



Specifications for Tucor Flowmaster TWI Control System

GENERAL:

The Automatic Sprinkler System Controls shall be the TUCOR Flowmaster TWI-12/24/50/100/150/200 Control system, as hereinafter specified and as shown on the drawings.

The system shall include the TWI- XXX controller, SERVLINK AIR (LTE-M, CAT-M) ("SERVLINK-AIR"), or SERVLINK E (Ethernet) ("SERVLINK-E") PD-100 Pump Decoder (optional), Radio Field Access Unit (optional), SD-100 Sensor Decoder, field wiring, Line Decoders ("LD-XXX"), surge protection ("SP-100"), Solar Powered Weather Station (ET-300W-N) and all other equipment required for a complete system and as hereinafter specified. The numerical designation following the TWI- XXX shall indicate the maximum number of decoder addresses capable of being controlled by the system.

The TWI shall be a stand-alone controller and shall have the possibility to be managed from any web browser with the Cycle Manager+ server-based software application. The remote operation will be by a GPRS enabled internet connection.

The TWI shall be capable of logging every action in the system (opening and closing of valves, start/stop of schedules, sensor actions, power failure, etc.) to a maximum of 3,200 actions. When the TWI is accessed from a server, the TWI shall upload the complete log to the server.

The controller shall support the use of a sensor decoder connected directly to the two-wire path. The sensor decoder shall support the use of a flow meter (pulse or 4-20 mA) and the controller software shall log the flow measurements. On over or under flow, the software shall stop the active stations, and shall attempt to continue irrigation according to the active irrigation schedule. If the controller is in the active mode the flow sensor shall trigger an alarm that will activate/deactivate the master valve circuit, should flow be detected prior to start of any active schedule. The flow measurements may be summed and the total flow can be used to trigger actions.

Hi Flow alarms shall be based on the summed flow and shall be triggered during irrigation. Optionally the alarm shall be set to activate a N/O master valve, which will run for 999 minutes, allowing time to locate and fix the problem.

SEUF is a special way of treating the summed flow and shall be used to isolate a valve that is failing in an over or under flow condition.

Leak Flow alarms are also based on summed flow and shall be triggered when during unscheduled flow conditions.



MPF (Main Pump Failure) shall be triggered by sum flow. It shall shut down all running schedules and thus shall stop the MV, all booster pumps and decoders.

The controller sensor decoder shall support the use digital (on/off), and analog (4-20mA) sensors with the following reaction based on a measurement which consists of the following parameters:

<Action> <Object type> <Object Identity>

The “Action” shall be any of the following: Activate, Deactivate, System Off, Pause Schedule, Resume Schedule, Irrigation Prevent, Irrigation Allow, Activate SEUF, Deactivate SEUF, Call Operator (send SMS or email)

The “Object Type” shall depend on the Action selected: The type shall be Decoder, Schedule, Pump/Master Valve , NA (Not Available = not used),

The “Object Identity” shall depend on the “Action” and “Object Type”

Action	Obj (Object)	Obj.ID (Object Identity)	
Deactivate	Decoder	All	All decoders currently active will be stopped All pumps will be stopped, but delayed according to setup
		Decoder	A decoder selected from list will be stopped Any booster pump linked to it will be stopped, unless another decoder running uses the booster. The stop is delayed according to setup.
	Pump	All	All Pumps will be stopped, but no stop signal is transmitted to the decoders
		1 Master	Master Valve will be stopped, but no decoders will be stopped
		2 Boost	Booster 1 will be stopped
		3 Boost	Booster 2 will be stopped
	
	9 Boost	Booster 9 will be stopped	
	Schedule	All	All running schedules will be stopped. If no decoders are running on a manual start the pumps will also be stopped
		1 through 10	The selected Schedule will be stopped. If not used by other decoders running the pumps will be stopped



Activate	Decoder	Decoder	Decoder selected from list will be started The pump will be started If Booster pump allocated it will be started.
	Pump	1 Master Valve	Master Valve will be started
		Booster	Booster 1,,,9 will be started
	Schedule	1 through 10	Selected Schedule (i.e. decoders, MV and possibly booster pumps will be activated
System off			The system will be taken out of Auto Mode. All decoders, MV and boosters are stopped.
Irrigation Allow			Removes the prevent of irrigation schedule start.
Irrigation Prevent			Prevents start of any schedule. Controller remains in Auto mode
Pause	Schedule	All	All schedules will be paused (i.e. decoders, MV and possible Boosters will be stopped
		1 through 10	
Resume	Schedule	All	
		1 through 10	
Activate SEUF			Will start seek of failed valve
Deactivate SEUF			Stop seeking for failed valve
Call operator			Send SMS or email

