Service Manual

MK5™ EX™ and MK5™ TT-EX™ Electronics

DEALER: Keep this manual. The procedures in this manual **MUST** be performed by a qualified technician.

For more information regarding Invacare products, parts, and services, please visit www.invacare.com

INVACARE®

Yes, you can.™

⚠ WARNING

A QUALIFIED TECHNICIAN MUST PERFORM THE INITIAL SET UP OF THIS WHEELCHAIR. ALSO, A QUALIFIED TECHNICIAN MUST PERFORM ALL PROCEDURES IN THE SERVICE MANUAL.

WHEELCHAIR USERS: DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING (1) THE OWNER'S OPERATOR AND MAINTENANCE MANUAL AND (2) THE SEATING SYSTEM'S MANUAL (IF APPLICABLE). IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS, AND INSTRUCTIONS, CONTACT INVACARE TECHNICAL SUPPORT BEFORE ATTEMPTING TO SERVICE OR OPERATE THIS EQUIPMENT - OTHERWISE INJURY OR DAMAGE MAY RESULT.

DEALERS AND QUALIFIED TECHNICIANS: DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING (1) THE OWNER'S OPERATOR AND MAINTENANCE MANUAL, (2) THE SERVICE MANUAL (IF APPLICABLE) AND (3) THE SEATING SYSTEM'S MANUAL (IF APPLICABLE). IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS AND INSTRUCTIONS, CONTACT INVACARE TECHNICAL SUPPORT BEFORE ATTEMPTING TO SERVICE OR OPERATE THIS EQUIPMENT - OTHERWISE, INJURY OR DAMAGE MAY RESULT.

NOTE: This manual is also available in French Canadian (Part Number 1123834).

NOTE: Updated versions of this manual are available on www.invacare.com.

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SPECIAL NOTES

WARNING/CAUTION notices as used in this manual apply to hazards or unsafe practices which could result in personal injury or property damage.

NOTICE

THE INFORMATION CONTAINED IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

⚠ REPAIR OR SERVICE WARNING

Setup of the Electronic Controller is to be performed ONLY by individuals certified by Invacare. The adjustments of the controller may affect other activities of the wheelchair. Damage to the equipment could occur under these circumstances. If uncertified individuals perform any work on these units, the warranty is void.

⚠ OPERATION WARNING

Performance adjustments should only be made by professionals of the health care field or persons fully conversant with this process and the driver's capabilities. Incorrect settings could cause injury to the driver, bystanders, damage to the chair and surrounding property. After the wheelchair has been setup, check to make sure that the wheelchair performs to the specifications entered in the setup procedure. If the wheelchair does NOT perform to specifications, turn the wheelchair OFF immediately and re-enter setup specifications. Repeat this procedure until the wheelchair performs to specifications.

SECTION 1—EMI INFORMATION

⚠ WARNING

CAUTION: IT IS VERY IMPORTANT THAT YOU READ THIS INFORMATION REGARDING THE POSSIBLE EFFECTS OF ELECTROMAGNETIC INTERFERENCE ON YOUR POWERED WHEELCHAIR.

Electromagnetic Interference (EMI) From Radio Wave Sources

Powered wheelchairs and motorized scooters (in this text, both will be referred to as powered wheelchairs) may be susceptible to electromagnetic interference (EMI), which is interfering electromagnetic energy (EM) emitted from sources such as radio stations, TV stations, amateur radio (HAM) transmitters, two way radios, and cellular phones. The interference (from radio wave sources) can cause the powered wheelchair to release its brakes, move by itself, or move in unintended directions. It can also permanently damage the powered wheelchair's control system. The intensity of the interfering EM energy can be measured in volts per meter (V/m). Each powered wheelchair can resist EMI up to a certain intensity. This is called its "immunity level." The higher the immunity level, the greater the protection. At this time, current technology is capable of achieving at least a 20 V/m immunity level, which would provide useful protection from the more common sources of radiated EMI.

There are a number of sources of relatively intense electromagnetic fields in the everyday environment. Some of these sources are obvious and easy to avoid. Others are not apparent and exposure is unavoidable. However, we believe that by following the warnings listed below, your risk to EMI will be minimized.

The sources of radiated EMI can be broadly classified into three types:

1) **Hand-held Portable transceivers (transmitters-receivers with the antenna mounted directly on the transmitting unit. Examples include: citizens band (CB) radios, "walkie talkie", security, fire and police transceivers, cellular telephones, and other personal communication devices).**

NOTE: Some cellular telephones and similar devices transmit signals while they are ON, even when not being used.

2) **Medium-range mobile transceivers, such as those used in police cars, fire trucks, ambulances and taxis. These usually have the antenna mounted on the outside of the vehicle; and**

3) **Long-range transmitters and transceivers, such as commercial broadcast transmitters (radio and TV broadcast antenna towers) and amateur (HAM) radios.**

NOTE: Other types of hand-held devices, such as cordless phones, laptop computers, AM/FM radios, TV sets, CD players, cassette players, and small appliances, such as electric shavers and hair dryers, so far as we know, are not likely to cause EMI problems to your powered wheelchair.

⚠ WARNING

Powered Wheelchair Electromagnetic Interference (EMI)

Because EM energy rapidly becomes more intense as one moves closer to the transmitting antenna (source), the EM fields from hand-held radio wave sources (transceivers) are of special concern. It is possible to unintentionally bring high levels of EM energy very close to the powered wheelchair's control system while using these devices. This can affect powered wheelchair movement and braking. Therefore, the warnings listed below are recommended to prevent possible interference with the control system of the powered wheelchair.

Electromagnetic interference (EMI) from sources such as radio and TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones can affect powered wheelchairs and motorized scooters.

FOLLOWING THE WARNINGS LISTED BELOW SHOULD REDUCE THE CHANCE OF UNINTENDED BRAKE RELEASE OR POWERED WHEELCHAIR MOVEMENT WHICH COULD RESULT IN SERIOUS INJURY.

