



# DXi Wireless Output Board (WMS only) Installation and Setup Guide

TORO®

## Selecting the Controller Installation Site

The DXi wall-mount cabinet is designed for indoor or outdoor environments. Selecting an installation site that provides user accessibility as well as basic protection from extreme hot or cold environments is considered good installation practice. At minimum, the installation site should provide the following:

- Protection from direct exposure to irrigation spray, midday sun, and snow accumulation.
- Access to all required wiring connections.
- Access to a dedicated, single-phase AC power source.
- Line of sight from the DXi controller, especially by metal walls or obstructions.

## Installing the Wallmount Enclosure

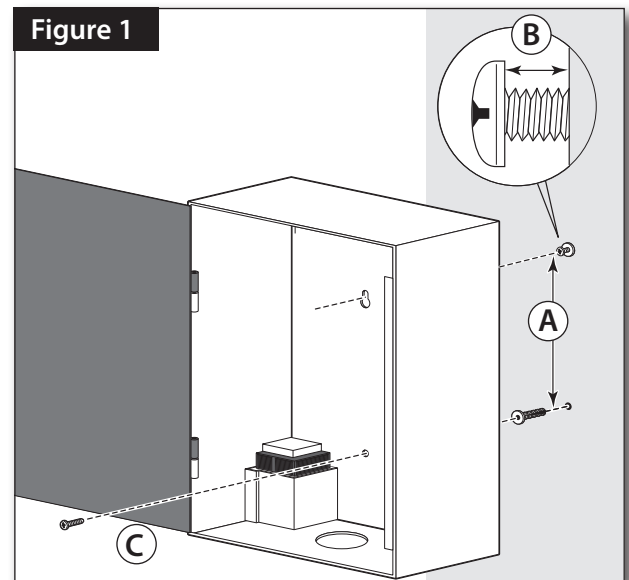
1. Unlock and open the cabinet door, then open the hinged control panel. Position the controller on the wall at eye level, and mark the top and bottom mounting screw locations. See Figure 1.

*Note: Two stainless steel screws are provided for installation to a wall stud. If installing the controller on masonry or drywall, use the appropriate type screw anchors and fasteners.*

2. Install the screw anchors at  $8\frac{3}{4}$ " (22,23cm) (A) on center.

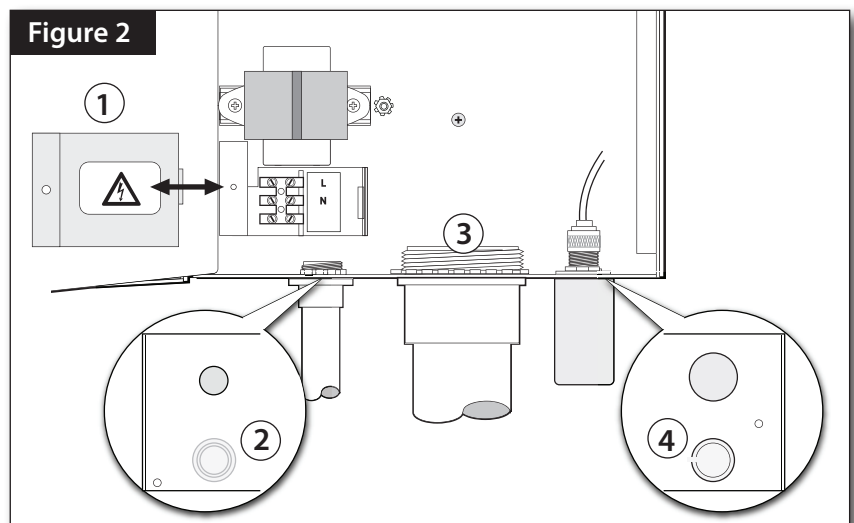
**⚠ Caution: All cabinet openings required for installation and wiring are provided. Drilling or cutting through the cabinet should be avoided. Metal chips and filings entering the cabinet can damage internal components.**

3. Install the top mounting screw (B) leaving a  $\frac{1}{4}$ " (6,4mm) gap between the screw head and wall.
4. Hang the controller on the mounting screw, ensuring the screw is located at the top of the cabinet keyhole slot. Install the lower mounting screw (C), then tighten both screws securely.



