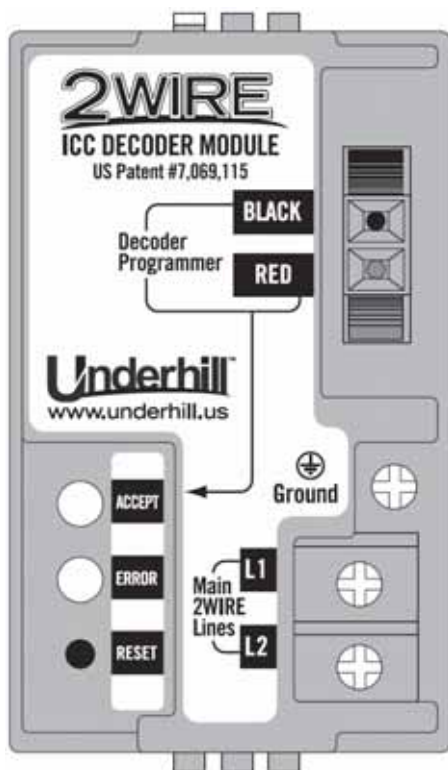


Underhill™ 2WIRE

ICC Decoder Module Installation Guide

For use with the Hunter® ICC Controller

Revised June 1, 2009



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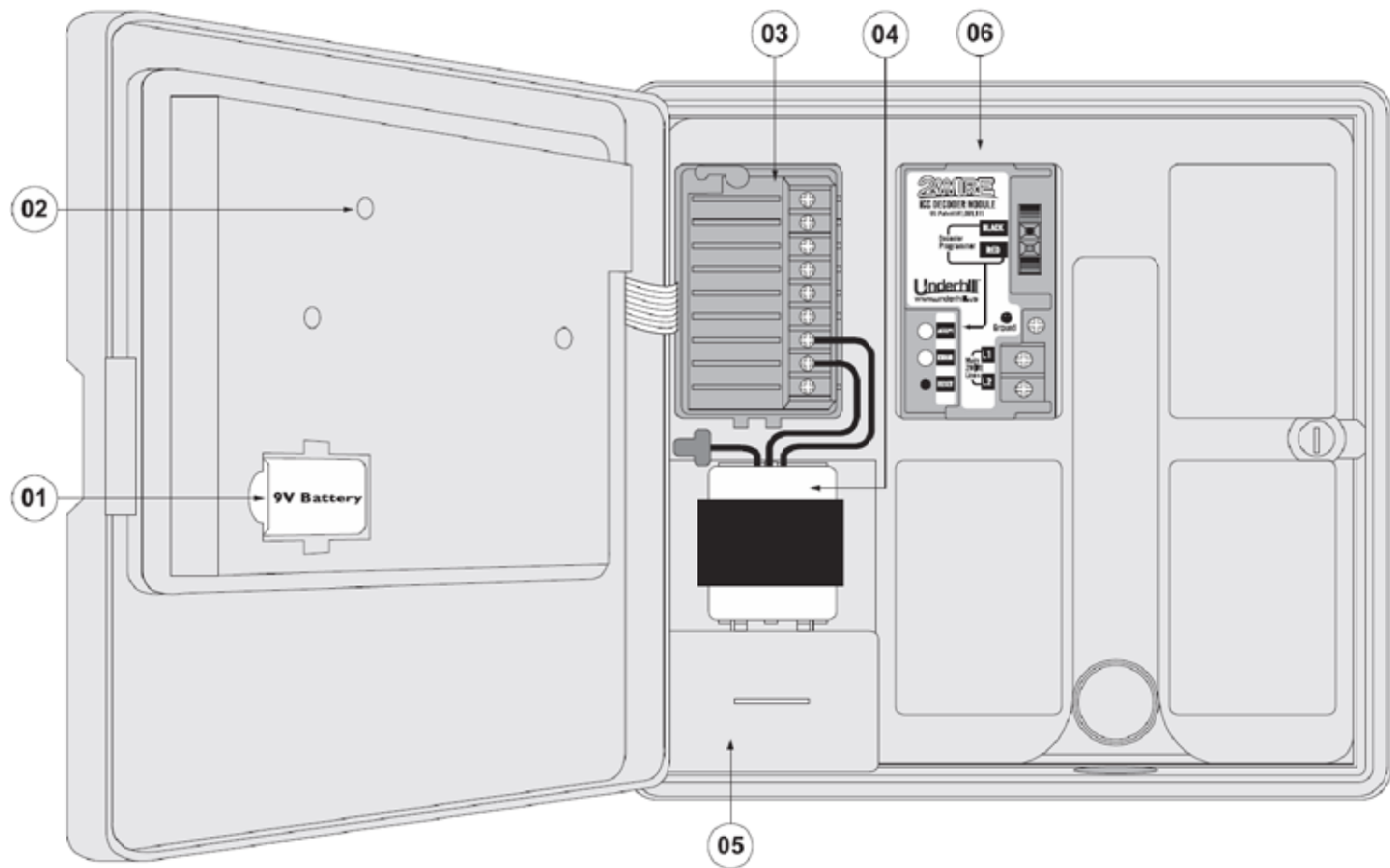
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INTRODUCTION

The option to use irrigation decoders with one of the worlds most popular institutional/commercial controllers (ICC) marks a further milestone in its versatility and flexibility.

