Installation & Operation Manual



Subtv Controller

for BERMAD Waterworks Applications

Water Control Solutions

BERMAD

Table of Contents

Introduction	3
Technical Data & Installation Instructions	4 - 5
Control Panel	6 - 7
Programming	8 - 16
Monitoring	17
Manual Operation	18

SUBtv - DC Volumetric One Station Controller

Installation & Operation Manual

This document provides installation and operation instructions for the Subtv controller as it is used with the following Bermad control valves waterworks applications:

- Pilot change at High/Low pressure management application
- Dead end pipes purging application



Subtv Controller

for BERMAD Waterworks Applications

Technical data and installation instructions

The following I/Os are used for Bermad's waterworks applications:

DC Solenoid:

Connect the solenoid wires to the cable coming out of the controller's first station port. Connect the solenoid's RED wire to the controller's RED wire and the BLACK wire to the controller's BLACK wire.

Power Supply:

Open the battery compartment lid and connect a good quality alkaline 9 Volt battery, then firmly close the lid. When the battery is first connected, the controller performs a self-test, closes the DC solenoid and displays the first settings screen. Under normal use, the battery should last for at least one season.

Hydrometer:

Bermad's 900 series Hydrometer, or a water meter with pulse output, is used in pipes dead-end purging application where the purged-out water is measured by volume instead of by time. Connect the two water meter pulse wires to the two controller's RED wires. Please note that there is no polarity significance in this connection.

Flow Switch:

Flow switch can be used with the pressure management application for switching to the high pressure setting in case of a high demand for water, i.e. in case of fire. In order to connect a Normally Closed flow switch, cut the YELLOW wire loop coming out of the controller and connect the cut wires to switch.

Wiring Schematic:

The controller is supplied with the following wires connected to its terminal strip:

Wire Color	Task	Remarks
	DC type solenoid - 9V-12V DC Latch	
Red	To be connected to the solenoid's red wire	Joint together with the solenoid's black wire in a black cable
Black	To be connected to the solenoid's black wire	Joint together with the solenoid's red wire in a black cable
	AC type solenoid - 24V AC	
Red	To be connected to one of the solenoid's wires	Joint together with the solenoid's black wire in a black cable. No polarity significance in this connection.
Black	To be connected to the solenoid's black wire	Joint together with the solenoid's red wire in a black cable. No polarity significance in this connection.
	Water meter	
Red	Connect one of the water-meter's pulse wires to one of the controller's red wires.	There is no polarity significance in this connection.
Red	Connect the other water-meter's pulse wire to the second controller's red wire.	There is no polarity significance in this connection.
	Flow switch	
Yellow	Connect one of the flow switch wires to one of the controller's yellow wires.	There is no polarity significance in this connection.
Yellow	Connect the other flow switch wire to the second controller's yellow wire.	There is no polarity significance in this connection.

The Control Panel

The Subtv Human-Machine Interface consists of a graphical display screen and a four keys keyboard:



NEXT STEP button - Used to advance to the next screen or programming step



SHIFT button - Used to sequentially change the focus between the items of the current screen



PLUSE / ON button - Used to increase numeric data, set on operation days and start manual operation



MINUS / OFF button - Used to decrease numeric data, set off operation days, and stop manual operation

Display Icons

The following icons may appear on the display screen during programming or operation modes:

Please note:
Some of the following icons are not related to BERMAD applications.

	Setting Mode		Operation Days
	Set Time / Time Mode		Manual Operation
	Volumetric Mode		Sequential Program
	Operation Time		Semi Auto seq. Operation
AUTO	Automatic Operation		Uncontrolled Water Meter
%	Seasonal Adjustment		Station Number
	Stopped by Flow Switch		Flow OFF / Low Battery
	High Flow (seconds)		

Programming Steps

This chapter describes the required programming steps of the controller and it is divided into three sections: Basic Settings, Pressure management settings, and end of line flushing settings.

