

# Standard Product Specifications

## CENTRAL CONTROL IRRIGATION SYSTEM

### A. COMPUTER EQUIPMENT AND SOFTWARE

#### 1. Central Computer Hardware

- a. The Central Computer shall be an IBM compatible 80586 (Pentium) with minimum 1.0 GHz, and operating with Windows Vista/XP/2000
- b. The Central Computer shall run with a minimum of 256 MB of RAM available (512 MB RAM recommended) for program operation and a minimum of 150MB (600 MB recommended) hard disk space for data storage.
- c. The Central Computer shall have a CD-ROM drive with two serial ports for specific communication options with a 17" True-Color VGA monitor.
- d. The Central Computer shall have a 28.8 K or faster non-WinModem with a Microsoft compatible mouse and Microsoft compatible printer.

#### 2. Central Computer Software

- a. The Central Computer software shall have the ability to communicate with and control up to 9,999 controllers, from a single or multiple computer location(s).
- b. The software shall be capable of operating with multiple communication modes and shall allow for mixed modes within the same system, including Local Radio, Spread-Spectrum radio, Ethernet, wireless Ethernet, GPRS, Phone, Fiber Optic, and Direct Hardwire.
- c. The software for the Central Computer shall allow for the uploading and downloading of all programs and log data by controller or groups of controllers.
- d. All programming shall be capable at the Central Computer as well as at each individual field controller.
- e. The software shall allow direct, real-time access to run stations, run programs, check for flows, check master valve operation, and turn controllers on or off.
- f. The software shall be an intuitive Windows-based menu driven format and shall not conflict with any other software programs running on the same computer.
- g. Weather data from an ET gage, Campbell Scientific model 107 weather station, Tipping Rain Bucket and/or through the *WEATHERSENSE* network, shall be uploaded automatically and re-distributed to all field units. Each individual field controller shall then calculate station run times based on the % of ET dialed in for each station and the programmed precipitation rate for each station. The system shall still allow the operator the opportunity to use his expertise and input to have each station adjust automatically to compensate for different types of soils, grasses, plant materials, exposures, etc.
- h. Real-time evapotranspiration provided using the *WEATHERSENSE* option uses the internet to gather ET and rain data from multiple weather sources and uses the most appropriate data for a specific controller based upon its latitude and longitude, and calculates ET using a modified Penman-Monteith equation. The data collected includes the dew point, relative humidity, temperature, wind speed, vapor pressure and solar radiation. Information is provided by the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory (ESRL) Global Systems Division (GSD).

- i. Failure of the central computer system or communication links to the field controller shall not affect normal, water management and/or flow management operation of irrigation controllers.
- j. Water usage data shall be automatically retrieved monthly from each controller and written to text files for easy placement into windows graphing programs.
- k. The software shall be able to poll any controller with a Tipping Rain Bucket or site with a weather station throughout various times of the day and/or night and automatically turn off all controllers due to an operator set rain amount, communicating on the system instantly.
- l. The software shall allow all program data, log data, summary data and alert data for each controller to be selectively printed by controller, by group, or by manager.
- m. The software shall allow users to view and/or override any changes made at irrigation controllers. The user can identify who accessed any field unit, what was done, and when the user left, through the use of a multi-level access control feature.
- n. Alerts shall print each day based on operator-set filters. This feature shall print only program changes, communication status and problem flags selected by the operator. The software shall report alarm conditions at a minimum to include the following:
  - 1. Communication failures and successes (identifies type of problem, time, and location).
  - 2. High or excessive, low flow and no flow conditions with the time (AM/PM) of the occurrence for each individual valve.
  - 3. Main line breaks during scheduled irrigation as well as all other times when flow exceeds user set parameters.
  - 4. Manual watering and manual operation by station and time in the field controller.
  - 5. Current (amperage) alarms by station and time, both high and low, and output shorts due to solenoid failure.
- o. The software program shall be able to provide and print a water usage report per station, per controller, per month, per year in gallons or HCF, the total as well as in the following categories: programmed irrigation, test and manual, radio remote usage, and non-controller (quick coupler, hose bib usage, bleeding valves manually, etc.).
- p. The software program shall be able to provide and print a water management report including graph depicting by month the amount of irrigation water used compared to a monthly allotment in HCF or gallons, and ET weather demand for the month, with a percent savings without the need to export data to any formatting program in order to produce said reports.
- q. The software shall have the capability to interface with GIS data and provide an integrated GIS Viewer visually representing user's controllers on a map. Highly customizable, this feature shall show the status of each controller including mainline breaks and flow alerts through the use of color-coded icons.
- r. Future software upgrades and enhancements to the central control software shall be provided to the end user at no charge.

