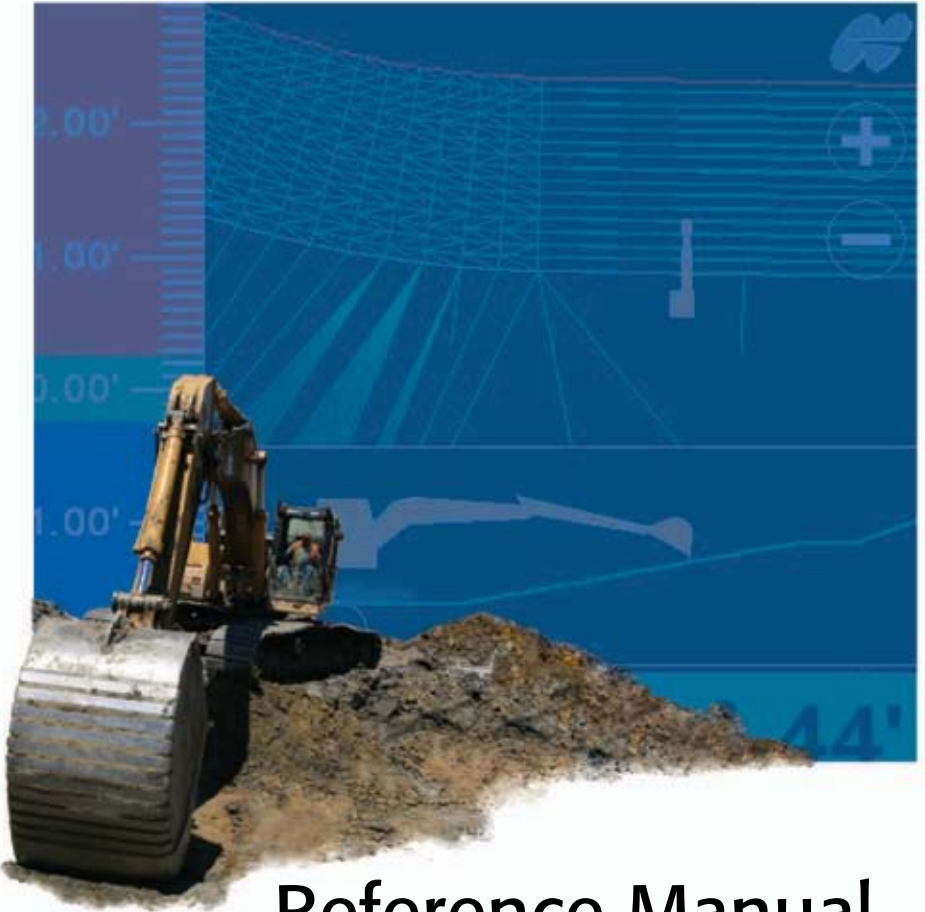




3Dxi

GPS Excavator Indicate Systems



Reference Manual



3Dxi Reference Manual

Part Number 7010-0696

Rev. B

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June, 2006

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Preface

This manual has been developed to provide machine operators or superintendents with information necessary to operate and maintain the TOPCON 3Dxi excavator system. Proper service and use is important for reliable operation of the equipment. The sections provided in this manual include information necessary for the correct operation, care, and troubleshooting of this product.



Please read these Terms and Conditions carefully.

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Manual Conventions

This manual uses the following conventions:

Example	Description
File ▶ Exit	Press the File menu, then press Exit .
Enter	Press the button or key labeled Enter .
<i>Machine files</i>	Indicates the name of a dialog box or screen, or a tab within a dialog box or screen.
<i>Name</i>	Indicates a field or tab on a dialog box or screen.



Further information to note about the configuration, maintenance, or setup of a system.



Supplementary information that can help you configure, maintain, or set up a system.



Supplementary information that can have an affect on system operation, system performance, measurements, or personal safety.



Notification that an action has the potential to adversely affect system operation, system performance, data integrity, or personal health.



Notification that an action *will* result in system damage, loss of data, loss of warranty, or personal injury.



Under no circumstances should this action be performed.

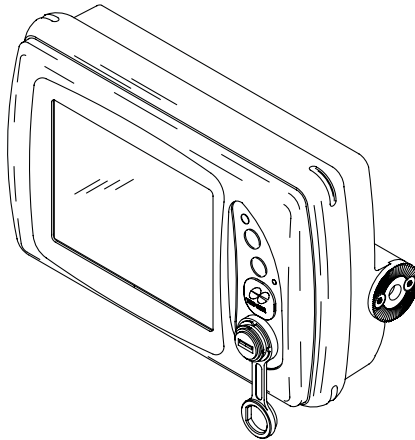
What's New with 3Dxi

This chapter briefly describes new features and functions for the 3Dxi system.

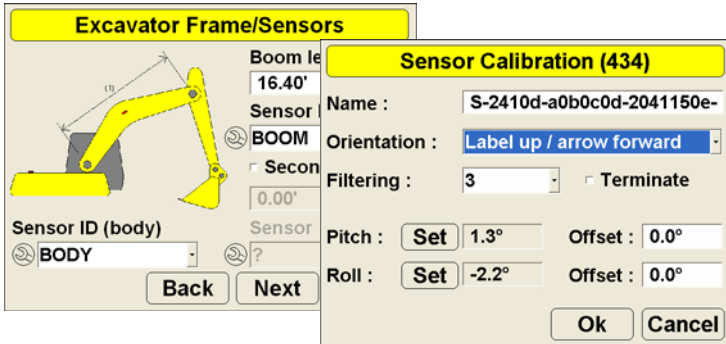
- ⇒ The GX-60 control box is Topcon's interface between the operator and the 3Dxi system components. The 3DMC application software continues to provide viewable, accurate, and up-to-date jobsite control.