Basic Settings:

First Basic Settings Screen

The basic controller setting should be done once the controller is wired to the system and the power is connected, or after a total reset operation is performed. The first setting screen appears displaying 3 optional settings:

1. Solenoid Type:

Upon initial start-up the connected solenoid type is checked by the controller; it must be a DC latch solenoid for BERMAD applications. The word dC appears on screen indicating that the type of solenoid found is DC. When the controller is operated by a 9V battery the solenoid type is DC only and it cannot be changed by the operator.

2. Clock Mode:

Press the (ON) button and set the system clock to 12 or 24 hour clock. Factory default - 24h.

3. Time / Volume Operation:

Press the (OFF) button and select the required operation mode. Select TIME for BERMAD's pressure management application and VOLUME for BERMAD's purging application.

Note the icons change according to your selection:

for time operation and for volumetric operation.

Factory default - Time.

Press the (NEXT) button to move to the next basic settings screen.

Second Basic Settings Screen

In the second setting screen the operator can set the Flow Switch usage mode. Please note that a flow switch can be used only for BERMAD's pressure management application.

Flow switch mode:

Press the (▶) button to enable or disable the flow switch operation. When a flow switch is enabled the  icon appears on screen. Factory default - flow switch enabled.

Press the (NEXT) button to move to the next basic settings screen.

Third Basic Settings Screen

The third setting screen is used for setting the system time and day of the week.

System Time:

Use the (▲ ON) and the (▼ OFF) buttons to set the system time.
Hold the button pressed to quickly advance the digits.
Press both buttons simultaneously to reset the time and day to the factory default setting.

Day of the week:

Use the (▶) button to scroll through days of the week and set the current day.

Press the (NEXT) button to exit the basic settings screens and move to the operation programming screens.

Total Reset Operation

In order to return the controller to its factory defaults setting, erasing the memory, and restarting the controller operation, press the (NEXT) button for at least 6 seconds.

Pressure Management Application Settings

BERMAD's pilot switch pressure management application is based on a series 700 control valve equipped with two pressure reducing pilots: one for high pressure setting and the other for low pressure setting. Normally the **high pressure** pilot controls the valve, while the low pressure pilot is on standby mode. A Subtv controller with a DC solenoid can switch the high pressure pilot with the low pressure pilot according to a pre defined time based operation regime.
Such arrangement can switch the system to **low pressure** settings during night, while maintaining high pressure during day time.

The system is also equipped with a high flow switch that can stop the low pressure regime when higher demand for water is detected, such as in case of fire.

The following chapter describes the programming steps required for setting-up this application:

Programming a Pressure Management Application

The **Subtv** operation programs consist of three parameters per each valve program: Operation Time or Volume, Operation Days, and Start Time.

For controlling BERMAD's Pressure Management Application the controller is supplied with a single solenoid (valve), operated by time with up to three start times a day, and with a flow switch.

In municipal water systems the demand for water in residential neighborhoods is high during the mornings and evenings and low during the night and mid day hours; therefore, the control valve is set for the high pressure during high demand hours.

Operating the valve with the **Subtv** controller reduces the too high pressure settings during the low demand hours.
For example, in typical such pressure regime, the day low pressure hours are between 10:00 AM and 06:00 PM and the night low pressure hours are between 10:00 PM and 06:00 AM, during the high demand hours the valve maintains the high pressure setting.

Therefore, the three required program parameters of the controller are: Operation Time - 8 hours, Operation Days - 7 days and two Start Times one at 10:00 and the other at 18:00.

1. Operation Time:

Use the (NEXT) button to move to the Operation Time programming screen, this is the screen with blinking icon, blinking triangle with the digit 1 in it, and the icon. Use the (ON) and the (OFF) buttons to set the required operation time (8:00 hours in our example).

Press the (NEXT) button to move to the next programming screen which is the Operation Days screen.

2. Operation Days:

Use the (ON) to set a particular day as an operation day, the cursor will advance to the next day. In our example set all 7 week days for operation.