## Installing the Electrical Conduit

1. Remove wiring terminal block cover (1). Install electrical conduit from the power source circuit breaker panel to the controller location. Attach conduit to bottom of cabinet using the  $\frac{1}{2}$ " /  $\frac{3}{4}$ " (13mm / 19mm) access opening (2).
2. For field wiring, attach 2" or 3" (51mm or 76mm) conduit to cabinet using center access hole (3).
3. An additional  $\frac{1}{2}$ " /  $\frac{3}{4}$ " (13mm / 19mm) access hole (4) is provided for auxiliary wiring.



## Connecting Input Power Wiring



### WARNING!

THIS PRODUCT MUST BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE INSTALLATION CODE BY A PERSON FAMILIAR WITH THE CONSTRUCTION, INSTALLATION, AND OPERATION OF THE PRODUCT AND THE HAZARDS INVOLVED.

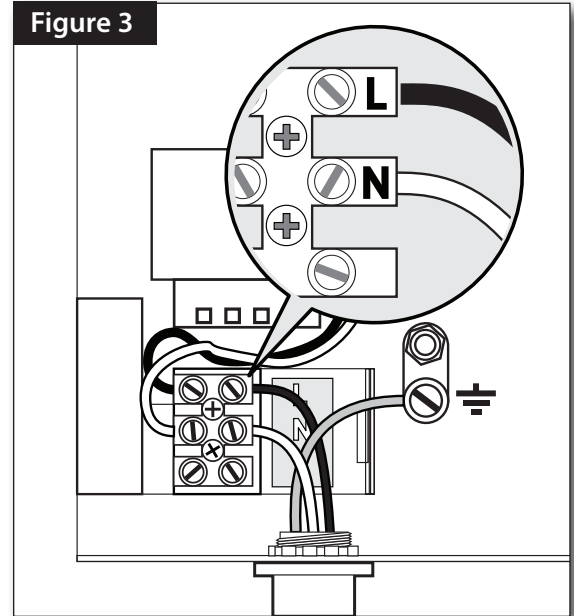
AC POWER WIRING MUST BE INSTALLED AND CONNECTED BY QUALIFIED PERSONNEL ONLY.

ALL ELECTRICAL COMPONENTS AND INSTALLATION PROCEDURES MUST COMPLY WITH ALL APPLICABLE LOCAL AND NATIONAL ELECTRICAL CODES. SOME CODES MAY REQUIRE A MEANS OF DISCONNECTION FROM THE AC POWER SOURCE, INSTALLED IN THE FIXED WIRING, HAVING A CONTACT SEPARATION OF AT LEAST 3mm IN THE LINE AND NEUTRAL POLES.

ENSURE THE AC POWER SOURCE IS OFF PRIOR TO SERVICING. FAILURE TO COMPLY MAY RESULT IN SERIOUS INJURY DUE TO ELECTRICAL SHOCK HAZARD.

1. Ensure the power is disconnected at the source.  
See Warning above.
2. Remove the terminal block cover, located below the transformer.
3. Route the AC power and equipment ground wires through electrical conduit into the controller.
4. Strip wire ends to expose  $\frac{3}{8}$ " (9,5mm) bare copper wire.
5. Using a small flat-blade screwdriver, secure wires to the terminal connectors as shown in Figure 3 and as follows:  
Line (black) to L, Neutral (white) to N, and Equipment Ground (green) to the Ground Lug  $\oplus$ .
6. Install and secure terminal block cover.

*Note: Do not apply power to the controller until all remaining installation procedures have been completed*



