CE

User's Guide

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⚠**CAUTION**:
THIS PRODUCT IS NOT INTENDED TO BE USED IN LIFE SUPPORT APPLICATIONS!

FMA-TOTAL
totalizer

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(a) UNPACKING THE FMA-TOTAL

a.1 Inspect Package for External Damage

Your FMA-TOTAL was carefully packed in a sturdy cardboard carton, with anti-static cushioning materials to withstand shipping shock. Upon receipt, inspect the package for possible external damage. In case of external damage to the package contact the shipping company immediately.

a.2 Unpack the *FMA-TOTAL*

Open the carton carefully from the top and inspect for any sign of concealed shipping damage.

When unpacking the instrument please make sure that you have all the items indicated on the Packing List. Please report any shortages promptly.

a.3 Returning Merchandise for Repair

Please contact an Omega customer service representative and request a **Return Authorization Number (AR).**

It is mandatory that any equipment returned for servicing be purged and neutralized of any dangerous contents including but not limited to toxic, bacterially infectious, corrosive or radioactive substances. No work shall be performed on a returned product unless the customer submits a fully executed, signed SAFETY CERTIFICATE. Please request form from the Service Manager.

(b) DESCRIPTION

Model FMA-TOTAL is designed to be used with existing models of mass flow meters and controllers. It can be connected to the modular jack instead of the LCD display, or optionally with the additional connector in parallel with the LCD display. Mechanically FMA-TOTAL can be installed on the top of the LCD display with two brackets and screws.

It is uncalibrated. The full scale range for this model is not specified on the back label. It by default adjusted for 30 unit/min which corresponds to SCALE 5.00kHz and DIVISION 1000. This FMA-TOTAL has to be re-scaled for the desired full scale range (see f.4).

(c) FEATURES

The FMA-TOTAL takes analog output flow signals of 5 to 10 Vdc from the FMA1700/1800 or the FMA5400/5500 models, or 0 to 5 Vdc from other transducers. It integrates and accumulates up to 7 digits of direct engineering units for the given gas and flow rate (i.e. standard liters, standard cubic centimeters, etc.). In order to reduce low signal (noise) totalizing, provision is made for 1% cut off schematic which allows to accumulate only flow rates which exceeded 1% F. S.

(d) SPECIFICATIONS

d.1 General Attributes

INPUT ANALOG RANGE:	5 to 10 VDC or 0 to 5 VDC jumper selectable.
POWER SUPPLY REQUIREMENTS:	
	12Vdc, 100mV Pk-Pk, less than 0.5 watts
POWER CONSUMPTION:	10 mA at 12 VDC, less than 0.125 watts.
ACCURACY:	±0.5% of full scale.
TEMPERATURE STABILITY:	±200 ppm/°C in the range of 5°C to 50°C.
DISPLAY:	7 digit, 8-mm figure height.
READING BACKUP:	20 years lithium battery, no external power required.
RESET:	front panel push button momentary tact switch
	(works only when totalizer is connected to the power).
ALTITUDE:	up to 10,000 feet.
CONNECTION METHOD:	Telephone modular plug.

d.2 CE Compliance

Any model FMA-TOTAL bearing a CE marking on it, is in compliance with the below stated test standards currently accepted.

EMC Compliance with 89/336/EEC as amended;
Emission Standard: EN 55011:1991, Group 1, Class B
Immunity Standard: EN 55082-1:1992
Environmental (per IEC 664): Installation Level II; Pollution Degree II

(e) ELECTRICAL CONNECTIONS

e.1 Connector Pin Assignments

All connections are made at connector J1 (telephone modular plug). Model FMA-TOTAL can be connected directly to the FMA1700/1800 or FMA5400/5500.

⚠ **CAUTION:** Exceeding the following voltages will cause device failure and/or hazardous conditions to exist:

TERMINAL NUMBER	MAXIMUM VOLTAGE (VDC)	MODE
T1 (YELLOW)	16	Voltage Input
T2 (GREEN)	16	Reference Voltage Input
T3 (BLACK)	16	Power Input

⚠ **CAUTION:** Make sure power is OFF when connecting or disconnecting any cables in the system.

e.2 Jumper Assignments

JP1- Division factor jumper
(has to be installed during calibration, See Calibration procedure).
Pins 1 and 2 select division 10
Pins 3 and 4 select division 100
Pins 5 and 6 select division 1000
Pins 7 and 8 select division 10000

JP2- Input mode jumper

Pins 2 and 3 select 5 - 10 Vdc input mode for FMA-TOTAL.

⚠ **CAUTION:** Improper setting of jumpers may result in incorrect operation of the unit and could cause damage to the FMA-TOTAL.

