CHIPKIN

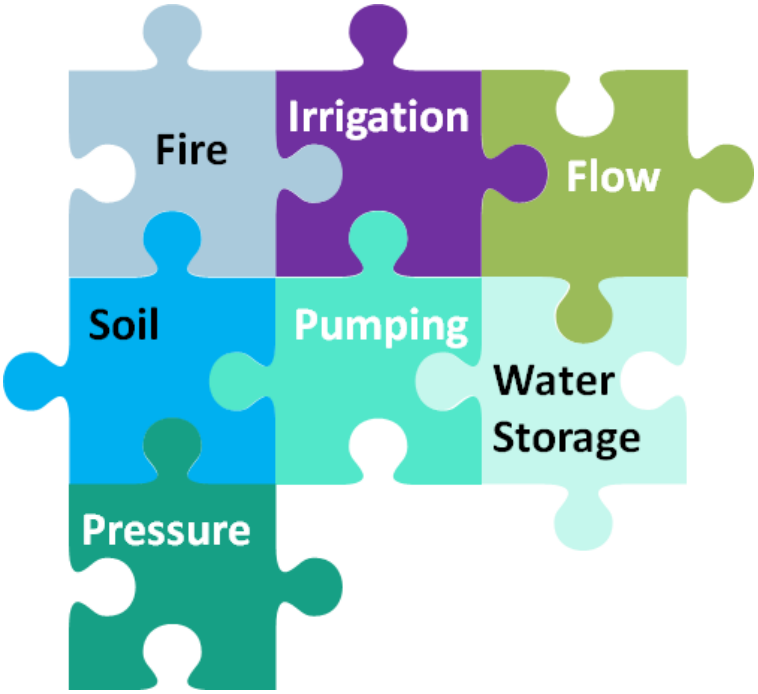
Toll Free: 1 866 383-1657
3381 Cambie St., #211 Vancouver, BC Canada V5Z 4R3

Irrigation System Automation

When things work together – they work better

"How do I connect my irrigation Controller to other systems for pumping, flow control, fire, weather, soil and other sensors?"

The Problem: I want my irrigation system to work with some 3rd party components

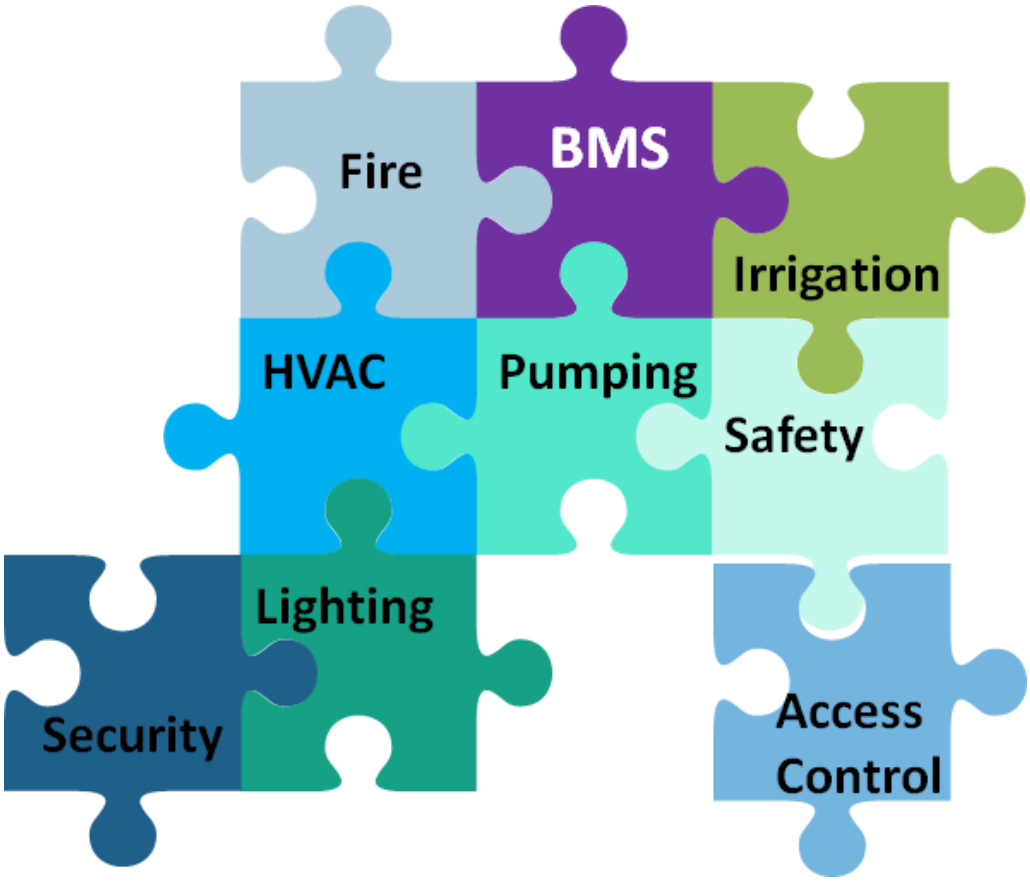


Connecting your irrigation system to a site's individual 3rd party systems and devices can have extensive benefits, by extending the utility of your Irrigation controller to the additional commands from other devices for example, pressure sensors from Pumping Stations.