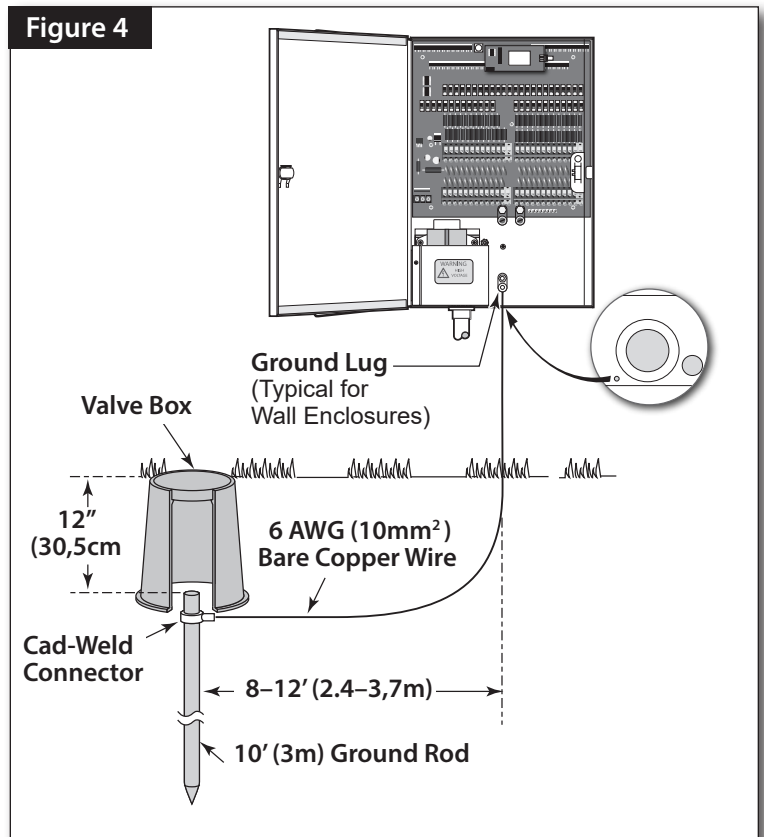
## Connecting an Earth Ground

**⚠ IMPORTANT!** The DXi controller surge protection components cannot properly function unless an efficient pathway to earth ground is provided. The ground path must be as direct as possible, without sharp bends and must not exceed 10 Ohm resistance (when measured with an earth ground resistance device). All electrical components throughout the irrigation system should be grounded similarly to provide the same ground potential.

The following instructions depict one of several acceptable earth grounding methods. Due to variables in soil composition and terrain, the method shown may not be suitable for your installation site. Contact your local Toro distributor for assistance and availability of the required earth ground resistance test instrument. Recommended ground testers are: AEMC Instruments, model 3710 clamp-on tester, or Biddle Megger, model 250260 (or equivalent).

### Steps

1. Drive a 5/8" by 10' (17mm x 3m) copper-clad steel rod into well-moistened soil, not less than 10' (3 m) or more than 12' (3.7 m) from the controller. The top of the ground rod should be buried approximately 12" (30.5cm) below grade.
2. Route a 6 AWG (13,0mm<sup>2</sup>) solid copper wire connected to the earth ground device into the controller cabinet through the access hole provided below the copper ground lug. Insert and secure the copper wire to the ground lug. To provide the most efficient path to earth ground, route the ground wire between the ground rod and controller with the least amount of bending possible. There should be no tight radius bends, nicks, or deep scratches the entire length of the wire.
3. For optimum connectivity, secure the ground wire to the ground rod using a Cad-Weld™ (or equivalent) metal-fusion connection method.
4. Using an earth-ground resistance tester; i.e., Meggor® or equivalent, confirm the resistance reading between the controller and ground rod is 10 ohms or less. Contact your local Toro distributor for assistance in obtaining the earth ground-resistance test device. Periodically retest the earth ground connection to confirm that resistance remains at 10 ohms or less.



## Connecting Field Wiring

**⚠ Caution:** The DXi WOB transformer is rated at 24 VAC, 50 VA. Each station output terminal is rated 24 VAC, 0.5A (max.) @ 77°F (25°C), and capable of operating more than one valve solenoid (typically 2 or 3).\*

Ensure the current load on any output does not exceed 0.5A.

Ensure the total current load imposed on the controller does not exceed 1.75A.

\* The irrigation system hydraulic capacity must be also be capable of maintaining adequate volume and pressure for all automatic and manual watering operations.

To provide a field common wire, attach one wire to either solenoid lead of all valves to be operated by the controller.

Attach a separate power wire to each remaining solenoid lead.

Label these wires for identification at the station output modules.