1) **Do not operate hand-held transceivers (transmitters receivers), such as citizens band (CB) radios, or turn ON personal communication devices, such as cellular phones, while the powered wheelchair is turned ON;**
2) **Be aware of nearby transmitters, such as radio or TV stations, and try to avoid coming close to them;**
3) **If unintended movement or brake release occurs, turn the powered wheelchair OFF as soon as it is safe;**
4) **Be aware that adding accessories or components, or modifying the powered wheelchair, may make it more susceptible to EMI (NOTE: There is no easy way to evaluate their effect on the overall immunity of the powered wheelchair); and**
5) **Report all incidents of unintended movement or brake release to the powered wheelchair manufacturer, and note whether there is a source of EMI nearby.**

Important Information

1) **20 volts per meter (V/m) is a generally achievable and useful immunity level against EMI (as of May 1994) (the higher the level, the greater the protection);**
2) **The immunity level of the product is unknown.**

Modification of any kind to the electronics of this wheelchair as manufactured by Invacare may adversely affect the RFI immunity levels.

SECTION 2—TROUBLESHOOTING

All Power Wheelchairs

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Error Code: E9 or E10 - MPJ joystick 3 flashes - DPJ joystick	Motor lock levers disengaged.	Engage motor lock levers. Refer to the wheelchair Owner's Manual for more information.
	Bad motor connection.	Check all motor connections.
	Bad brake coil.	Ohm out motors. Check brushes and replace if necessary. Replace motors if high reading is present. Normal reading is 0-5 Ohms (4 Pole only). Calibrate GB motors. Refer to wheelchair Service Manual.
Error Code: E28 - MPJ joystick 5 flashes - DPJ joystick	Battery charger connected.	Unplug battery charger from the wheelchair. Refer to the wheelchair Owner's Manual for information about the battery charger.
Error Code: E14 - MPJ joystick 5 flashes - DPJ joystick	Batteries need to be charged.	Charge batteries. Refer to the wheelchair Owner's Manual for charging instructions.
Joystick erratic or does not respond as desired.	Damaged motor coupling.	Contact Dealer/Invacare for Service.
	Electrical malfunction.	Contact Dealer/Invacare for Service.
	Controller programmed improperly.	Contact Dealer/Invacare to have controller reprogrammed.
Wheelchair veers to the left or right when driving on level surface.	Joystick needs to be calibrated.	Calibrate joystick with programmer. If this does not work, replace joystick. Refer to Joystick Throw on page 25 for calibration information.
No LED's on joystick.	Joystick connection to controller unplugged or damaged.	Check all joystick connections. Refer to wheelchair Owner's Manual. If damage is found, replace joystick.
Corroded wiring or connections.	Possible water, salt, or urine damage.	Replace wiring harness. Refer to wheelchair Owner's Manual.
Wheelchair does not respond to commands.	Poor battery terminal connection.	Have clean terminals. Refer to wheelchair Owner's Manual.
	Bad joystick connection.	Check all joystick connections. Refer to wheelchair Owner's Manual.
	Bad wiring harness connection or blown fuse.	Replace wiring harness. Refer to wheelchair Owner's Manual.
Power indicator off - even after recharging.	Electrical malfunction.	Contact Dealer/Invacare for Service.
Wheelchair slows or stops while driving AND one (1) of the following occurs: DPJ Joystick - ORANGE LED flashes MPJ Joystick - "HOT" or "SLOW" is displayed	Current rollback. Wheelchair has been driving under a heavy load for an extended period of time.	Adjust driving parameters to match driving environment. Allow time for the electronics to cool down (Light Duty Use).

Wheelchairs With Powered Seating Systems

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair Power ON but does not drive.	System tilted, reclined or elevated beyond drive lock-out angle (20°).	Return to neutral position (upright and completely lowered). Refer to the seating system Owner's Manual for seating system operating instructions.
		Use the programmer to check the Current Status Menu, particularly the drive lock-out setting. Refer to TRECM Current Status Menu Description on page 59.
		To adjust drive lock-out angle, Refer to the Formula TRE setup instructions, part number 1125061 for drive lock-out adjustment instructions.
		To turn drive lock-out on or off, refer to TRECM Performance Adjust Menu Description on page 57.
Seating system not functioning or working intermittently.	Low batteries.	Charge batteries. Refer to the seating system Owner's Manual.
	Faulty electrical connection.	Check all connections.
	Blown fuse.	Replace wiring harness. Refer to the seating system Owner's Manual.
	Seat has been driven under a heavy load for an extended period of time.	Allow time for the electronics to cool down (Light Duty Use). Leave power on, and do not activate powered seating functions for at least 3 minutes.
	Open Motor connection/Motor locks disengaged.	Check all motor connectors.
		Make sure motor locks are engaged.
	Malfunctioning seating system controller (TRECM, SAC-E, or ESC).	Replace seating system controller. Contact Invacare.
	Bad user switch.	Use the programmer to check the TRECM Current Status Menu for switch status. Refer to TRECM Current Status Menu Description on page 59.
Error Code: E28 - MPJ joystick or 5 flashes - DPJ joystick	System tilted, reclined or elevated beyond drive lock-out angle (20°).	Return to neutral position (upright and completely lowered). Refer to seating system Owner's Manual.
		Use the programmer to check the Current Status Menu, particularly the drive lock-out setting. Refer to TRECM Current Status Menu Description on page 59.
		To adjust drive lock-out angle, Refer to the Formula TRE setup instructions, part number 1125061 for drive lock-out adjustment instructions.
		To turn drive lock-out on or off, refer to TRECM Performance Adjust Menu Description on page 57.
	Bad limit switch, limit switch out of position or limit switch missing.	Check limit switch setting. Refer to TRECM Current Status Menu Description on page 59.
		Refer to the Formula TRE setup instructions, part number 1125061 for limit switch adjustment instructions.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair slows or stops while driving AND one (1) of the following occurs: DPJ Joystick - ORANGE LED flashes MPJ Joystick - "SLOW" is displayed	Elevating seat is elevated. The elevating seat is equipped with a speed reduction safety mechanism. While the seat is in an elevated position, the safety feature slows the speed of the wheelchair by 80%.	Return the seat to its lowest position. Refer to the seating system Owner's Manual.
Wheelchair drives at full speed when seat is elevated.	Faulty electrical connection.	Check all connectors.
	Malfunctioning seating system controller (TRECM, SAC-E, or ESC).	Check for error codes. Refer to Options on page 42 for the correct performance adjustment menu descriptions. Replace seating system controller, if necessary. Contact Invacare.
Wheelchair will not drive when seat is elevated.	If not an Elevate Only system, the seat may be tilted or reclined beyond the drive lock-out angle (20°).	Return to neutral position (upright and completely lowered). Refer to seating system Owner's Manual.
		Use the programmer to check the Current Status Menu, particularly the drive lock-out setting. Refer to TRECM Current Status Menu Description on page 59.
		To adjust drive lock-out angle, Refer to the Formula TRE setup instructions, part number 1125061 for drive lock-out adjustment instructions.
		To turn drive lock-out on or off, refer to TRECM Performance Adjust Menu Description on page 57.
Programmer does not work or gives "communication error"	System tilted, reclined or elevated beyond drive lock-out angle (20°).	Return to neutral position (upright and completely lowered). Refer to seating system Owner's Manual.
		Use the programmer to check the Current Status Menu, particularly the drive lock-out setting. Refer to TRECM Current Status Menu Description on page 59.
		To adjust drive lock-out angle, Refer to the Formula TRE setup instructions, part number 1125061 for drive lock-out adjustment instructions.
		To turn drive lock-out on or off, refer to TRECM Performance Adjust Menu Description on page 57.