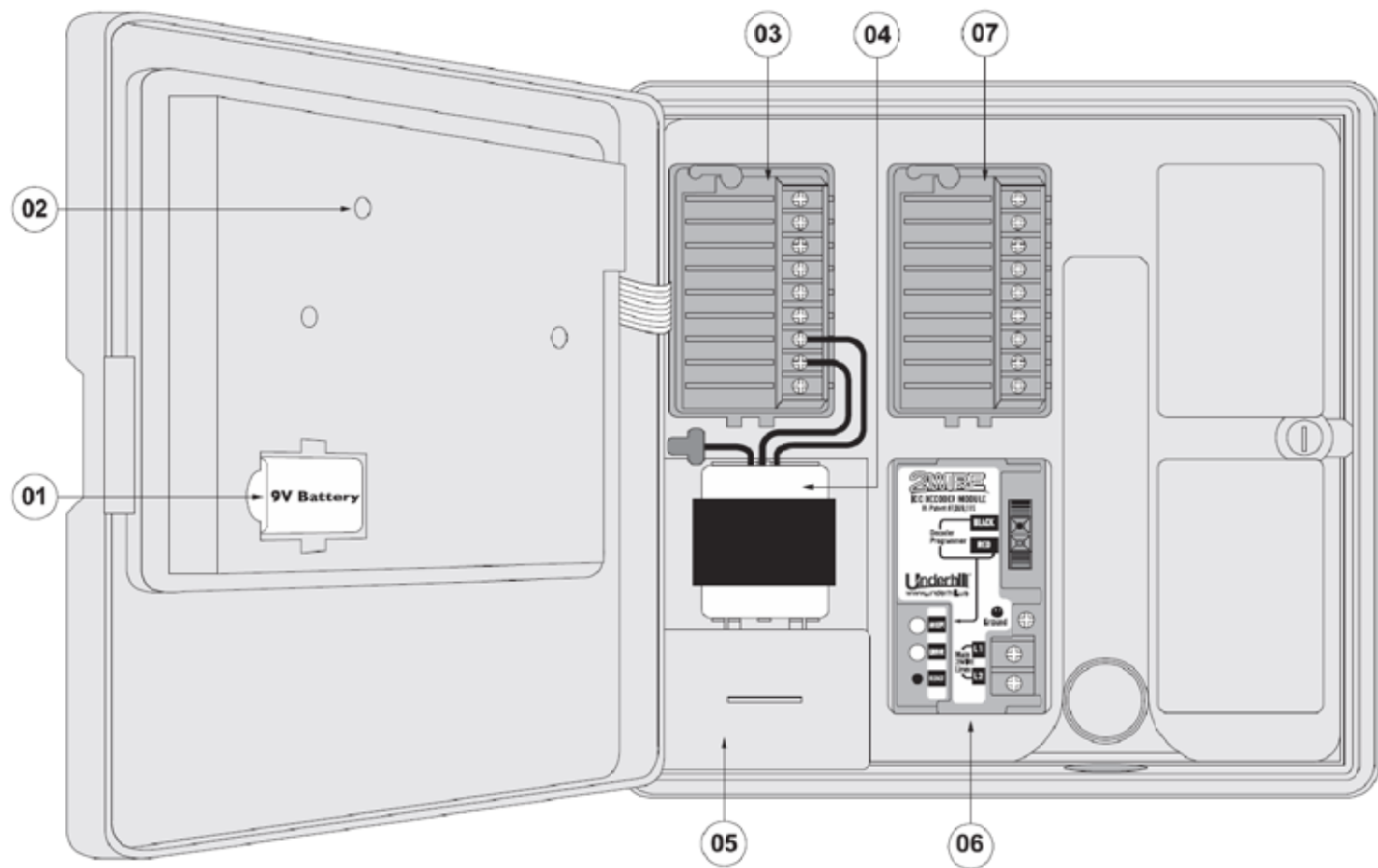
This installation booklet describes the installation and commissioning of the ICC with decoders. The routine operation of the ICC with decoders is identical to that with Hunter® multi-wire station modules.

Please refer to the Owner's Manual for controller programming and operation. We wish to thank you for purchasing this quality option to an already popular and well-engineered controller.



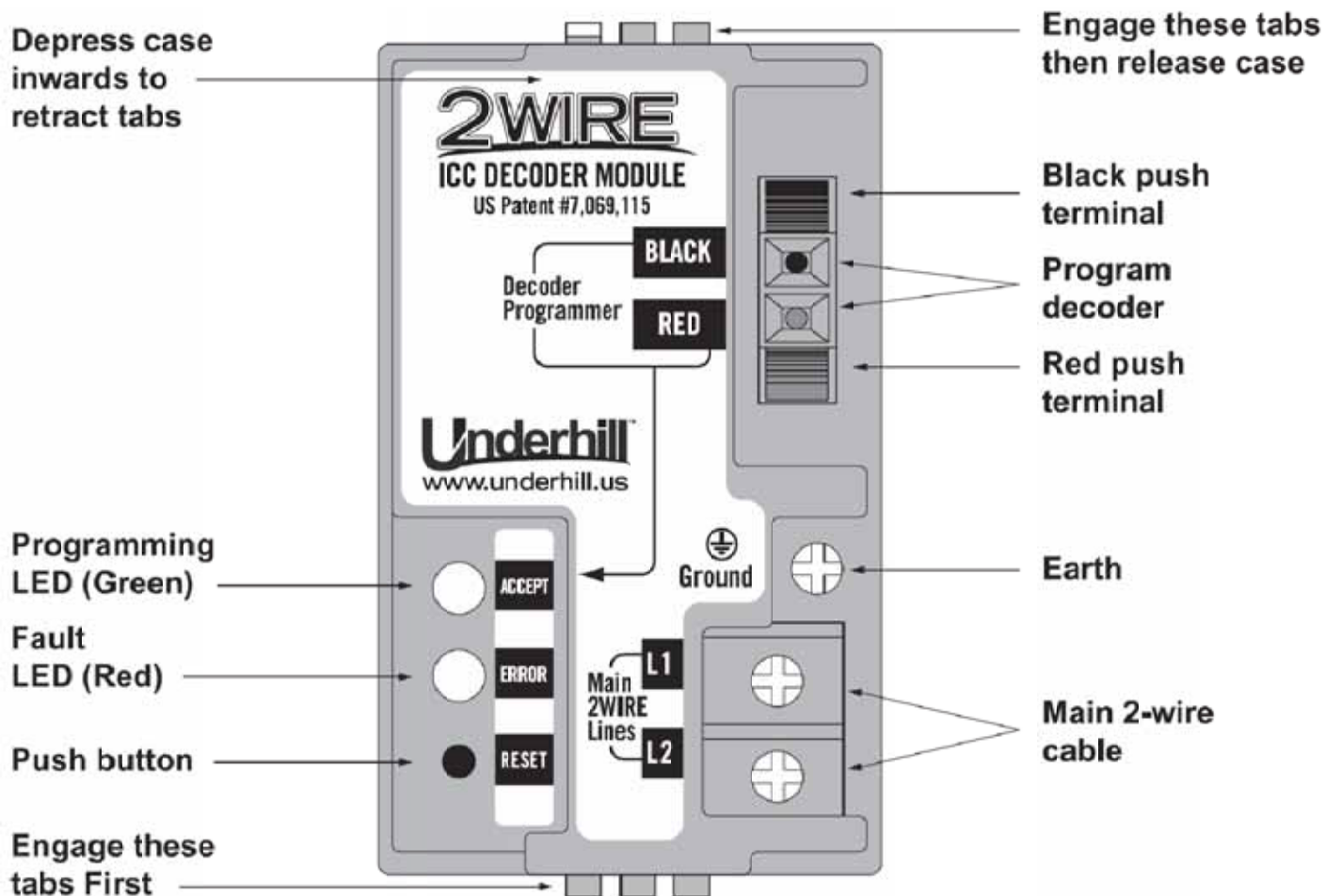
WIRING CABINET - DECODER ONLY

1. 9-Volt Battery - The alkaline battery keeps time during power outages or if the transformer is disconnected. The user may also program the controller without ac power.
2. Reset Button - This button will restart the computer in case of power surge or display freezing. No programmed data will be lost.
3. Power Module Area - Used to attach transformer, master valve, and other systems from their source to the controller.
4. Transformer - A transformer is installed in the controller to route ac power from the power cable to the terminal strip area and to ground the controller.
5. Junction Box - This box contains a terminal strip for connecting 115 Volt and 230 Volt power connections. For instructions on how to wire the mains power, please refer to the Hunter® 'Connecting ac Power' section in the ICC owner's manual.
6. The ICC Decoder-Module - This may be used instead of the Hunter® Station Modules to make a decoder only system (48 stations) it must be plugged into the first slot as shown in the diagram opposite.