Features of the GX-60 control box include USB device support for USB storage devices or other device connected via USB. Integrated serial ports in the back and updated cable configurations provide low-profile, efficient connections to the system's components.

For more information on the GX-60 control box, see "GX-60 Control Box" on page 1-3 and "GX-60 Control Box Features" on page 2-1.

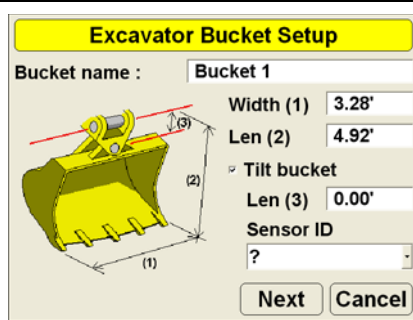


⇒ 3DMC is used to configure and calibrate the TS-1 sensors. See Appendix A for details applicable to creating a machine setup file. Refer to the *3Dxi Installation and Calibration Manual* for specific details.

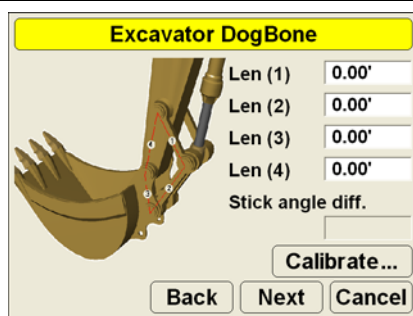


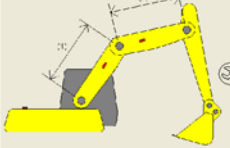
⇒ New machine information and configurations are available when creating a machine setup file. See “Create a 3Dxi Machine Configuration” on page 4-14 for more information.

Tilt buckets can now be configured.



TS-1 placement on the dog-bone is now supported.



<p>GPS precision can be entered.</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: yellow;">GPS Precisions</p> <p>Max. GPS errors (roving) :</p> <p>Max. Horizontal RMS : <input type="text" value="0.20'"/></p> <p>Max. Vertical RMS : <input type="text" value="0.30'"/></p> <p>Max. GPS errors (point measurement) :</p> <p>Max. Horizontal RMS : <input type="text" value="0.10'"/></p> <p>Max. Vertical RMS : <input type="text" value="0.20'"/></p> <p style="text-align: right;"> <input type="button" value="Back"/> <input type="button" value="Next"/> <input type="button" value="Cancel"/> </p> </div>
<p>Measurements for a jointed boom can be entered.</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; background-color: yellow;">Excavator Frame/Sensors</p>  <p>Boom length (1) <input type="text" value="16.40'"/></p> <p>Sensor ID (boom) <input type="text" value="?"/></p> <p>Secondary (2) <input type="text" value="0.00'"/></p> <p>Sensor ID (body) <input type="text" value="?"/></p> <p>Sensor <input type="text" value="?"/></p> <p style="text-align: right;"> <input type="button" value="Back"/> <input type="button" value="Next"/> <input type="button" value="Cancel"/> </p> </div>

- ⇒ A grade indicator can be displayed on the right of the screen. See “Right Window View” on page 5-6 for details.
- ⇒ The number of decimal places to display on-screen can be selected. See “Display Units Options” on page 5-22 for details.
- ⇒ The receiver and/or RTK positioning can be reset using 3DMC. See “Viewing Receiver Information and Resetting the Receiver/RTK” on page 5-25 for details.

Introduction

Topcon's 3Dxi™ for excavator systems is a productive, positioning system to use for 3D grade and slope control. 3Dxi is a three-dimensional, GPS system using four to five accelerometers and GPS technology to precisely locate the cutting edge of the machine, in real time, anywhere on the construction site, reducing the need for costly stakeout and survey.

3Dxi Components

The 3Dxi package consists of the following components:

- Machine Components:
 - GX-60 control box
 - Cables
 - Mounting hardware
 - TS-1 tilt sensors
 - Radio antenna
- GPS Components:
 - Two MC-A1 machine antennas
 - Machine MC-2.5 receiver box (includes radio modem)
 - Base station kit
- Optional Components:
 - Pocket-3D
 - Supporting accessories and software/hardware
 - Additional options

Figure 1-1 on page 1-2 illustrates the components on an excavator.

