# WATER-INSIGHT

Application Notes

Rev 04

AN28 - Tips and Tricks for Site operation using the EP3

Valid for V3.xx or V5.xx IPC firmware versions

This document provides a handy guide to checking the operation of IPCs in the field. It is assumed that the reader is familiar with the IPC pod configuration, schedules and other concepts and has a basic working knowledge of an IPC system and its functions. It is advisable to familiarise yourself with the "EP3 User Guide" in conjunction with this application note. There is also a range of application notes to suit some specific processes available from Water-Insight.
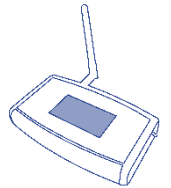
In this document we refer to V5 as new generation V5.xx firmware running on the IPC, EP3 and INC. V3 refers to older generation firmware running on the IPC (V3.xx), on the INC (V3.xx) and on the EP3 (V4.xx).

Essential Equipment

Installers should have the following on Hand when they go to site:
- a) EP3 with SD card loaded with podlist, schedules and latest firmware (for IPC, INC and EP3)
- b) Spare SD card
- c) Spare lithium ion batteries for EP3
- d) Spare antenna for EP3
- e) Stylus
- f) At least 2 magnets (in case you drop one)
- g) Spare IPC batteries and replacement kits (gel)
- h) Spare king connectors, screws
- i) Screwdriver to remove IPC from post/pods
- j) Flat blade to remove bottom plates and battery from IPC
- k) A rag (to clean IPC solar panel or to shield from sun to see if solar panel has a fault (battery voltage monitoring)
- l) A map of the site showing post and IPC positions
- m) A printout of the operating time summary and IPC serial number/names/mac addresses (a clipboard is handy)
- n) Laptop (in case changes need to be made to podlist)
- o) Spare IPCs (if there is a likelihood that some need swapping out)

Arrival on Site

Always carry a spare set of batteries for the EP3 and a magnet when going on site. Radio communications can draw heavily on batteries and the EP3 batteries will last less than a day if radio communications are constant. A magnet is useful because the IPC has two reed switches operated by a magnet situated at either end of the unit: a) one end powers the units off if the magnet is held in place for a few seconds and restarts it when the magnet is removed, b) at the other end is a label that reads "magnet" placing a magnet for a few seconds at this end will place the unit into bootloader active mode awaiting a firmware upgrade, it is also used for bring the unit out of hibernation.

When you arrive on site it is imperative that the EP3 has the correct pod configuration loaded into its memory and the schedule files for the site. These are provided on an SDcard and the SDcard must be maintained at the latest edition of the pod files and schedules. Some sites leave the SDcard in the EP3 or in a place where operators can find it and load their EP3 before going on site.

If there is an INC on the site – never go out into the field without making sure that the card in the INC matches any other card you might be using. We recommend having a copy of the card but use the card from the INC in your EP3 in case you have to swap out IPCs at a post (there is a separate app note for this) then before leaving the site fit the card back into the INC and if swaps have been made load the podlist and schedules. If you use a second card make a copy of the INC card for your records.

EP3 User interface

The EP3 has a touch sensitive screen and runs a menu style interface navigated by tapping buttons, selecting from lists and checking checkboxes to select commands. When you turn the EP3 on you will see a top level menu of buttons. In this document we will refer to it as the "main menu" screen. Usually to return to the main screen from a sub menu there is a button labelled back. Tapping this button sometimes repeatedly will navigate back up the menu chain to the main screen.

AVOID GETTING IT WET.

Check the Time

Before undertaking any work check the time on the EP3. It should be set to the same time, date, day cycle and period as the IPCs that are operating on site. An easy way to check the time on the site is to view the status of a few IPCs nearby. Viewing the status will return their time, day and cycle period. Do this for a few units until you are satisfied with the local site time. To check the time issue a status command: main>ipc list>(select an IPC)>view>comms>(check statusbox)>send. Make sure the IPC you selected is nearby so that local radio communications are effective. The IPC will return its status as well as time. Once you have established the site time then choose main>settings>time to set the time on the EP3. Do not tap the send button because this will attempt to transmit the time to all nearby units.

If there is an INC on the site – never go out into the field without synchronising the time on the EP3 to the time on the INC (not necessarily to your mobile phone in case the site time is different).

Watch out for EP3 times that are out by a massive amount if you haven't used it for a while. The EP3 real time clock backup battery might need replacing and you could upset the time on the site by accidentally sending a bad timeset.

Always make sure that you are using the latest firmware on the INC and EP3.
- V5.xx INC must match V5.xx EP3 (the 5 is important the other two digits may vary)
- V3.xx INC must match V4.xx EP3 (the first digit is important the xx may vary)

IMPORTANT
On V5 Ep3 firmware the day of the cycle is automatically calculated and the cycle period (number of days in the cycle) is derived from the schedule files. When using a V5 Ep3 on a V3 IPC site it pays to timeset and resend all the schedules to the IPCs to create the correct alignment of day and cycle.