Formula™ TRE only

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
One or more functions do not stop at the desired position.	Limit switch not adjusted properly.	Check limit switch setting. Refer to TRECM Current Status Menu Description on page 59.
		Refer to the Formula TRE setup instructions, part number 1125061 for limit switch adjustment instructions.
Incorrect switch response.	Programming error or bad switch.	Use the programmer to verify TRECM programming. Save the proper standard program to reset switch functions. Refer to TRECM Standard Programs Menu Description on page 58.

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Drive lock-out will not engage.	Programming error.	Use the programmer to verify the drive lock-out setting in the Current Status Menu. Refer to TRECM Current Status Menu Description on page 59.
		To adjust drive lock-out angle, Refer to the Formula TRE setup instructions, part number 1125061 for drive lock-out adjustment instructions.
		To turn drive lock-out on or off, refer to TRECM Performance Adjust Menu Description on page 57.
	TRECM failure.	Check all connections to TRECM.
		Check limit switch setting. Refer to the Formula TRE setup instructions, part number 1125061 for limit switch adjustment instructions.
	MK5 controller failure.	Replace MK5 controller. Refer to the Service Manual for the wheelchair.
	Drive lock-out turned off for that particular drive.	Turn on drive lock-out for the desired drive using your programmer. Refer to TRECM Performance Adjust Menu Description on page 57.
	Limit switch not adjusted properly.	Check limit switch setting. Refer to TRECM Current Status Menu Description on page 59.
		Refer to the Formula TRE setup instructions, part number 1125061 for limit switch adjustment instructions.
Actuator speed too slow.	Low battery voltage.	Recharge batteries. Refer to the seating system Owner's Manual.
	Programming speed set too low.	Check TRECM programming to confirm the speed setting for the desired actuator. Refer to TRECM Performance Adjust Menu Description on page 57.
Actuator speed too fast.	Programming error.	Check TRECM programming to confirm the speed setting for the desired actuator. Refer to TRECM Performance Adjust Menu Description on page 57.
Functions respond to switch command, but do not operate through the driver control.	Programming error	Check the Tilt/Recline setting and make sure it is adjusted to the correct operating mode in the appropriate drive. Refer to TILT/RECLINE on page 30.
	Incorrect or malfunctioning driver control	Replace driver control. Refer to wheelchair Service Manual.
Functions will only operate in one direction	Improperly wired actuator motor leads.	Check actuator wiring.
	Limit switches not adjusted properly.	Check limit switches for damage. If damaged replace them. Contact Invacare.
		Check limit switch setting. Refer to TRECM Current Status Menu Description on page 59.
		Refer to the Formula TRE setup instructions, part number 1125061 for limit switch adjustment instructions.

SECTION 3—JOYSTICK DESCRIPTIONS

Joystick Overview

There are two (2) standard joysticks which make up the MK5 system. The two (2) joystick types are the DPJ™ and MPJ™. The joysticks differ in user controls, switches, number of programmable drives and performance adjustments. The joysticks provide proportional drive control of speed and direction.

DPJ Joystick Switches and Indicators

NOTE: For this procedure, refer to FIGURE 3.1.

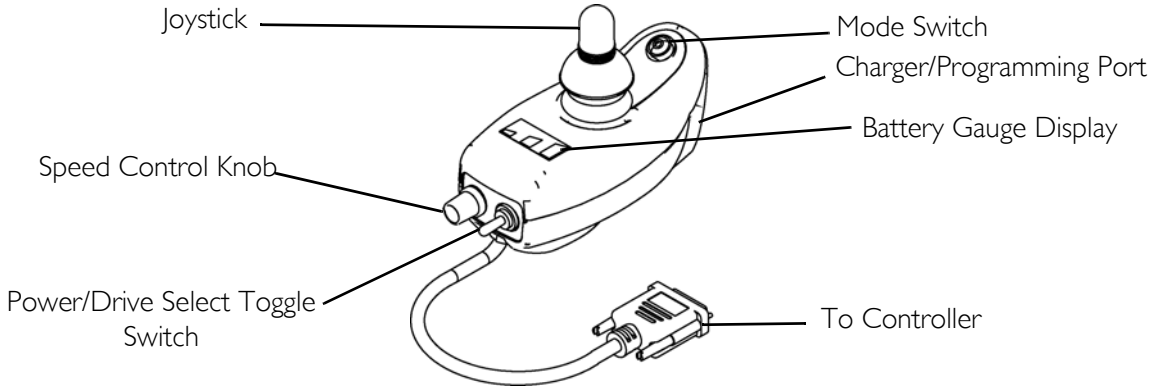


FIGURE 3.1 DPJ Joystick Switches and Indicators

Power/Drive Select Toggle Switch

The three (3) position power/drive select toggle switch is located at the back of the joystick housing. This switch allows the operator to select the type of operation or performance which best suits a particular control need or situation and turn the wheelchair off. The DRIVE 1 program uses performance values which are independent of those used for the DRIVE 2 program. For example, an operator may have a control need for spasticity in the morning and a very different need in the afternoon. DRIVE 1 can be programmed for higher speeds and quicker response while DRIVE 2 can be programmed for slower speeds and less responsiveness or vise versa.