WIRING CABINET - MIXED MULTI-WIRE AND DECODERS

1. 9-Volt Battery - The alkaline battery keeps time during power outages or if the transformer is disconnected. The user may also program the controller without ac power.
2. Reset Button - This button will restart the computer in case of power surge or display freezing. No programmed data will be lost.
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5. Junction Box - This box contains a terminal strip for connecting 115 Volt and 230 Volt power connections. For instructions on how to wire the mains power, please refer to the Hunter® 'Connecting ac Power' section in the ICC owner's manual.
6. The ICC Decoder-Module - This may be used as the end module after Station Modules to utilize the remaining stations as decoders, up to 48.
7. Station Modules - There are 4 (plastic cabinet) or 6 (metal or stainless steel cabinet) modular positions inside the controller. With the addition of 4 or 8 station ICM modules, you have the ability to run anywhere from 8 to 32 Multi-wire stations (plastic cabinet), and 8 to 48 stations (metal and stainless steel cabinet). However with the ICC Decoder Module, all 48 stations may be run in the 4 position plastic cabinet.



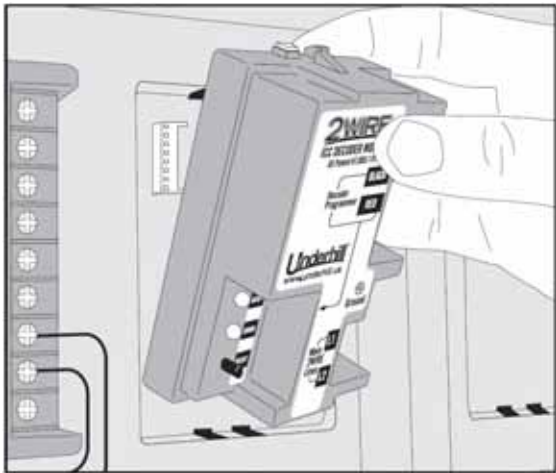
CONNECTING THE ICC-DECODER MODULE

The ICC controller is supplied with one factory-installed station module for up to 8 stations. If a decoder-only controller is required, this module may be removed and the ICC-Decoder Module installed in its place. In this case, all 48 stations will be assigned to decoders.

If, on the other hand, multi-wire stations are required as well, the ICC Decoder Module may be installed into the next available position (expansion slot). The remaining unused stations, up to 48, will then be assigned to decoders. It is not permissible to install further multi-wire station modules above the ICC-Decoder Module; it must always be the 'end' module. It is not permissible to install more than one ICC Decoder Module per ICC controller.

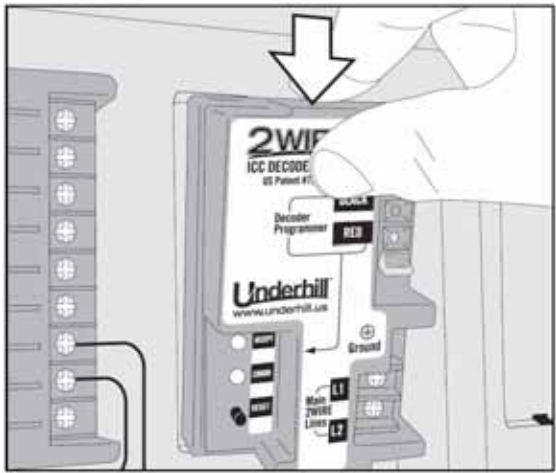
INSTALLATION

1. When installing the ICC-Decoder Module, you will need to turn ac power off at the controller. You should also temporarily remove the 9 Volt battery if one is being used.
2. The module needs to be inserted into the next free position in the back of the controller
3. Insert the module into the controller's expansion slot with the long tabs end first, to engage into the two holes in the expansion slot. (fig01)



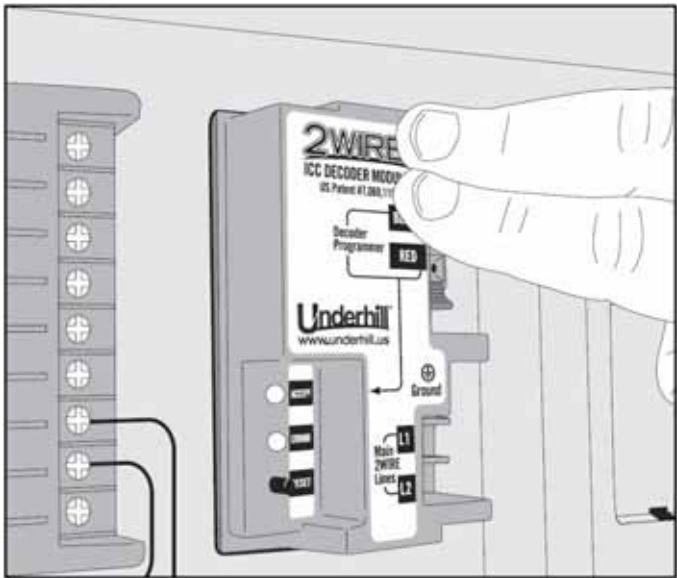
(fig01)

4. Push the other end of the module into the expansion slot squeezing its case above the short tabs (fig02) to retract them before engaging the module fully into the slot. Release the squeeze to lock the module in place. (fig03)



(fig02)

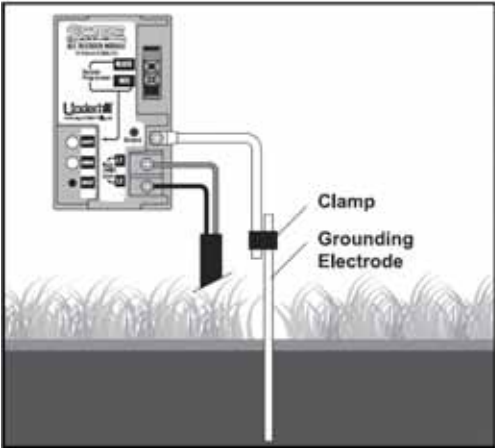
5. Restore power to the controller. Turning the power off and on again permits the microprocessor to recognize the newly installed module. You can also use the reset button on the back of the front panel to reset the microprocessor to recognize all installed modules.
6. To verify the module is correctly inserted, press and hold the push button. If the green programming LED starts to flash, the module has been correctly installed. Release the push button, the green LED will stop flashing in about 15-20 seconds.
7. All stations, starting from the lowest one marked next to the expansion slot, up to number 48, will be enabled. Not every enabled station need have a decoder fitted, so care must be taken to exclude unused stations in any watering program.