On V3 sites it is very easy to go out to the site and start timesetting IPCs not realising that the site is on a different day, this is because on older EP3s (V4) you must manually set the day of the cycle. This must always match the time on the site but beware a V5 EP3 may calculate this day differently so once you start using V5 Eps always set the time from that version of EP3.

No Communications

Communications to an IPC can be undertaken in local mode or mesh mode. In local mode the EP3 is within sight and radio range of the IPC and this is the simplest and easiest mode to be working with when working on a site and visiting IPC posts.

Mesh mode communications is used when there is no direct line of site or radio coverage directly between the IPC and the EP3. Mesh mode communications relies on messages propagating across the site to reach the destination IPC and can take longer to complete. Though mesh communications are effective, for site work it is quicker to use local communications unless you are simply requesting status from a remote IPC.

When work in local mode communications, if you issue a status request to an IPC but do not receive a response or receive a message like "no response after 5 attempts" then try these checks:
1. Verify that the shipping magnet is not still in place on the end of the IPC.
2. Verify that the serial number on the IPC on the post is the same serial number listed in the podlist for that post name
3. Verify that the unit is not in hibernation (status led on rear of unit flashes every 10s)
4. Verify that the unit responds to placing the magnet over the label that says "magnet" this will place the unit in bootloader mode and after 1 minute it will exit and you should try to immediately reissue the status request. If it responds not the battery level.
5. Very occasionally the on/off reed switch can stick and hold the IPC in power off mode. A gentle tap on the end of the IPC is usually enough to loosen it.
6. Note the serial number ran post number and monitor the post for scheduled operations. If it is still watering ok then don't remove the unit from the post immediately.
7. Verify that the radio channel and farmID are a match in the podlist for the IPC. If you suspect this is not the case then first discover the radio channel that the IPC is on and set to the desired channel, then set the farmID (V5) see other app notes for this process.

Timesets.

There are two ways to issue the time to a site a) a broadcast timeset and b) a unicast timeset. A broadcast timeset is issued from the EP3 using the settings>time>send button and will be transmitted to all nearby IPCs which will then retransmit the time to neighbouring IPCs to propagate the time. This method is not guaranteed to reach every IPC on a site but my moving around on a site and repeating the process the time is propagated. IPCs should then be status checked to see if they have received the time and if not then the preferred method is to issue a unicast (local) timeset to the specific IPC.

In general, once a site is set up broadcast timesets should be avoided except for routine maintenance every few months for change of daylight saving or to resynchronise the site when watering schedules are revised. If not undertaken carefully broadcast timesets can leave parts of the site on different times thus interfering with correct schedule operation.

To repair the time on an individual IPC a local timeset method is used. First select the IPC you want to change then issue the timeset comms command to it: main>ipc list>(select an IPC)>view>comms>(check timeset box)>send. After issuing a timeset it always pays to follow this by requesting the IPC status to verify the time and that the schedule on the IPC matches the schedule held in the EP3 schedule list for that IPC.

Broadcast timesets to IPCs running V3.xx firmware should deselect the "Use FarmID" option in EP3 settings for time and Date. IPCs on V5.xx firmware must have a valid FarmID and must select the "Use FarmID " option.

Scheduled operation.

It is important understand that changing the time on an IPC can result in invalidating alarm times for operation and it can take some time thereafter to resynchronise the IPC because it needs to recalculate the alarm times from the schedule list. The schedule list is described in relative terms (e.g. day 1 on at 13:30 for 20 mins, day 2 on at 9:30 for 20 mins) but the alarm times are converted to a date/time (e.g. 16/12/2017-13:30-on, 16/12/2017-13:50-off, 17/12/2017-9:30-on etc.) these alarm times are stored in on-off pairs in a list that is calculated. The list is only recalculated when:

1. The IPC undergoes a power restart
2. The IPC receives a message with the schedules
3. At midnight at the end of the last day of the cycle period (i.e. one minute after 11:59 pm on day 2 of a 2 day cycle period.)
4. For V5 IPCs the schedule alarms are also updated when a timeset is received.

If the time on an IPC is altered so that then the IPC will continue the current operation (valve on or not) until the time match the alarm value. Beware that if you move the IPC time beyond the alarm time the alarm event will not occur. This could result in units being stuck on or off. Eventually when midnight at the end of the cycle period occurs the alarm table is recalculated and new alarm values are generated for the real-time clock. All currently on IPC will turn off until the next alarm event to turn on occurs.

At midnight IPCs will turn off and drive circuits for IPC scheduled to turn on at midnight will charge ready for operation just after midnight. It can take up to a minute for this process to complete which can result in no IPC valves on at all for a short time until the new events of the new cycle period commence.