Selecting the Drive Mode

1. To select DRIVE 1 mode, move the toggle UP.
2. To select DRIVE 2 mode, move the toggle to the MIDDLE position.

Turning the Wheelchair Off

1. To turn the wheelchair off, move the toggle DOWN.

Speed Control Knob

The speed control knob is located at the back of the joystick housing.

1. Turn the knob clockwise to increase the maximum speed of the wheelchair.
2. Turn the knob counterclockwise to decrease the maximum speed of the wheelchair.

Mode (On/Off) Switch

The mode (on/off) switch is a push button switch located at the front of the joystick. When an optional actuator control [Single Actuator control, (SAC), Two Actuator Control (TAC) or Tilt and Recline Control Module (TRCM)] is present, pushing the switch will change the controller mode to control the optional actuators through the joystick. The mode switch LED indicator will be ON. Push the switch again to return to normal joystick driving. The mode switch LED indicator will be off.

Battery Gauge Display (BGD)

Located at the rear of the joystick housing, the BGD provides information on the remaining charge in the batteries. At full charge, all six (6) segments of the bar graph are lit. As the battery discharges, the farthest right (GREEN) segment will go out until only the red bar is lit. At this level, the last red bar will start to flash on and off to indicate that the user should charge the batteries as soon as possible.

The BGD also serves as a system diagnostic device when a fault is detected by the control module. A specific number of flashes (up to eight (8) flashes) of the two (2) RED bars separated by a pause will indicate the type of fault detected. A chart of the diagnostic indications is given in Diagnostic Codes on page 38.

MPJ Joystick Switches and Indicators

NOTE: For this procedure, refer to FIGURE 3.2, unless otherwise indicated.

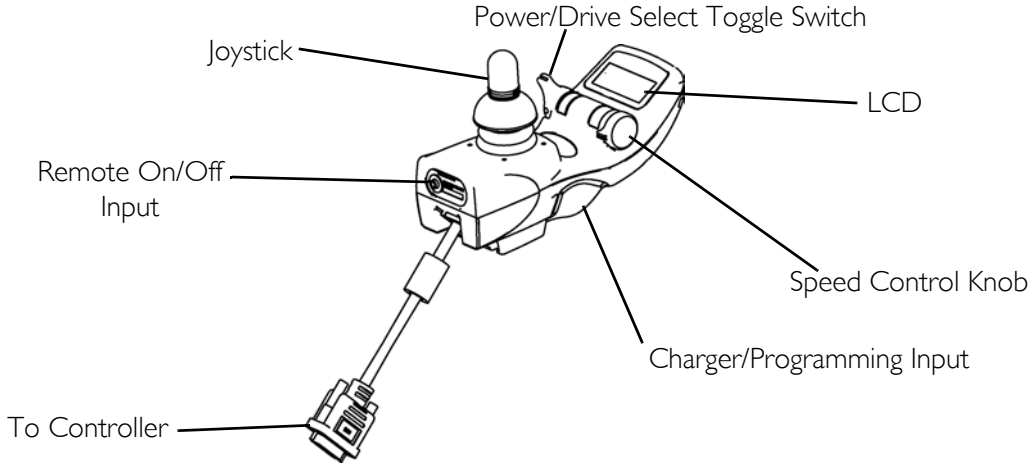


FIGURE 3.2 MPJ Joystick Switches and Indicators

Power/Drive Select Toggle Switch

A three (3) position power/drive select toggle switch is located on the side of the joystick housing. The DRIVE SELECT position is momentary.

This switch allows the operator to select the type of operation or performance which best suits a particular control need or situation. The DRIVE 1 program uses performance values which are independent of those used for the DRIVE 2 or 3 or 4 program. As an example, an operator may have a control need for spasticity in the morning and a very different need in the afternoon. DRIVE 1 can be programmed for higher speeds and quicker response while DRIVE 2 can be programmed for slower speeds and less responsiveness. The remaining drive programs could also be used for indoor and outdoor versions of DRIVE 1 and DRIVE 2. Finally, when a powered seating system is installed, one of the remaining drives may be used to control the tilt, recline and/or elevate functions.

Selecting the Drive Mode

1. Move the toggle UP and release. DRIVE 1 will appear on LCD.
2. Move the toggle UP and release again. DRIVE 2 will appear on LCD.
3. Move the toggle UP and release again. DRIVE 3 will appear on LCD.
4. Move the toggle UP and release again. DRIVE 4 will appear on LCD.
5. Move the toggle UP and release one more time to select DRIVE 1.

Turning the Wheelchair Off

1. Move the toggle BACK to turn the wheelchair off.

Speed Control Knob

The speed control knob is located on the side of the joystick housing.

1. Rotate the knob forward to increase the speed of the wheelchair to the programmed max speed (FIGURE 3.2).

LCD Display

NOTE: For this procedure, refer to FIGURE 3.2 and FIGURE 3.3.

The LCD Display is located in front of the joystick and provides information on the status of the wheelchair through a 2 line by 12 character length back lighted display. The LCD display is readable in both bright sunlight and complete darkness (FIGURE 3.2).