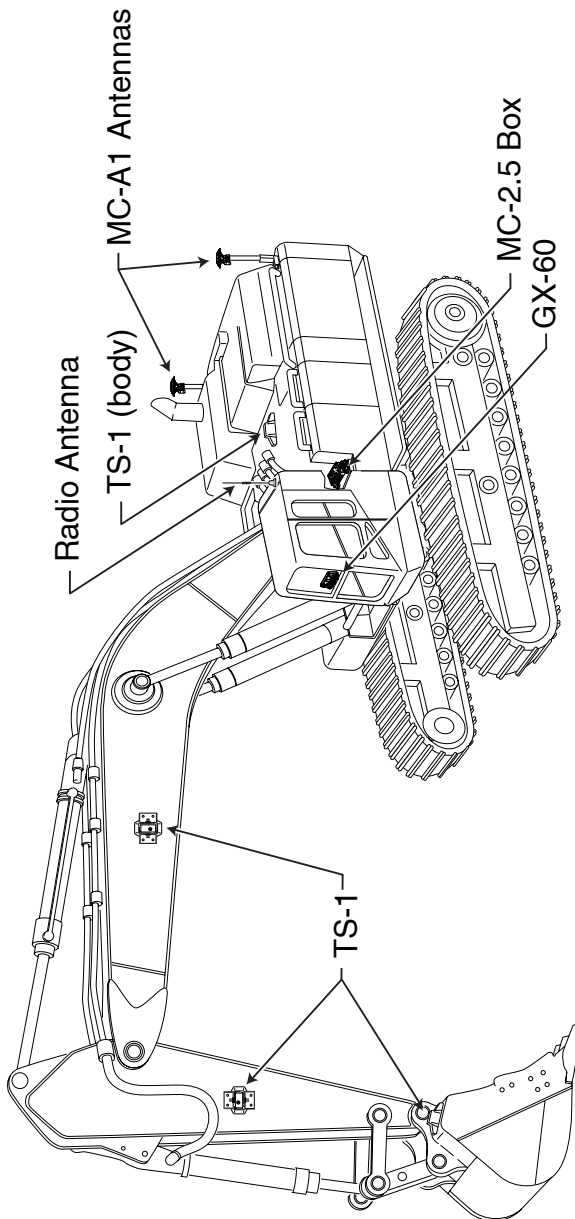


Figure 1-1. 3Dxi Excavator System Components

GX-60 Control Box

The GX-60 control box (Figure 1-2) is the operator's interface, as well as the primary control, for the 3Dxi excavator components. The GX-60 control box with the installed 3DMC application software calculates three-dimensional, stakeless GPS positions.

- The high-resolution, bright touch screen display easily adapts to a variety of machine applications, providing the operator with easy-to-view graphical information.
- A mount secures the control box in the cab. The clamps provide easy attachment at the beginning of the day and easy removal for storage at the end of the day.
- All cables attach in the back and remove easily with quick-disconnect connectors.

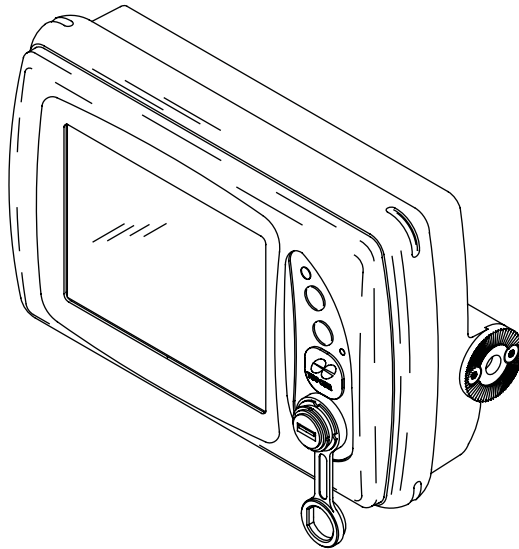


Figure 1-2. GX-60 Control Box

GPS MC-2.5 Receiver Box

The GPS MC-2.5 Receiver Box (Figure 1-3) attaches to the machine with shock isolated magnetic mounts. The MC-2.5 Receiver Box can be easily removed at the end of each day for storage, and contains no manual adjustment.

The MC-2.5 Receiver Box combines Topcon's GPS receiver module and a radio module into a single, rugged housing. When used in conjunction with a Base Transmitter, this combination provides the GX-60 control box and operator with Real Time Kinematic (RTK) measurements. The control box processes these real time measurements to compute grade and graphical mapping information.

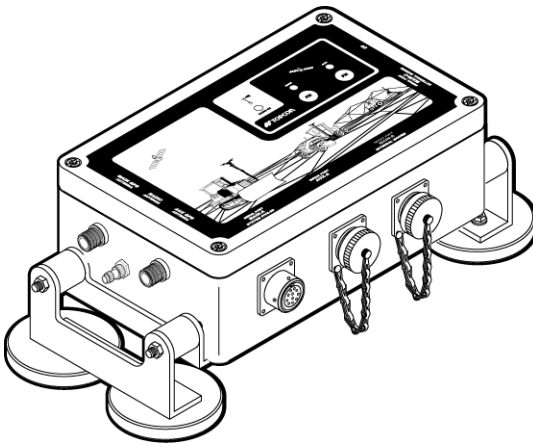


Figure 1-3. MC-2.5 Rover GPS Receiver Box

TS-1 Tilt Sensors

The TS-1 tilt sensors (Figure 1-4) provide lateral and longitudinal angle measurements, regardless of the object's position in space. Each of the four sensors accurately measures the position of the body, boom, stick and bucket, sending this angle data to the GX-60 to provide precise positioning. Using 3DMC software, each sensor is configured and calibrated for its specific location on the excavator.

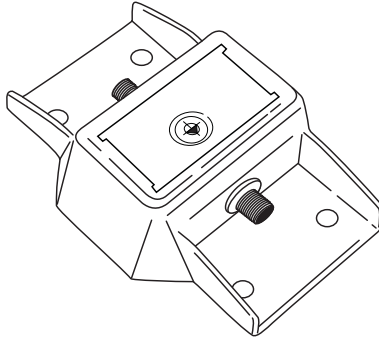


Figure 1-4. TS-1 Tilt Sensor

Machine GPS MC-A1 Antenna

In GPS indicate applications, the machine's GPS MC-A1 Antenna (Figure 1-5) affixes to the top of the mounting pole installed on the body of the machine. The antenna should be removed at the end of each day for storage.

The rugged antenna is specially designed to perform on earth-moving machinery; the 3Dxi system uses two MC-A1 antennas.

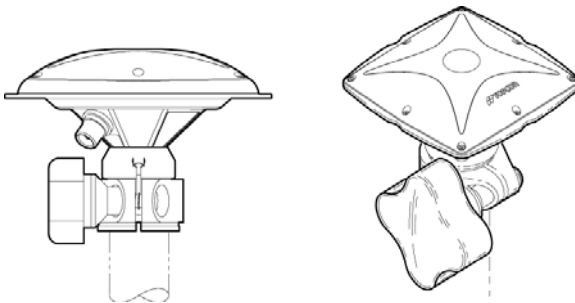


Figure 1-5. MC-A1 GPS Antenna

Base Station Kit

The Base Station Kit (Figure 1-6) sends position corrections to the machines or survey Rover. As a remote system, an unlimited number of machine or Rovers can use the Base Station. The kit includes Topcon's Legacy-E+ receiver, PG-A1 antenna, radio modem, tribrach, cables, and a hard carrying case. In spread spectrum applications, the HiPer Lite or HiPer Lite+ replaces the Legacy-E+ and PG-A1 antenna, providing simple, one button, cable free operation.