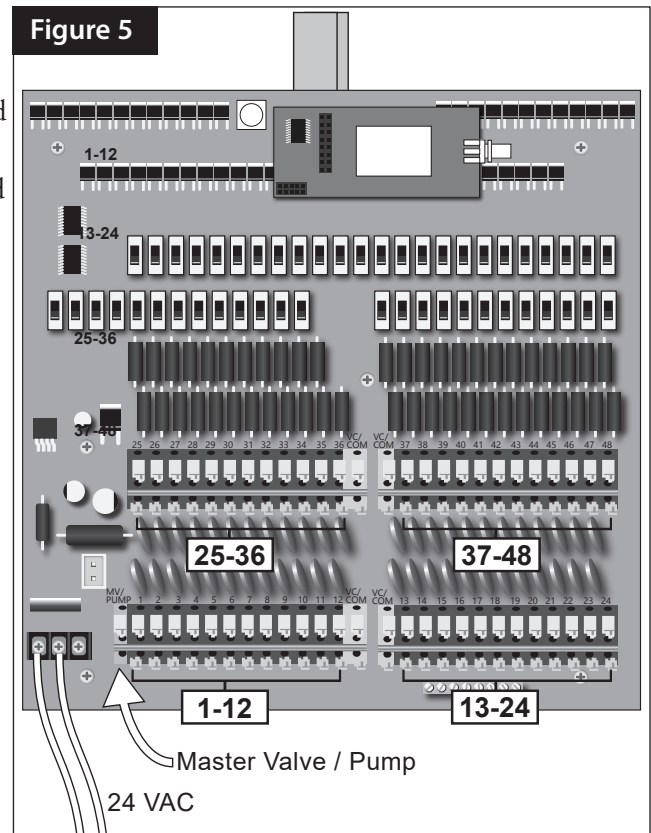
Use an approved waterproof splicing method to properly insulate all valve solenoid wire connections.

### Connecting Station Valves

The DXi features up to 48 direct-insertion, quick-release wire terminals for all low-voltage wire connections. Each field output terminal accepts a 14–18 AWG (2,08mm<sup>2</sup> – 0,823mm<sup>2</sup>) solid-core wire in each of two connection ports – enabling two field wires to be connected independently to one terminal position.

#### Steps

1. Route the field wires into the controller cabinet through 2" (50mm) conduit.
2. Remove approximately 3/8" (10mm) insulation from the ends of each wire.
3. Connect the valve common wire(s) to terminal marked "VC / COM".
4. Connect each valve power wire to the appropriate station number terminal. See **Figure 5**.
5. Pull lightly on each wire to confirm positive retention.
6. Ensure all exposed wiring inside the controller is taped back and properly insulated.
7. To release, depress the small tab (nearest the wire) using a small blade screwdriver.



### Output Switch Operation

The 3-position switches provided on the station output module (**Figure 6**) enables local control of the station and master valve output.

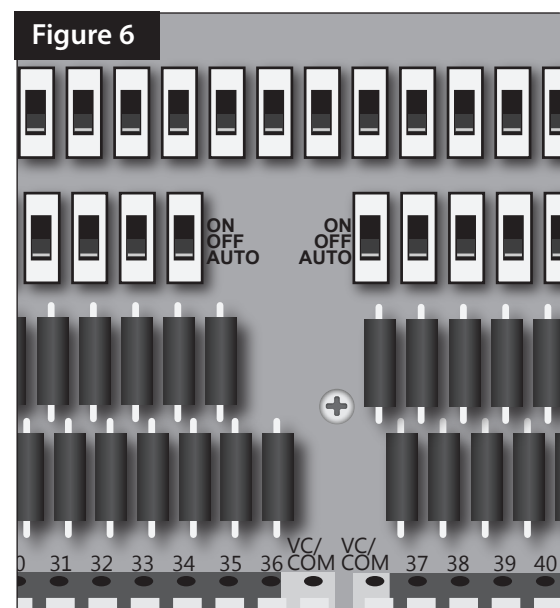
The switch positions are as follows:

**ON** – Manually activates the terminal. The terminal will remain on until the switch is moved to the AUTO or OFF position. An indicator LED will illuminate when the switch is on the ON position.

**OFF** – Shuts off the terminal. The terminal will be inoperative (for both automatic and manual operation) while the switch is in the OFF position.

**AUTO** – Enables the terminal to be automatically controlled during automatic or manual operation.

**⚠ Caution:** To prevent controller damage, do not operate more than six stations concurrently (1.75A total load maximum) during either manual or automatic operation.