## **B. FIELD EQUIPMENT**

### **1. Controllers**

All controllers shall have the following specifications and capabilities:

- a. Shall be capable of fully automatic, semi-automatic, and manual operation using a keypad that is an integrated part of the controller. Each controller shall be capable of storing irrigation schedules, monitor and manage flow all without the Central Computer (i.e. if the Central Computer is turned off, removed, or if communication from/to the Central Computer fails, the field controllers will continue to perform weather and flow management functions).
- b. Backlit display shall have a minimum of sixteen (16) lines by forty (40) characters so that scrolling through menus is minimized. The display shall allow the user to easily move from screen to screen through an intuitive, self-prompting display so that it is easier for the user to program, read and understand the controller. The controller shall display an area description for each station including the station's location, the type of plant material irrigated and type of irrigation equipment used.
- c. The controller shall have the built-in capacity for sensing flow via a flow meter input and utilizing a master valve without the addition of sensor boards, decoders, or other pieces of equipment.
- d. There shall be a minimum of seven (7) regular irrigation programs with individual station cycle and soak watering, plus two additional syringe/propagation programs each with minimum of six (6) start times, adjustable station run times and with automatic programming capability up to a specific date. When the date is reached the controller shall automatically cease irrigating the manual program.
- e. The controller shall have a water budget feature that provides monthly water volume allotments proportionate to historical evapo-transpiration (ET) which is interactive with all programs, and able to alert the user (via on screen alarms) when the controllers' water usage is more than the user set water budget.
- f. A full year master schedule to allow twelve (12) month programming shall be a standard feature of the controller.
- g. Programming shall be based on a seven (7), fourteen (14), twenty-one (21) or twenty-eight (28) day scheduling and shall be able to irrigate in minutes and as a % of ETo.
- h. The controller shall be able to receive real-time weather data directly from an ET gage and tipping rain bucket, and as a stand-alone controller automatically use the data to calculate appropriate run times for each station without use of a central control system.
- i. The controller shall be able to irrigate with the use of soil moisture sensing whereas the soil moisture sensor overrides programmed irrigation minutes, or minutes calculated when using real-time weather data. The soil moisture sensor used with the irrigation control system shall be by the same manufacturer.
- j. The controller shall have flow management capability as a standard feature whereas the controller shall learn each station's expected GPM flow rate automatically at night over several irrigations, and use the mainline GPM capacity programmed, to operate up to four (4) valves at the same time plus the master valve to shorten the water window.
- k. Alerts shall be able to be processed and responded to at both the field controller location and at the Central Computer location.
- l. When an alert, such as High Flow is indicated on the controller, the station with the High Flow shall still attempt to come on each watering cycle and then shut off, rather than having the alert keep the station off until someone clears the alert from the central computer or at the field controller.

