTION (G)

(N) NEMA 4X FIBERGLASS (STANDARD)

(E) EXPLOSION-PROOF COMPLIANCES

MEETS NEC CLASS I, GROUPS E, F & G

CLASS II, UL STANDARD 886

CSA STANDARD (ADALET XJF-081004 W/XG30 WINDOW)

MOUNTING STYLE

MODEL 45-()-()-()-()-()-()-()-()-()-()

OPTION (H)

(W) WALL MOUNT (STANDARD)

(F) FLOWMETER MOUNT OPTION INCLUDES NEMA HUB AND FLOWMETER RISER

INPUT POWER

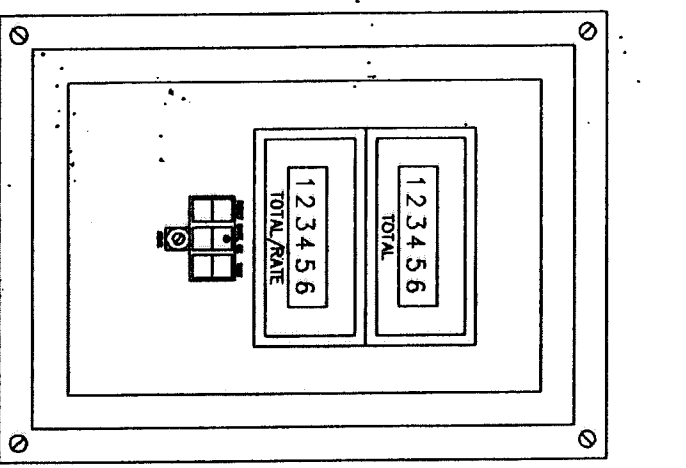
MODEL 45-()-()-()-()-()-()-()-()-()-()

OPTION (I)

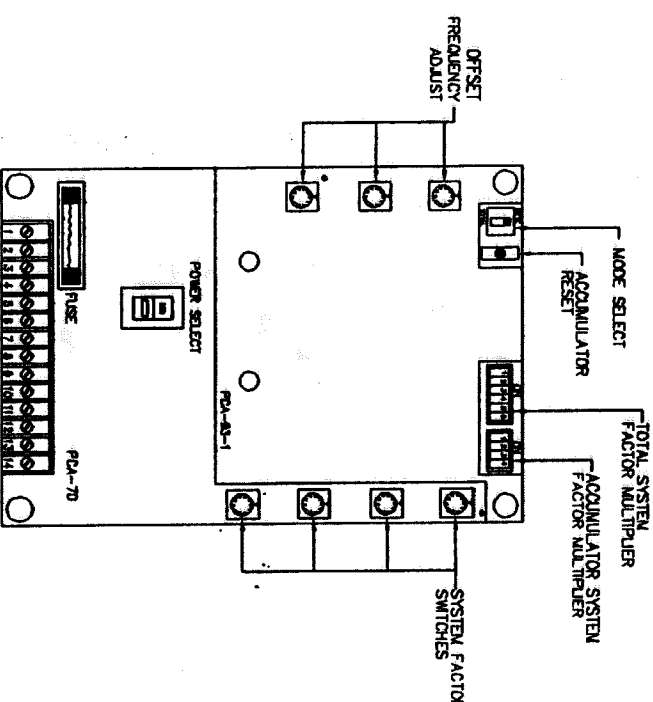
(IC) INTERNAL CONDITIONER

NOTE: INSERT (X) IN MODEL NUMBER FOR EVERY OPTION NOT SPECIFIED.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APP
A		REDRAWN	10/85	JD
B		REDRAWN ON CAD, DRAWING NO. WAS 43-401.	950829	JD



DOOR CLOSED



MULTIPLIER	1	2	3	4
X1	ON	OFF	OFF	OFF
X.1	OFF	ON	OFF	OFF
X.01	OFF	ON	ON	OFF
X.001	OFF	ON	OFF	ON
X.0001	OFF	ON	ON	ON

SWITCH DETAIL FOR SYSTEM FACTOR MULTIPLIER

MARK	DATE	DESCRIPTION
JD	7/85	PRODUCTION
JD	7/85	CHECK
JD	7/85	DRAWN

H HOFFER FLOW CONTROLS, INC
 ELIZABETH CITY, NC 27909

CONTROLS AND ADJUSTMENTS-
 MODEL 45

CASE CODE: 33321
 DWG NO: 700-0015
 SCALE: NONE

REV B
 SHEET 1 OF 1

SECTION II

FLOWMETER INSTALLATION

GENERAL

Proper application of the turbine flowmeter requires a suitable piping installation in order to achieve accurate and reliable operation.