The type of options on the Base Station kit can be customized based on individual needs; some kits support GPS+ positioning with RTK measurement and others support normal GPS positioning with RTK measurement. If used with a portable foundation, like a tripod, daily setup and daily height measurements are required.

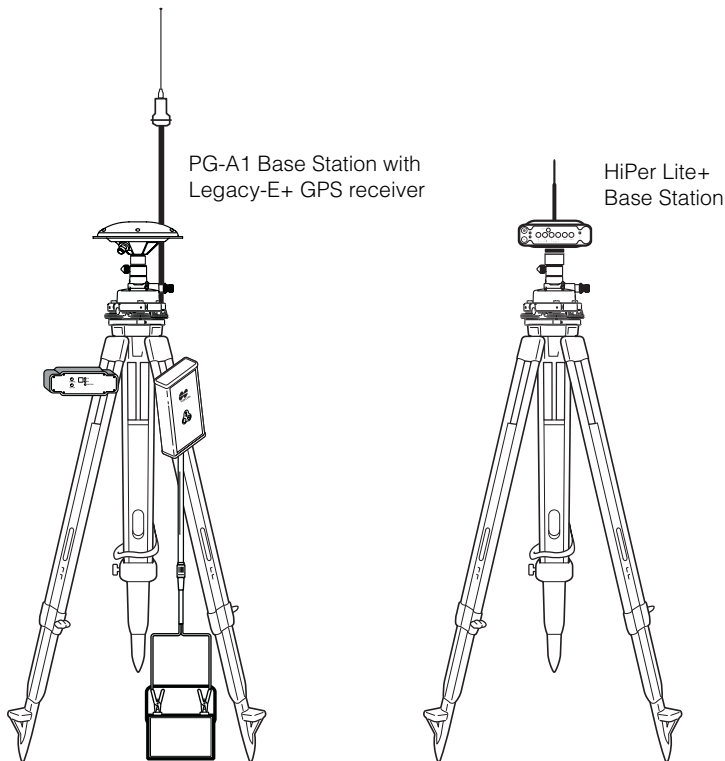


Figure 1-6. Base Station Kit Examples

Pocket-3D

Optional field software for all control applications, Pocket-3D assists superintendents, operators or grade checkers when staking or checking grade on a site. This software runs on a portable controller (Figure 1-7) and uses files common with other equipment on the job site, allowing multiple users to work at the same time.

Using Pocket-3D on an FC-100 (or other Pocket-PC based hand-held controller), you can:

- Set up and initialize the Base Station
- Create and edit Control Point files and Design Surface files
- Create and edit Machine Configuration files and radio configuration files
- Create and edit Point files and Linework files
- Import and export files
- Perform stakeout and grade check
- Perform topographic surveys



Figure 1-7. Pocket-3D on the FC-100

3Dxi Control Overview

To determine the position of the teeth, 3Dxi begins by reading the position of the MC-A1 antennas and using the data from the TS-1 on the body to locate the body of the machine in 3D space (Figure 1-8).

The remaining TS-1 sensors on the boom, stick, and bucket project the measured position out to the teeth.



Careful measurements of the machine lengths are important to overall accuracy.

With the added accuracy of RTK providing quick corrections from the Base Station, the cut/fill reading precisely provides, in real time, the difference between the teeth and the design elevation.

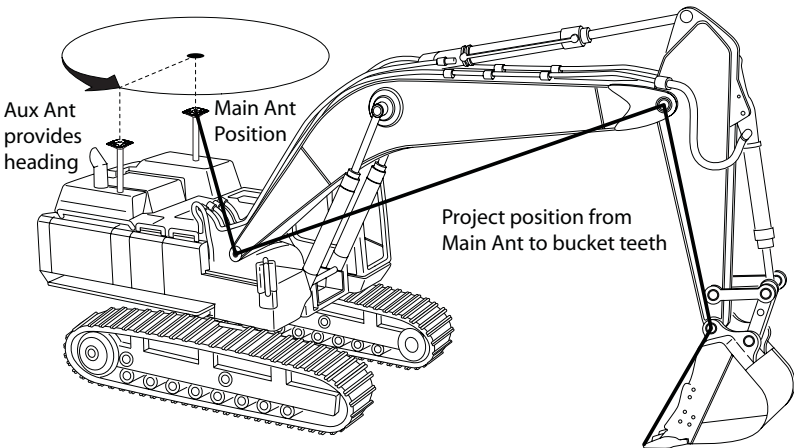


Figure 1-8. Determining Teeth Location

Component Functions

The components of the 3Dxi™ excavator system constantly communicate with each other to provide accurate, real-time measurements. Each component has a specific function to provide operator control, graphical jobsite displays, or GPS measurements for quick and easy grading.

GX-60 Control Box Features

The GX-60 control box is the operator's main interface with the 3Dxi excavator system, and provides the following functionality:

- displays the machine's position and orientation, as well as the distance between the teeth and finish grade
- translates user input into system commands
- communicates with system sensors, and processes information
- acts as a "personal computer" to support digital data

The operator controls 3Dxi operation using the LCD touch screen. A USB port on the front of the control box provides access to the internal memory for transferring files and other data; the top port on the back of the control box provide connections for the MC-2.5 receiver box and the TS-1 sensors (CAN communication).

The following sections describe the different features of the GX-60 control box in more detail.

LCD Touch Screen and Display

The LCD touch screen (Figure 2-1) provides textual information, graphic symbols and graphic mapping, all of which the operator can use to prepare a job, to apply changes on screens and functions, and to perform machine grading. For every operation, simply tap the screen with a finger to make selections or enter information.

Use the control box's buttons to vary the screen's backlight, so the operator can always view the screen's information under optimum brightness.