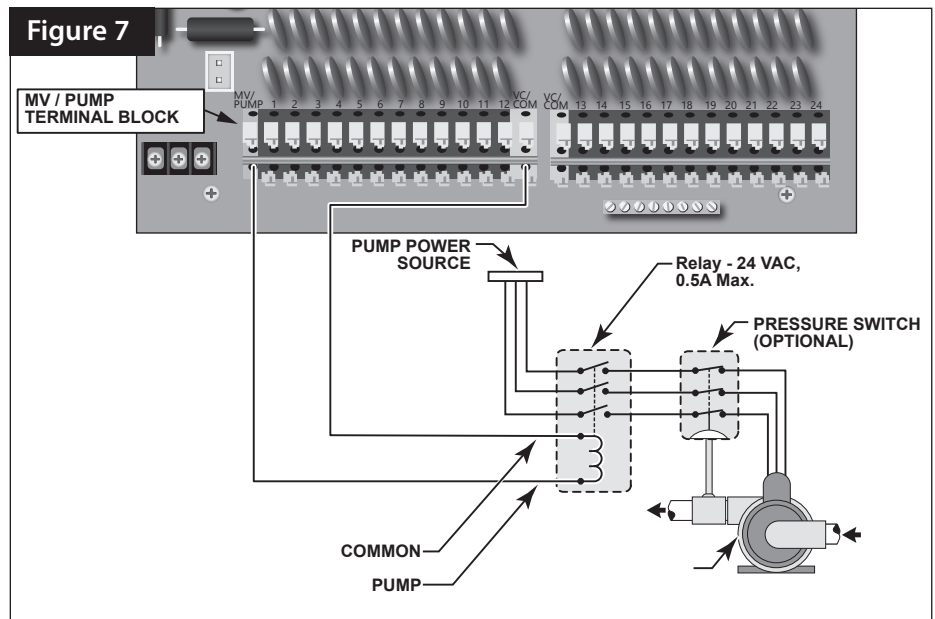
## Connecting a Pump Control

**⚠ Caution:** Do not connect the controller directly to the pump motor or starter. A 24 VAC isolation relay; i.e., Irritrol SR-1 Pump Start Relay (or equivalent), must be used to facilitate the pump control circuit connection.

1. Install a 24 VAC pump start or equivalent isolation relay. Route and connect a control wire and a common wire from the Pump terminal of the Pump/Master Valve terminal block to the relay. See **Figure 7**.
2. Connect the remaining pump wiring per the instructions provided by the pump equipment manufacturer.

**⚠ Caution:** If multiple controllers are utilized within the irrigation system, do not interconnect the controllers' field common, pump or master valve wires. Damage to the controllers can result.

*Note:* Contact technical support at 1-800-777-1477 for information regarding multiple-controller wire connections.



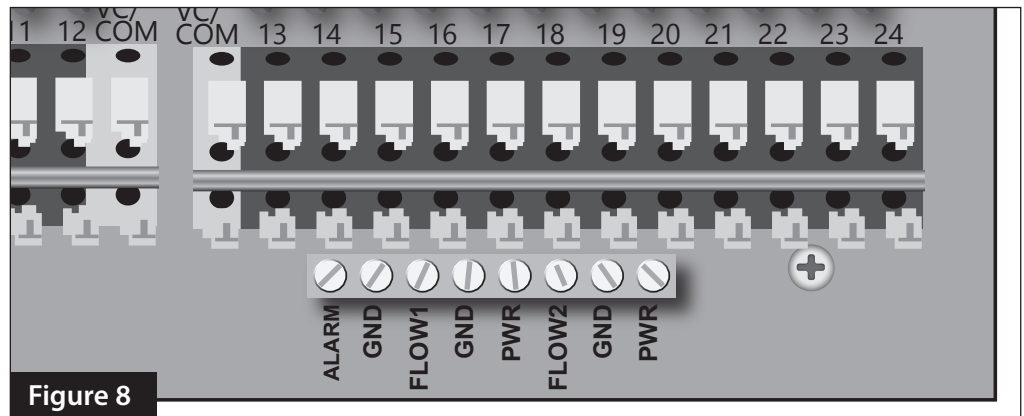
## Connecting Sensors

The DXi controller provides connection terminals for two flow sensors at the bottom of the WOB. One terminal is marked FLOW1, the other FLOW2 (see **Figure 8**).

**⚠ Caution:** To prevent damage to the controller and/or sensor equipment, turn off power to the controller prior to connecting sensor wires.