The piping configuration immediately preceding and following the flowmeter is termed the meter run. Refer to the manufacturer's outline and installation instructions when installing the flowmeter and meter run.

RELATIVE - The performance of the turbine flowmeter is affected by fluid swirl and on uniform velocity profiles. The following recommendation will reduce such flow irregularities.

It is advisable not to locate the meter run immediately downstream of pumps, partially opened valves, bends or other similar piping configurations. In addition, the area surrounding the flowmeter should be free of sources of electrical noise such as motors, solenoids, transformers and power lines which may be coupled to the pickoff device.

The metering section should not be subjected to excessive vibration or shock. Such a condition may result in a mechanically induced output signal from the pickoff device.

METER RUN - In general, the meter run should be chosen to have the same inner diameter as the meter bore. A minimum of 10 pipe diameters of straight pipe up stream and 5 pipe diameters downstream are required. Where this optimum line configuration can not be implemented, it is advisable to install a flow straightener properly positioned upstream of the flowmeter. Orientation is not a critical factor, however, horizontal is a preferred orientation.

BYPASS RUN - A properly sized bypass run with suitable blocking valves may be equipped where an interruption in fluid flow for turbine meters servicing can not be tolerated.

STRAINER - A strainer, filter and/or air eliminator is recommended to reduce the potential of fouling or damage. See table for recommended mesh size.

On initial start-up of a line, it is advisable to install a spool piece purging the line to eliminate damaging the flowmeter, due to flux, tape, solder, welds or other contaminants carried along by the fluid stream.

CAVITATION - Cavitation causes measurement inaccuracies in turbine flowmeters and should be avoided by suitable line and operating configurations.

Whenever the pressure within a pipeline instantaneously falls below the equilibrium vapor pressure of the fluid, a portion of the fluid vaporizes and forms bubbles in the pipe line. This is termed cavitation. Cavitation is eliminated by maintaining adequate back pressure on the flowmeter. A downstream valve that provides the necessary back pressure is one means for preventing cavitation in the metering run. Control valves should be located downstream, if possible. Some installations may also make use of a vapor eliminator upstream of the flowmeter.

The minimum required back pressure may be estimated using the following equation:

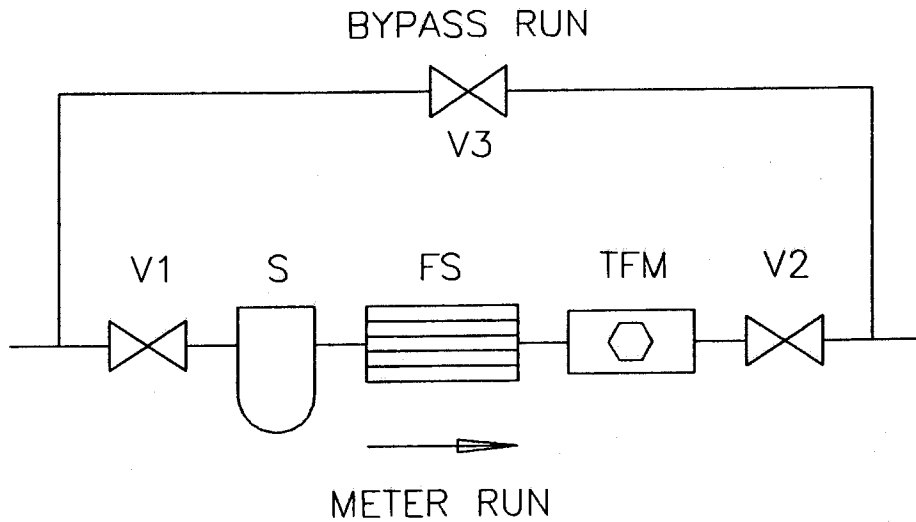
$$\text{Min: Back Pressure} = 1.25 \times \text{Vapor Pressure} + 2X \text{ Pressure Drop}$$

NOTES:

1. FACTORY RECOMMENDS 10" PIPE DIA. UPSTREAM AND 5 PIPE DIA. DOWNSTREAM OF SAME SIZE PIPE AS FLOWMETER. A FLOW STRAIGHTENER IS RECOMMENDED IF THIS IS NOT POSSIBLE OR FOR CUSTODY TRANSFER APPLICATIONS.