The surface of the Touch Screen Display has a durable coating, but avoid contact with metal or abrasive objects.

- Prevent hardware from contacting the display.
- Do not rub or force dust from the surface.

See “Touch Screen Display Cleaning” on page 6-2 for more information.

Also, avoid striking the display with heavy or sharp objects.

The touch screen display also provides an interface between the user and the 3DMC software application. For more information on the 3DMC software, see “3DMC Functions” on page 2-6.

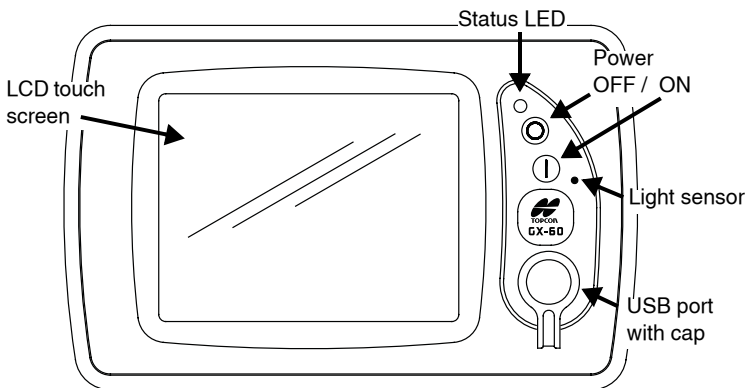


Figure 2-1. GX-60 Front

Status LED

The status LED (Figure 2-1 on page 2-2) indicates the power status of the GX-60 control box.

- Green – the control box is on.
- Red – the control box is powering on or off.

Power On/Off Buttons

The power buttons (Figure 2-1 on page 2-2) turn the control box on and off, as well as the connected components (MC-2.5 receiver box and sensors). A few moments after pressing the ON power button, the 3DMC main screen displays.

To turn on/off the GX-60, momentarily press the corresponding button.

Light Sensor

The internal light sensor (Figure 2-1 on page 2-2) measures ambient light, automatically adjusting the display's backlight to provide optimum viewing of the screen.



Blocking the light sensor may cause incorrect adjustments of the display's brightness level.

USB Port

The USB port (Figure 2-2) provides access to downloading files from or uploading files to a connected device (hand-held controller, keyboard, mouse) or USB device (data storage device). The internal driver is compatible with USB 1.0 or higher and commercially available USB devices and plugs. A rubber cap seals the port to prevent dust, water, etc. from entry.



Keep the USB port cap on when not in use to prevent dust from entering the port.

When copying files to/from a device connected to the port (data storage device, hand-held controller, etc.), an hourglass displays on the screen indicating that the system is busy.

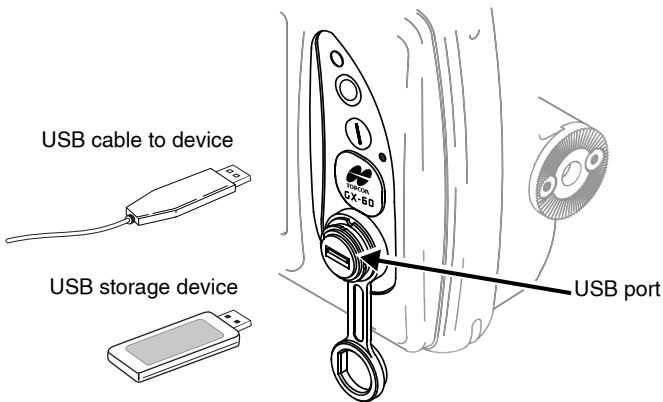


Figure 2-2. GX-60 USB Port

Connectors

The GX-60 has two serial-type connectors, but uses only one for the MC-2.5 box and the TS-1 sensors (Figure 2-3). A jaw mount or ball mount connects the control box to the machine's mounting bracket.

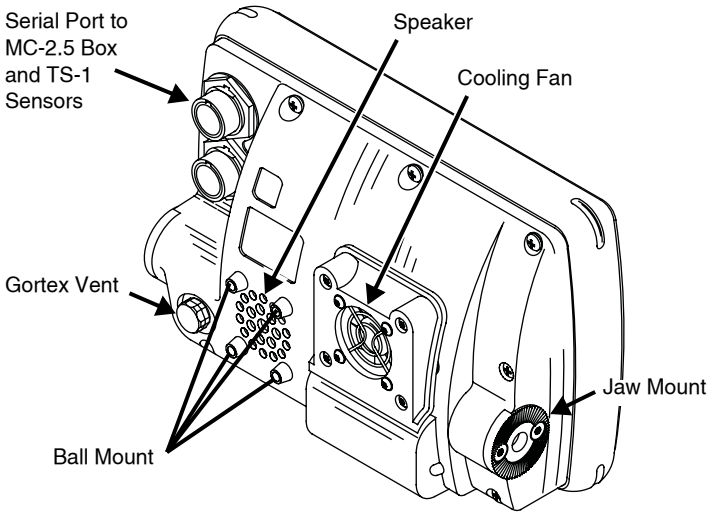


Figure 2-3. GX-60 Back

Speaker

The control box produces sounds through the speaker (Figure 2-3) to indicate certain activities, such as selecting a menu option or changing a selection on the touch screen.

Cooling Fan

An efficient air-cooling system keeps the control from overheating. When the control box is on, the cooling fan rotates to pull air into the interior of the control box (Figure 2-3). Air within the control box constantly circulates, cooling the internal components.



Do not obstruct the cooling fan.

3DMC Functions

The screen of the GX-60 control box provides an interface between the operator, the software, and the 3Dxi components. The screen displays jobsite information and the 3DMC menus needed to configure and use your 3Dxi components. The menus and keys allow files to be created, updated, superimposed, copied, or deleted. Information and files the operator can access will be stored and continuously updated to either the internal memory or a USB device.