During normal operation the active drive is displayed on the left half of the first line. The left half of the second line displays the Battery Gauge Display (BGD). It provides information on the remaining charge in the batteries. At full charge solid blocks fill in all five segments between E (Empty) and F (Full). As the battery becomes discharged, the furthest right segments will progressively disappear a half bar at a time until no segments appear between E and F. At this level the word RECHARGE will appear on the second line to indicate that the user should charge the batteries as soon as possible.

The right half of the display is the Information Center. The Information Center displays current data on the wheelchair. FIGURE 3.3 shows the factory default odometer display. The top line shows the unit of measured MI (miles). The second line is the value, 0000 (total miles driven).

The Information Center can display:

ITEM	DESCRIPTION
Speedometer	Current Wheelchair Speed - MPH/KMH
Trip Odometer	Distance traveled since the wheelchair was last powered ON
Odometer	Total Distance Traveled (Factory Default) - MI/KM
Trip Amp-Hour meter	Battery Capacity consumed since the wheelchair was last powered ON - AH
Battery Volts	Current Battery Voltage - VOLT
Battery Current	Battery current being used - AMP
Load Test Results	Current battery condition based on a load test - BATT

If a fault is detected, the cause of the fault will be scrolled across the second line of the display.

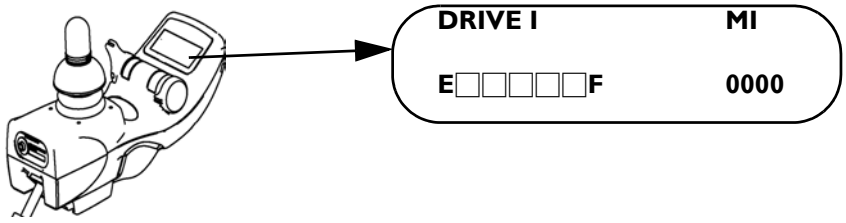


FIGURE 3.3 MPJ Joystick Switches and Indicators - LCD Display

Remote On/Off Input

The remote on/off input allows the power switch to be operated by an ability switch (normally open momentary switch with mono plug). To use the remote on/off feature, the Drive Select/On/Off switch must be in the ON position. Each activation of the ability switch will alternately turn the joystick ON or OFF.

SECTION 4—REMOTE PROGRAMMER

Overview

NOTE: For this procedure, refer to FIGURE 4.1.

The Remote Programmer is the information center of the control module. Through simple key sequences, the Remote Programmer allows modification of the performance characteristics, gives diagnostics information for trouble shooting and permits calibration of the control module.

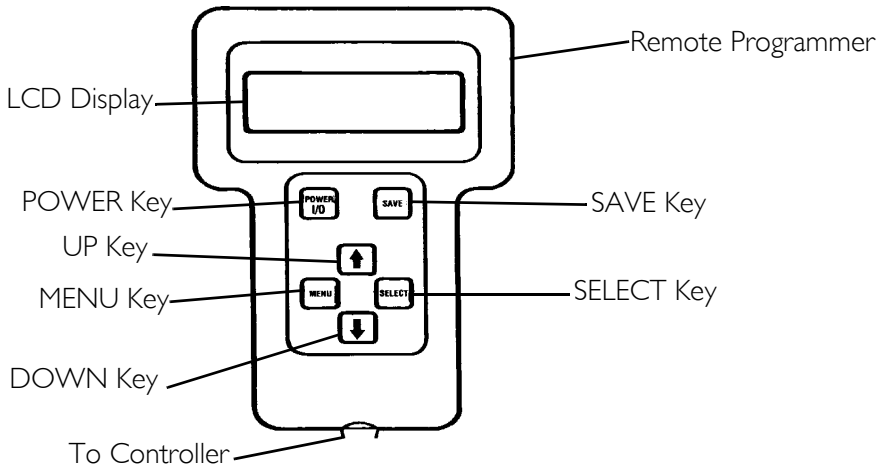


FIGURE 4.1 Overview

Remote Programmer Terminology

Function

A function is a performance characteristic which can be adjusted or modified to improve the operation of the wheelchair for a particular control need. Two (2) examples are:

The forward speed function may be adjusted to a higher or lower speed the same way as you would adjust a trimpot in other controls.

Stand-by Mode Function may be turned ON or OFF the same as a switch would be used. All functions are listed in a menu.

Value

Each function has a value. It is the degree or amount of the function which is used to influence the overall wheelchair performance. Most values are numerical or in percentages, for instance - high speed may be set to 75% of the wheelchair's maximum. For others, the value is either ON or OFF, for example - Stand-by Mode. Changing a value is called Adjustment.

Standard Program (Preset Programs)

The standard programs are fixed function values which are used as an initial set up point from which individualization of the wheelchair performance can begin. Standard values are NEVER altered or modified.

User Memory Values

The user memory values can only be changed through the Remote Programmer by first modifying the temporary memory values and then by saving them in the user memory where they become the user program. The Remote Programmer is activated by pressing the POWER key when the wheelchair is in neutral. The wheelchair cannot be driven when the LCD display is illuminated. The display will automatically turn itself OFF after 45 seconds if no keys are pressed. It can also be turned OFF by pressing the POWER key.

Description Of Remote Programmer Keys

KEY	DESCRIPTION
POWER KEY	The POWER key turns on and off the LCD display. Press the POWER key once and the display will come ON. Press the POWER key again and the display will turn OFF.
MENU KEY	The MENU key returns the LCD display to the previous screen. If a function is being adjusted, pressing the MENU key returns the display to the Performance Menu. Pressing the key again will cause the display to change to the Main Menu.
UP ↑ AND DOWN ↓ KEYS	These keys are used to move the selection arrow on the LCD up and down or adjust a value up or down. An adjusted value is not saved unless the SAVE key is pressed.
SELECT KEY	The SELECT key chooses the item to which the selection arrow on the LCD is pointing and displays the appropriate next screen.
SAVE KEY	The SAVE key causes the Save screen to appear or causes the values that have been modified in temporary memory to be permanently stored in the driving program specified by the selection arrow.