REVISIONS

REV	DESCRIPTION	DATE	APP
A	REDRAWN	1-31-92	
B	ADDED NOTE 2, CHG'D MESH SIZE	3-17-92	
C	DRAWING NO. WAS INSTL-104.	950907	<i>JG</i>

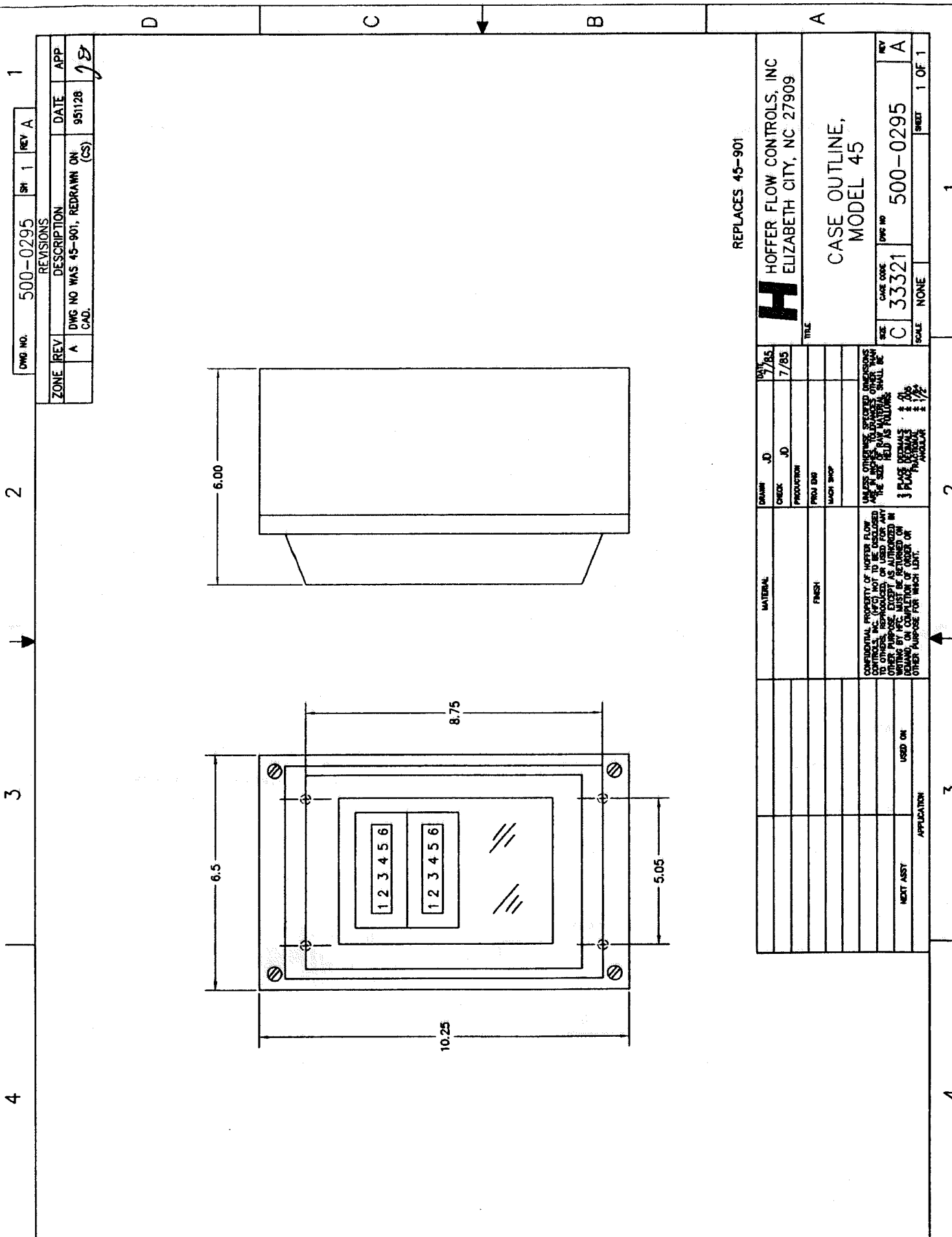


METER SIZE	MESH SIZE
MF SERIES	100
1/4" - 1/2"	100
5/8" - 1 1/4"	70
1 1/2" - 3"	40
4" - 12"	24

- V1, V2 BLOCKING VALVE
- S STRAINER
- FS FLOW STRAIGHTENER
- TFM TURBINE FLOWMETER
- V3 BYPASS VALVE

REPLACES INSTL-104

		MATERIAL	DRAWN DW	DATE 1-31-92	HOFFER FLOW CONTROLS, INC. ELIZABETH CITY, NC 27909	
			CHECK JD	1-31-92		
			QA H.COVELL	1-31-92		
		FINISH	PROJ ENG KRH	1-31-92		
		CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES OTHER THAN RAW MATERIAL SHALL BE HELD AS FOLLOWS: 2 PLACE DECIMAL ±.01 3 PLACE DECIMAL ±.005 FRACTIONAL ±1/64 ANGULAR ±1/2°		TITLE TYPICAL TURBINE INSTALLATION	
NEXT ASSY	USED ON		SIZE	CAGE CODE		DWG NO
APPLICATION			A	33321	500-0194	C
			SCALE	NONE	SHEET	1 OF 1