When turning on the control box, 3DMC will start up. If the application has been exited, double-tap the icon on the screen to open 3DMC (Figure 2-4).



Figure 2-4. Open 3DMC

The 3DMC main screen (Figure 2-5 on page 2-7) displays a graphical view of the current Design Surface, the machine, and status information.

The main screen has the following components:

- **Display** – a graphical representation of the design surface and the machine. “Changing the Display Options” on page 5-17 describes the different displays available to view jobsite and grade information. Units can be in feet or metric.
- **Pop-up Menu** – tapping anywhere on the display screen brings up a pop-up menu. Depending on the view, the pop-up menu provides various functions, including design elevation at point tapped, steer/grade to polyline, move control, and grade indicator changes. For some pop-up menus, you may have to tap and hold for up to one second.
- **Topcon Logo Key** – accesses the menus that control 3Dxi functions. See “Topcon Logo Key” on page 2-9 for more information on the key and its menus.
- **Zoom In Key** – increases the magnification of the design view. The zooming pivot is the center of the screen.

- **Zoom Out Key** – decreases the magnification of the design. The zooming pivot is the center of the screen.
- **Elevation Control Key** – displays elevation control information and indicates the status of the connected sensor. Tap this key to view or edit elevation information. See “Elevation Control Key” on page 2-10 for more information on this key and its menu.

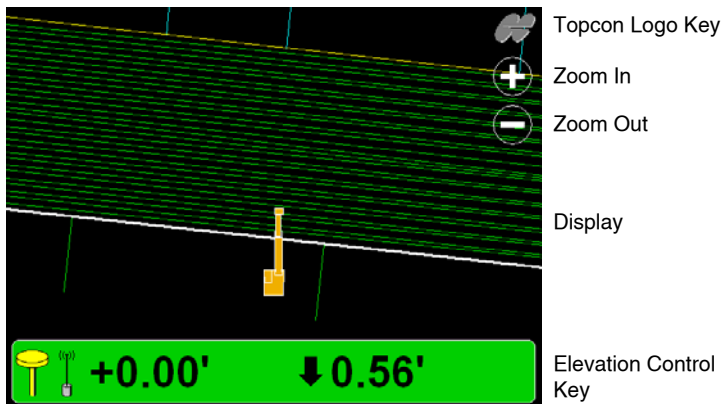


Figure 2-5. Main Screen

The various dialog boxes of the 3DMC application have buttons to perform operations, such as creating, updating, copying, or deleting files (Figure 2-6 on page 2-8). Any and all information the operator can access will be stored and continuously updated to either the internal memory or a USB device.

- **New** – Creates a new file or element.
- **Edit** – Changes an existing file or element. To edit a file, select a file or element, then press the **Edit** key.
- **Copy** – Copies a file either from the USB device to the internal memory or from the internal memory to the USB device. To copy a file, select a file, then press the **Copy** key. Copy new or edited files to the USB device to backup the file.
- **Delete** – Removes an existing file or element from the internal memory. To delete a file or element, select a file and press the **Delete** key.



Once you delete a file, it no longer exists. The file will need to be re-created.

- Next – Displays the next step or dialog box during an operation after all applicable settings have been entered.
- Back – Displays the previous step or dialog box during an operation.
- OK – Applies settings and inputs and exits the dialog box and/or operation, or used to change files or apply settings in sub-screens.
- Cancel – Cancels or pauses an operation without applying changes or edits. However, changes or edits on the previous screen will still be applied.

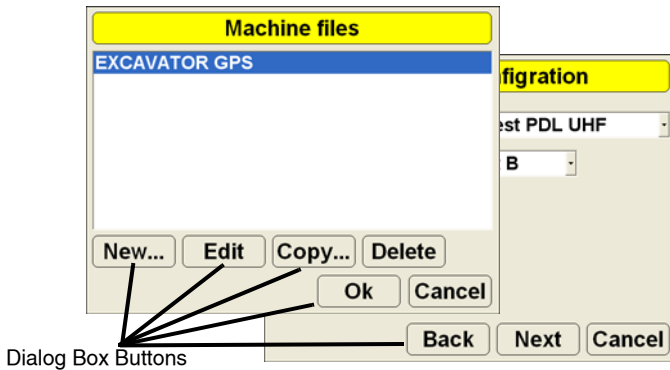


Figure 2-6. Example Dialog Box Buttons

When entering text or numbers, one of the following two pop-up keyboards displays (Figure 2-7 on page 2-9):

- Alphanumeric keyboard – for entering letters and numbers.
- Numeric keyboard – for entering numbers.

File and point names can be up to 32 characters long; point descriptions up to 64 characters long.

When you press **OK** on the keyboard, entered information is saved and the keyboard leaves the screen.

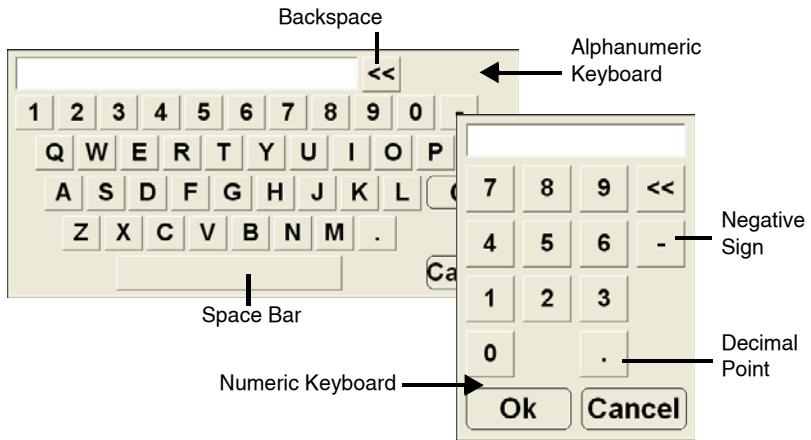


Figure 2-7. Keyboards

Topcon Logo Key

The Topcon Logo key at the top right corner of the Main Screen displays a pop-up bar of four menus: File, Control, Tools, and View.