Installation Notes:

- The ALARM terminal is not used.
- The sensor connection terminals accept 16–28 AWG (1,5mm<sup>2</sup>–0,08mm<sup>2</sup>) solid-core copper wire. To enable positive wire retention, insulation must be removed from the end of each wire to expose  $\frac{3}{8}$ – $\frac{1}{2}$ " (10–13mm) bare copper wire.
- Flow sensor wires have specific polarity that must be maintained for proper operation of these devices. Note the GND indicators on each sensor connection terminal and connect accordingly.



## Training the Wireless Output Board (WOB)

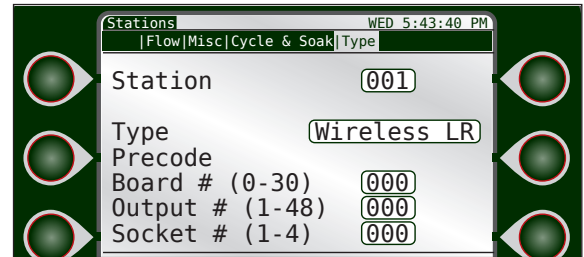
You are now ready to “train” the Wireless Output Board to communicate with the DXi Timer Module.

1. From the DXi controller Main menu, select **Stations**  **Stations** .

2. Press RT button  to navigate to the **Type** screen.

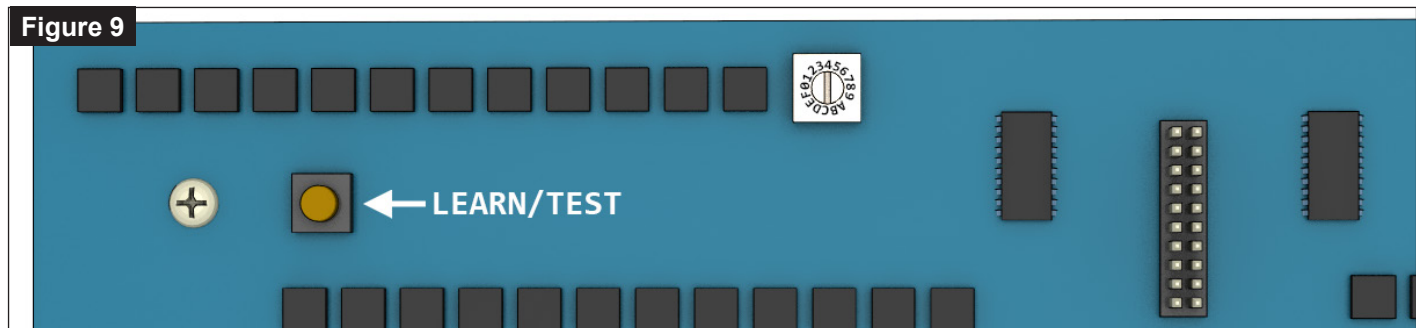
3. Complete the following:

- **Type:** Select **Wireless LR**.
- **Precode:** Set to the precode the WOB is trained to (000-999). Typically this is set to the same as the unit code of the controller.
- **Board #** (0-30) – This corresponds to the position of the rotary switch on the WOB (see **Figure 9**).  
Note: Switch positions labelled A = 10, B=11, C=12, D=13, E=14, and F = 15
- **Output #** (1-48) This corresponds to the output terminal desired on the WOB.



After communication is setup, the WOBs can be trained. Put the WOB in Training Mode by pressing, pausing, and releasing the **Learn/Test button** on the WOB. The board's LED will begin flashing. If you press the button a second time, the board will self test, running each output for about 1 second. Wait for the test to complete before retrying to enter Training Mode OR reset the WOB by power cycling the controller.

**Figure 9** below shows the top portion of an AC WOB (with radio module removed). Note the Learn / Test button and the 16-position board address switch.



The AC WOB. Note the Learn/Test button and the 16-position board address switch.

*Once a board is in Training Mode, the next WOB communication it detects will cause the precode in the communication to be “learned” so that, from that point forward, the board will only listen to communications with that precode.* This allows multiple DXi controllers to run WOBs with the same board numbers within radio range since each WOB only listens to the precode of its master.

Once a board is in Training Mode, send a communication from the DXi TM by turning on any wireless output. All boards in Training Mode will learn the precode and stop flashing the LED. Make sure the switch is in the AUTO position. The output you turned on will turn on and the LED will light on the designated WOB, but all boards in Training Mode will have learned the precode.