DWG NO. 500-0295		SHEET 1		REV A	
REVISIONS					
ZONE	REV	DESCRIPTION	DATE	APP	
	A	DWG NO WAS 45-901, REDRAWN ON CAD.	951128	JB	

REPLACES 45-901

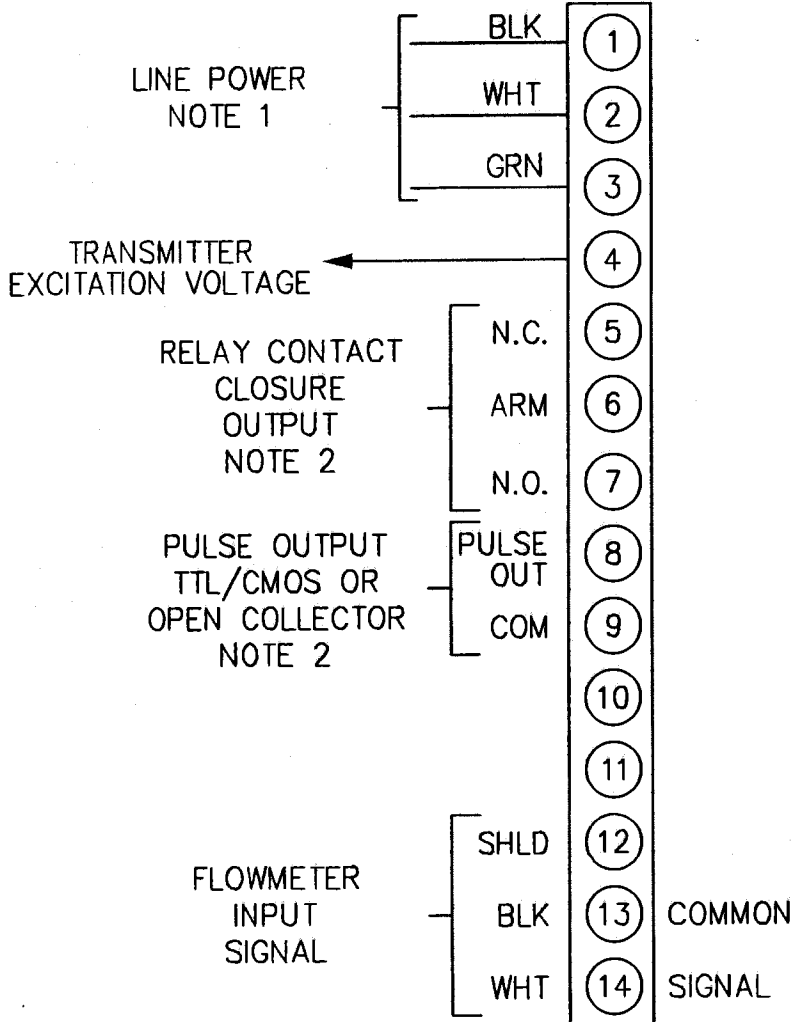
DRAWN		J.D.	DATE	7/85
CHECK		J.D.	DATE	7/85
PRODUCTION				
MATERIAL				
FINISH				
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS SHALL BE IN INCHES. DIMENSIONS SHALL BE TO CENTER UNLESS OTHERWISE SPECIFIED. TOLERANCES SHALL BE AS FOLLOWS:</p> <p>3 PLACE DECIMALS ± .005</p> <p>2 PLACE DECIMALS ± .010</p> <p>1 PLACE DECIMAL ± .015</p>				
<p>CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED OR USED FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN PERMISSION OF HFC. THIS DRAWING IS THE PROPERTY OF HFC AND IS TO BE RETURNED TO HFC UPON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH MADE.</p>				
NEXT ASST		USED ON		
APPLICATION				
TITLE		<p>H HOFFER FLOW CONTROLS, INC ELIZABETH CITY, NC 27909</p> <p>CASE OUTLINE, MODEL 45</p>		
SIZE	CASE CODE	DWG NO	REV	SHEET
C	33321	500-0295	A	1 OF 1
SCALE	NONE			

NOTES:

1. LINE POWER IS USER SELECTABLE BETWEEN 110VAC / 220VAC 50/60 Hz.
2. WIRE TO THESE TERMINALS ONLY REQUIRED IF OPTION IS SELECTED.