SECTION 5—PERFORMANCE ADJUSTMENTS

Speed and Response Screen

The first display screen shown after powering on the Remote Programmer is the Speed and Response screen.

The first line shows the current drive. The second line shows the forward speed. The third line shows the responsiveness of the wheelchair to changes in drive commands. The fourth line is the entry point to the Main Menu.

MENU ITEM	DESCRIPTION
SPEED	Adjusts the speed of the wheelchair. It affects forward speed, turning speed and reverse speed simultaneously and uniformly. The fastest speed setting is 100%. Use the ↑ and ↓ to increase or decrease the speed of the wheelchair.
RESPONSE	Adjusts the responsiveness or quickness of the wheelchair to changes in drive commands. It affects acceleration, turn acceleration, turn deceleration, braking, torque and turning speed. The value of the Response parameter is set to 50% whenever a Standard Program is selected. It is good practice to first select a standard program that is close to the desired performance and then use Response to individualize the driving performance to the user. The Response parameter will be ineffective in making large changes in wheelchair responsiveness, e.g. changing a fast/responsive drive into one suitable for users needing tremor dampening. Use the ↑ and ↓ to increase or decrease the responsiveness of the wheelchair.

Advanced Menu

Allows entry into the Main Menu where the Performance Adjust menu, Standard Programs menu, Calibrations menu and Current Status menu are displayed. Press the SELECT key to display the Main Menu.

Performance Menu

NOTE: For this procedure, refer to FIGURE 5.1.

Each of the standard joysticks and optional joysticks/devices has its own performance menu. Only the menu for the particular configuration of the joystick and options connected to the control module appear on the performance menu. Common to all of the MK5 control systems are the following:

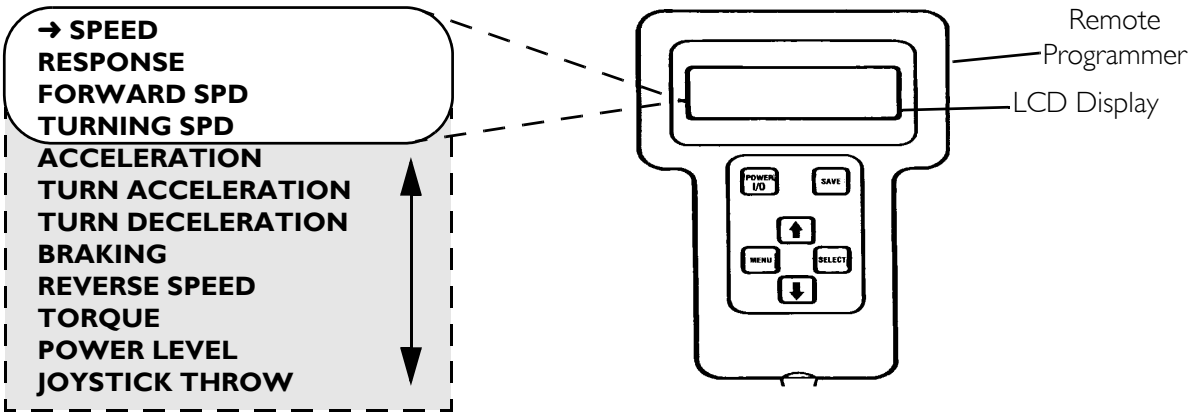


FIGURE 5.1 Performance Menu

The following menu items are added as shown in the chart below:

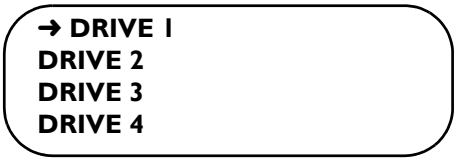
JOYSTICK/OPTIONAL DEVICE	ADDITIONAL MENU ITEM
THE MPJ JOYSTICK **1500M4 RIM** **1558M4 COMPACT JOYSTICK** *NOTE: The entire menu can be customized and stored in four drive programs (DRIVE 1 - 4)*	MOM/LATCH
	LATCHED TYPE
	MOM REVERSE
	STANDBY MODE
	STANDBY SEL
	STANDBY TIME
	RIM CONTROL
	REMOTE SEL
	AUDIBLE IND - Not available with MPJ joysticks
	DISPLAY SELECT
	AXES SELECTION
	NO DRIVING
1812M4 DUAL PROPORTIONAL CONTROL	INPUT SELECT - determines which driver control device is active in each driving program
ENVIRONMENTAL CONTROLS (ACCESSED THROUGH AUX12 AND AUX34)	ECU 1, ECU 2
	ECU 3, ECU 4
MK5 SINGLE ACTUATOR CONTROL (SAC)	SAC - Single Actuator
MK5 TAC **MK5 TRCM** **MK5 TRECM**	Tilt/Recline

Making Performance Adjustments

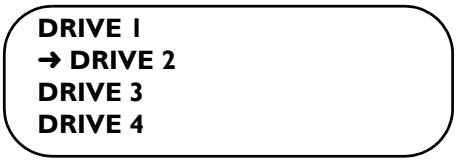
The arrow to the left is the selection pointer. It can be moved up or down the main menu by pressing the [↑] or [↓] key. The selection arrow points to PERFORMANCE ADJUST. To select this activity press the SELECT key.

➜ PERFORMANCE ADJUST
STANDARD PROGRAMS
CALIBRATIONS
CURRENT STATUS

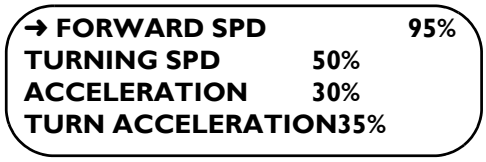
The display screen will change to show the driving programs available for programming. The DPJ joystick has only two driving programs, only DRIVE 1 and DRIVE 2 will be shown. Use the [↓] key to move the selection arrow down to select drives displayed.



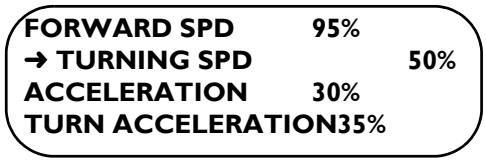
Use the [↓] key to move the selection arrow down.