(fig03)

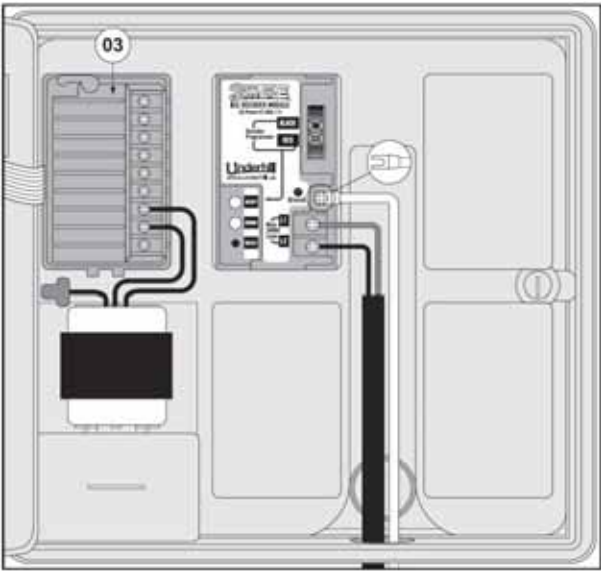
GROUNDING THE ICC

Both the ICC and the ICC-Decoder Module are equipped with built in electrical surge protection. For this system to function properly, the ICC-Decoder Module must be connected to a ground rod that is driven into the earth. It is important for protection against indirect lightning strikes that the module is grounded to ground rods or plates with less than 10 Ohms resistance. Use grounding electrodes that are UL listed or manufactured to meet the minimum requirements of the National Electrical Code (NEC). For detailed information on earth grounding of irrigation components, refer to the American Society of Irrigation Consultants Earth Grounding Guideline 100-2002 (www.asic.org).




(fig04) 1. Important: Use a #10 (6 mm2) or #8 (10 mm2) bare wire to connect the controller to the ground rod. Use a standard copper clad, 5/8" (1.6 cm) diameter, 8' (2.5 m) long ground rod. (fig04)

2. The ground terminal on the ICC-Decoder Module is located next to the main two-wire cable terminals (L1 and L2). The Symbol on the label is . For proper termination, a crimped fork or ring should be used to connect to the earth terminal.

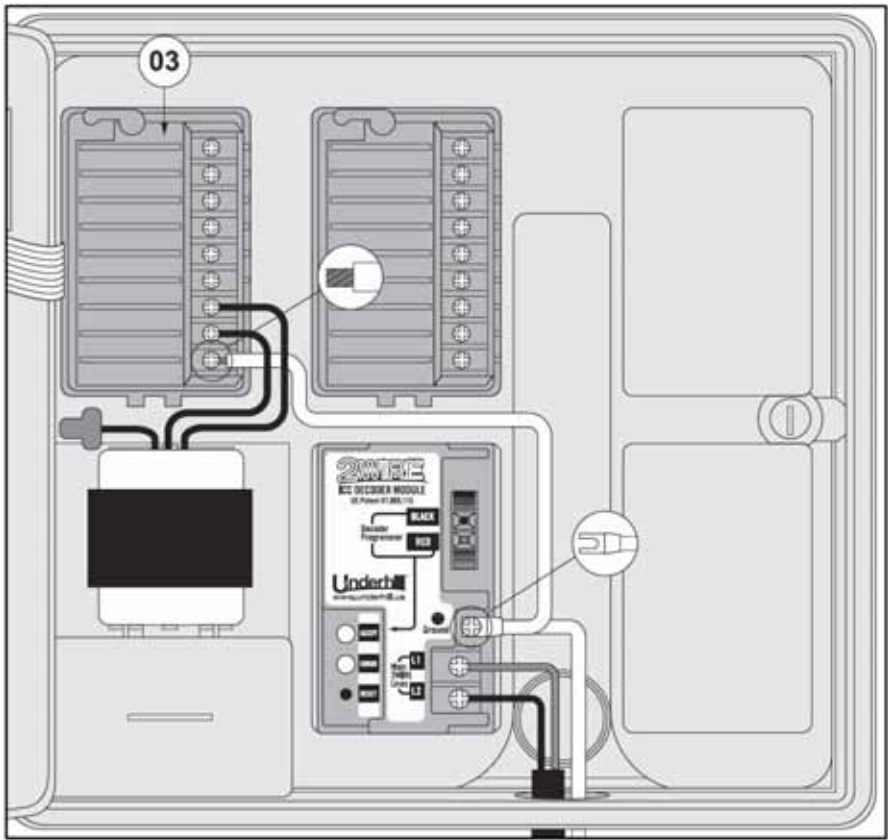


3. For a decoder-only system i.e. no multi-wire Station Modules fitted (*fig05*), route the earth wire from the ICC-Decoder Module ground terminal directly to the earth system. Do not connect the 'GND' terminal on the Power Module (03).
4. For a MIXED MULTI-WIRE AND DECODER SYSTEM i.e. some multi-wire Station Modules and the ICC-Decoder Module coexisting (*fig06*), the 'GND' terminal on the Power Module (03) and the earth terminal on the ICC-Decoder Module must be connected together and to the earth grounding system.

IMPORTANT

On no account connect the ground terminal  on the ICC Decoder module to the building ground or place the ICC grounding electrode(s) within the 'sphere of influence' of the building's grounding system.

For the most effective lightning protection for the ICC controller, do NOT connect the green/yellow wire exiting from the transformer with the 2 yellow wires (see page 2 item 04). Instead insulate its wire end as per fig 05 or fig 06.



(fig06)

PROGRAMMING DECODERS WITH STATION ADDRESSES

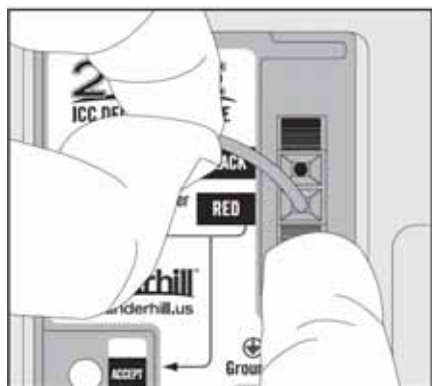
Decoders must be set to a unique station address before installation. When the controller turns on a decoder station, it sends power down the main two-wire cable, along with a digital signal (an address) specific to a particular decoder. As the decoder hears its own address, it applies voltage to the solenoid and the communication from controller to the field is complete.

There are two methods of programming an address into a decoder prior to installation. For the professional contractor, there is a portable programmer/tester (*fig07*). To use this product, please refer to its instruction manual. The second method is to use the built-in decoder programmer on the ICC-Decoder Module. This allows the installer to program a station number into a decoder, without extra hardware.