REVISIONS

REV	DESCRIPTION	DATE	APP
A	REDRAWN ON CAD, DRAWING NO. WAS 45-702. (CS)	950828	<i>JD</i>



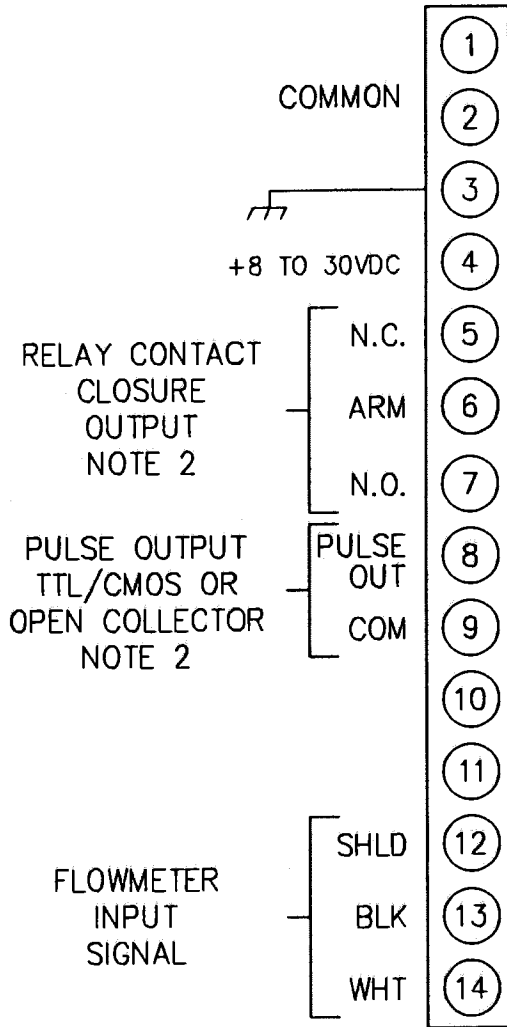
REPLACES 45-702

		MATERIAL	DRAWN JD	DATE 7/85	<p>HOFFER FLOW CONTROLS, INC. ELIZABETH CITY, NC 27909</p>
			CHECK		
			PRODUCTION		
		FINISH	PROJ ENG		TITLE
					INSTALLATION WIRING, 110/220VAC-MODEL 45
		CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES OTHER THAN RAW AS FOLLOWS: 2 PLACE DECIMAL ±.01 3 PLACE DECIMAL ±.005 FRACTIONAL ±1/64 ANGULAR ±1/2°		SIZE
NEXT ASSY	USED ON				
APPLICATION					DWG NO
					700-0012
					REV
					A
					SCALE
					NONE
					SHEET
					1 OF 1

NOTES:

- VOLTAGE FROM A DC SUPPLY MUST NOT EXCEED +30VDC OR UNIT WILL BE DAMAGED.
- WIRING TO THESE TERMINALS ONLY REQUIRED IF OPTION IS EQUIPPED.

REVISIONS			
REV	DESCRIPTION	DATE	APP
A	REDRAWN ON CAD, DRAWING NO. WAS 45-703. (CS)	950828	<i>J.D.</i>



REPLACES 45-703

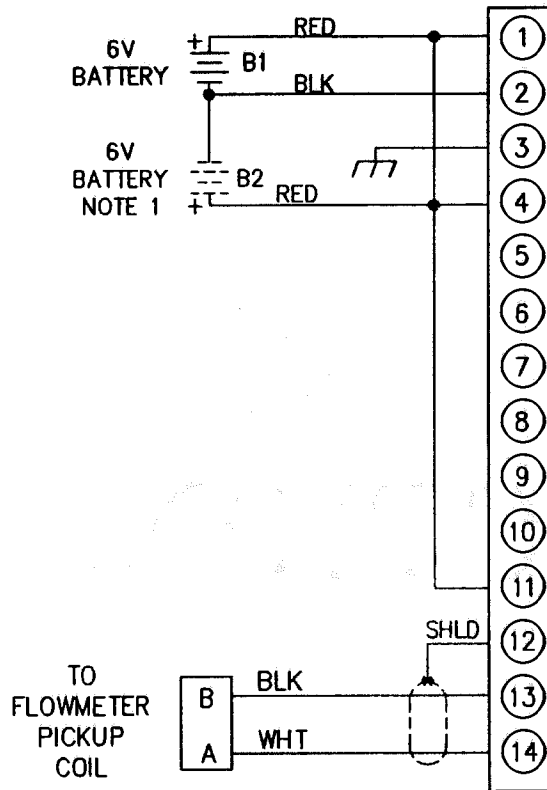
		MATERIAL	DRAWN JD	DATE 7/85	H HOFFER FLOW CONTROLS, INC. ELIZABETH CITY, NC 27909
			CHECK		
			PRODUCTION		
		FINISH	PROJ ENG		TITLE
					INSTALLATION WIRING, 8-30VDC-MODEL 45
		CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES OTHER THAN RAW MATERIAL SHALL BE HELD AS FOLLOWS: 2 PLACE DECIMAL ±.01 3 PLACE DECIMAL ±.005 FRACTIONAL ±1/64 ANGULAR ±1/2°		SIZE
NEXT ASSY	USED ON				
APPLICATION					DWG NO
					REV
					A 33321 700-0013 A
					SCALE NONE
					SHEET 1 OF 1