A protocol gateway can allow your irrigation controller to monitor, respond to, or control 3rd part devices. The gateway does this by exposing the 3rd party status and command data in such a way that the irrigation controller can understand them.

For Example, if your Irrigation system is connected to the Fire System, irrigation controller can halt all irrigation activities when a fire system reports an alarm, to conserve water for emergency reactions.

The Problem: I want my irrigation system to be part of my site / building automation system



Connecting your irrigation system to a site's Building Automation System (BAS) can have further benefits, especially in system convenience, energy/water savings, fire safety etc.

You already have a site BAS that is well integrated. Now you can add the control and monitoring of the irrigation system to the BAS. A protocol gateway can expose the irrigation controller's status and commands to the site's BAS to be controller and monitored directly through the BAS interface.

For Example, if your Irrigation system is connected to the BAS system, it can receive a message from the Fire Detection system to halt all irrigation activities to conserve water for emergency reactions.

Irrigation Automation Integration Possibilities

Weather

ACC Controllers are equipped with their own Solar Sync sensor inputs. These add-on sensors adjust irrigation amounts automatically for local conditions in the controller, using the Seasonal Adjustment feature to set percentages of the base run time (100%) of each station.

Integrated into a BAS, the controller will simply report the current level of adjustment which is adequate for many applications. These sensors can also provide rain and freeze shutdowns to inhibit irrigation locally, and this status can be reported to the system.

Alternative Weather Sources

It is also possible to use a local weather station or an online weather source that is connected to the automation system to provide a source for similar, or more advanced, adjustments.

At a minimum, the weather source must provide:

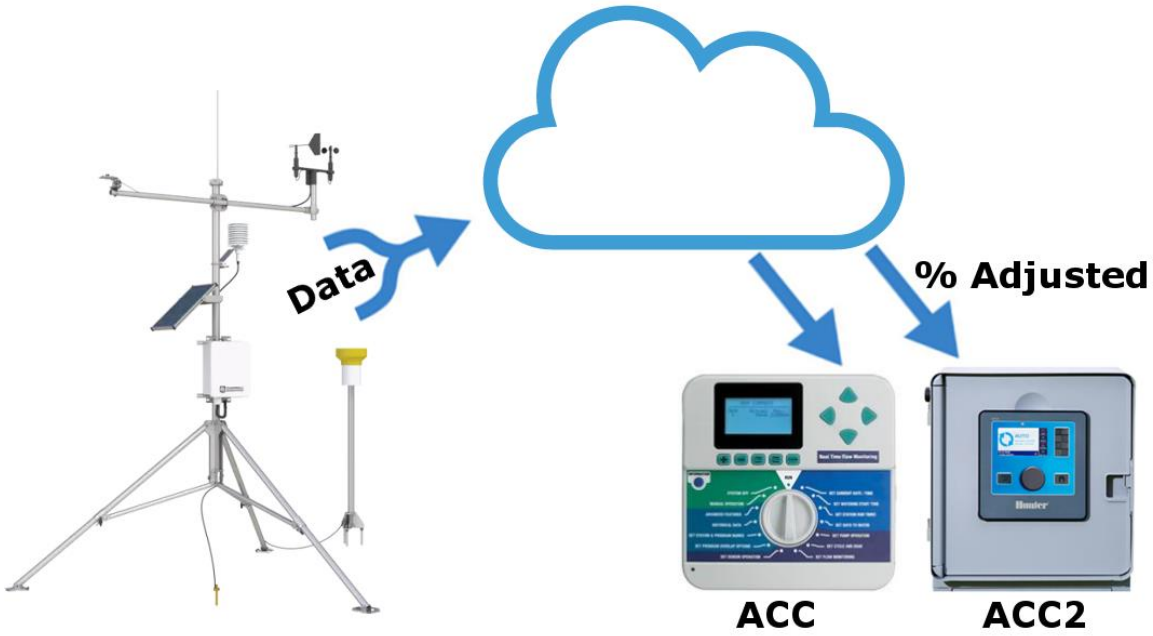
- Solar Radiation
- Air Temperature

Ideally, it would also provide:

- Relative Humidity
- Wind Speed
- Rainfall Totals

All inputs should be compiled on a time-stamped, hourly basis.

NOTE: Most irrigation systems require immediate shutdown during rainfall events, and a dedicated rain sensor (Hunter Rain Clik™) at each controller is always recommended for this purpose.