Press the (NEXT) button to move to the next programming screen which is the Start Times screen.

3. Start Times:

Use the (ON) and the (OFF) buttons to set the first required Start Timed (10:00 in our example).

Press the (▶) button to move to the second Start Time and set it as required (22:00 in our example).

The controller is now set for automatically operating the Pressure Management Application.

Dead-end Pipes Purging Application Settings

Due to operational conditions, in some municipal and industrial water systems, there is a need for periodic purging of the systems dead-ends of pipes for refreshing the water supply. BERMAD's control valves equipped with Subtv controllers can be installed in these systems. BERMAD's Dead-end Pipes Purging Application accounts for the purging out of the system. This task is automatically performed based on three major parameters:

1. Purging interval - set at specific days of the week or as day's interval
2. Amount of purged water - set by operation time or by volume
3. Start time - set for the operation day (with up to three start times per such day)

The following examples depict three typical scenarios:

A. Purging interval by Days of the Week and purging amount by operation time:

In this example the pipe needs to be purged for 5 minutes every Monday and Friday at 08:00 AM. Therefore, the three required program parameters of the controller are: Operation Time - 5 Minutes, Operation Days - Monday and Friday, and Start Time at 08:00 AM.

I. Operation Time:

Use the (NEXT) button to move to the Operation Time programming screen - this is the screen with blinking icon, blinking triangle with the digit 1 in it and the icon. Use the (ON) and the (OFF) buttons to set the required operation time (00:05 minutes in our example).

Press the (NEXT) button to move to the next programming screen which is the Operation Days screen.

2. Operation Days:

Use the (ON) to set a particular day as an operation day, the cursor will advance to the next day. In our example set Monday and Friday for operation.

Press the (NEXT) button to move to the next programming screen which is the Start Times screen.

3. Start Time:

Use the (ON) and the (OFF) buttons to set the required Start Time (08:00 in our example).

The controller is now set for automatically operating this Dead end Pipes Purging Application.

B. Purging interval by Days Interval and purging amount by operation time:

In this example the pipe needs to be purged for 5 minutes every 10 days at 08:00 AM. Therefore the three required program parameters of the controller are: Operation Time - 5 Minutes, Operation Interval - 10 days, and Start Time at 08:00 AM.

I. Operation Time:

Use the (NEXT) button to move to the Operation Time programming screen - this is the screen with blinking con, blinking triangle with the digit 1 in it and the icon. Use the (ON) and the (OFF) buttons to set the required operation time (00:05 minutes in our example).

Press the (NEXT) button to move to the next programming screen which is the Operation Days screen.

2. Operation Interval:

On the days of the week screen press the ▶ button to 7 times for skipping the operation by days of the week and advancing the cursor to the Days Cycle line. Two numbers appear on this line: the right number presents the program's Days Interval and the left number display the number of days left till the next operation day. Note that during the first setup of this program the number of day till next operation number is zero.

Use the ▲ ON and the ▼ OFF buttons to set the required Days Interval (10 days in our example). Note that the maximal interval is 30 days.

Press the NEXT button to move to the next programming screen which is the Start Times screen.

3. Start Time:

Use the ▲ ON and the ▼ OFF buttons to set the required Start Time (08:00 in our example).

The controller is now set for automatically operating this Dead-end Pipes Purging Application.

C. Purging interval by days of the week and purging amount by Water Volume:

In this example the pipe needs to be purged for 50 water meter pulses every Monday and Friday at 08:00 AM. Therefore, the three required program parameters of the controller are: Operation Volume - 50 pulses, Operation Days - Monday and Friday, and Start Time at 08:00 AM.

In order to operate the above program the system should be based on BERMAD's series Hydrometer, or on other BERMAD's control valve and a water meter. The Subtv controller should be also set to volumetric operation, which can be done only at the

initial setup process of the controller (when power is connected or when the controller's reset operation is performed).