To access the Topcon Logo menus (Figure 2-8), tap the **Topcon Logo**. Unless used, the menus disappear after 10 seconds.



Figure 2-8. Topcon Logo Menus

Table 2-1 describes the functions available in each menu.

Table 2-1. 3DMC Menu Options for 3Dxi

Menu	Functions
File menu <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Control...</p> <p>Surfaces</p> <p>Alignments...</p> <p>Linework...</p> <p>Point files...</p> <hr/> <p>Exit 3DMC</p> </div>	<ul style="list-style-type: none"> • creates, edits, and deletes control point files • creates, edits, and selects design surface files • selects alignment files • selects linework • creates, edits, and deletes point files • exits 3DMC

Table 2-1. 3DMC Menu Options for 3Dxi (Continued)

Menu	Functions
<p>Control menu</p> <div style="border: 1px solid black; padding: 5px;"> <p>Machine setup...</p> <p>Steer indication...</p> <hr/> <p>Elev. reference ›</p> <hr/> <p>Bucket ›</p> </div>	<ul style="list-style-type: none"> • creates, edits, deletes, and applies configurations for the machine • sets the steering indication • selects the location of the elevation reference on the machine bucket • selects the configured and attached bucket
<p>Tools menu</p> <div style="border: 1px solid black; padding: 5px;"> <p>Topo survey...</p> <p>Position check...</p> <hr/> <p>Configure radios...</p> </div>	<ul style="list-style-type: none"> • collects topographic points • checks the current position of the bucket • configures the radio
<p>View menu</p> <div style="border: 1px solid black; padding: 5px;"> <p>Main window ›</p> <p>Left window ›</p> <p>Right window ›</p> <p>Lower window ›</p> <hr/> <p>Display options ›</p> <hr/> <p>About 3DMC...</p> </div>	<ul style="list-style-type: none"> • displays Plan, Section, and Profile views in the Main Window • displays a left window for Profile, Section, or the Grade indicator • displays a right window for the Grade indicator • displays a lower window for Profile, Section, or Light bar • views and selects display options for design surface, points, linework, background, and units; menu options depend on the file(s) selected for display • displays 3DMC information, authorization codes, and options

Elevation Control Key

The Elevation Control key displays cut/fill readings and the cut/fill offsets for the elevation of the blade. The key also indicates the status of the connected sensor with graphics, informational messages, and colors (Figure 2-9 on page 2-11).

- Receiver and Radio icons – displays the current status of the indicated component. The icon will be crossed out if the component is unavailable for some reason. Messages in the Elevation Control Key may indicate the reason.

- Left number – displays the current cut/fill offset, and can be changed at any time.
- Right number – displays the current cut/fill reading, or distance from finish grade. The number continuously updates according to the elevation difference between the cutting edge and the Design Surface. The arrow indicates if that distance is above (down arrow) or below (up arrow) the Design Surface.
- Elevation Control Key color – the background color of the elevation control key indicates sensor status. Green: sensor status suitable for grading; Red: an error status has occurred. Messages about system status also display.

When pressing the Elevation Control key, the *Adjust elevation* dialog box displays, containing elevation information and elevation configuration functions. See “3Dxi Operations” on page 5-1 for more details on using this dialog box.

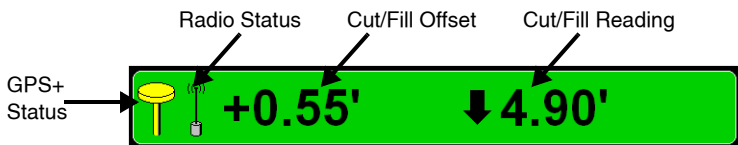


Figure 2-9. Elevation Control Key

Adjust Elevation

To display the *Adjust elevation* dialog box, press the **Elevation Control Key**. The *Adjust elevation* dialog box (Figure 2-10 on page 2-12) displays the following information and settings:

- Elevation (left edge) – displays the elevation of the left edge of the bucket based on local site coordinates.
- Elevation (right edge) – displays the elevation of the right edge of the bucket based on local site coordinates.
- Elevation set point – displays the current cut/fill offset, or amount of additional height applied to the Design Surface.
- Match – sets the current Design Surface to the elevation of the cutting edge, changing the cut/fill reading to zero. The cut/fill Offset number then displays the distance from the new, matched

grade to the original Design Surface. This key allows you to quickly adjust the grade to a more manageable cut or fill.

- Zero – sets the elevation set point value to zero.
- GPS info – displays the GPS information dialog box.

Figure 2-10. Open Adjust Elevation Dialog Box

See “Changing Cut/Fill Offsets” on page 5-12 for details on adjusting the elevation while grading.

GPS Info

To view the *GPS information* dialog box and tabs (Figure 2-11), press the **Elevation control** key, then press the **GPS info** button. For more information on the various tabs, see “Viewing GPS Information” on page 5-23.

Figure 2-11. GPS Information Dialog Box

3DMC Options

The 3DMC software manages the options needed to enable the components for the desired application. For most applications, the authorization codes that enable options are initially entered at the factory. If purchasing upgrades to the system, the enabled options in the control box will need to be updated.

Viewing 3DMC Options

To view the enabled options for the GX-60 control box, press **Topcon Logo ▶ View ▶ About 3DMC**. The *about 3DMC* dialog box displays the version number, copyright date, publisher, and registered user (Figure 2-12) for the 3DMC software.

To view options enabled in the control box for 3Dxi, press **Options** (Figure 2-12). See the following section for details on modifying the options for system upgrades or updates.

