

EX-RAY

Digital Speedometer Panel
for Golf Carts, NEV, Conversions



USER'S MANUAL

SPEED | DISTANCE | TEMP | CLOCK | REMOTE



*"An Aftermarket solution
for Electric Vehicles used
on-road or off-road"*

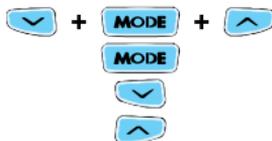


Short Cuts



Normal Mode:

- = Activate backlight manually
- = Switch between screens in normal mode
- = Start or stop the stop watch



Data Setting Mode:

- = Enter data setting mode
- = Switch between screens in data setting mode
- = Scroll through current data setting
- = Move to next digit of current data setting



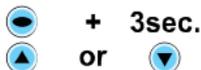
Data Reset:

- = Reset single-ride data



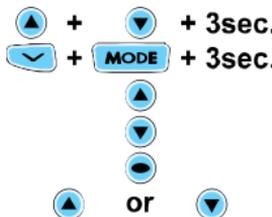
Adjustable Trip Distance Edit:

- = Enter/exit adjustable trip distance edit mode
- = Scroll distance value



Rally Mode:

- = Enter/exit rally mode
- = Scroll distance value



Lap Timer Mode:

- = Enter/exit lap timer mode
- = Clear lap timer data
- = Start/stop lap timer
- = Signal new lap
- = Enter/exit lap data review mode
- = Scroll through lap information

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Welcome to Alltrax

Thank you for purchasing an Alltrax Product:

The EX-RAY™ is Digital Speedometer Display, the EX-RAY™ product line provides valuable information about your vehicle for your gas or electric golf car or modified buggy, Neighborhood Electric vehicle (NEV), or Small Task Oriented Vehicle (STOV).

Please read this manual carefully before installing your EX-RAY™ Display.

EX-RAY™ is a trademark of the Energy Design Tek LLC Company in Oregon USA; licensed to Alltrax Inc. of Oregon USA.

Please Record Important Information:

For future reference and customer support, please record the following information:

PURCHASE DATE: _____

DEALER: _____

DEALER PHONE: _____

EX-RAY MODEL (ON BOX): _____

Keep this manual, sales receipt, and original box for future use.

SAVE THESE INSTRUCTIONS

Precautions

WARNING:

When using the EX-RAY™ follow basic precautions, including the following:

- Read all instructions before using the EX-RAY™
- When installing the DC Motor temperature Sensor, be careful removing the bolt and not to damage the motors internal field coil. Alltrax is not responsible for damage done during this process.
- Use EX-RAY™ only for its intended purpose.
- To reduce rick or injury, do not disassemble EX-RAY™ or its accessories.
- EX-RAY™ can be used in the rain but should not be used under water.
- Do not leave the main unit in direct sunlight when not being used.
- Check magnetic sensor gap and magnet mounting periodically.
- Do not bend, twist, kink, or otherwise abuse the sensor cables. A damaged cable may produce incorrect readings.
- When installing EX-RAY™, turn the vehicle power off (or ignition switch off); the wires carry power from the vehicles battery.
- Avoid contact with gasoline, de-greasers or other chemical cleaners as they may damage the EX-RAY™.

Specifications

FUNCTION	DISPLAY	RANGE
CURRENT SPEED	SPD	4 - 399.9 KM/H or M/H
AVERAGE SPEED	AS	4 - 399.9 KM/H or M/H
MAXIMUM SPEED	MS	4 - 399.9 KM/H or M/H
DISTANCE	DST	0.00 - 9999.99 KM or M
STOP WATCH	TT	0 - 9999 hour 59 min
ODOMETER	ODO	0.0 - 999999 KM or M
RIDE TIME	RT	0 - 999 hour 59 min
ACCUM. RIDE TIME	ART	0 - 9999 hour 59 min
TEMPERATURE	°C or °F	0 - 399°
12H or 24H CLOCK	00:00:00	12:59:59 or 23:59:59
LOW BATTERY	LO	About 1 Year Life
TIRE SIZE		0 - 3999 mm
OIL REMINDER		0 -9999 KM or M
MAINTENANCE		0 -9999 KM or M
LAP TIMER		0-18 Hours/Lap, 29 Laps

SPEED/DISTANCE SENSOR TEMPERATURE SENSORS

Non-contact Magnetic Speed Sensor
Ambient and Engine Temp. Sensors

PRODUCT DIMENSIONS

106.93x59.46x23.7mm WxHxD
(4.21x2.34x0.93" WxHxD)

SCREEN DIMENSIONS

78.75 x 28.6mm WXH
(3.1 x 1.13" WxH)



UNITS	INCREMENTS	ACCURACY
KM/H or M/H	0.1 KM/H or M/H	+/- 0.1%
KM/H or M/H	0.1 KM/H or M/H	+/- 0.1%
KM/H or M/H	0.1 KM/H or M/H	+/- 0.1%
KM/H or M/H	0.1 KM/H or M/H	+/- 0.1%
Hours:Minutes	1 Second	+/- 0.1%
KM or M	1 KM or M	+/- 0.1%
Hours:Minutes	1 Minute	+/- 0.1%
Hours:Minutes	1 Minute	+/- 0.1%
°C or °F	1 Degree	+/- 0.1%
H:M:S		+/- 0.1%
2.5 Volts		
		+/- 0.1%
KM or M	1 KM or M	+/- 0.1%
KM or M	1 KM or M	+/- 0.1%
KM or M	1 Second	

PRODUCT WEIGHT	3.9 oz. (110 grams) (0.24 lbs.)
WHEEL CIRCUMFERENCE	0 to 3999 mm
OPERATION TEMPERATURE	0°C to 60°C (32°F to 140°F)
STORAGE TEMPERATURE	-20°C to 80°C (-4°F to 176°F)
BATTERY	3V CR2032 (About 1 Year life)
EXTERNAL POWER INPUT	9.0-400 VAC/VDC (No polarity requirements.)

Overview

EX-RAY™ Digital Speedometer:

Main Display:

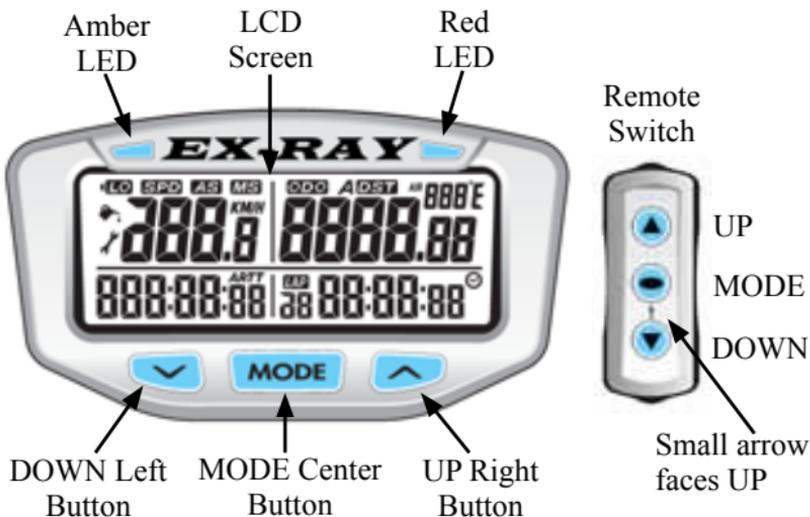
- The display panel includes 3-user buttons, 2-warning LED's, and the LCD screen.

