



# FlowCom™ Register

DIGITAL DATA & COMMUNICATIONS

## MODEL FC100/FC101

## CONFIGURATION SHEET

## FLOWCOM REGISTER



FC100  
Mc Propeller



FC101  
Water Specialties Propeller

### DESCRIPTION

The FlowCom Register displays a flowmeter's flowrate and volumetric total. The FlowCom can be fitted to any new or existing McCrometer propeller flowmeter.

### FEATURES & SPECIFICATIONS

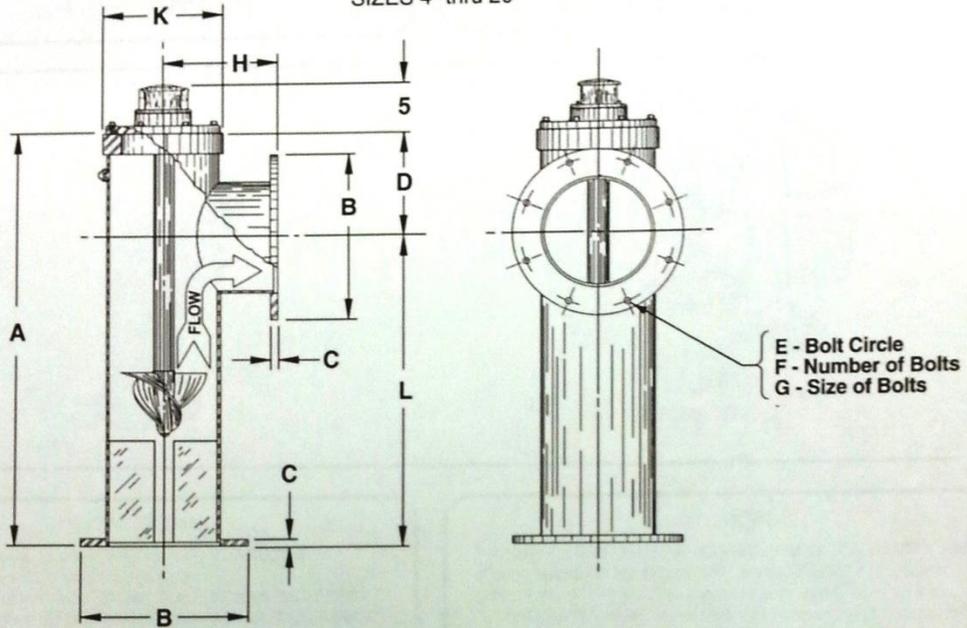
- Retrofits to any existing McCrometer Propeller Flowmeter
- Four output options: 4-20mA Loop, Open Collector, Optically Isolated, and Contact Closure.
- Unique Units of Measurement for Rate, Total, 4-20mA and Pulse Outputs
- Factory sealed Remote and Meter-Mounted Models

<b>Environmental</b> Operating Temp: -4°F to 158°F (-20°C to 70°C) Storage Temperature: -40°F to 158°F (-40°C to 70°C) Housing Rating: NEMA 4X		<b>4-20mA Analog</b> Power Requirements: 12 to 40 VDC Transmissions: 5,000 feet max. 4mA/20mA Trim: .01 mA to .50 mA Engineering/Time Units: 22 different units	
<b>Input Signal</b> Input Compatibility: McCrometer Flowmeters Remote Distance: 100 feet max.		<b>Pulse Outputs</b> Engineering Units: 20 different units Optically Iso. Pulse Width: 80 ms Open Collector Pulse Width: adjustable Collector to emitter voltage: 50v @ 250 mA max. Pulse Width: 80 ms Max Pulses Per Minute: 30 Signal Distance: 500 feet max.	
<b>Rate Functions</b> Display: 5-digit Rate Units: 22 different units		<b>Contact Closure Output</b> Contact Rating: 30v @ 1 Amp max. Pulse Width: 80 ms Max Counts Per Minute: 30 Signal Distance: 500 feet	
<b>Totalizer Functions</b> Display: 8-digit Totalizer Units: 20 different units Accuracy: 0.25% Non-Volatile Storage: Updated hourly		<b>Power Requirement</b> Battery Type: Lithium 3.6 V Battery Life: 6 - 10 years Optional 4-20mA: Loop powered	
<b>Programming</b> Program Access: Magnetic wand Access Lockout: 4-digit code Test Modes: 4 mA and 20 mA test modes Totalizer Reset: Programming Total Reset Disable: Programming (permanent) Calibration Adjustment: + or - .01% to 10%			