The controller shall include a special circuit for monitoring, on a continuous basis, the line voltage condition to assure that the mean voltage relative to the ground is slightly negative. Thus, if this condition is changed, due to a leakage in the system, etc., the voltage on the communication lines shall be automatically modified by the central unit to prevent damage to the controller. The system shall include a special circuit for monitoring on a continuous basis, the line voltage to be maintained within certain limits. Thus, if this condition is changed due to a short in the system etc., the voltage on the communication lines shall be automatically modified by the central unit to prevent damage to the controller.

The controller shall come in 6 versions: The TWI-12/10 for individual control of up to 12 valves and 10 sensors, TWI-24/10 for individual control of up to 24 valves and 10 sensors, TWI-50/10 for individual control of up to 50 valves and 10 sensors, the TWI-100/10 for individual control of up to 100 valves and 10 sensors, the TWI-150/10 for individual control of up to 150 valves and 10sensors, and the TWI-200/10 for individual control of up to 200 valves and 10 sensors. It shall be possible to upgrade any lower-rated TWI to a higher rated TWI via software key codes entered at the controller or remotely.



The TWI shall be capable of managing a maximum of 12/24/ 50/100/150/200 Line Decoders operating a maximum of 10 solenoids at a time. Each LD-100 (1 output) and LD-200 (two outputs) shall be capable of operating 2 solenoids per address, whereas the LD-050 (1 output), LD-400 (4 outputs) and LD-600 (6 outputs) shall be capable of operating 1 solenoid independently on each output address.

The TWI shall be capable of managing a maximum of 10 schedules at any one time. Each of the 10 schedules can have up to 6 independent start times per day. The scheduling for each program shall be on 14 or 15 day irrigation cycle, allowing operation to occur on any or all of the 14 or 15 days. Each of the 10 schedules shall be capable of independently being water budgeted from 0% to 250% in 1% increments to accommodate adjustment for daily climatic changes, etc.

The TWI shall display total and remaining run times and shall give a warning for mistakes in programming like overlapping schedules, missing start times, etc. Overlapping schedules shall be permissible, excepting that they shall not have identical start times or start/end times, and the total number of operating valves in the combined schedules shall not exceed ten.

The TWI shall provide the possibility to program schedules either for day and time start or for a link-start with first the schedule being the master schedule and the rest being linked to the master, thus avoiding overlapping when water budgeting.

The TWI shall provide two modes of operation: Automatic or Manual. In the Automatic mode the TWC shall carry out active schedules as programmed. In the Manual mode it shall be possible to turn on any of the valves for 1-999 minutes up to the system capacity of 10 solenoids.

Programming shall be done in a maximum of 100 steps each of a maximum of 999 minutes, which shall allow for repetition of a certain valve (cycle and soak) or pauses "between" steps.

LINE DECODERS:

Furnish and install, where shown on the drawings, TUCOR Line Decoders, LD-050, LD-100, LD-200, LD-400 or LD-600, for interfacing between the communication 2-Wire path and the remote control valves of the sprinklers. The decoders shall be completely epoxy sealed for complete water proofing. The decoder shall have two (2) blue colored wires for connection onto the 2-Wire Communication path and two (2) white colored wires for connection to the solenoid of the remote control valve. Decoders LD-200, LD-400, and LD-600 shall additionally have wires of other colors to distinguish the independent outputs. Each decoder shall be clearly marked with a four (4) or five (5) digit number indicating the number (address) that it has been set to respond to. Decoders may be installed in any random order desired.

The contractor shall be responsible for accurately recording on the drawings, as each decoder is being installed, the address number of the decoder at that location. It is also necessary that it be indicated which remote control valves are being controlled by each specified decoder. In this way he will have the necessary information when he is ready to input the system installation data.



Where the decoder are activating and controlling individual remote control valves, the valve and the decoder shall be installed in a standard plastic valve box of sufficient size to provide easy and necessary access to service the valve and decoder. In no case shall the decoders be buried directly in the soil.