LED's:

- Amber LED: Lights for temperature warning alert indicates lap times in lap timer mode.
- Red LED: Lights for over-temperature alert and indicates slow lap time in lap timer mode.

Remote Switch (optional):

- The optional remote switch (sold separately) is required to access lap timer or rally mode extended feature set.
- If not in lap timer or rally mode, the remote switch buttons function as duplicates of the buttons on the Display.



Parts and Features

Display Backlight:

EX-RAY is equipped with a backlight for easy viewing during night time operation.

Using External 12V Power:

- Display Backlight will light up with all five backlight LED's
- EX-RAY will remain lit as long as it senses wheel movement. After 20 minute of inactivity, EX-RAY shuts off the backlight. Press any button, roll the wheels, turn on key switch (electric golf cars) or start the engine (gas golf cars) and EX-RAY will light up again
- Amber and Red LED's enabled (Shift or temperature)
-

Using Internal Batteries Only:

- EX-RAY will only stay lit for 3 seconds
- EX-RAY backlight will light up with 10% power to conserve the internal battery power.
- If the LO symbol is present, the backlight will not turn on. The LO symbol appears when battery voltage drops below 2.45V
- If ambient temperature is cold (below -5°C , 23°F) the backlight will not turn on.



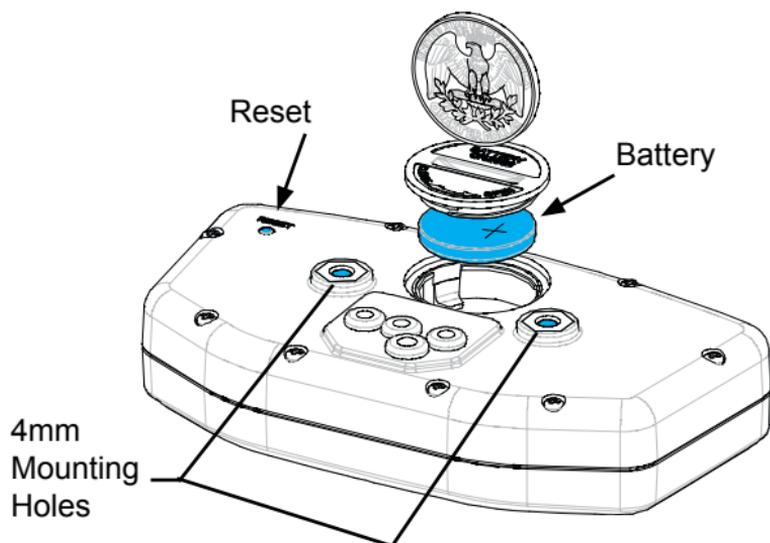
TO ACTIVATE BACKLIGHT MANUALLY PRESS



Parts and Features

Reset Button:

Use the Reset Button to erase data from the current ride including clock and trip distance. Reset may also be required when ever UNPLUGGING A SENSOR. (Forced computer to re-read the sensor)



Internal Battery:

- EX-RAY has an internal non-rechargeable Lithium watch type battery (#CR2032). The computer can be run from the internal battery without external connection to vehicle power source.
- To change the battery, unscrew the battery cap on the back of the computer with a coin. Make sure the POSITIVE SIDE of the battery is FACING UP when replaced.
- **REPLACE WITH BATTERY MODEL NUMBER CR2032**

Installation

Unpacking the Display:

Carefully remove the display from the packaging and verify all the parts are included for your application.

Carefully remove the EX-RAY cardboard TRAY from the box. Be careful not to damage the rear mounted connectors.



A sheet included will list the components included in this kit.



Remove the bottom separator and remove the display mounting bracket (CNC Bracket Shown, your application may vary). Color options also available.

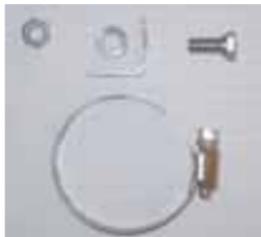


Installation Parts

PARTS BREAKDOWN:

The kit includes the following:

1) **6MMx12MM Metric Magnetic bolt** mounts on the front DRIVERS side wheel HUB with bracket and clamp. (Install sheets may detail drilling the hub)



1) **Speed Sensor** that mounts on the AXLE (either 10MM BOLT or PLASTIC TAB Sensor depends on your application).



1) **Power Wires** that connects to your 12Volt accessory system to provide backlight and LED power.



1) **Temp Sensor** mounting to the electric motor field coil bolt or to a 10mm bolt on a gas engine golf cart.



1) **Temp Sensor Extension Cable** from the motor to display.



1) **Bag Misc. Hardware**

1) **Display Mount Bracket, Hardware**

*EXRAY-UBOLT Universal Bracket

*EXRAY-Mxx CNC Machined

MEZ Ezgo, MCC ClubCar, MYAM, etc.

> See end of this book for model number breakdown.

Display Installation

STEERING COLUMN MOUNTS:

Most installations will be on the Golf Cart Steering column using either the universal mount EXRAY-UBOLT, or optional CNC 6061-T6 Aluminum bracket EXRAY-MEZ. (Optional dashboard mounting will include separate installation instructions).

Universal Bracket Mount EXRAY-UBOLT EXRAY-UXRT

The UBM will fit on all column diameters from 1" to 2".

Note: Some vehicles have plastic column cover installed. Some cutting may be required for secure installation.

The parts shown include rubber grommets inserted into the display mounting holes with 4mmx0.7x12mm metric screws. Metric Allen wrenches will be needed. (See parts sheet)

The RED inserts are inserted into the rubber grommets as shown to the right. These are stops to prevent the screws from damaging the display. The RED FLAT BACK is farthest away from the display.



Display Installation

Universal Bracket Mount:

Lay a soft cloth on the work surface and lay the display face down. Install the Display using the two 4mm x 12mm Allen head screws.

Notice the red flat back is the bump stop, the screws will stop when fully compressed. The RED FLAT BACK is farthest away from the display.
> DO NOT OVER TIGHTEN!

Install the pipe clamp onto the steering column.

Position the display 6 inches (150mm) behind the steering wheel, about 1 inch (25mm) away from the steering wheel mounting hub.

Hand tighten the clamp bolt until the display no longer moves and aligned straight.