3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92345 USA  
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**MODEL VF29**  
 VERTICAL UPFLOW TEE TUBE METER  
 SEALED METER MECHANISM - MAGNETIC DRIVE  
 SEALED TOTALIZER  
 SIZES 4" thru 20"



METER & PIPE SIZE	FLOW RANGES, GPM			STANDARD DIAL FACE (GPM/GAL)	DIMENSIONS										EST SHIPPING WEIGHT POUNDS
	MIN.	MAX.	INT.		A	B	C	D	E	F	G	H	K	L	
4	55	500	700	500/100	18	9	5/8	4 1/2	7 1/2	8	5/8	5	6	13 1/2	180
6	130	1200	1500	1200/1000	40	11	11/16	10	9 1/2	8	3/4	9	11	30	190
8	170	1500	2000	1500/1000	40	13 1/2	11/16	10	11 3/4	8	3/4	10	11	30	240
10	200	2000	3000	2000/1000	40	16	11/16	10	14 1/4	12	7/8	11	11	30	330
12	220	3000	3500	3000/1000	40	19	13/16	10	17	12	7/8	12	11	30	440
14	320	4000	4500	4000/1000	40	21	15/16	10	18 3/4	12	1	14	11	36	520
16	420	5000	6000	5000/1000	54	23 1/2	1	11 1/2	21 1/4	16	1	15	11	42 1/2	620
18	720	6000	7500	6000/1000	60	25	11/16	12	22 3/4	16	1 1/8	18	11	48	720
20	870	8000	9000	8000/10000	66	27 1/2	1 1/8	14	25	20	1 1/8	20	11	52	820

**McCROMETER**  
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 TEL: 951-652-6811 • FAX: 951-652-3078

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The following image is a photograph of one of the District's meters as it is installed in the field and a close-up view of the indicators.



*Meter Close-up – Rate and Totalizer*



*Typical Farm Gate Installation*

## **Attachment B**

### **Engineer Certification and Apportionment Required for Water Measurement - Technically Infeasible**

Since the District measures water at each farm-gate and not at an upstream point on a lateral, there is no apportionment of flow not provided for by a discreet indicator and this certification is moot.

## Attachment C

### Description of Water Measurement Best Professional Practices

The aforementioned technical specifications attached hereto on the Water Specialties flow meter is representative of all meters used throughout the District to quantify volumetric deliveries and substantiate customer billing. Each month, unlocked meters are read and recorded by the District's field staff. Meters are locked for various reasons, including but not limited to:

- Customer generally does not order water (for whatever reason), or
- Customer is ineligible to receive water due to delinquent payments to the District.

#### Professional Practices

- *Water Measurement Data Collection and Frequency*

Meter totalizers are read and recorded on all unlocked District delivery meters on a monthly basis (unless District water is unavailable such as during the dewatering of the Friant-Kern Canal in which case there is no possibility for water to be delivered to any individual customer).

- *Method for Determining Irrigated Acreage*

Just prior to the beginning of each CVP contractor "Contract Year" which coincides with March 1 through the last day of the following February, the District provides each landowner in its service area with a crop survey form which they must complete in accordance with the USBR Water Conservation Plan. This information is tabulated on a District wide basis and reported to the USBR in order to determine the irrigation requirement for the District. The calculation includes crop type and acreage per crop type along with corresponding crop coefficients to determine the consumptive side of the water balance. That water requirement is balanced by the supply side, which includes; the readily quantifiable effective precipitation (using local CIMIS Station information) and CVP contracted surface deliveries. From these parameters the less readily quantifiable groundwater use is determined to balance supply and irrigation demand.