PUMP DECODERS: (Optional)

Furnish and install a TUCOR PD-100 Pump Decoder for each of the pumps on the system, including any Booster pumps, for interfacing between the communication 2-Wire path and the pump main motor starter holding coil relay.

FIELD ACCESS UNIT: (Optional)

Furnish a TUCOR FA-100 Portable Field Access Unit for manual operation of decoders from remote locations in the field. It shall be possible to "Plug" the Portable Field Access Unit into the 2-Wire Communication path by means of an FAB-100, and by keying in the proper decoder identification have the central computer "turn on" or "turn off" the designated decoder. It shall be possible to turn on decoders in any order desired, anywhere on the system, for a length of time from 1 to 999 minutes for each to operate and to have as many in operation at one time (up to a maximum of 10 solenoids/decoders total) as may be desired.

FIELD ACCESS UNIT CONNECTION BOX: (Optional)

Furnish and install, where shown on the drawings and/or where directed, a TUCOR FAB-100 Field Access Unit Connection box assembly. The box shall be of molded plastic (5" x 5" x 2 1/4" deep) with coin-operated latch for the hinged cover. A 1/2" cable gland shall be provided at the bottom for connection of the 2-Wire Communication path to the Plug-In Socket housed in the box on a stainless steel bracket.

Each Field Transmitter Connection Box shall be securely mounted on a 4" x 4" treated and painted wood post, which is securely anchored on a 12" x 12" x 8" deep poured concrete base. The Connection Box shall be approximately 42" above the finish grade. A 1/2" conduit shall be run from below grade, up through the concrete base and attached to the bottom of the transmitter connection box, through which the 2-Wire Communication Wire shall be run up to the box and connected to the socket in the box.

2-WIRE COMMUNICATION PATHS:

All wire required for the 2-wire Communication Paths, from the Line Termination Box, at the central computer location out to the various field decoders shall be double jacketed two (2) conductor cable specially designed for use with the TUCOR Flowmaster control systems. The cable shall be suitable for direct burial and may also be installed in ducts or conduits.



The conductors shall be tin coated, soft drawn, annealed, solid copper conforming to ASTM 33 with 4/64" thick PVC (polyvinyl chloride) insulation, conforming to UL Standard #493 for thermoplastic-insulated style UF (Underground Feeder), rated at 60 degree C.

The two insulated conductors shall be laid in parallel and encased in a single outer jacket of 2/64" thick, high density, sunlight resistant Polyethylene conforming to ICEA S-61-402 and NEMA WC5, having a minimum wall thickness of 0.030". The outer jacket shall be pressure extruded so as to completely fill the interstices between the two insulated wires, or may have Tube Jacketing to form an envelope over the two insulated UF conductors lying in parallel, at the discretion of the manufacturer.

The two conductors shall be color coded with one conductor black and the other red. Both conductors shall be the SAME SIZE and shall be of sizes as required for the proper operation of the Field Decoders and solenoids and/or as called for on the drawings.

All splices and connections in this wiring shall be made using 3M, DBY/R or 82A1 epoxy wire connector kits. Any other type of wire connectors will not be acceptable. Care shall be taken with each wire joint or connection to assure that a completely good, waterproof connection will result. It is important that all wire connections be absolutely watertight, with no leakage to ground nor any shorting from one conductor to the other.

The Grounding Network at the controller shall measure not more than 5 Ohms when measured with a Vibra-Ground, or similar type instrument. It is extremely important that a good ground be maintained for the surge arrestors to be effective and periodic testing is recommended, to assure that you do have a good grounding system at all times.

SURGE PROTECTION - GENERAL:

All Surge Protection, Grounding and Installation of equipment, therefore specified, shall be installed in strict compliance with the manufacturer's recommendations and in accordance with Local, State and Federal codes and requirements.

PRIMARY POWER SURGE PROTECTION:

Furnish and install on the Power Circuit, furnishing power to the power transformer a surge arrestor model Intermatic AG2401 or equal.

FIELD SURGE PROTECTION:

Surge protection SP-100 shall be installed at every line termination point. Additional installation of SP-100's are needed per 500 feet of wire cable, located at the nearest line decoder. The SP-100 ground wires shall be connected to a single 8 foot ground rod. If the valve is metallic or the solenoid valve has a metallic center pin, one SP-100 ground wire shall be connected to this. The LD-400 and LD-600 contain a SP within and may be grounded.



The ground shall measure 50 Ohms or less. Other grounding methods may be necessary to attain this value.