(f) CALIBRATION PROCEDURE

f.1 Equipment Required for Calibration

You will need:

1. Two 4 ½ digit Digital Multi Meters set to the selected analog output range and frequency
2. - for FMA-TOTAL: FMA1700/1800 mass flowmeter or MA5400/5500 mass flow controller with power supply

f.2 Calibration

If full scale range for the FMA-TOTAL was not specified on the back label it was by default adjusted for 30 unit/min which corresponds to SCALE 5.00kHz and DIVISION 1000. In this case the FMA-TOTAL has to be re-scaled for the desired full scale range (see f.4). Internal timing schematic GAIN and OFF-SET is adjusted in the factory and does not require additional readjustment when re-scaling the FMA-TOTAL for different flow ranges or engineering units. The GAIN and OFFSET adjustment procedure (see f.3) must be performed only if the potentiometer R12 (GAIN) was accidentally readjusted.

Choose from TABLE 1 the option which better matches your case:

TABLE 1		
1	The FMA-TOTAL does not have label with corresponding flow rate on the back (default calibration for 30 unit/min) and **you do plan** to change the full scale range.	Refer to **f.4** RE-SCALING OF FMA-TOTAL.
2	⚠ Use this option **only** if the potentiometers R12 (GAIN) or R19 (OFFSET) were accidentally readjusted.	1. Refer to **f.3** and perform GAIN ADJUSTMENT 2. Refer to **f.4** and perform RE-SCALING OF FMA-TOTAL for desired flow range.

f.3 GAIN ADJUSTMENT (required only if potentiometer R12 GAIN was accidentally readjusted)

1. Carefully remove front panel from the FMA-TOTAL.
2. Set potentiometer R8 (SCALE) into completely up position (CW direction).
3. Connect the FMA-TOTAL to the transducer (see e.1).
4. Using a digital multimeter connected to the 0 to 5 Vdc signal at the output of transducer, set the output rate on the transducer to full scale (5 Vdc). Connect a second digital multimeter with selected frequency function (resolution of 4 ½ digit is required) to pin T5 on the FMA-TOTAL printed circuit board. Maintain full scale flow (5000 mV output from transducer) and adjust the potentiometer R12 (GAIN) for frequency reading of 5.000 kHz $\pm$10 Hz.
5. Maintain 2% full scale flow (100 mV output from transducer) and adjust the potentiometer R19 (OFFSET) for frequency reading of 100 Hz $\pm$2 Hz.
6. Maintain again full scale flow (5000 mV output from transducer) and adjust the potentiometer R12 (GAIN) for frequency reading of 5.000 kHz $\pm$10 Hz.

f.4 RE-SCALING OF FMA-TOTAL (if necessary)

It may be desirable to re-scale the FMA-TOTAL for different flow ranges or engineering units. To change flow range:

1. Calculate the Fs factor which is flow rate specified in UNIT/SEC. (i.e. standard liters per second [L/sec.], standard cubic centimeters per second [mL/sec], etc.)

   Fs = Fm/60;

   where: Fm = Full scale range in [UNIT/MINUTE] for which your transducer has been calibrated (usually shown on the front label). If engineering unit is not minute based it has to be converted. For example 300 SCFH has to be converted to 300/60 = 5 cubic feet/minute.

2. Choose scale factor Vs and division factor D from Table2 which correspond to your previously calculated Fs.

3. Connect the FMA-TOTAL to the transducer (see e.1)

4. Carefully remove front panel from the FMA-TOTAL. Using the digital multimeter connected to the 0 to 5 Vdc signal at the output of transducer, set the flow rate on the transducer to the full scale flow (5 Vdc). Connect the second digital multimeter with selected frequency function (resolution of 4 ½ digit is required) to pin T5 on the FMA-TOTAL printed circuit board. Maintain full scale flow and adjust the potentiometer R8 (SCALE) for frequency reading equal to Vs. For example if you have a transducer with full scale flow range of Fm = 6 L/Min, your Fs = 6/60 = 0.1 and from Table 1 the value of Vs = Fs * 10 = 1 kHz.

5. Install jumper JP1 into a position which corresponds to your division factor D from Table1. For previous example, D = 10000 and the jumper has to be installed for pins 7 and 8 JP1.