The alternative weather source can be used to calculate a percentage adjustment similar to that performed by the Solar Sync. sensor and used to adjust all controllers to a specific percentage using the Seasonal Adjust commands. This is a simple formula, based on the Modified Penman-Monteith equation for evapo-transpiration.

Additionally, a contingency can be created to suspend irrigation for a number of days based on measured local rainfall amounts, using the controller's Programmable Days Off command. This state may be overridden by a user with the Cancel Programmable Days Off command.

More detailed scenarios are possible that allow modeling the soil moisture level of the root zone of plants in each zone of irrigation.

There are many weather service providers. Most are online (the cloud) and the data is accessed by an API (see below link for an example). Often the weather server can be installed locally at a site. Most of this data cannot easily be used by an irrigation controller. Why? Because the data is provided in a format that the irrigation controllers cannot accept as input. Solutions are provided by means of protocol gateways.

http://weather.chipkin.com/

IP Address: 178.128.239.15

Slave Address: 255

Function Supported: 1,2,3,4,5,6,15,16

Modbus register map

Flow Sensors

Hunter ACC controllers allow direct connection of a flow sensor. ACC2 controllers allow direct connection of up to 6 flow sensors.

In most irrigation scenarios, we recommend direct connection of the irrigation flow sensors to the controller, which is already programmed to monitor and report flow on command.

- Controllers can learn the typical flow of each zone of irrigation and allow adjustment to alarm limits and delay factors to prevent false alarms.
- The controllers are therefore able to detect high or low flow conditions on their own and perform local diagnostics to identify and shutdown malfunctioning devices.
- They will report the details of such alarms to the system, after the situation is diagnosed.

Alternative Flow Sources

By connecting the irrigation system into a BAS, it is possible to accept flow information from sensors connected separately through the automation system and then issue commands to the controllers based on those inputs. However, local diagnostics require a high level of real-time interaction with the field outputs, as the controller halts irrigation, then samples suspect stations one by one to determine which one is causing the condition.

- Flow diagnostics require access to a station database, with all the elements the controller already has.
- The flow diagnostic process will create more data traffic on the network.
- Latency between the flow source and the controller during diagnostics has the potential to create erroneous results, which may have serious consequences.

Higher level functions are certainly possible via automation connection to external flow sensors, such as cancelling irrigation when total flows have exceeded a user-defined limit or switching to another water source.

Pump Stations

Many pump stations can be equipped with their own software and connection options for automation systems. In addition, most will automatically turn on or off, based on their own sensors.

Hunter ACC controllers have 2 Pump/Master Valve (PMV) outputs, and ACC2 controllers may have up to 6. These outputs may be used to start local pumps via pump start relay, when necessary.

Higher level pump monitoring (for example, motor temperature or other alarm conditions) should be monitored by the pump interface with the automation system, and any resulting actions for the controllers can be sent with the standard command set.

Pressure Sensors

Hunter controllers do not have direct pressure sensor inputs. If pressure sensing is a system requirement, this should be supplied via the automation system, with conditional programming to issue whatever commands are required to the controllers with the standard command set.

Pump stations often supply pressure data as part of their information, and this is a potential source of pressure data if the pumps are integrated into the automation system

Hunter controllers monitor flow, which is a function of pressure and pipe diameter, so significant changes in pressure will be seen as changes in flow at the controller level. The controllers will begin flow diagnostics (as described in Flow Sensors) if pressure conditions result in high or low flow conditions.

Water Tanks

Hunter controllers have no specific inputs for water tank levels. They do have normally open/normally closed sensor inputs, but these are simple open/closed contact closures that will not report tank levels or make decisions based on tank volume.

Tank levels should be supplied to the automation system via sensors designed for that purpose. Conditional programming can then be created within the automation software to take specific controller actions with the standard command set, if necessary.

If a tank level is low, the system might suspend controller irrigation, or switch to another tank or water source, as examples.

Fire Systems

A common requirement is to halt all irrigation activities when a fire system reports an alarm, to conserve water for emergency reactions.

This would be easily done with the standard command set via the automation system, where an active alarm monitored by the fire system would issue controller Programmable Off commands to all connected controllers.

The Programmable Off state can be cancelled with standard commands, if it is determined that it was a false alarm.

Soil Sensors

Hunter ACC controllers do not have specific soil moisture logic. The most command applications consist of using the Clik sensor inputs to inhibit irrigation when a connected soil sensor reads “wet” (open or closed input). ACC has 4 Clik inputs, ACC2 has 3, and these may be adequate to prevent unnecessary irrigation on their own.

More detailed responses could be created via automation, with a network-connected sensor array reporting conditions from the field. This technique is not yet widely used in commercial irrigation, and soil moisture sensors are often used as informational-only for the human operator to consider in programming decisions.