Checking Schedules

Schedules are sent to the IPC using the EP3 when the site is set to work. They are retained in non-volatile memory in the IPC and the IPC uses them to calculate an absolute date/time alarm into the IPCs real time clock. When the IPC time reaches the alarm time it generates an event in the IPC to turn the sprinkler valve on or off. When you check the status of an IPC then it pays to verify that that the IPC has the correct schedule.

If the status message says schedule matches then the EP3 and IPC concur that that the IPC has the correct schedule. If the status message says schedule wrong then this can be corrected by reissuing the schedule to the IPC: main>ipc list>(select an IPC)>view>comms>(check schedule box)>send.

If the status message says inhibited or not present then the schedule can be reissued to remove the inhibit condition. Inhibit is a special state that means the IPC has been prevented from operating its scheduled watering by issuing the inhibit command. This feature is sometimes used to suspend operation while for example, fertilizer is applied to the paddock. To resume from inhibit send the schedule to the IPC.

If the EP3 says the schedule is wrong it may be being reported as wrong because of a difference between V5 and V3 operation. In fact if schedules have not been redistributed to the IPC they should be ok. If in doubt resend the schedule from a V5 EP3.

Manual operation.

To verify that an IPC/solenoid/valve is working the technician will occasionally manually activate the valve to confirm water is flowing. To manually activate a sprinkler: main>ipc list>(select an IPC)>view>comms>(check "manual" box and check "on" checkbox)>send. To turn it off again: main>ipc list>(select an IPC)>view>comms>(check "manual" box and check "off" checkbox)>send. Never leave the "manual" checkbox selected, always check the status afterwards to ensure that you don't manually activate an IPC accidentally.

If no watering occurs this could be due to a number of problems which may or may not include the solenoid, wiring, valve etc. try these:

1. Turn the valve tap on then off then back to auto (for three position tap) to reseat the valve
2. Do a EP3 **manual off** (wait one minute)
3. Do a EP3 **manual on** (listen for solenoid click, watch for water flow)
4. Do a EP3 **manual off**
5. Check the IPC status
6. If this doesn't work then hold the magnet over the power off reed switch (not the bootloader reed switch) for 30 seconds and repeat from step 2.
7. If you can hear solenoid clicks usually the IPC will be functioning correctly. If you cannot hear solenoid clicks the solenoid may be faulty or incorrectly wired or ultimately there may be an issue with the IPC valve drive circuit.

Winterizing a Site

This is optional (but note recommendations below). Many farmers don't bother because they will need to reschedule next summer and if they only have an EP3 this will take time.

In winter months the IPC can be put into a state so that operations are minimised to prevent watering and extend battery life. This is especially useful if the site receives very little sunlight in the winter months. This is done by inhibiting the IPC. Inhibiting removes the schedule from the IPC so that it cannot automatically operate the valve. Follow these steps to inhibit the entire site:

1. Make sure the IPC configuration is loaded in the EP3
2. Make sure you are in radio range of the IPC you want to inhibit
3. Turn on the EP3
4. From the main menu Tap **IPC list** and select the first device in the list, tap **view** to display the IPC details
5. Tap comms
6. If the IPC is currently watering you must first turn it off. Tap the checkbox marked **manual** and tap **off** to select then make sure **local** checkbox is selected then tap **send**. Wait until the IPC turns off.
7. Select the **inhibit** checkbox and select **on** then tap send to inhibit the device.
8. Tap **back** to go up a menu level then tap **next** to proceed to the next IPC in the list
9. Repeat from step 5 until you have inhibited all the IPCs on the site. You may need to move around to ensure that you stay in radio range of the IPCs.

Note that some valves will not operate correctly if the water line is not pressurised.

IMPORTANT

It is highly recommended that sites that dip regularly below 0 degrees C be winterised to prevent damage to the battery. Very cold sites should have the **magnet put back on the battery disconnect end of the IPC** (not the end that says magnet but the other end where a magnet is typically applied for transit and storage of the IPC when not in use. Use duct tape or something similar. This will disconnect the battery from the solar charging circuit and make the device inoperable (un responsive to radio). It must be removed in spring well in advance to provide time for the unit to recharge.

Other tips for winter maintenance are as follows:
1. From time to time check the solar panel and ensure it is free from dust or bird fouling, clean with a damp rag
2. Minimise radio communications to the IPC, radio communications has a significant impact on power consumption
3. Keep trees pruned if IPCs are located in the shadow of trees lines.
4. Upgrade to the latest firmware version of IPC for best ongoing performance next season.
5. Check battery status from time to time to verify that batteries are not excessively discharged or are coming close to the end of their operable life (about 4 years).

For more information contact Water-Insight support@waterinsight.co.nz