I. Operation Volume:

Make sure that the controller is configured for Volume operation as described in the BASIC SETTINGS chapter at the beginning of this document.

Once a Volumetric operation is set on the first setup screen, press the (NEXT) icon to move to the next water meter setting screen. This screen allows the user to set the following water meter parameters:

High Flow Rate (H.F.R.) - indicated by the on-screen icon. This parameter defines the minimal allowed time between two water meter pulses. When pulses are received in shorter interval than this parameter a High Flow indication is presented by the controller and the operation stops. (See the fault messages paragraph in the monitoring chapter below.) The factory default is 60 seconds; use the (ON) and the (OFF) buttons to set the required H.F.R. parameter.

Press the (▶) button to move to the next water meter setup parameter.

Timer Override (T.O.R.) - indicated by the on-screen icon. This parameter defines the maximal allowed time between two water meter pulses. When pulses are received in longer interval than this parameter a water meter malfunction indication is presented by the controller and the operation stops. (See the fault messages paragraph in the monitoring chapter below.)
The factory default is 10 minutes; use the (ON) and the (OFF) buttons to set the required T.O.R. parameter.

Press the (▶) button to move to the next water meter setup parameter.

Fill-Up Time (F.U.T.) - indicated by the on-screen icon. This parameter defines the time it takes to fill-up the system pipes at the beginning of the valve operation. During this time the system does not enter to High Flow fault. In purging systems where the purged water is released by open-end pipe to the atmospheric pressure, the flow rate can be high. Make sure that the F.U.T. and the H.F.R. parameters are correctly set for your system requirements. The F.U.T. factory default value is 6 minutes and it can be changed by the ON and OFF buttons. Press the NEXT button to move to the next programming screen.

Move to the Operation length programming screen, this is the screen with blinking icon, blinking triangle with the digit 1 in it, and the icon. Use the ON and the OFF buttons to set the required operation volume (050 pulses in our example).

Press the NEXT button to move to the next programming screen which is the Operation Days screen.

2. Operation Days:

Use the ON to set a particular day as an operation day, the cursor advances to the next day. In our example set Monday and Friday for operation.

Press the NEXT button to move to the next programming screen which is the Start Times screen.

3. Start Time:

Use the ON and the OFF buttons to set the required Start Time (08:00 in our example).

The controller is now set for automatically operating this Dead-end Pipes Purging Application.

Monitoring

When no button is pressed in the controller's keyboard for 3 minutes, the controller moves to the main monitoring screen indicated by the word AUTO in the middle of the screen.
The AUTO screen displays the current status of the controller, which includes the current time and day, as well as the opened valve indication and its remaining operation time or volume.

During a fault or malfunction mode the relevant fault message overrides the AUTO screen data, see the faults table below.

To cancel the fault check the system for the cause of the fault, repair the necessary components and then press the ON and OFF the buttons simultaneously for 2 seconds.

Please note:

- When a fault message is displayed on the AUTO screen moving to the other screens is not possible.
- In case the controller has more than one fault, this screen alternates the current fault messages every few seconds.

Fault Messages Table

Type	Display	Operation stopped at:	Remarks	
Low Battery	"AL:bt"	All Valves (!)		"OFF" icon is lit
Too High Current Usage	"AL:Cr"	The faulty valve only		The valve's number icon is lit
High Flow	"AL:HF"	The faulty valve only		The valve's number icon is lit
Timer Override	"AL:tr"	All Valves (!)	Automatically canceled at midnight	

Manual Operation

The operator may manually start / stop the operation of the valve at the manual operation screen.

Move to the manual operation screen by pressing the NEXT button at any screen for 2 seconds. The  icon appears.

Use the ON and the OFF buttons to start or stop the operation of the valve. Please note that when manually started, the valve operates for the duration of its programmed operation time or operation volume.

Disclaimer

The Subtv is a general purpose controller supplied as an electronic device controlling BERMAD valves. Therefore this document is limited to BERMAD's applications only.

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