TABLE 2

Fm - Full scale range in [UNIT/MINUTE]					
Fm [unit/min]	0.3 to 3.0	3 to 30	30 to 300	30 to 3000	> 3000
Fs [unit/sec.]	0.005 to 0.05	0.05 to 0.5	0.5 to 5.0	5.0 to 50	> 50
Vs [kHz] SCALE FACTOR	Fs *100	Fs *10	Fs	Fs / 10	Fs / 100
D DIVISION FACTOR	10000 JP1 7-8	10000 JP1 7-8	1000 JP1 5-6	100 JP1 3-4	10 JP1 1-2
OUTPUT UNIT	[unit]	[unit]	[unit]	[unit]	[unit]

(g) TROUBLE SHOOTING

Your FMA-TOTAL was thoroughly checked at numerous quality control points during and after manufacturing and assembly operations. It was calibrated in accordance to conditions for a given.

It was carefully packed to prevent damage during shipment. Should you feel that the instrument is not functioning properly please check for the following common conditions first:

Are all cables connected correctly?

Is the power supply correctly selected according to requirements? When several meters are used a power supply with appropriate current rating should be selected.

Were the connector pinouts matched properly? When interchanging with other manufacturers' equipment, cables and connectors must be carefully wired for correct.

For best results it is recommended that instruments are returned to the factory for servicing. See section a.3 for return procedures.

⚠ **CAUTION: Use of the FMA-TOTAL in a manner other than that specified in this manual or in writing from Omega, may impair the protection provided by the equipment.**

(h) TECHNICAL ASSISTANCE

Omega Engineering will provide technical assistance over the phone to qualified repair personnel. Please call our Technical Assistance at 800-872-9436. Please have your Serial Number and Model Number ready when you call.

APPENDIX 1

GLOSSARY

Fm Full scale range in [UNIT/MINUTE] for which your transducer has been calibrated (usually shown on the front label). If engineering unit is not minute based it has to be converted. For example 300 SCFH has to be converted to 300/60 = 5 cubic feet/minute.

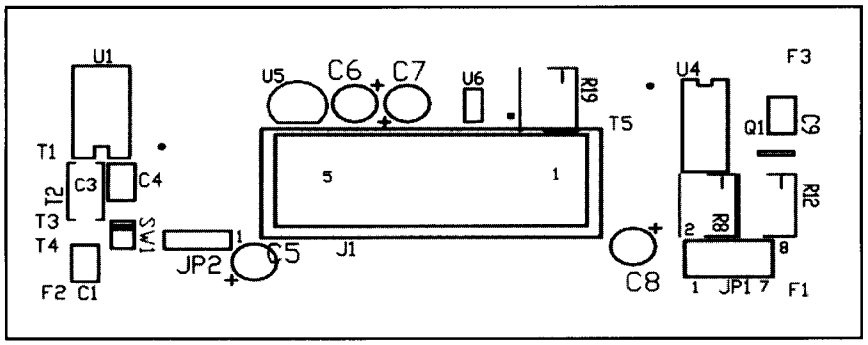
Fs Full scale range specified in UNIT/SEC.

Vs SCALE FACTOR in kHz which corresponds output frequence for given flow rate (see Table 2).

D DIVISION FACTOR corresponds division of the output frequence for particular flow rate (see table 2).

APPENDIX 2

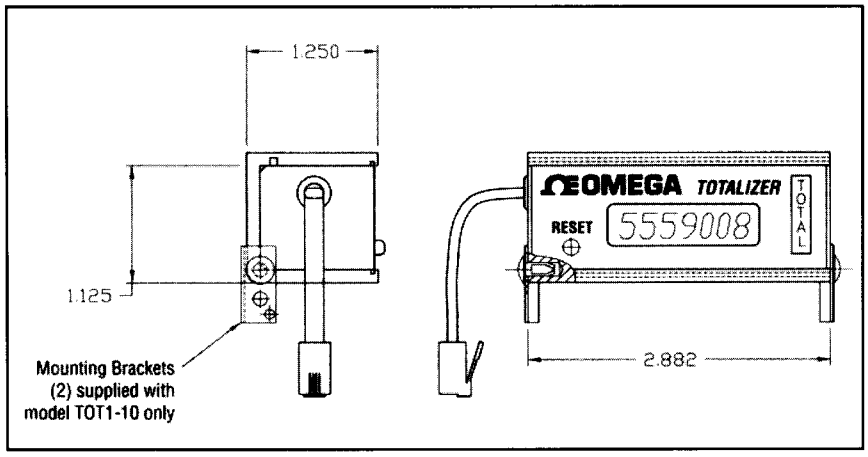
COMPONENTS DIAGRAM



R19- OFFSET ADJUSTMENT
R12- GAIN ADJUSTMENT
R8 - SCALE ADJUSTMENT

APPENDIX 3

DIMENSIONS



FMA-TOTAL

NOTES: Omega Engineering reserves the right to change designs and dimensions at its sole discretion at any time without notice. For certified dimensions please contact Omega Engineering.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal one **(1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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RETURN REQUESTS /INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order 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, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

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

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