NOTES:


1. WHEN BATTERY TEST INDICATES BATTERY REPLACEMENT, THE NEW BATTERY MAY BE INSTALLED AS SHOWN. THIS PROCEDURE WILL MAINTAIN UNINTERRUPTED FLOW INDICATION ALONG WITH TOTAL FLOW.
2. DO NOT CONNECT TWO FULLY CHARGED BATTERIES, AS DAMAGE WILL OCCUR TO THE UNIT.

REVISIONS

REV	DESCRIPTION	DATE	APP
A	DWG NO WAS 45-701. REDRAWN ON CAD. (CS)	951128	JD



REPLACES 45-701

		MATERIAL	DRAWN JD	DATE 7/85	 HOFFER FLOW CONTROLS, INC. ELIZABETH CITY, NC 27909
			CHECK JD	7/85	
			PRODUCTION		
		FINISH	PROJ ENG		TITLE
					INSTALLATION WIRING, 6V BATTERY OPERATION - MODEL 45
		CONFIDENTIAL PROPERTY OF HOFFER FLOW CONTROLS, INC. (HFC) NOT TO BE DISCLOSED TO OTHERS, REPRODUCED, OR USED FOR ANY OTHER PURPOSE, EXCEPT AS AUTHORIZED IN WRITING BY HFC. MUST BE RETURNED ON DEMAND, ON COMPLETION OF ORDER OR OTHER PURPOSE FOR WHICH LENT.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES OTHER THAN RAW MATERIAL SHALL BE HELD AS FOLLOWS: 2 PLACE DECIMAL ±.01 3 PLACE DECIMAL ±.005 FRACTIONAL ±1/64 ANGULAR ±1/2°		SIZE
NEXT ASSY	USED ON				
APPLICATION					DWG NO
					REV
					A 33321
					700-0134
					A
					SCALE
					NONE
					SHEET
					1 OF 1

SECTION III

CALIBRATION AND SETUP OF DIGITAL FLOW TOTALIZER (LIQUID APPLICATION)

INTRODUCTION

In general, all Digital Flow Totalizers manufactured by Hoffer Flow Controls have a special feature which allows the user to scale the flow information into the desired units of measurement. This feature is termed the SYSTEM FACTOR and is composed of two arrays of switches.

By utilizing the SYSTEM FACTOR, the total flow may be indicated in gallons, pints, liters, barrels, cc's. On flow measurement systems which provide temperature compensation, the total flow may be in desired mass units (i.e., pounds, kilograms, etc.).

PROCEDURE

Begin by obtaining a copy of the calibration sheet for the flowmeter to be used with the Digital Flow Totalizer. Obtain the desired units of measurement from the project supervisor or equipment specification.

From the calibration sheet for the flowmeter obtain the MEAN K FACTOR in cycles/gallon, designate this as the K FACTOR. If the flowmeter is one of the Mini Flow (MF) Series, also obtain from the calibration sheet the offset frequency, F (OS).

Finally, note the maximum flow rate in desired units as R (MAX) in unit volumes/minute.

Compute the equivalent number of pulses per desired measurement unit, designated K' from the K FACTOR for the flowmeter and the conversion factor relating the gallons per user's desired measurement units. This may be done with the following equation and the aid of a conversion chart.

$$K' = K \text{ FACTOR} \times CF$$

WHERE

CF is the conversion factor equal to the ratio of the number of gallons per user chosen volume unit.

Example

Given: 200 pulses/gallon = K FACTOR
Desire units of measurement = Liters

Obtain: Conversion Factor CF = .2642 gallons/liter from Table

$$\begin{aligned} \text{Calculate: } K' &= 200 \times .2642 \\ &= 52.84 \frac{\text{Pulses}}{\text{Liter}} \end{aligned}$$

CALIBRATION AND SETUP OF DIGITAL FLOW TOTALIZER (CONTINUED)

SYSTEM FACTOR CALCULATION

For operation with standard, in-line, axial flowmeters.

Determine the SYSTEM FACTOR by the following equation

$$SF = \frac{1}{K'}$$

Example

$$S.F. = \frac{1}{52.84} = .0189251$$

For operation with the Mini Flowmeter Linearizer.