- Test communications with each WOB by turning on an output on that board from the DXi controller.
- Now that the WOBs have learned the precodes, it is possible to use Command Interpreter Mode to set flow parameters in each WOB as well as check flow readings from individual WOBs.
- In Command Interpreter Mode, address each board using its precode (aaaa below) and its board address (bb below).

### Command Interpreter (send radio commands to a specific WOB):

- Used to set flow mode parameters on WOB and for general testing of communications and flow.
- To send a command to a board, connect XTEND serial radio to laptop, and launch a terminal program (hypertrm is installed Windows XP). Set to 19200 baud with no flow control (19200 N81). You may find it easier to create a .txt file with the desired commands, and then use hypertrm Transfer menu -> Send text File to send the commands to the radio. It is also possible to type commands directly into hypertrm but note that a delay between characters or commands will cause the command to fail.

All commands Start with ATaaaaabb where:

aaaa is the board precode (typically 00 followed by the three digit address of the master unit)

bb is the board number on the address switch. ( A=10,B=11,C=12,D=13,E=14, and F = 15 )

To test communication:

|                 |                                                      |
|-----------------|------------------------------------------------------|
| Send: ATaaaaabb | Response: aaaa:bb->WOB ver:0.51 (or current version) |
|-----------------|------------------------------------------------------|

To read k factor:

|                                                                    |                                          |
|--------------------------------------------------------------------|------------------------------------------|
| Send: ATaaaaabbKc?<br>(where c is the flow input number (1, or 2)) | Response: aaaa:bb->Kc = <K setting here> |
|--------------------------------------------------------------------|------------------------------------------|

To set k factor:

|                                                                                    |                           |
|------------------------------------------------------------------------------------|---------------------------|
| Send: ATaaaaabbKc=ddd.ddd<br>(where ddd.ddd is desired k factor padded with zeros) | Response: aaaa:bb->Kc Set |
|------------------------------------------------------------------------------------|---------------------------|

To read offset:

|                    |                                               |
|--------------------|-----------------------------------------------|
| Send: ATaaaaabbOc? | Response: aaaa:bb->Kc = <offset setting here> |
|--------------------|-----------------------------------------------|

To set positive offset:

|                                                                             |                           |
|-----------------------------------------------------------------------------|---------------------------|
| Send: ATaaaaabbOc=e.eee<br>(where e.eee is offset factor padded with zeros) | Response: aaaa:bb->Oc Set |
|-----------------------------------------------------------------------------|---------------------------|

To set negative offset:

|                                                                              |                           |
|------------------------------------------------------------------------------|---------------------------|
| Send: ATaaaaabbOc=-e.eee<br>(where e.eee is offset factor padded with zeros) | Response: aaaa:bb->Oc Set |
|------------------------------------------------------------------------------|---------------------------|

To read flow mode:

|                   |                                                                   |
|-------------------|-------------------------------------------------------------------|
| Send: ATaaaaabbM? | Response: aaaa:bb-> <flow mode 1+2 or 1-2 will be indicated here> |
|-------------------|-------------------------------------------------------------------|

To set flow mode:

|                                                                                      |                                  |
|--------------------------------------------------------------------------------------|----------------------------------|
| Send: ATaaaaabbM=f<br>(where f = 0 for additive (1+2) or f = 1 for difference (1-2)) | Response: aaaa:bb->Flow Mode Set |
|--------------------------------------------------------------------------------------|----------------------------------|

To read flow data:

|                   |                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------|
| Send: ATaaaaabbF? | Response: <several lines of flow data showing channel 1, channel 2, and combined results> |
|-------------------|-------------------------------------------------------------------------------------------|

## FCC and IC Statement

This product contains a modular approval with FCC ID MCQ-XBPSX and IC 1846A-XBPSX.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/recepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'innovation, Science et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device complies with FCC and ISED RF radiation exposure limits set forth for general population. This device must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux niveaux limites d'exigences d'exposition RF aux personnes définies par ISDE. L'appareil doit être installé afin d'offrir une distance de séparation d'au moins 20cm avec les personnes et ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.



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For more information, please visit [www.toro.com/CAProp65](http://www.toro.com/CAProp65).