- m. The controller shall have built-in amperage meter to accurately measure and diagnose valve solenoid electrical problems such as “no current”, “station short”, “under current”, “over current”, etc.
- n. The controller shall have an irrigation test program or “walk-thru” program that has a delay time to allow a user to walk to a certain area before valves come on. The controller shall then manually water a sequence of predetermined stations for set program times. The programmable delay time shall be an integral part of the irrigation test program. The controller shall be capable of operating a test program without affecting the controller’s normal program station times or without terminating a regular watering schedule.
- o. The system shall be capable of allowing the user to make changes to the irrigation program via either at the Central Computer or at the field controller without requiring the user to go back to the Central Computer to accept the change.
- p. The controller shall allow for operator-set water window, which prevents irrigation from continuing beyond a set end time. Remaining run-times shall be carried in a hold-over table and shall be applied at the next scheduled irrigation with the system prioritizing which valve to operate based on accumulated ET and the hold-over time.
- q. The system shall provide a multi-level access control up to four (4) levels for controlling who programs what at each controller. The controller shall have the ability to track and report on when an access code or “individual” user logged into the controller, what keys were pushed while there, and when an access code logged out of the controller. These shall be date and time stamped.
- r. The controller shall be able to display for the user a detailed water usage report categorizing for each month the usage during scheduled irrigation, test and manual key operation, and for non-controller usage such as bleeding valves on manually, using quick couplers or hose bibs.
- s. Optional Radio Remote receiver board shall be built-in the controller and a hand-held radio remote transmitter will be supplied so that the end user can trouble shoot valves remotely without having to go the controller itself. The hand-held transmitter shall display operational information such as valve on, station description, expected and actual gallon per minute flow rates and electrical draw in amps. Station programming information such as total minutes, minutes per cycle, soak in time, expected flow rate and station square footage shall be editable at the handheld transmitter.
- t. The field controller(s) shall be capable of utilizing a single mode or a combination of communication modes such as hardwire cable, standard telephone, Ethernet, wireless Ethernet, point-to-point spread spectrum radio, local radio in the 450-470 MHz range, fiber optic modems, or GPRS wireless modem application as communication links to the central computer. The field controllers shall be capable of directly receiving, storing, and operating commands downloaded from the central computer.
- u. The field controller shall come with a ten (10) year warranty from the manufacturer.

Model Calsense ET2000e or equal

## **2. Controller Enclosures**

- a. The enclosure shall be of a vandal and weather resistant nature manufactured entirely of 304-grade stainless steel, and the top shall be 12 gauge and the body 14 gauge. The main housing shall be louvered upper and lower body to allow for cross flow ventilation. A stainless steel backboard shall be provided for the

purpose of mounting electronic and various other types of equipment. The stainless steel backboard shall be mounted on four stainless steel bolts that will allow for easy removal of the backboard.

- b. The 38-inch height with flip top shall provide easy access for programming from a standing position under normal installations.
- c. The pre-assembled vandal resistant enclosure factory pre-assembled and supplied by controller manufacturer shall come complete with lightning and surge protection and all terminals shall be factory labeled. The pre-assembled enclosure shall come provided with an On/Off switch to isolate the controller along with a GFI receptacle. An optional radio antenna shall be pre-mounted and connected on SSE-R enclosure. The enclosure shall include 2-7/8", 1-1/2" thick, 6-pin cylinder, die-cast steel padlock with unique shackles design.
- d. Factory pre-assembled enclosure with controller shall carry a full UL listing.
- e. Controller manufacturer shall offer a double-wide pre-assembled enclosure for two controller placements side by side. All necessary wiring between the two controllers in order to share central communications and/or flow and weather data shall be pre-wired by manufacturer for easy installation
- e. The factory pre-assembled enclosures shall carry a ten (10) year warranty.

### 3. Wall-Mount Installation

- a. The wall-mount package shall be as indicated on the drawings, and shall be installed per manufacturer's specifications, as shown on the drawings, and as specified herein. The wall-mount package shall consist of the controller housed in a weatherproof, lockable powder coat painted steel cabinet, and the model –TPP consisting of a transient protection board labeled with the appropriate station count and accessory component terminals, housed in a outdoor, weatherproof, and lockable powder coat painted steel cabinet, and an AC line and surge protection on the 110 VAC side.
- b. ALL wall-mount equipment shall be available as a pre-assembled package mounted on a stainless-steel back plate directly from the factory.

### 4. Flow Meters

- a. The Model FM flow meter shall use two #14 AWG; one red, and one black in 1" PVC conduit to connect to the irrigation controller. The maximum wire run between flow meter and controller shall be 2000 ft. The flow meter shall send low voltage digital pulses back to the controller and therefore all electrical connections must be waterproof and shall resist any moisture entry.
- b. It is intended that all wire runs between the controller and flow meter shall be direct pulls and shall have no splices. If wire splices are unavoidable, they shall be installed in a valve box with Spears DS-100 connectors with Spears sealant or 3M Scotchlok No. 3570 connector sealing pack used, with valve boxes properly labeled.
- c. Each flow meter shall have the following characteristics:
  1. Housing to be a Sch 80 polyvinyl chloride tee or bronze tee
  2. Have a pulsing output that operates at 9VDC and a pulse rate that is proportionate to the GPM
  3. Fully compatible with the internal interface at each field controller
  4. Powered by the controller
  5. Replaceable metering insert shall feature a six-bladed design with a proprietary, non-magnetic sensing mechanism