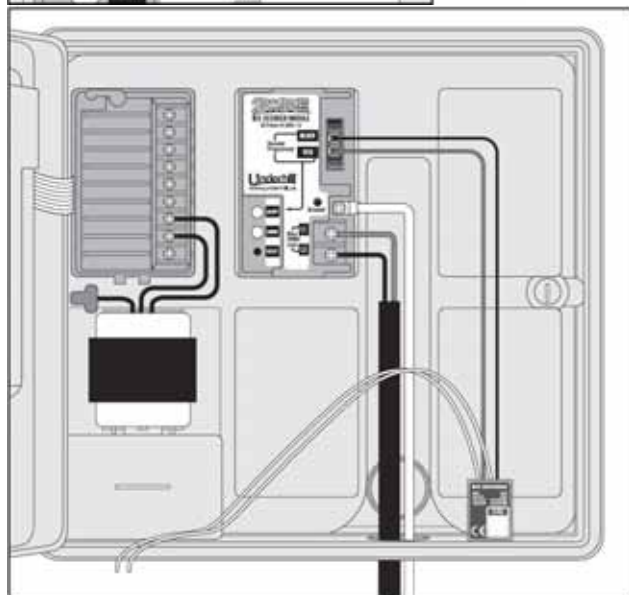


USING THE BUILT-IN DECODER PROGRAMMER IN THE ICC DECODER-MODULE

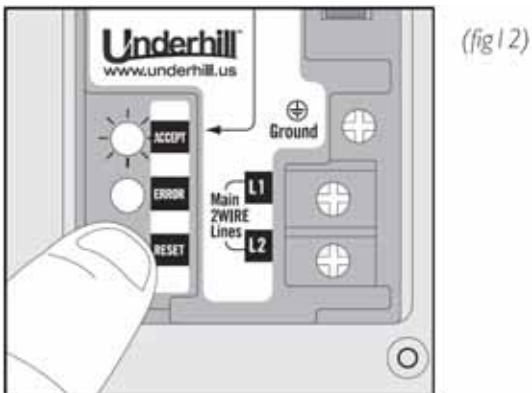
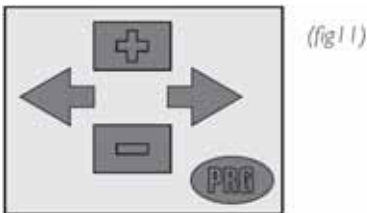
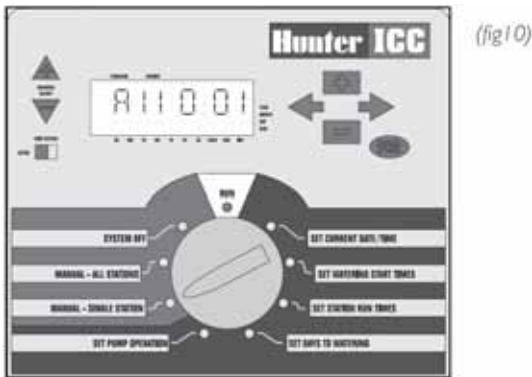
1. Identify the programming connector on the ICC-Decoder Module.
2. Press down, in turn, the levers on the connector and insert the red and black decoder wires into their respective holes (*fig08*). Release the levers, ensuring the conductor in the decoder wire is in contact with its terminal (*fig09*).
3. The yellow decoder wires are not used in this operation.
4. It is not necessary to remove the Main2WIRE cables to program decoders. However, wire it into the Main 2 WIRE terminals; in which case removal of the Main 2 WIRE cables may be convenient.



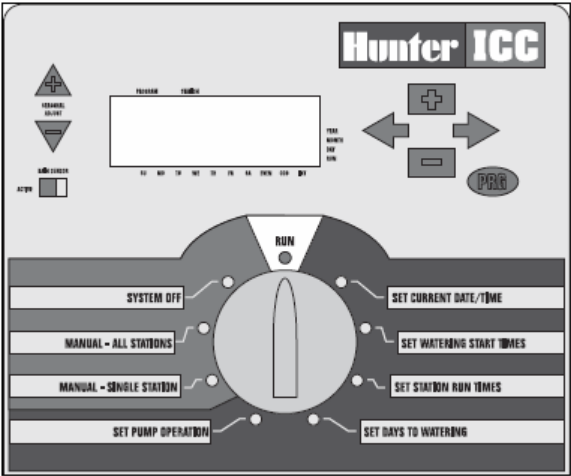
(fig08)



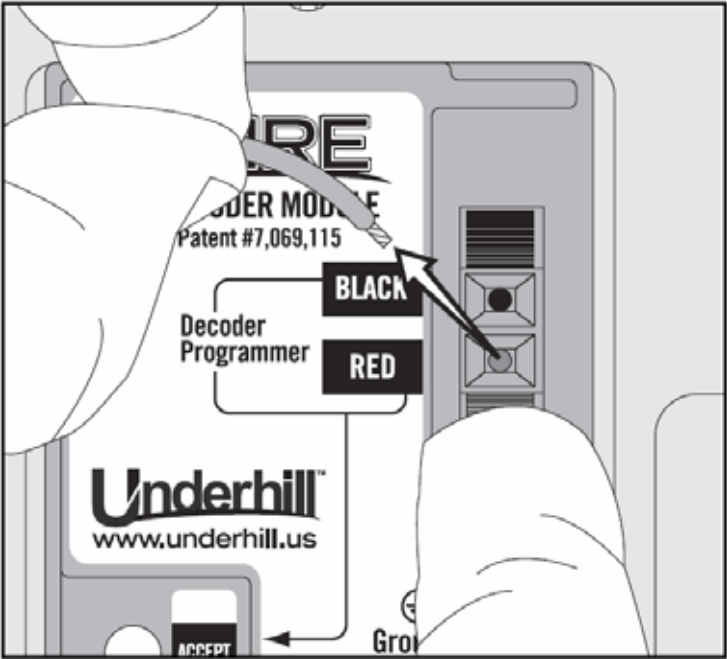
5. On the ICC control panel, turn the dial to the **MANUAL- SINGLE STATION** position (*fig10*).
6. Station run time will flash in the display. Use the arrow buttons to move to the desired station number to program into the decoder. You may then use the + and - buttons to select a non-zero watering time (*fig11*). Any non zero time is acceptable.
7. Press and hold the pushbutton on the ICC-Decoder Module until the green LED begins to flash slowly. Hold it down until you see at least 2 flashes (*fig12*).



8. Turn the dial to the **RUN** position to program that station number into the decoder (fig13). The green LED will flash more quickly for a few seconds and then turn a steady green when programming is complete.
9. Turn the dial back to the **MANUAL-SINGLE STATION** position to repeat (fig10).The green LED will extinguish.
10. Remove the programmed decoder by depressing the red and black levers on the connector (fig14).