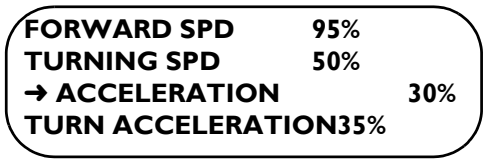
To view the menu for DRIVE 2 press the SELECT key. The display screen changes to show the first four performance functions and the programmed values for the functions. The selection arrow points to the first function. Pressing the [↑] or [↓] key will move the selection arrow up or down.



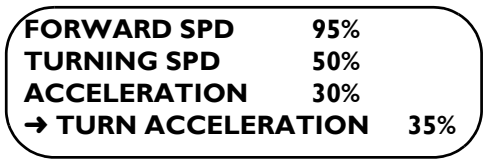
Move the selection arrow down to TURNING SPD by pressing the [↓] key.



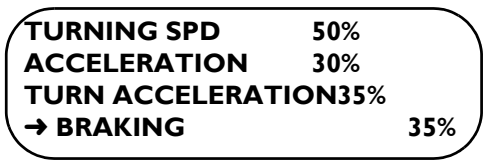
Move the selection arrow down to ACCELERATION by pressing the [↓] key again.



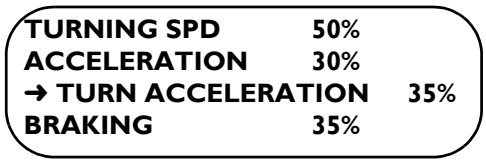
Move the selection arrow to TURN ACCELERATION by pressing the [↓] key again.



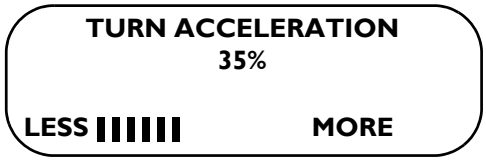
Pressing the [↓] key again leaves the selection arrow in the same place and the entire performance menu shifts up one line. The selection arrow now points to BRAKING.



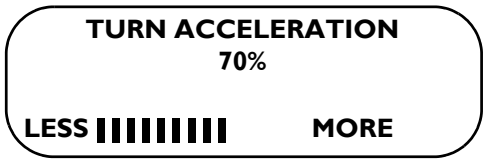
To change the programmed value for TURN ACCELERATION, press the ↑ key so the selection arrow points to TURN ACCELERATION.



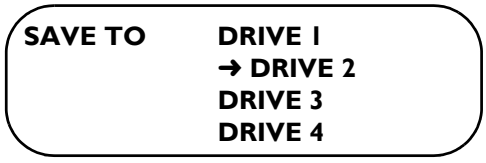
Press the SELECT key. The display screen changes to the adjustment screen. The top line shows the function. The second line shows the value. At the bottom is a bar graph which shows the relative position of the current value to the total adjustment range. Pressing the ↑ or ↓ key will adjust the value.



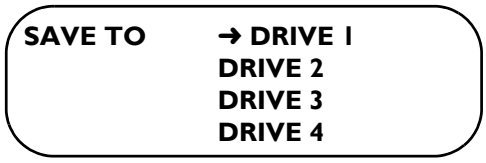
Pressing the ↑ key causes the value to increase and the bar graph to move toward MORE.



If another change is needed, press the MENU key to change the screen back to the performance menu and move the selection arrow to a new function. To save this change, press the SAVE key to show the first save screen. The select arrow points to DRIVE 2. (The DPJ joystick will show only two drive programs.) To select the drive program to which the changes just made will be stored use the ↑ or ↓ key to move the selection arrow to point to the intended drive program.



Press the ↑ key to move the selection arrow up to DRIVE 1.



To store the program into DRIVE 1, press the SAVE key again. The display screen changes to show that the command is being executed.

When saving to the drive program is complete, the screen will change to display:

SAVING CHANGES TO
DRIVE 1
CONTINUE? PRESS MENU
QUIT? PRESS POWER

Pressing the MENU key allows the adjustment sequence to be repeated for other drive programs or the new program can be test driven by pressing the POWER key to turn OFF the display screen (The wheelchair cannot be driven while the display screen is ON.).

→ PERFORMANCEADJUST
STANDARD PROGRAMS
CALIBRATIONS
CURRENT STATUS

Performance Menu Description

The performance adjustment menu is listed with its display mnemonic and a description of its function.

MENU ITEM	DESCRIPTION
FORWARD SPEED	Sets the maximum forward speed. The fastest speed setting is 100%. Use the [↑] and [↓] keys to change the value.
TURNING SPEED	Sets the TURNING SPEED as a percentage of the maximum forward speed. The turning speed is independent of the forward speed setting so that the turning speed can be greater than the forward speed. The fastest turning speed setting is 60%. Use the [↑] and [↓] keys to change the value.
ACCELERATION	ACCELERATION sets the time that it takes the wheelchair to accelerate to its maximum speed. A value of 100% is the quickest acceleration. Use the [↑] and [↓] keys to change the values.
TURN ACCELERATION	TURN ACCELERATION is the response time to start turn commands. A value of 100% is the quickest response to turn commands. Use [↑] and [↓] keys to change the value.
BRAKING	BRAKING sets the response time to slow or stop the wheelchair. 100% represents the maximum braking capability of the system. This function is independent of the acceleration setting. Use the [↑] and [↓] keys to change the value.
TORQUE	Adjusts the stiffness of the response and tracking ability of the wheelchair to joystick commands. A 100% value is the maximum stiffness while a 0% value is the maximum softness. The MK5 TT-EX True Track Feature is turned off when the value is set to 0%. Use the [↑] and [↓] keys to change the value.
POWER LEVEL	POWER LEVEL is an adjustment to the current limit of the control. Lower values reduce the maximum pulling power and increase the range of the wheelchair. Reduced power should be used for chairs operated very slowly or child-sized chairs. A value of 100% provides full power output. Use the [↑] and [↓] keys to change the value.