The District's CVP supply is supplemental to groundwater and effective precipitation. At a 100% Bureau of Reclamation declaration the District may allocate 1.4 feet per acre to all landowners in the District. If initial orders do not reserve the total supply declaration, growers may receive additional supply above and beyond the 1.4 feet per acre-foot quantity and many in the District rely on this as they have limited groundwater access. Because of the supplemental nature of the supply and the fact that applying water to crops has a cost, farmers have a strong disincentive to over irrigate.

- *Quality Control and Quality Assurance Procedures*

- Gross Comparison by Delivery System

- The District delivers water from the Friant-Kern Canal, a federal CVP facility, through 15 discreet turnouts off the Canal, which are connected to individual pressurized pipeline systems. These systems convey water to up to 1,200 farm-gates within the District's legal boundary.

- Surface water diverted from the Friant-Kern Canal at each of these 15 turnouts flows through United States Bureau of Reclamation owned meters (FKC meters) before entering the District's system. FKC meters are routinely maintained and calibrated by the non-federal operating entity, which in this case is the ***Friant Water Authority***. The Friant Water Authority is the entity responsible for operation and maintenance of the Friant-Kern Canal under a cooperative agreement with the United States Bureau of Reclamation and they read each of the FKC meters on a daily basis.

- The following image is a capture of the FKC meter recorder output.



*FKC Meter Recorder Output*

Each month, a gross numerical comparison (by individual delivery system) is performed by District staff to ensure that the quantity of water metered through the FKC meters matches the cumulative total of corresponding farm-gate meters in the District. Performing this calculation assists in identifying potential meter problems.

In addition to this method of meter validation, each landowner is required (under penalty assessed for noncompliance) to place a water order every time they irrigate. A discrepancy between the cumulative monthly order and the end of the month meter reading provides an indication that the meter may not be working properly. This validation is done every month and motivates District staff inspection of individual meters.

Monthly totals indicated by the FKC meters are the basis of monthly payments to the United States. The FKC meters installed at the District turnouts are predominantly venturi (differential pressure) type meters, which according to the Bureau of Reclamation measure to within an accuracy range of +/- 1%.

While the FKC meters are the basis of payments to the United States for quantifying the diversion of the District's Contract supply, each of the District's farm-gate meter readings are the basis for customer billing; regardless of FKC meter indication. In other words, the District pays for water used based on the FKC meters, whose accuracy is validated by the United States.

Variation among FKC and District meters is therefore self correcting through the District's staffs efforts, as it is essential that the District's meters reflect actual farm-gate diversions (which is presumed to be reflected by FKC meters) particularly in a closed / pipeline system case where conveyance losses are, for all intents and purposes, zero.

It has long been the District's observation that on a long term cumulative basis there is close agreement between the FKC meters and the District's meters by system and overall to within 1%. While this indicator reflects the overall accuracy of the water supply consumed by the District and not each individual farm-gate's accuracy, it does suggest that the District's quantification of deliveries is very good. Below is Calendar year comparison of the respective quantifications from 2010 forward.

Contract Year	FWA vs. District Meters
	% Variance
2010	-2.11%
2011	+2.72%
2012	+0.44%
2013	+0.92%
2014	-1.3%
2015	-1.14%
2016	<u>+5.37%</u>
<b>Average</b>	<b>+0.87%</b>

Comparison of FWA and District meter totals by Contract Year

- Direct Observation

Whenever the District staff reads an active meter the instantaneous flow is compared to the water order (daily customer orders are required by all users of District water and are ordered on an instantaneous flow basis in gallons per minute) for a specified duration (i.e. 48 hours). If there is an apparent difference between the instantaneous flow observed by staff and the ordered flow rate, this informs that the meter's instantaneous mechanism is not working properly. In addition to instantaneous anomalies, the monthly-totalized volume is compared to the monthly volume that would be achieved by the time factored water rate orders. If there is a discrepancy in this respect, this informs that the totalizer portion of the mechanism is malfunctioning.