Display Installation

CNC Bracket Mount:

Steering tube column diameters vary between golf cart manufacturers, ensure you have the correct diameter before starting the project. (Example: the 1.50" EZ-Go tube uses 1.51" Clamp)

MODELS:

- **EXRAY-MEZ EZ-Go 1.51"**
-
- **EXRAY-MCC ClubCar 1.66"**
-
- **EXRAY-MYAM Yamaha 1.71"**
- **EXRAY-MCCP ClubCar with Plastic Tube 1.76"**
- **EXRAY-MXRT ClubCar XRT with Plastic Tube 1.76"**



The parts shown include rubber grommets inserted into the display mounting holes 4mm x 12mm metric screws. Metric Allen wrenches will be needed (not included). (See parts sheet)

The RED inserts are inserted into the DEEP DRILLED HOLE section. These are stops to prevent the screws from damaging the display. The RED FLAT BACK is farthest away from the display.



Display Installation

CNC Bracket Mount:

Lay a soft cloth on the work surface and lay the display face down. Install the Display using the two 4mm x 12mm Allen head screws.

Notice the red flat back is the bump stop, the screws will stop when fully compressed.

> DO NOT OVER TIGHTEN!

Insert the two 6mmx40mm Allen head bolts (Cap Screws) with 1-flat washer. (Note bolts may differ from picture)

Position the display 6 inches (150mm) behind the steering wheel, about 1 inch (25mm) away from the steering wheel mounting hub.

Hand tighten the 6mm bolts until the display no longer moves and is straight.

CLUB CAR with plastic tube see next page. (MCCP and MXRT Models)



Display Installation

Steering Column Mount:

Some Club Car models utilized plastic tube covers. The diameter of the CNC bracket accounts for this tube and uses 45 degree "Stake bolts" which lock the display in place. This process will "ding" the plastic tube permanently, but necessary to lock the display in place.

Club Car with plastic cover: (MCCP and MXRT Models)

Tighten the bottom 6mmx40mm bolts as shown on the previous page.

Insert the two 6mmx20mm (or 6mmx25mm bolts, which ever came with your kit) into the 45 degree staking holes. Hand tight them to just touch the plastic tube. Then making sure the display is straight up, 1/4 turn each bolt side. Do not overtighten.

The display should be inside the steering wheel window. If the display is too high, move it farther away down the steering column and tighten.

Note: Some stainless steering covers differ in size. The tube may need to be cut to allow the EX-RAY to fit directly onto the steel steering column. Measure tube diameter.



Temp Sensor Installation

Temp Sensor Mount:

Electric Motor: Two options: 1) Motor field coil bolt or secure using the included Aluminized tape. (Both methods shown)
Gas Engine: 10mm bolt (optional water jacket sensor available, contact your dealer for more info).

ELECTRIC MOTOR:

The temperature sensor monitors the field coil temperature, an indication of $>75^{\circ}\text{C}$ (167°F), the internal temperature is too hot.

Option 1: Performed by authorized personnel, Carefully remove the motor field bolt and install the temp sensor. Install the bolt and torque to manufacturers specifications.



Option 2: Use the supplied tape, clean the area with de-grease agent, dry, and apply the tape over the sensor and part of the wire.



GAS ENGINE Temp Sensor Installation

The Golf Cart gas engine Temp Sensor:

The typical installation is for Air Cooled engines. Cylinder Head temperature is most critical. Oil temperature is also a good indicator. Find a location that a bolt can safely be removed and temp sensor can be installed.

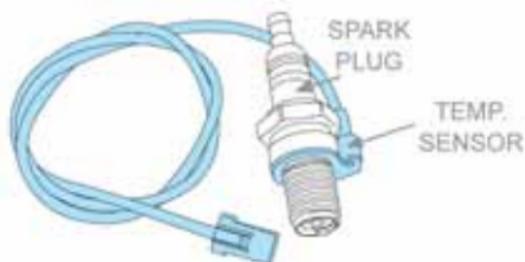
GAS MOTOR:

Any bolt near the cylinder head will provide good indication. (Preferably a mounting bolt that does not require re-torquing the head bolts).

CAUTION: THE CABLE MUST NOT CONTACT MUFFLER EXHAUST COMPONENTS!

Secure the cable with cable clamps. Watch for CHAFFING points that may damage the cable.

Follow the EXTENSION CABLE guidelines to properly route the cable to the display.



Cylinder Head Temperature Sensor for air-cooled machines

Temp Sensor *EXTENSION* Installation

Temp Extension Cable:

Install and use the supplied cable ties to secure the 6 foot temperature extension cable. Ensure the connectors are securely attached, do not apply any stress on the wires as the motor moves up and down.



INSERT THE
CONNECTORS



TAPE THE SPLIT LOOM
(NOT SUPPLIED)



FACING FORWARD



FACING REARWARD

Temp Sensor *EXTENSION* Installation

Temp Sensor Extension Cable:

The cable routes to the Digital Speedometer display through the front floor board. Golf Cart Models vary, pictures below are typical - your cart may look different.

ELECTRIC MOTOR:

Route the cable through an opening through the steering column opening.

CAUTION: THE CABLE MUST NOT CONTACT THE MOVING STEERING KNUCKLE!

Secure the cable with cable clamps. Watch for **CHAFFING** points that may damage the cable.

Feed the connector through the **TOP** of the steering column. Let cable hang for now. (The speedometer cable must be installed first shown on the next several pages)



SPEED Sensor BOLT Installation

10mm BOLT SPEED Sensor Installation (Most all):

Speed sensor is a magnet and wheel speed sensor. The sensor mounted on the steering knuckle, the magnet on the rotating wheel. A mixture of small brackets are supplied best suit your application. EZ-GO shown below. Club Car & YAMAHA following pages. Some stock SHORT HUBS require special bracket.

BOLT SENSOR - AXLE Mount:

Remove the Drivers side wheel,
**SUPPORT WITH SAFETY
JACK**

**CAUTION: DO NOT PERFORM
THIS PROCEDURE ALONE.
ENSURE A STABLE SAFE
WORK ENVIRONMENT.**

Mount the 6mm x 19mm Magnet
bolt. Some brackets may re-
quire the extra 6mm "Jam Nut".

**DO NOT OVER TIGHTEN this
bolt. It only needs to support
its own weight.**

Position the Clamp head and
magnet bracket **OPPOSITE** of
each other onto the wheel hub
and tighten clamp. This will off-
set any weight balance.



SPEED Sensor BOLT Installation

BOLT SENSOR - AXLE Mount (Most all):

Locate the appropriate bracket with 10mm hole with two 10mm JAM nuts. Various brackets used for different golf carts and steering arm knuckles. (Lifted EZ-GO Shown)

CAUTION: THE CABLE MUST NOT CONTACT THE MOVING STEERING KNUCKLE!