(fig 3)



(fig 4)

11. Write the station number onto the decoder body using an indelible marker (*fig15*).

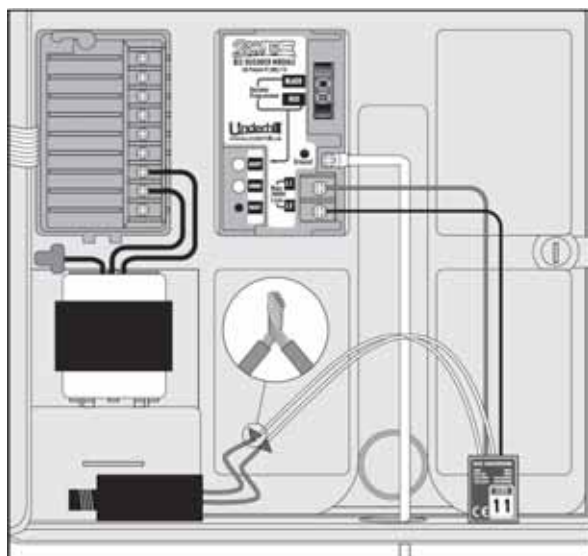
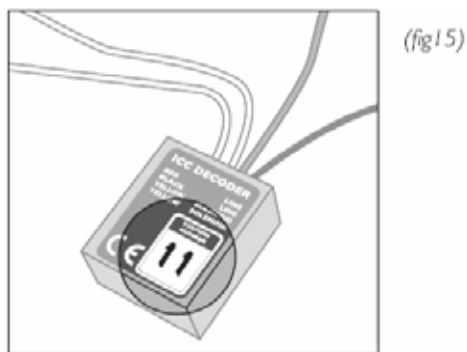
12. The decoder can optionally be tested by attaching it to the main two-wire cable with a solenoid connected to the decoder's yellow wires (*fig16*). Turn the dial to the MANUALSINGLE STATION position to select that station and say, a 1 minute time. Then turn the dial to the RUN position to see if the decoder operates the solenoid.

Note:

If the dial is not turned to the MANUAL-SINGLE STATION position within about 15 seconds after pressing the button on the ICC Decoder Module, the green LED will stop flashing and the module will come out of programming mode.

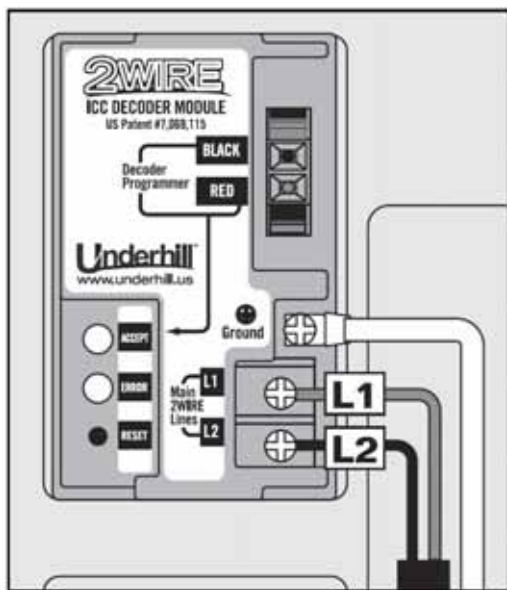
After the decoder has been programmed, the LED will stay a steady green until either the knob is turned away from RUN, or the manual run-time has expired.

As long as the green LED is flashing or steady, no run signal nor ac voltage will be sent out on the main two-wire cable.



CONNECTING VALVES AND DECODERS

1. Route the main two-wire cable between each control valve location and controller.
2. At each valve, cut the main cable and strip back the outer insulation 4" (100mm) on each cut end. Strip each conductor ½" (13mm). Strip the 4 wires on the decoder ½" (13mm). Splice the decoder red and black wires into the main cable; connect the decoder's red wire to the main cable's L1 conductor and the black to L2. Attach each of the decoder's yellow wires to each solenoid wire valve. All wire splice connections should be done using waterproof connectors (*fig17 on page 18*).
3. Open hinged faceplate on the controller to access the station module area.
4. Route the main two-wire cable through the conduit and attach conduit to the controller at the large conduit opening on the right side of the bottom of the cabinet. The conduit opening has a triple knockout to accommodate 1", 1 ¼" or 1 ½" (25, 32 or 40 mm) conduit.
5. Strip ½" (13mm) of insulation from ends of the main two wire cable. Secure each conductor into the bottom two terminals of the ICC-Decoder Module. Connect the conductor on which the decoder's red wires are attached to L1. Connect the conductor on which the decoder's black wires are attached to L2. (*fig08*).
6. The multi-wire 'TEST' terminal will not work with decoder stations (Hunter Owner's Manual page 8). Instead use 'Manually Run All Stations' (Hunter Owner's Manual page 26). See the 'test' section in these instructions.



(fig 8)

HUNTER QUICK CHECK™ WITH THE ICC-DECODER MODULE

Irrigation professionals are continuously looking for ways to more efficiently and effectively diagnose programs in the field. Instead of having to physically check each field wiring circuit for potential problems, the user can run a modified version of the Hunter Quick Check™ circuit test procedure. This circuit diagnostic procedure is very beneficial because of its ability to aid in quickly identifying "shorts" and "opens" commonly caused by faulty solenoids, wiring joints or occasionally, a faulty decoder.

To initiate the Hunter Quick Check™ test procedure; Press the +, -, Arrow, PRG buttons. In the standby mode, the LCD will display all segments (helpful when troubleshooting display problems). Press the + button to begin the Hunter Quick Check™ test procedure. Within seconds, the system searches all stations in an effort to detect a fault. When a field wiring short or open is detected, the red LED on the ICC-Decoder Module will begin to flash. After the Hunter Quick Check™ completes running this circuit diagnostic procedure, the controller returns to the automatic watering mode.

To cancel the red flashing LED, press and hold the pushbutton on the ICC-Decoder Module while the controller is in the SYSTEM OFF position.

Note:

Because the ICC-Decoder Module automatically enables all stations up to 48, any decoders not fitted at a station address will generate the flashing red fault LED.

TEST PROGRAM WITH THE ICC-DECODER MODULE

The ICC allows the user a simplified method for running a test program. This feature operates each station in numerical sequence, from the lowest to station 48. You can start with any station. This is a great feature to check the operation of your irrigation system.

TO INITIATE THE TEST PROGRAM:

1. Press and hold the PRG button. The station number will be flashing.
2. Press the Arrow buttons to scroll to the station you would like the test program to start with. Use the + or - button to set the run time up to 15 minutes. The run time needs to be entered only once.
3. After a 2 second pause, the test program will begin.
4. When a station is being run that is open circuit (or decoder not installed) the red fault LED will illuminate continuously for its run time.
5. When a station is being run that is short circuit (the solenoid or its wiring short circuit), the fault LED will turn a steady red. Both the module and the ICC will be protected from damage.
It is recommended that the test be halted immediately and the fault rectified before proceeding with further testing.
6. After any fault is encountered, the red fault LED will continue to flash.

To cancel the red flashing LED, press and hold the pushbutton on the ICC-Decoder Module while the controller is in the SYSTEM OFF position.