Whatever the case, observation is an important tool to identify meter issues/inaccuracies and the District's staff acts immediately to rectify an observable meter malfunction, as failure to do so has economic consequences back to the District.

- Meter Repair / Calibration Protocols

If observation suggests a discrepancy or if a meter is observed not to be working properly (making a noise, needle bouncing, water in the meter, etc...), or if a landowner informs the District that a meter is not working properly, the District staff pulls the meter for internal inspection and repair as necessary. The District spends approximately \$10,000 annually on meter repair parts / new meters.

A meter that is suspected of not working properly based on the aforementioned observable indicators is connected to a mechanical bench-testing device in order to test its instantaneous and totalizing meter functions (see photograph below of mechanical bench test device).



*Mechanical Meter Bench Test*

If there is a variance observed, repair parts are installed and adjustments are made until retest confirms accuracy to within +/- 2%.

▪ Meter Accuracy Validation Facility and Protocols

The District constructed an active real time flow-through meter test facility (Facility) to validate accurate farm gate meter performance. The Facility utilizes a factory calibrated magnetic flow meter (validation meter) upstream of a randomly pulled propeller meter to be tested (test meter) to ensure that the instantaneous and totalized tested meter mechanisms are performing within the manufacturer's stated accuracy range, namely +/- 2%. The pictures below show some aspects of the constructed test facility.



*Test Meter in the Foreground and Validating Meter in the Background*



*Image of District Meter Test Facility*

The image to the left depicts the District’s Meter Test / Accuracy Validation Facility. The meter stand mimicking field-installed meters is visible in the upper right hand portion of the image left of the stairway. The Facility pumps water (at a controllable rate) through the Test and the Validating meters for direct comparison, before discharging the flow in a recirculating manner so that meters can be tested without the delivery of water to District outlets. If the test meter does not operate within the manufacturers specified range, District staff repairs or replaces it.



The District is replacing each mechanical register with digital registers, which have no wear parts and perform with greater accuracy. The District has budgeted register replacement at 50 units per year.

A log will be kept of each meter tested. It was anticipated that 25 meters would be tested annually, depending on observed accuracy of meters tested.

During 2014 and 2015 water years, the District received a zero allocation of water supply. As such, no testing was performed during those years and so at this time there is nothing to report relating to Test Meter observed accuracy. The next report will include information on the use and results associated with the Facility.

The flow through test facility design included input from meter technical sales representatives / vendors of the meters used by the District, as well as the District's Engineer-Manager who has an engineering degree and a Masters Degree in Hydrologic Science from UC Davis.

Based on information gathered from this Facility, the District will further improve upon its high standard of individual farm-gate accuracy, which is certainly a primary goal of the District as fairness dictates customers pay in direct proportion to the resource actually consumed.

## **Attachment D**

### **Documentation of Water Measurement Conversion to Volume**

The conversion to volume is achieved by the meters' totalizers, which indicate in acre-feet. All meters utilized by the District have this capability so there is nothing to be discussed relative to this Attachment.

## **Attachment E**

### **Device Corrective Action Plan Required for Water Measurement**

As stated, the District has several existing tools to ensure accurate metering of water to its customers. These methods and the nature of the District's sophisticated delivery system strongly indicate that water is metered most accurately. Notwithstanding agreement between gross diversion quantification indicated by FKC and cumulative District meter readings, the District will endeavor to improve individual farm-gate measurement accuracy with the addition of the aforementioned flow-through meter test facility. This test facility was constructed in-house by District staff; the same staff that purchases, installs, reads, maintains, repairs and replaces all the District's meters. Similarly, the District budgets for replacement of 50 of its mechanical registers with digital registers each year and this program will continue until all registers are of the digital type.