Carefully bend the cable and secure the cable with cable ties. Watch for CHAFFING points that may damage the cable.

Add Cable ties to secure the cable to the tie rod arm shown below.



SPEED Sensor BOLT Installation

BOLT SENSOR-AXLE Mount

(Most all):

Route the cable to prevent contact with the wheel. The full LEFT and full RIGHT turn stops should be checked to ensure the cable is not pinched, binds, or rubs.

CAUTION: THE CABLE MUST NOT CONTACT THE MOVING STEERING KNUCKLE OR TIRE!



Secure the cable with cable clamps. Watch for CHAFFING points that may damage the cable. Always use TWO cable ties side by side (should one break in the future)



Feed the connector over the TOP of the steering column. Let cable hang for now. (as shown in the Temp Extension Cable Installation section)



SPEED Sensor BOLT Installation

BOLT SENSOR - YAMAHA - EZGO SHORT HUB AXLE Mount:

The short hub axles (with BLACK bearing cap) leaves no room to mount the 6mm magnet sensor with a clamp.

Either replace with aftermarket bearing hubs - or use the magnet extension bracket and drill the bearing hub.

Use a drill guide (1/8" or 3.15mm thick plastic), lay across the top wheel lugs, draw a line using permanent marker. Mark top and bottom as shown.

Measure from the LEFT EDGE 2.4 inches (2-3/8" or 61mm) and mark the hub. This will be the pilot hole.



SPEED BOLT Sensor Installation

BOLT SENSOR - YAMAHA - EZGO SHORT HUB AXLE Mount:

Use a 13/64" (5mm) Drill Bit (no larger than 7/32" or 5.5mm) to drill a pilot hole at 2.4" (61mm) from left BETWEEN THE LINES marked earlier.

The objective is drill a hole between the ridges behind the hub as shown.

See Below: The 10-24x1" (5mm) mounting screw is a COUNTER-SUNK, use a larger bit 13/32" (10mm) or 7/16" (11mm) just deep enough to countersink the screw.

DO NOT DRILL ALL THE WAY THROUGH !



SPEED BOLT Sensor Installation

BOLT SENSOR - YAMAHA - EZGO SHORT HUB AXLE Mount:

Gather the parts for the 6mm x 19mm Mag mount. TWO 6mm nuts will be needed, 1-LOCK and 1-JAM nut.



Use the 10-24x1 (or 5mm x 25mm) countersunk screw, bracket, flat washer and nuts. Secure but do not over tighten.



Place a 6mm JAM nut on the 6mm x 19mm Magnet, insert the magnet in the bracket, attach the lock nut. Hand tighten for now. It will be adjusted after the sensor is mounted.

The bracket may be slightly ANGLED as shown. This is normal.



SPEED Sensor BOLT Installation

BOLT SENSOR - YAMAHA - EZGO SHORT HUB AXLE Mount:

Locate the 90° TAB bracket as shown.

Mount the Speed Sensor 10mm BOLT with two jam nuts onto the bracket, move the speed sensor so very little protrudes as shown.

Mount the bracket to the REAR WARD bolt on the steering knuckle. Shown is a LIFTED cart with spacer block, but stock OEM will operate the same. Re-tighten the bolt to OEM Specifications.

Adjust BOTH 6mm Magnet and 10mm Speed Sensor until 1/4" (6 to 7mm) space (the width of cable tie).

SLOWLY rotate the hub and check for any interference that could damage the 6mm magnet. **MUST be at least 1/4" (6 to 7mm) space between ANY object.**

This assumes the carts bearings are in good working order.



SPEED Sensor BOLT Installation

BOLT SENSOR - YAMAHA - EZGO SHORT HUB AXLE

Mount:

Route the cable as described earlier.

**CAUTION: THE CABLE MUST
NOT CONTACT THE
MOVING STEERING KNUCKLE
OR TIRE!**



Secure the cable with cable clamps. Watch for CHAFFING points that may damage the cable. Always use TWO cable ties side by side (should one break in the future).



Mount the wheel and recheck for rubbing or any damage that may occur to the cable.



Feed the connector through the TOP of the steering column. Let cable hang for now. (as shown in the Temp Extension Cable Installation section)

SPEED Sensor BOLT Installation

BOLT SENSOR - LIFTED CLUB CAR or JAKE'S LIFT KIT / HUB AXLE Mount:

The Club Car with 6 inch spindle lift, or most Jakes Lift kits with angles spindle axles require the 30° Degree bracket (supplied).

Mount the Speed Sensor 10mm BOLT with two jam nuts onto the bracket, move the speed sensor so very little protrudes.

Mount the bracket to the steering knuckle with a cable clamp. Shown is a LIFTED Club Car cart with angled axle knuckle. (Most Jake's kits are angled in similar manner). The 10mm Sensor will be angled slightly. This is normal.

Adjust BOTH 6mm Magnet and 10MM Speed Sensor until 1/4" (6 to 7mm) space (the width of cable tie).



SLOWLY rotate the wheel hub and check for any interference that could damage the 6mm magnet.

MUST be at least 1/4" (6 to 7mm) space between **ANY** object.

This assumes the carts bearings are in good working order.

SPEED Sensor BOLT Installation

BOLT SENSOR - LIFTED CLUB CAR or JAKE'S LIFT KIT / HUB AXLE Mount:

Attach cable ties to the steering arm. Rotate the steering wheel FULL LEFT and FULL RIGHT and check for binding.

Route the cable as described earlier.

CAUTION: THE CABLE MUST NOT CONTACT THE MOVING STEERING KNUCKLE OR TIRE!

Secure the cable with cable clamps. Watch for CHAFFING points that may damage the cable. Always use TWO cable ties side by side (should one break in the future).

Mount the wheel and recheck for rubbing or any damage that may occur to the cable.

Feed the connector through the TOP of the steering column. Let cable hang for now. (as shown in the Temp Extension Cable Installation section)



XRT SPEED Sensor TAB Installation

TAB SENSOR - CLUBCAR XRT HUB AXLE Mount:

The XRT requires a special TAB speed sensor mounted to the cast iron steering knuckle.

MAGNET MOUNT:

The 6mm x 19mm magnet mount is the same as previously described.

Mount the 6mm x 19mm Magnet bolt. Some brackets may require the extra 6mm "Jam Nut".

DO NOT OVER TIGHTEN this bolt. It only needs to support its own weight.

Position the Clamp head and magnet bracket **OPPOSITE** of each other onto the wheel hub and tighten clamp. This will offset any weight balance.



XRT SPEED Sensor TAB Installation

TAB SENSOR Continued:

Mount the TAB Speed Sensor to the supplied bracket using the two 4mm x 12mm countersunk screws with NYLOC nut as shown.