When the Mini Flowmeter Linearizer option is equipped a third switch matrix is used to enter the offset frequency for the Mini Flowmeter. The circuitry then linearizes the conditioned output signal from the Mini Flowmeter by the method of frequency injection of offset frequency.

Dial F (OS) into the thumbwheel switches located on the PCA-50 printed circuit card.

In addition, however, the method used to implement the Mini Flowmeter linearization requires a post scaling factor which must be accounted for in calculating the SYSTEM FACTOR. When the linearizer option is equipped use the following equation to calculate the SYSTEM FACTOR.

$$SF = \frac{5}{K'}$$

Concerning the SYSTEM FACTOR and SYSTEM FACTOR MULTIPLIER.

From the description given in the Controls and Adjustment Section, it may be observed that the SYSTEM FACTOR and SYSTEM FACTOR MULTIPLIER are used together as a scale factor to provide an indication of total flow in the user desired units.

It is important to consider how to best represent a required scale factor within the limitation of SYSTEM FACTOR and SYSTEM FACTOR MULTIPLIER.

CALIBRATION AND SETUP OF DIGITAL FLOW TOTALIZER (CONTINUED)

The SYSTEM FACTOR should be programmed with the largest number of significant figures which may be represented within the limitations of the switch array.

The SYSTEM FACTOR MULTIPLIER is then set to the position which results in the correct scale factor.

Example

S.F. = .0189251

Dial into SYSTEM FACTOR SWITCHES .1893.

SYSTEM FACTOR MULTIPLIER SWITCH to X.1 position.

SECTION IV

Section IV

INITIAL START-UP

On initial start-up of any new piping system, a high risk of damage to the turbine flowmeter exists until the piping has been flushed of debris from the process assembly. Perform any purging of the installation with a spool piece substituted for the turbine flowmeter.

Once the lines have cleared, reinstall the flowmeter and make all necessary connections to the pickup coil and/or the signal conditioner before applying power to the indicator.

Turn the power to the indicator "ON". Push the RESET, the display should read 00. With no flow, the display should not be incriminating.

If there are counts being generated, indicating flow, noise is being coupled into the unit. Slowly turn the "SENS" control on the model 45 (or the signal conditioner if one is used) counter clockwise until the false counting stops.

The unit is now ready to be put into service. Flow indication will commence upon flow through the flowmeter. The units of measurement are those that were established during the setup of the instrument.

PRINCIPLE OF OPERATION

A simplified block diagram of the Model 45 is given on drawing 45-601. Key functional blocks as well as flow information are designated. The basic operation of the system is as follows.

The frequency signal from the turbine flowmeter is connected to the Model 45 with a twisted pair shielded cable. The signal enters through the SENSITIVITY control which is used to reject unwanted noise by raising the trigger threshold above the background noise present.

The low level flowmeter signal is then passed through a signal conditioning chain where it is filtered, amplified and shaped into a train of digital pulses whose frequency is related to the volume flow rate and where each pulse represents a discrete volume of fluid.

If the Miniflowmeter linearizer option has been equipped the signal is then passed through the linearizer where the offset frequency signal is injected into it. For flow rates within the range of the meter, the linearized output will be linearly related to the volumetric flow rate. In addition, this circuitry divides the pulse train by five to reduce irregular pulse spacing.

The linear or linearized pulse train is then passed to the system factor which scales the signal for flow totalization while providing proper scaling for flow rate indication.

The pulse scaling circuitry composing of the system factor effectively multiplies the pulse rate by a number set into the rotary DIP switch array. The output of the system factor produces a pulse which represents a decimal multiple of the desired flow measurement units.

At the output of the system factor, each pulse represents a decimal multiple of the desired flow measurement units. The pulse train is then divided into two stages, where one stage is for total flow indication and the second stage is for rate indication or for a second total indication.

The pulse from the first stage is fed into the system factor multiplier which effectively multiplies the pulse rate by either 1, .1, .01, .001, or .0001 depending on the position selected on the corresponding switch.

At the output of the system factor multiplier each pulse represents one unit of flow in the desired measurement units.

This pulse then provides the required drive capabilities for the total display. This pulse also is diverted into a multivibrator which is factory wired to provide user specified pulse width output for the options of TTL/CMOS or OPEN COLLECTOR. Also the pulse is fed into drive circuitry for providing proper drive for the relay contact closure output.

ACCUMULATOR/RATE INDICATION OPTION

The pulse train coming out of system factor is fed into a second system factor which is used in conjunction with a TOTAL/RATE select switch. When the switch is in the total position the second display will become an accumulated total flow indicator, while disabling the time base.