TROUBLESHOOTING AND SPECIFICATIONS

Electrical Specifications for ICC-Decoder Module and Decoder

ICC-Decoder

Minimum operating voltage	13V ac
*Most solenoids require a minimum of 19V ac to operate	
Maximum continuous solenoid current	0.6A (600mA)
Decoder standby current	2.8mA (typical)
Station number range	1 -48 (inclusive)

ICC-Decoder Module

Maximum ac input voltage	32V ac
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WIRE SIZING GUIDE

It is important to ensure the solenoids have enough power to pull in their plungers at maximum water pressure. The ICC controller with decoders has to share solenoid power between a maximum of two solenoids on a common two-wire cable. The following two charts (Imperial or Metric) give guidance in choosing the size of the two-wire cable.

BASIC ASSUMPTIONS:

Voltage output at the ICC-Decoder module output	27V ac
Minimum voltage to operate a solenoid	19V ac
Solenoid type	Hunter Heavy Duty
Mains Frequency (the worst case)	50Hz

HOW TO DETERMINE THE MAXIMUM LENGTH RUNS

FOR A GIVEN WIRE/CABLE SIZE

Refer to either the U.S. AWG wire chart or the International Metric wire chart as applicable.

FOR JUST ONE SOLENOID RUNNING ON PROGRAMS A, B, OR C AND NO SOLENOID ON PROGRAM D:

1. At the origin = 0, move up the vertical scale to the distance that is equal to the distance to the furthest solenoid from the controller.
2. Select the wire/cable size that is at least as large as is indicated on the distance on the vertical axis.

EXAMPLE: U.S. AWG WIRE

Distance to the furthest solenoid is 2,700 ft. Wire size must be at least 16AWG

Example: Metric Cable

Distance to the furthest solenoid is 1,200m. Wire size must be at least 2,5mm.sq

FOR 2 SOLENOIDS RUNNING SIMULTANEOUSLY (INCLUDING A SOLENOID ON ICC PROGRAM D):

1. Identify a solenoid that is the far from the controller that might run concurrently with an even more-distant solenoid.
2. On the horizontal axis (OE1st Run), measure off the distance. Move vertically from there until you intersect a wire size curve.
3. Move left from the intersect until you reach the vertical axis
4. This is the maximum length and size of the wire required to ensure successful operation of both solenoids operating at the same time.

EXAMPLE: U.S. AWG WIRE

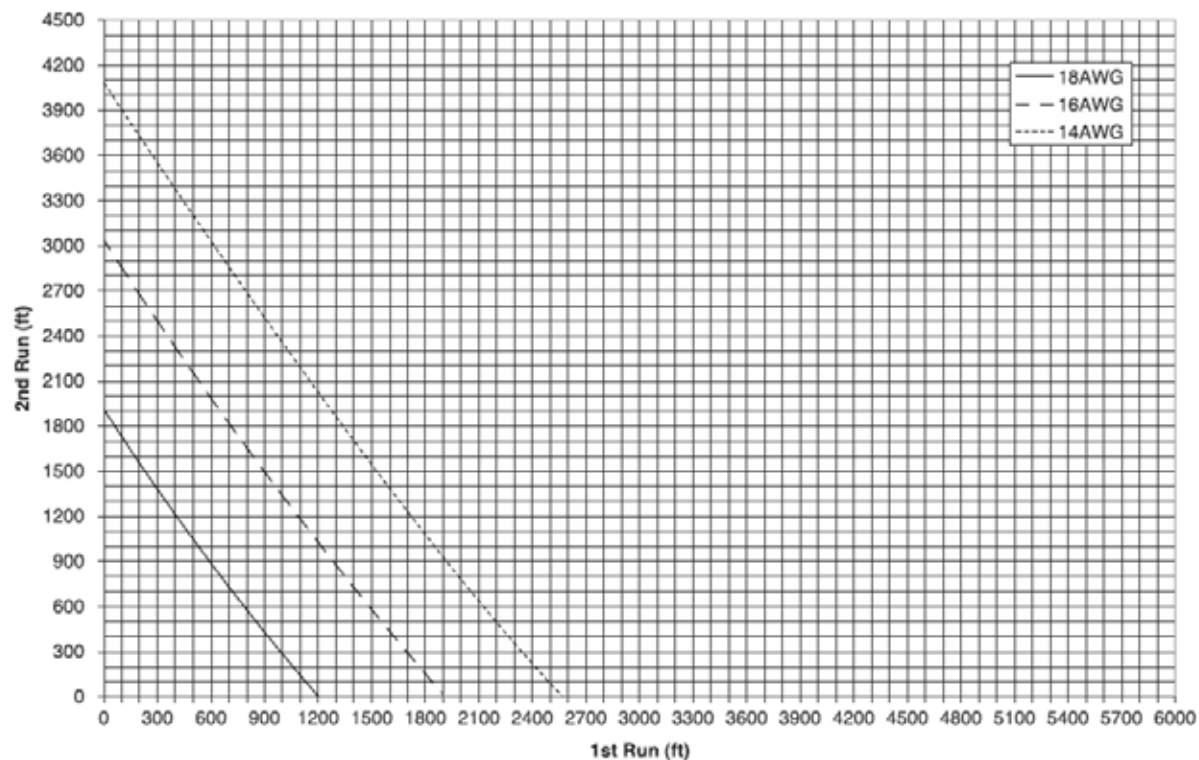
1500ft distance to the solenoid from controller that might run concurrently with a solenoid a further 1500ft would require 14 AWG Wire or larger.

EXAMPLE: METRIC CABLE

400m distance to the solenoid from controller that might run concurrently with a solenoid a further 200m from the controller would require 1.5mm.sq cable or larger.