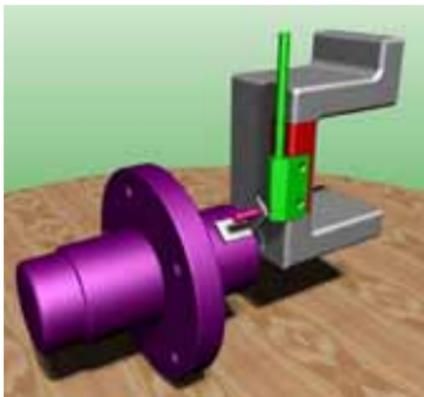
Mount the bracket to the REAR WARD edge of the drivers side steering knuckle.

The Size 36-40 hose clamp around the TOP 1/2" (13mm) of the bracket between the sensor wire and the mounting bracket. Loosely tighten the clamp We will need to adjust this after the magnet is installed.

Adjust the TAB Sensor so the MAGNET passes through the "bottom" edge of the sensor, with 1/4" (6 to 7mm) space (the width of cable tie).

SLOWLY rotate the hub and check for any interference that could damage the 6mm magnet. **MUST be at least 1/4" (6 to 7mm) space between ANY object.**

This assumes the carts bearings are in good working order.



Power Wire (Optional) Installation

EXTERNAL POWER WIRES:

The external power cable **KIT-EXRAY-PWR** provides power to the backlight and two warning LED. The supplied wire must be connected to a **FUSED 12 VOLT CIRCUIT**. (Cable assembly may vary from photo).



OPTIONAL 36-48-72 Volt DC low-current reducers are available from Alltrax Inc.

Route the cable through to the dashboard described earlier and connect to a 12 Volt DC circuit.



CAUTION: THE CABLE MUST NOT CONTACT THE MOVING STEERING KNUCKLE!



Wiring Column Protector Installation

Wire Harness Protection:

The wires are routed along the TOP of the steering column. A optional protection tube covers the wires and offers a clean installation look.

MODEL: HDW800-006-CPT

Carefully attached all the connectors. Make sure the fragile wires are **NOT STRESSED**. Leave a little slack. ** Use cable ties to secure the wires to the steering column.

Snap the optional column protector in place, careful not to pinch any wires. (Display removed for clarity in this picture.

Installation Complete. (Optional CNC machined bracket Model **EXRAY-MEZ** shown)

Proceed to the **SETUP PROCEDURE**.



Tire Wheel Size Calculation

Calculating Proper Tire Size:

Four methods to set the proper size which determines speed. The number needed in the computer is in millimeters.

Method 1) Easy Ruler Method:

Find the circumference of the front wheel by measuring its diameter in millimeters. (An inch to conversion is available in the back of this booklet)

Multiply the wheel diameter by 3.14. The result is your tire size.

Example: [INCH x 25.4 = mm]

So 21.4" tall x 25.4 = 545mm

545mm x 3.14 = 1706mm



Method 2) Rolling Measurement:

On a flat surface, mark the tire sidewall (with the speed sensor mounted) and the ground with a marking pen or chalk. Roll the wheel until the mark on the tire completes 1 revolution and back on the ground. Mark the ground at this location. (Driver should be in the car at the time)

Measure the distance between the marks on the ground and convert the measurement to millimeters (multiply INCH by 25.4 to get mm). Use this number for your wheel size. For accuracy, the driver's weight should be on the cart when making this measurement.

Tire Wheel Size Calculation

Method 3) Distance Measurement:

For the most accurate measurement, use wheel size measurement from Method 2 or set the wheel size to 1700 for lifted carts (20-22 inch tires) and 1435 for stock 18 inch wheels.

1. Find a length of road where the distance is known. (GPS is a best choice for accurate measurement).
2. Drive the distance and note the distance on the speedometer display. For example, the road is known to be 5 miles and the speedometer reads 4.95 miles. (drive more than 2-3 miles)
3. Use the numbers to solve for X in the following equation:

$$\frac{1675}{X} = \frac{4.95}{5.00} \quad \text{or} \quad \frac{(\text{current wheel size})}{(\text{new wheel size})} = \frac{(\text{current miles})}{(\text{actual miles})}$$

$$4.95X = 1675 * 5.00$$

$$4.95X = 8375$$

$$X = \frac{8375}{4.95}$$

$$X = 1691$$

Enter the new number from above method into the Speedometer (Described later in this booklet) Record this number below.

**My Tire
Size is:**

--	--	--	--

Tire Wheel Size Calculation

Method 4) Tire Chart Quick Set:

The chart below picks typical tire sizes and performed calculations. This is a reference and if accurate data is required, or speeding tickets can be issued, the previous methods 1-3 must be used. REMEMBER TO WRITE DOWN YOUR FINAL SETTINGS!

Tire size inches x 25.4 = Size in mm

Tire size in mm x 3.14 = Total Diameter size of tire

Tire Size	Tread	Typical Types	SIZE mm
18	Turf	OEM Stock	1395-1435
20	All Terrain	Alltrail, Trailwolf	1550-1595
20	Mudd	Trail wolf (measured 1580)	1565-1595
22	All terrain	AllTrail	1725-1760
22	Mudd	Stryker (measured 1775), Mudbuster, Carlise 489	1755-1775
23	All terrain	AllTrail	1800-1830
23	Mudd	Carlisle 489	1830-1850
25	All terrain	Alltrail	1955-1980
25	Mudd	Carlisle 489	1980-1995

WARNING: This is an example chart, tire pressure, vehicle weight, and other factors affect speed readings. If accuracy is required, use a GPS and the previous page examples.

DATA SETTING MODE

Overview:

Data setting mode is very important for EX-RAY to operate correctly.

Available Settings:

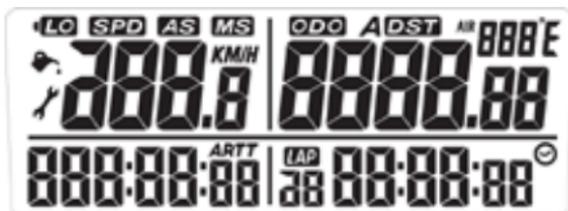
- Kilometers or Miles per Hour
- Wheel size in millimeters
- 12 hour or 24 hour Clock Format
- Time of Day
- Temperature unit of Measure, °F or °C
- Maintenance Reminders (M/K)

After setting is confirmed, EX-RAY will move on to the next setting in order. If no button is pressed for 15 seconds, EX-RAY will return to Normal Mode.

Enter Data Setting Mode:

> TO ENTER DATA SETTING MODE, PRESS AND HOLD ALL THREE BUTTONS FOR 3-SECONDS:

All digits will turn on.
Release the buttons to continue.



Program Kilometers or Miles Per Hour:

To cycle between KMH and MPH press the left button.



TO CONFIRM PRESS THE CENTER BUTTON.

EX-RAY will go to the next screen

MODE

Program Wheel size:

See “Measuring Wheel Size” section for more information.

FACTORY DEFAULT #2109

Enter Wheel Size determined in wheel size section.