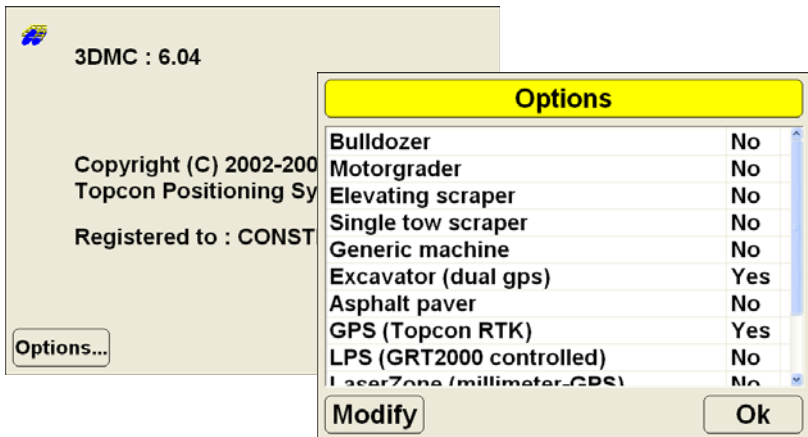


Figure 2-12. About 3DMC and GX-60 Options for 3Dxi

Updating 3DMC Options

3DMC options enable specific functions for different applications. Sometimes, you may want to purchase additional options; in this case, update the GX-60 with the new options.

1. To modify options, navigate to the *Options* dialog box and press **Modify** (Figure 2-12).
2. From the *ControlBox* dialog box, record the *Device identification* number to give to your Topcon representative. Contact your Topcon representative to obtain new authorization codes for the desired applications.
3. When you have received the new authorization codes, enter the codes in the *ControlBox* dialog box using the alpha-numeric keyboard (Figure 2-13).

The screenshot shows the 'ControlBox' dialog box with a yellow title bar. It contains the following fields and values:

- Device identification:** 55555555
- Registered user name:** JON DOE
- Authorization code (1):** 1234567890123456
- Authorization code (2):** AB1C23456D7E8901F

An alpha-numeric keyboard is overlaid on the right side of the dialog box. The keyboard includes a '<<' button, a numeric row (1-0), a QWERTY row, an ASDF row, a ZXCV row, and 'Ok' and 'Cancel' buttons. The 'Ok' button is highlighted in the keyboard overlay.

Figure 2-13. Enter New Authorization Codes

4. Press **Ok** to apply the new codes and options. Press **Ok** on each screen to return to the main screen.
5. Turn off, wait a couple seconds, and then turn on the control box to activate the new passwords.

MC-2.5 GPS Receiver Box Functions

Three LED indicators on the MC-2.5 GPS Receiver Box provide status on power, satellites, and radio signal (Figure 2-14 on page 2-16). Two function (FN) buttons provide diagnostic and reset for the internal receiver boards.

- Radio RX LED – radio status indicator. This LED blinks green when receiving data from the Base Station, typically once per second.
- Main LED and FN Button – power and satellite indicators for the Main antenna.
 - When the MC-2.5 box is hooked up to power, but is not connected to a GPS antenna and therefore not tracking any satellites, only the red LED blinks.
 - When the MC-2.5 box is attached to an MC-A1 GPS antenna, green blinks indicate the number GPS satellites being tracked; red blinks indicate the number of GLONASS satellites. A pause precedes each repetition of blinks.
 - Pressing the FN button changes the Main receiver board’s information mode between Normal Mode and Extended Information Mode. See “Receiver Box Extended Information Mode” on page 2-16 for details.

- Aux LED and FN Button – power and satellite indicators for the Aux antenna.

This LED and button perform the same functions as the Main LED and button, but for the Aux antenna.

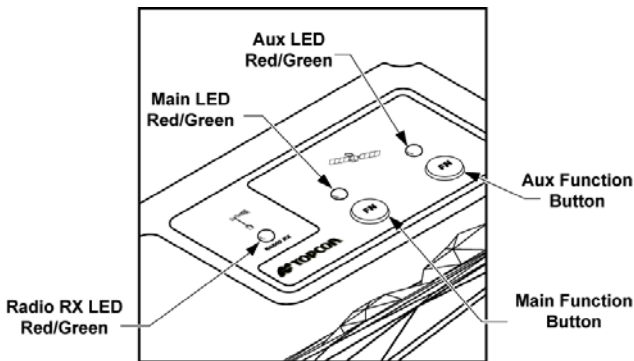


Figure 2-14. MC-2.5 GPS Receiver Box Indicators

Receiver Box Normal Mode

In normal mode, the LED indicates the number of tracked satellites and the position's computation status.

Receiver Box Extended Information Mode

EIM is used for receiver testing purposes. In this mode, the receiver continues to work as usual, but the LED indicates “extended” information using a delimiter. the delimiter is a distinguishable double-blink that shows the overall status of tests performed in EIM. The LED color for delimiter is calculated from the colors of other LED blinks.

- Orange – at least one blink is orange.
- Red – no orange blink and at least one red blink.
- Green – all other cases.

The delimiter double-blink is followed by six LED blinks corresponding to six receiver tests, where each blink indicates the following information:

- Blink 1. Sufficient data for position computation.
- Blink 2. GPS S/N ratios are good.

- Blink 3. GLONASS S/N ratios are good.
- Blink 4. Oscillator's frequency offset is less than three ppm.
- Blink 5. Oscillator's Allan Variance is better than $2.7e-10$.
- Blink 6. Continuous tracking time is more than 15 minutes.

The color of the blink indicates that information for test is unavailable (orange), the receiver passed the test (green), or the receiver failed the test (red).

1. To switch to EIM, press and quickly release (within one second) the **Main FN** button.
2. Watch for the delimiter double-blink. With good receiver, antenna, and observation conditions, all blinks should be green within 15 minutes of powering on.
 - Green – ok
 - Orange – wait
 - Red – some tests failed
3. To switch back to normal mode, press the **Main FN** button.