Rate indication is accomplished by selecting the RATE option, this will take the pulse train coming from the system factor and directly feed it into the display. The time base will generate a 0.6 or 1.0 second time delay, then generate the latch pulse. The latch pulse will allow the display to update to the new flow rate value while erasing the previous. After generation of the latch pulse a reset pulse is then generated. The reset pulse clears the internal registers of the display so that a new count sequence can be started.

BATTERY TEST

For battery operation a battery test switch has been incorporated, so that when depressed a green LED will light if the battery is okay.

SECTION V

MAINTENANCE

Hoffer Flow Controls Flow Measurement Systems are constructed to give a long service life in the targeted measuring field and service environment. However, problems do occur from time to time and the following points should be considered for preventive maintenance and repairs.

The bearing type used in the flowmeter was chosen to give compromise between long life, chemical resistance, ease of maintenance and performance. A preventive maintenance schedule should be established to determine the amount of wear which has occurred since last overhaul. See users manual for flowmeter for further instructions.

A Spare Parts List has been provided which, at the discretion of the user, may be user stocked. Consult with the manufacturer if an abridged spare parts list is sought. The recommended spare parts list may be found following this section and in the users manual for the flowmeter.

In case the flow measurement system malfunctions or becomes inoperative, a trouble shooting procedure is enclosed.

Factory consultation is available to assist in diagnosing problems. In addition, factory repair parts and service are available for individuals who wish to utilize this service.

A complete set of schematic diagrams for all printed cards is available from Hoffer Flow Controls for users who wish their own personnel to service the measuring system.

NOTE:

- ALL PRINTED CIRCUIT CARDS ARE UNDER WARRANTY FOR ONE YEAR AFTER DATE OF SALE.
- ALL PRINTED CIRCUIT CARDS MAY BE FACTORY REPAIRED AT A NOMINAL FEE FOR PARTS AND LABOR AFTER WARRANTY PERIOD.

TROUBLE SHOOTING AND MAINTENANCE

In case of an inoperable or malfunctioning system the following procedures can be used to isolate the condition. The majority of repairs can be made in the field thereby reducing the time a unit is out of service.

A recommended spare parts list is given immediately following the trouble shooting portion of this manual. The necessary documentation is contained within this manual with the exception of the calibration data sheet for the turbine flowmeter. This calibration is supplied separately.

Factory consultation is available to assist in diagnosing problems. Note that in some cases factory repairs can be performed more easily than can be accomplished in the field.

GENERAL INSPECTION TO DETERMINE IF UNIT IS OPERATING PROPERLY

Proper operation of the Model 45 can be assumed when:

- a. Applying power to the unit causes the LCD displays to light.
- b. Depressing the RESET return the counter to zero.
- c. Depressing the TEST switch cause the totalizer to start counting and rate indication if equipped.

OBSERVED CONDITION

CORRECTIVE ACTION

UNIT REPEATEDLY
BLOWS FUSES
(AC OPERATION)

1. Inspect terminal strip wiring for conformity to the installation instruction and for acceptable workmanship.
2. Verify correct fuse size.
3. Replace PCA-70.

LCD DISPLAY FAILS
TO LIGHT

1. If AC powered verify that the fuse is okay and replace as needed.
2. For any other power option verify polarity of power source is correct.
3. Replace counter module.
4. Replace PCA-70.

NOTE: THE COUNTER MODULE SHOULD ONLY BE CHANGED BY QUALIFIED PERSONNEL, USING EXTREME CARE.

LCD SEGMENTS FAIL
TO LIGHT

1. May occur on start-up. Push RESET.
2. Replace counter module.

NOTE: THE COUNTER MODULE SHOULD ONLY BE
CHANGED BY QUALIFIED PERSONNEL, USING
EXTREME CARE.

WITH NO FLOW UNIT
COUNTS

1. Noise on input, slowly turn SENS
adjust CCW until counting stops.

NOTE: IN THE FULLY CW POSITION UNIT
WILL OPERATE.

2. Replace pickoff coil and/or cable.
3. Replace PCA-70.

UNIT GIVES ERRONEOUS
READINGS WITH MINI
FLOWMETER LINEARIZER

1. Replace PCA-93.
2. Check Mini Flowmeters calibration.

MODEL 45 FLOW TOTALIZER/RATE INDICATOR

PART NO.	NOMENCLATURE	QTY.
PCA-70	PRINTED CIRCUIT CARD	1
PCA-93-1	PRINTED CIRCUIT CARD	1
COUNTER MODULE	SUB-CUB	1
AMP SLO BLO*	FUSES FOR AC POWER SUPPLY	1 BOX

*NOTE: SEE MAIN DRAWING FOR FUSE SIZE.