MODIFY FLASHING DIGIT BY
PRESSING THE LEFT BUTTON

CHANGE TO THE NEXT DIGIT BY
PRESSING THE RIGHT BUTTON

TO CONFIRM PRESS THE CENTER
BUTTON. EX-RAY will go to the next
screen.



MODE

Program 12 or 24 Hour Clock:

EX-RAY factory default is 12 hour format..

TO CYCLE BETWEEN 12
AND 24 HOURS, PRESS
THE LEFT BUTTON



TO CONFIRM PRESS THE CENTER BUTTON.

EX-RAY will go to the next screen



Program Time of Day:

MODIFY FLASHING DIGIT BY
PRESSING THE LEFT BUTTON



CHANGE TO THE NEXT DIGIT BY
PRESSING THE RIGHT BUTTON



TO CONFIRM PRESS THE CEN-
TER BUTTON. EX-RAY will go to
the next screen.



Data Setting

Program Temperature Unit of Measure:

Choose between °C or °F.



TO CYCLE BETWEEN
°C or °F HOURS, PRESS
THE LEFT BUTTON

TO CONFIRM PRESS THE CENTER BUTTON.

EX-RAY will go to the next screen

MODE

Program HIGH Temperature Warning:

When the motor temperature sensor (Electric or Gas) reaches the value of this setting, The Amber left LED will turn on as a CAUTIONARY warning. Setting to 0 disables the alert. (Factory default = 0°)

MODIFY FLASHING DIGITS BY
PRESSING THE LEFT BUTTON.

CHANGE TO NEXT DIGIT BY
PRESSING RIGHT BUTTON.



TO CONFIRM PRESS THE CENTER BUTTON.

EX-RAY will go to the next screen

MODE

Program DANGER Temperature Warning:

When the motor temperature sensor (Electric or Gas) reaches the value of this setting, The Red Right LED will turn on as a CRITICAL warning. Setting to 0 disables the alert. (Factory default = 0°)

MODIFY FLASHING DIGITS BY PRESSING THE LEFT BUTTON.



CHANGE TO NEXT DIGIT BY PRESSING RIGHT BUTTON.

TO CONFIRM PRESS THE CENTER BUTTON.
EX-RAY will go to the next screen

Electric Motors: (Typical Settings - do not exceed 85°C)

- WARNING: 65°C (149°F)
- CRITICAL: 75°C (167°F)

Gas Engines: (Suggested warnings, see MFG)

- Spark Plug / Head Temp WARNING: See MFG
- Oil Temp WARNING: 82°C (180°F)
- Coolant WARNING: 99°C (210°F)

- Spark Plug / Head Temp CRITICAL: See MFG
- Oil Temp CRITICAL: 99°C (210°F)
- Coolant CRITICAL: 110°C (230°F)

See MFG = Check manufacturers recommendations

Note: Oil Temp varies depending on quality of oil.

Note: Head temperature, see article:

<http://nortonclub.org/docs/OilTemp.pdf>

Set Battery and Gas Maintenance Reminders:

Maintenance reminder used for either Gas or Electric golf carts to check the oil or add water to the batteries in an electric cart. Set the number of miles or kilometers left until EX-RAY displays the oil and wrench shaped reminder icons. After setting <OIL>, the <CARE> setting screen will appear. EX-RAY defaults to 0000.

MODIFY FLASHING DIGITS BY PRESSING THE LEFT BUTTON.



CHANGE TO NEXT DIGIT BY PRESSING RIGHT BUTTON.



TO CONFIRM PRESS THE CENTER BUTTON.

EX-RAY will return to normal mode after setting <CARE>



- Each km/mile the vehicle travels lowers the maintenance reminder values by 1.
- When a reminder countdown reaches 0 while driving, the respective icon will turn on (activate).
- EX-RAY will not increase the reminder value automatically, they must be increased in the data setting mode.
- When reminder settings screens are viewed in data setting mode, the icons will turn off if they have been activated.

Things that will not affect the maintenance reminders:

- Entering data setting mode
- Using the adjustable trip distance feature
- Resetting single ride data (distance traveled since last reset)

NORMAL MODE SCREENS

Switch between 3 Normal Mode Screens:

All of the information the EX-RAY provides is on one of these 3 screens.

When driving, the user has the choice of staying on screen 1 or screen 2. Screen 3 will default back to screen 1 after 5 seconds.

TO SWITCH BETWEEN SCREENS,
PRESS THE CENTER BUTTON



SCREEN 1:

Screen 1 displays:

- Speed (SPD)
- Distance (DST)
- Ride Time (RT)
- Time of Day
- Engine Temperature (above 100°F)



Normal Screen Modes

SCREEN 2:

Screen 2 displays:

- Average Speed (AS)
- Distance (DST)
- Stop Watch (TT)
- Time of Day
- Air temperature



SCREEN 3:

Screen 3 displays:

- Maximum Speed (MS)
- Odometer (ODO)
- Accumulated Ride Time (ART)
- Time of Day
- Maximum Motor / Engine Temperature



EX-RAY will display “- -” for motor / engine temperature until the temperature reaches 100°F (38°C)

EX-RAY FEATURES

Overview:

The EX-RAY is in Normal Mode during regular use.

Available Features:

- Sleep Mode
- Speedometer (Speed, Average Speed, Maximum Speed)
- Distance (Odometer, Adjustable Trip Distance)
- Clock (Time of Day, Ride Time, Stop Watch, Accumulated Ride Time)
- Temperature (Ambient Air and Electric Motor / Gas Engine)
- Reset single ride data to zero (distance traveled)

Sleep Mode:

If EX-RAY receives no data for 20 minutes (either wheel data or a button pressed), it will enter Sleep Mode. It will only display the clock while in Sleep Mode. It will exit Sleep Mode when it receives sensor data or a button is pressed.



EX-RAY Features

Speedometer:

DESCRIPTION: The speedometer shows vehicle speed. EX-RAY also shows average and maximum speed since last reset.

SPEED: Speed is displays top left of SCREEN 1 from 0-399.9 M/H or KM/H. The SPD Icon and M/H or KM/H will also appear next to the speed reading.



AVERAGE SPEED: Average Speed displays on SCREEN 2 next to the AS Icon. The Average speed the vehicle has traveled since the last reset.



MAXIMUM SPEED: Maximum Speed displays on SCREEN 3 next to the MS Icon. The Average speed the vehicle has traveled since the last reset.



EX-RAY Features

Odometer:

DESCRIPTION: The Odometer shown on SCREEN 3 will provide the user with a numeric display of total accumulated distance in miles or kilometers. The odometer is not re-set able.



Trip Distance Meter:

DESCRIPTION: The Trip Distance Meter shows how much distance has been traveled since the last reset. Valuable information for electric vehicles without fuel gauges on gas vehicles.

Trip Distance: Trip Distance is displayed on SCREEN 1 & 2 in the upper right corner beside the DST icon.