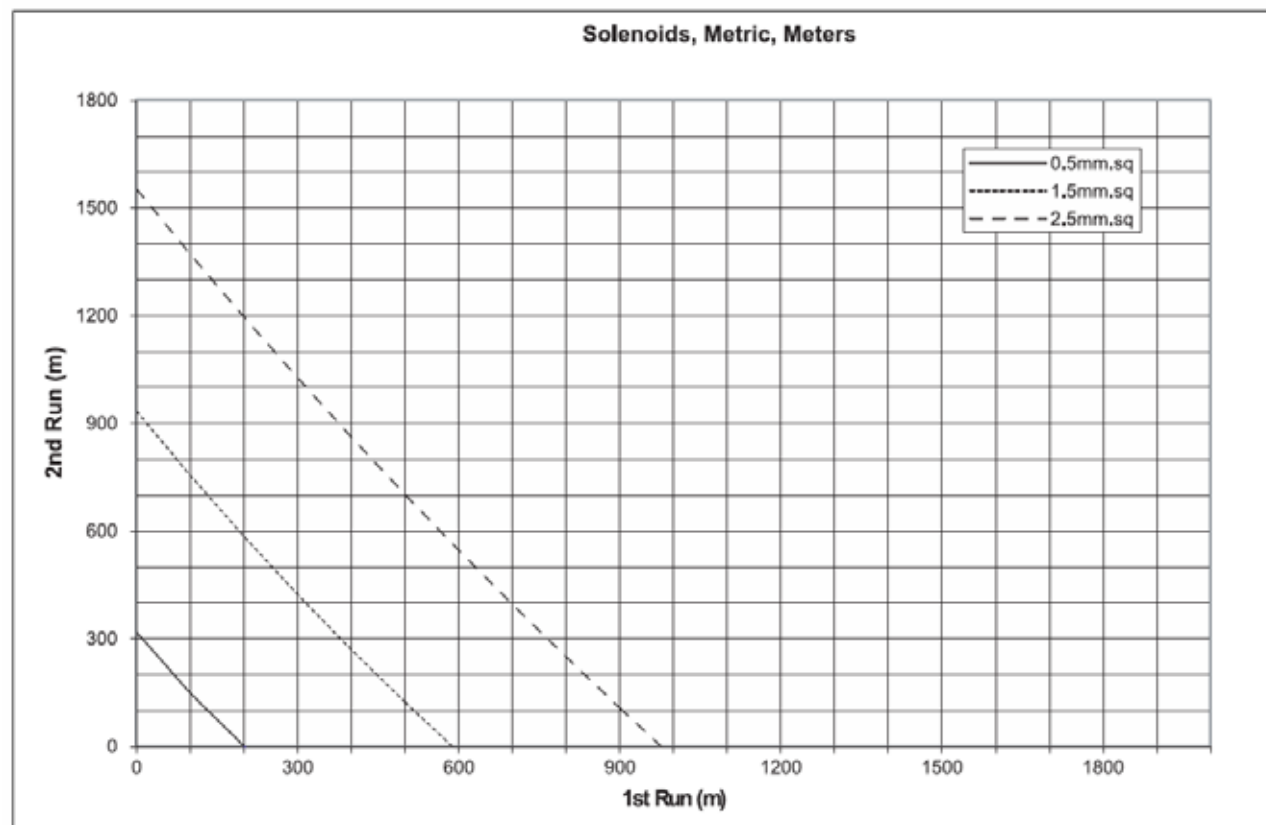
U.S.AWG Wire Size Chart

Solenoids, AWG, ft.



See instructions and examples on page 21

International Metric Wire Size Chart



See instructions and examples on page 21

FREQUENTLY ASKED QUESTIONS

RED LED FLASHING:

There was a station fault during a program. Use 'Test Program' (pg.20) to identify the failure. Clear the flashing LED by pressing the button on the ICC-Decoder module.

RED LED ON ALL THE TIME WHEN RUNNING A STATION:

This station is faulty. Possible faults are:

- No decoder fitted, or wrong station number encoded into it.
- Solenoid open circuit or short circuit.
- Decoder or solenoid not wired correctly.
- Solenoid surge current greater than 600mA (multiple solenoids on one decoder?).

RED LED ON ALL THE TIME WHEN RUNNING EVERY STATION:

There is a short circuit on the main two-wire cable.

ICC CONTROLLER SAYS 'ERR' ON EVERY STATION:

Reverse the connections on L1 & L2 of the module to the main two wire cable.

GREEN LED STOPS FLASHING WHEN PROGRAMMING A DECODER STATION:

If the pushbutton is not pressed for at least 2 flashes of the green LED, the decoder programming mode will not be entered.

After pressing the button on the ICC-Decoder module, the green LED will flash for about 15 seconds. After that time it will leave decoder programming mode. The ICC rotary switch must be turned to the RUN position before the 15 seconds is up.

The best order of operation is:

1. Connect decoder to the programming socket
 2. Move Rotary switch to 'MANUAL RUN ONE STATION'
 3. Set the desired station number and some non-zero time
 4. Press the pushbutton on the ICC-Decoder module, observe the LED continuing to flash.
 5. Rotate the rotary switch to the RUN position
 6. Watch that the green LED flashes faster for a few seconds then turns a steady green
- Programming is now complete.

ICC DOES NOT RUN ANY DECODERS:

Check operation of the ICC-Decoder module by pressing the pushbutton and observing if the green LED starts flashing. If not, turn off the mains power, remove the ICC-Decoder module and make sure the pins underneath are not bent or missing.

THE CONTROLLER RECOGNIZES SOME DECODERS, BUT OTHERS ARE MISSING:

MANUAL RUN ONE STATION to put 27V ac power on to the main 2-wire cable. Check cable voltage at a 'missing' station.

Remove and re-program the decoder station number into a 'missing' decoder. Test it on the main 2-wire terminals L1 L2, with a solenoid.

ICC-Decoder module is not plugged into the first slot in the ICC or into the next available slot if working with 8 way modules.

ICC-Decoder module is plugged in after a 4 way module. The upper 4 stations in the 4-way module will not be usable with decoders.

STATEMENT OF WARRANTY

Underhill International Corp. (Underhill) warrants all Underhill decoders and decoder driver modules to be free of defects and materials or workmanship under normal use for a period of two (2) years from the original date of manufacture on the label code. Additionally, if Underhill deems the decoders or decoder driver modules have been damaged by lightning, this warranty shall also apply. If a defect in these Underhill products is discovered during the applicable warranty period, Underhill will repair or replace, at its option, the product or defective parts.

The warranty does not extend to repairs, adjustments or replacement of a Underhill product or part that results from misuse, negligence, alteration, modification, tampering, or improper installation and/or maintenance of the Underhill product. The warranty on lightning damage shall also be excluded if inadequate or improper grounding is found.

If a defect arises in an Underhill product or part during the warranty period, you should contact Underhill at the address below.

UNDERHILL'S OBLIGATION TO REPAIR OR REPLACE ITS PRODUCTS AS SET FORTH ABOVE IS THE SOLE AND EXCLUSIVE WARRANTY SET FORTH BY UNDERHILL. THERE ARE NO FURTHER WARRANTIES, EXPRESSED OR IMPLIED,

INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. UNDERHILL WILL NOT BE LIABLE TO ANY PARTY IN STRICT LIABILITY, TORT, CONTRACT OR ANY OTHER MANNER FOR DAMAGES CAUSED OR CLAIMED TO BE CAUSED, AS A RESULT OF ANY DESIGN OR DEFECT IN UNDERHILL'S PRODUCTS, OR FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

If you have any questions concerning the warranty or its application, please email to underhill@uicorp.net for our address visit www.underhill.us.

FCC NOTICE

This controller generates radio frequency energy and may cause interference to radio and television reception. It has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient the receiving antenna*
- *Move the controller away from the receiver*
- *Plug the controller into a different outlet so that controller and receiver are on different branch circuits*

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C., Stock No. 004-000-00345 (price - \$2.00 postpaid).

CERTIFICATE OF CONFORMITY TO EUROPEAN DIRECTIVES

We certify that the ICC-Decoder Module and the ICC-Decoder conform to the European Directive 89/336/EEC Underhill International Corp.

Manufactured by:

Underhill International Corp.

Email to underhill@uicorp.net

For our address visit www.underhill.us.

Hunter® is a trade mark of Hunter Industries Inc

Hunter Quick Check™ is a trade mark of Hunter Industries Inc

Underhill International Corp.