6. Supplied by the same manufacturer as the irrigation controller.
- d. Several controllers, up to twelve shall be able to share one or multiple points of connection with multiple flow sensors when each controller has been specified as such. This option shall allow several controllers to share the irrigation programs and flow information for:
  1. Monitoring of system flows.
  2. Shortening water windows by maximizing the number of valves on without exceeding system flow capacity.
  3. Turning OFF valves with excessive flow rates due to broken lateral lines.
  4. Tracking water usage and comparing to a water budget.
  5. Eliminating relays when sharing pumps and master valves.
  6. Working in the field without the need for a central computer.
- e. The communication method between controllers specified for sharing flow information shall be either hardwire cable or spread spectrum radio. The hardwire cable shall be a 4 conductor communication cable known as Paige P-7171-D in conduit. The controllers shall be specified with the –M communication option. The radio link shall be spread spectrum and the controllers shall be specified with the –SR communication option when hardwire is not feasible or cost effective. This allows the user to link several controllers with unlicensed frequency hopping radios. A radio survey conducted by the manufacturer is required prior to installation to confirm proper communication.
- f. The hardwire and radio link options for the *FLOWSENSE*<sup>™</sup> option shall be mixed on a project to create the most efficient system possible.
- g. A field controller shall be able to interface and read up to three flow meters varying in size when the controller is specified as a –F option. A by-pass manifold design using the –F option shall provide for up to three different size flow meters and master valves at the POC and shall to be able to read and monitor all flow rates and detect individual station problems regardless of the range of flow (GPM) on the project.

## 5. Weather Monitoring

- a. The Central Control system shall include a remote connected ET gage (model ETG) where shown on the plans and specifications. The ET measuring device shall be powered by the selected field controller designated as a –G model. ET is measured directly in 0.01" increments and pulses from the gage shall be sent directly to the field controller. The daily, on-site ET data shall be stored in a 28-day table in the controller.
- b. Paige P-7171-D cable shall be installed in conduit and shall be run from the location of the ET gage back to the controller designated as the –G model. Maximum length of cable shall be 1,000 feet. Wire runs shall be direct pulls without underground splices.
- c. The top surface of the gage shall be 3'4" above grade. The location shall be representative of the area to be irrigated, free of any obstructions to sunlight and wind. The location of the gage shall be located in an area where water from sprinkler heads does not hit the top surface of the gage.
- d. A vandal-resistant stainless-steel enclosure shall be used to protect the ET gage. The ET gage shall be mounted on a poured concrete base 18"x18"x 6" with the enclosure metal base and stake embedded into the slab. The horizontal plate shall be one inch (1") below the poured concrete, and the finish grade shall be two inches (2") below top of the concrete base.

- e. The Central Control system shall include a remote connected Tipping Rain Bucket (model RB-1) where shown on the plans and specifications. The rain-measuring device shall be wired using the 60' of 2-conductor cable supplied with the Tipping Rain Bucket to the selected field controller designated as a -RB model. The cable should be installed in conduit and the connections are to be made at a terminal strip inside the enclosure. Maximum length of cable run shall be 200 feet.
- f. The Rain Bucket shall accurately measure rainfall in 0.01" increments by means of a tipping and emptying device mounted below the center of the collection dish.
- g. The controller shall provide the following programming parameters for rain:
  - Stop Irrigation after x.xx inches
  - Maximum Rain in One Hour is x.xx inches
  - Maximum Rain in 24 Hours is x.xx inches
  - Let Rain only build up to x.xx inches
- h. The ET Gage and the Tipping Rain Bucket shall be supplied by the controller manufacturer to the customer through local distribution.
- i. The system shall be able to interface with a complete weather station and shall be manufactured by Campbell Scientific, model ET107 or equal with Loggernet software and necessary Data logger hardware or equal.