TO RESET TRIP DISTANCE, RESET SINGLE RIDE DATA BY HOLDING THE LEFT AND CENTER BUTTONS FOR 3-SECONDS



EX-RAY Features

Adjustable Trip Distance Edit:

DESCRIPTION: The Trip Distance meter shows how much distance has been traveled since the last reset.

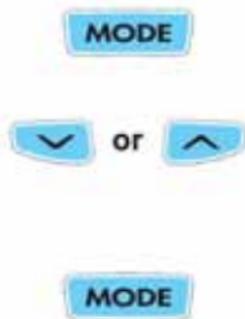
ADJUSTABLE TRIP DISTANCE: The Distance displayed in the upper right corner during trip distance edit mode, next to the ADST Icon.



Enter Trip Distance Edit by holding the CENTER button for 3 seconds.

SCROLL Distance Value by pressing the RIGHT or LEFT buttons. Hold the button down and EX-RAY will auto-scroll.

To EXIT Trip Distance Edit, hold the CENTER button for 3 seconds. EX-RAY will return to normal mode.



The EX-Ray will return to Normal Mode automatically after 5 seconds of inactivity.

EX-RAY Features

Clock and Stop Watch:

Time of Day
Clock:

The Time of Day Clock is displayed in the bottom right corner in all screens next to the Clock Icon and during sleep mode. The clock is displayed in either 12H or 24H format.

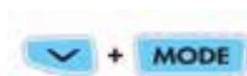


Stop Watch:

The Stop Watch (TT) is displayed on SCREEN 2. The Stop Watch functions like and simple stop watch. Press LEFT button to start or stop the stop watch.



To RESET the Stop Watch, reset single ride data by holding the LEFT and CENTER buttons for 3 seconds.



EX-RAY Features

Ride Time:

DESCRIPTION: Ride Time is displayed SCREEN 1 bottom left corner. Ride Time shows how long the motor / engine has been running since the last reset.



To RESET the Ride Time, reset single ride data by holding the LEFT and CENTER buttons for 3 seconds.



Accumulated Ride Time:

DESCRIPTION: Accumulated Ride Time (ART) tracks the total amount of time the vehicle has been in motion. Accumulated Ride Time is not re-set able. (Valuable for accounting for battery life time in EV or Gas Engine overhaul data)



DISPLAY: The highest Accumulated Ride Time EX-RAY can display is 9999.59 hours (When the maximum value is reached, EX-RAY will not roll the number back to 0).

EX-RAY Features

Ambient Air Temperature / Motor-Engine Temp:

EX-RAY displays different temperature information on each of the three normal mode screens.

SCREEN 1: Electrical Motor / Gas Engine Temperature

SCREEN 2: Air (Ambient) Temperature

SCREEN 3: Maximum Electric Motor / Gas Engine temperature received by the sensor since the last reset.

Temperature LED's:

- When temperature reaches EX-RAY HIGH temp setting, the **LEFT AMBER LED** will light, signaling the motor is starting to get too hot.
- When temperature reaches EX-RAY DANGER temp setting, the **RIGHT RED LED** will light, signaling the motor is too hot and recommended to stop.
- Temperature measurements are based on user defined values to advise when the motor is getting too hot. Temperature cutoffs must be programmed manually. See DATA SETTING section.
- **EX-RAY must be connected to EXTERNAL POWER or LED's will not function.**



RIGHT RED LED:
Over Temp Alert

LEFT AMBER LED:
Temp Caution Alert

EX-RAY will display "- -" for motor/engine temperature until the temperature reaches 100°F (38°C)

EX-RAY Features

Reset Single Ride Data to Zero:

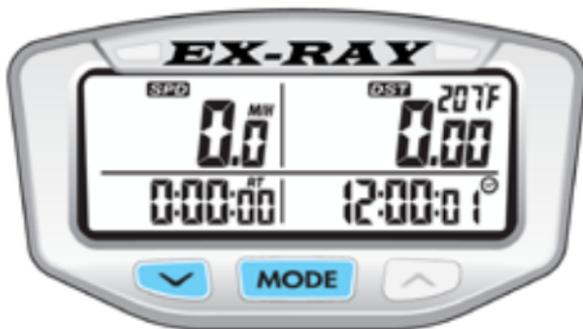
Resets Temporary Data:

- Maximum Speed (MS)
- Stop Watch (TT)
- Ride Time (RT)
- Distance Traveled (DST)

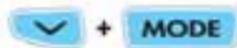
The data should be reset to zero at the end of your trip so that new information can be logged on the next event.

Notes:

- The reset can be done from any screen
- Accumulated Ride Time and Odometer cannot be reset and are intended to maintain cumulative information.



To RESET the single ride data by holding the LEFT and CENTER buttons for 3 seconds.



EX-RAY MUST BE RESET TO RECOGNIZE SENSORS:

- If ANY wires become unplugged from EX-RAY, do a reset after everything is re-connected. (Power wire not included)
- Alternately, push RED RESET button on the back of the EX-RAY.

TROUBLE SHOOTING / FAQ

Frequently Asked Questions:

Why Does Nothing Work?

- Try the RESET button on the back of the display.
- The internal battery may be weak or dead.
- EX-RAY external power may not be properly connected.

Why doesn't the Motor / Engine temperature work?

- You must have the engine temperature sensor properly installed for this feature to function. Review installation procedures.
- If a wire has been disconnected and plugged back in, perform the reset by pressing LEFT + CENTER buttons (or the RED RESET button on the back of the display. A data reset must be performed in order for EX-RAY to recognize the sensors if they become unplugged.
- EX-RAY will display “- -” for the engine temperature until it reaches 100°F (38°C).

Everything is working, but the (K)MPH reading is way off.

- The speed sensor / magnet may be installed incorrectly. Double check to make sure everything is set up right. See Sensor Installation Section.
- The wheel size setting may be incorrect. Please review wheel size measurement instructions section.

EX-RAY is not displaying information correctly.

- If the wires on the back of the EX-RAY become damaged, incorrect readings may be displayed.
- Avoid twisting, crimping, kinking, or otherwise abusing the wires.

Trouble Shooting / FAQ

The screen is cracked or hazed.

- Did gasoline, de-greasers, or other chemical cleaners come in contact with the EX-RAY's screen? Some chemicals can damage the display or finish of the EX-RAY.

The backlight won't stay on.

- EX-RAY requires external power to the vehicles 12 volt electrical (ignition switched and fused) in order for the backlight to be continuously on. Review installation procedure (See POWER WIRE installation section)

EX-RAY's internal battery is dead.

- To replace the battery, use a small coin to unscrew the round panel on the back of the EX-RAY. Remove and properly dispose of the spent battery. Install a new battery of the same make. Make sure the POSITIVE POLE IS FACING UP. Replace with common watch style battery CR2302. See Parts and Features Section.

Why aren't the LED's working?

- EX-RAY requires external power to the vehicles 12 volt electrical (ignition switched and fused) in order for the LED's to function. Review installation procedure (See POWER WIRE installation section)
- Temperature limit settings must be programmed manually. See Data Setting Section for details.

Inch to Metric Tire Size:

The following chart is calculations for tire size in mm entered into the EX-RAY. The tire size may vary with tire pressure, vehicle weight changes, etc. Use this chart for a starting reference. For more accurate speed measurements, utilize the methods described "Wheel Size Calculator" section.

Formula: Inch x 25.4 = mm x 3.14 = Actual tire size in mm.

Inch	mm	Tire Size	Inch	mm	Tire Size
10	254	798	21.5	546	1715
10.5	267	837	22	559	1755
11	279	877	22.5	572	1795
11.5	292	917	23	584	1834
12	305	957	23.5	597	1874
12.5	318	997	24	610	1914
13	330	1037	24.5	622	1954
13.5	343	1077	25	635	1994
14	356	1117	25.5	648	2034
14.5	368	1156	26	660	2074
15	381	1196	26.5	673	2114
15.5	394	1236	27	686	2153
16	406	1276	27.5	699	2193
16.5	419	1316	28	711	2233
17	432	1356	28.5	724	2273
17.5	445	1396	29	737	2313
18	457	1436	29.5	749	2353
18.5	470	1475	30	762	2393
19	483	1515	30.5	775	2433
19.5	495	1555	31	787	2472
20	508	1595	31.5	800	2512
20.5	521	1635	32	813	2552
21	533	1675	32.5	826	2592

GLOSSARY:

ACCUMULATED RIDE TIME (ART): The long term amount of time spent driving (all ride times added together). Cannot be reset.

ADJUSTABLE DISTANCE EDIT (ADST): Edit the distance traveled since the last trip data reset. For electric powered vehicles this can be very important data. For Gas powered golf carts without fuel gases, this can provide a known distance before refueling is required.

AVERAGE SPEED (AS): The Median (average) speed the vehicle has been traveling since the last trip data reset.

BACKLIGHT: The light brightens the LCD display for night time driving. Automatically comes on when power is applied to POWER input and speed sensor data is received.

DATA SETTING MODE: The place to set EX-RAY's settings. Includes distance units, wheel size, clock format, time, temperature units, high temp setting, over temp setting, and oil/battery maintenance reminders.

DISTANCE (DST): The amount of distance covered since the last reset.

HIGH/OVER TEMP INDICATORS: The LED indicators will turn on when the electric motor or gas engine gets to hot or dangerously hot.

GLOSSARY:

MAINTENANCE REMINDERS (🔧🔌): User programmable countdown in miles or kilometers for oil, care, or battery maintenance in electric vehicles.

MAXIMUM SPEED (MS): Highest speed achieved since the last reset.

NORMAL MODE: EX-RAY's standard mode of operation.

ODOMETER (ODO): The total accumulated distance EX-RAY has traveled. The odometer is permanent and cannot be reset.

RIDE TIME (RT): Shows how long the electric motor or gas engine has been running since last reset.

SENSORS: The speed sensor works with the magnet to provide EX-RAY wheel data. A second temperature sensor provides critical motor temperature information to the driver.

SLEEP MODE: If EX-RAY does not receive any sensory information, it will go into sleep mode and only display to the clock.

SPEED (SPD): The current speed the vehicle is traveling.

STOP WATCH (TT): A short term regular stop watch.

WHEEL SIZE: Very important. Used to determine speed and distance, Refer to the Wheel Measurement Data Setting section for an accurate measurement.

EXRAY MODEL NUMBERS:

MODEL	DESCRIPTION
EXRAY-UBOLT Fits most all vehicles	EXRAY display Universal mount, 10mm BOLT Speed Sensor
EXRAY-UXRT Fits ClubCar XRT only	EXRAY Display, Universal mount, TAB Speed Sensor ClubCar XRT



The universal brackets are simple sheet metal mount. The machined CNC brackets shown below add flare to to your ride.

MODEL	DESCRIPTION
EXRAY-MEZ EZGO 1.51" Steering column	EXRAY Display, CNC Machined mount, 10mm BOLT Speed Sensor
EXRAY-MCC ClubCar 1.66" Steering column	EXRAY Display, CNC Machined mount, 10mm BOLT Speed Sensor
EXRAY-MYAM Yamaha 1.71" Steering column	EXRAY Display, CNC Machined mount, 10mm BOLT Speed Sensor
EXRAY-MCCP ClubCar 1.76" Plastic Steering column	EXRAY Display, CNC Machined mount, 10mm BOLT Speed Sensor
EXRAY-MXRT ClubCar XRT 1.76" Plastic Steering column	EXRAY Display, CNC Machined mount, TAB Speed Sensor ClubCar XRT ONLY



EXRAY MODEL NUMBERS:

MODEL	DESCRIPTION
EXRAY DISPLAY	Replacement digital display head
KIT-EXRAY TEMP	ASY200-003-CHT, 10mm Temp sensor, ASY200-005-TMP, 72" extension cable
KIT-EXRAY PWR	Cable Power kit, 48"
KIT-SPD BOLT	Speed BOLT Sensor Kit, 65" cable 10mm
KIT-SPD TAB	Speed TAB Sensor Kit, 65" cable, TAB Use with Clubcar XRT vertical mount
KIT-UNIV BKT EXRAY	Universal Bracket mount w/hardware
KIT-MEZ	EZ 1.51" CNC Machined mount w/HDWR
KIT-MCC	CC 1.66" CNC Machined mount, HDWR
KIT-MYAM	YAM 1.71" CNC Machined mount, HDWR
KIT-MCCP	CC 1.76" CNC Machined mount, HDWR for 1.76" PLASTIC TUBE, and CC-XRT
ASY200-003-CHT	10mm Temp sensor, 21" w/JST Conn
ASY200-005-TMP	Replacement 72" Temperature Sensor extension cable, w/JST Conn
MET350-009-BCK	Simple Universal display mounting bracket w/hardware, replacement kit
EXRAY OP MAN	Operators manual, EXRAY
BATT-2032	Replacement CR2032 Lithium Battery
HDW800-006-CPT	Plastic steering column wire protector

EX-RAY

LIMITED WARRANTY

Within 1 year from the date of purchase, Alltrax Inc., will repair or replace, at it's option, and EX-RAY™ which is deemed defective in workmanship or materials.

Please contact the dealer where the EX-RAY™ was purchased for assistance. Retain Proof Of Purchase.

Damage or injuries resulting from negligence or misuse are not covered by this warranty. Incidental or consequential damages are specifically excluded.* This warranty gives you specific legal rights. You may also have other rights which vary from state to state. *Because some states do not allow the exclusion of incidental or consequential damages, this exclusion may not apply to you.

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