MENU ITEM	DESCRIPTION
JOYSTICK THROW	JOYSTICK THROW CALIBRATION is used to calibrate the neutral position and the full speed travel of the proportional joystick. By moving the joystick successively to each position, the control module stores the maximum displacement of the joystick and later, during driving, uses the values to generate a full speed command whenever that displacement is reached. Exceeding this displacement does not produce further increase in speed. The result of this method of calibration is a customized driving template. Each drive program can have its own driving template. Throw Calibration need only be performed when a joystick or control module is being replaced on the power wheelchair. After entering the performance menu, move the selection arrow down to point at the JOYSTICK THROW function. **REVERSE SPEED 65%** **TORQUE 30%** **POWER LEVEL 100%** **➔ JOYSTICK THROW** Press the SELECT key. The following screen will appear: **MOVE JOYSTICK TO** **FORWARD _ REVERSE _** **LEFT _ RIGHT _ AND** **THEN NEUTRAL _** Move the joystick the desired distance or displacement from neutral for full speed travel. When an acceptable minimum distance is reached, the space to the right of the displacement direction will be filled in. Continue moving the joystick to the desired full speed travel displacement for the other three directions. **MOVE JOYSTICK TO** **FORWARD ■ REVERSE ■** **LEFT ■ RIGHT ■ AND** **THEN NEUTRAL ■** When all four direction spaces are filled in, let the joystick return to its neutral position. A programmed delay of one (1) second or more occurs before all values are accepted. This is indicated when the NEUTRAL space fills automatically. The screen then returns to the previous menu. Save the values in the drive program. Repeat this procedure for each available drive and proportional joystick only when Global/By Drive is set to By Drive in the Calibration's Menu.

MENU ITEM	DESCRIPTION
INPUT TYPE?	The INPUT TYPE function tells the control module which joystick or switch is to be used to drive the wheelchair when more than one driver control device is mounted on the wheelchair. Use the [↑] and [↓] keys to select the driver control device for each DRIVE (1-4). The possible selections are given below. The selections actually displayed will depend upon the driving controls connected to the control module at the time of programming. *LED - With a 10 segment LED battery bar graph.* *LCD - Optional MPJ joystick with LCD.* *1500 - RIM control Model 1500M4.* *1812 - Dual proportional joystick Model 1812M4 and the Touch Pad Driver Control.* *SJOY - Microswitch input or slot type control input for Models 1554M4 and 1554M5.* *S&P - Pneumatic switch input of Models 1554M4 and 1554M5.* The SJOY selection should be used for joystick or slot type controls with four or five independent switches, one for each direction. Slot controls and miniature joysticks are examples of these types of controls. They plug into the 9 pin D-Subminiature connector of the switch input module. The S&P (Sip & Puff) selection should be used when breath control using the pressure transducer built into the switch input module is desired. This type of control uses pneumatic switches and wheelchair control is provided by sips and puffs through a breath tube. The control will respond to driver commands according to the following: *Hard Puff - FORWARD* *Soft Puff - RIGHT* *Soft Sip - LEFT* *Hard Sip - REVERSE* See 1554M5 or 1554M4 Sip & Puff Switch Input on page 49 for details on operation, mounting and calibration of pressures in Models 1554M4 and 1554M5.
MOM/LATCH	MOMENTARY/LATCHED mode selection determines the mode for drive commands. In the Momentary mode, drive commands are active only as long as the command is given. With proportional control the speed of the wheelchair varies with the amount of joystick deflection. With a switch type driver control, there is one speed in each direction and a selection of one or three speed levels in this mode which are shown by the second line of the LCD. *LOW SPEED - Lowest speed* *MED SPEED - Medium speed* *NORMAL DISPLAY - Fastest speed* Advancing to the next highest speed level is accomplished by actuating the RESET switch. Use [↑] key to select MOMENTARY (Momentary Mode Function). In the Latched mode, FORWARD commands from the driver control (either proportional or switch type) are held active even though the driver may have released the control. REVERSE commands may be either momentary or latched (see MOM REVERSE). LEFT and RIGHT commands are momentary. Latched commands are cancelled by giving a command in the opposite direction. Use the [↓] key to select LATCHED (Latched mode function).
MOM MODE SEL	MOMENTARY SPEED MODE provides a selection between one or three speeds in Momentary mode. Use the [↑] key to select 1 SPEED. Use the [↓] key to select 3 SPEEDS.

MENU ITEM	DESCRIPTION
LATCHED TYPE	LATCHED SPEED MODE - There is a choice of four latched speed modes which can be selected. In 5 SPEEDS there are five latched forward speeds which are successively engaged by repeatedly giving FORWARD commands. There is one reverse speed. In 3 SPEEDS, there are three forward speeds and one reverse speed. In 1 SPEED, there is one forward speed and one reverse speed. In CRUISE CTL. (Cruise Control), the forward speed increases in proportion to the length of time that the forward command is maintained in the activated condition. For example, two techniques are outlined below: 1. If the FORWARD command is given in short bursts, the speed will increase in proportionally short bursts. The speed will hold at the maximum level achieved at the end of each burst. 2. If the FORWARD command is maintained in the activated condition, the speed will continue to increase until either maximum is achieved or until the FORWARD command is released. The speed will hold at the maximum level achieved at the release of the FORWARD command. When given a reverse command, the speed decreases at the same rate. Two reverse commands within one second stops the wheelchair. In reverse, a single forward command stops the wheelchair. Use the [↑] and [↓] keys to select 1 SPEED, 3 SPEEDS, 5 SPEEDS or CRUISE CTL. *NOTE: Either Invacare's proportional or switch-type (TASH) joysticks can be used with MOM MODE SEL and LATCHED TYPE.*
MOM REVERSE	MOMENTARY REVERSE MODE - This mode provides a selection between latched or momentary in reverse. To select momentary reverse mode press the [↑] key. Use the [↓] key to select latched reverse.
STAND-BY MODE	STAND-BY ON selection permits the wheelchair to enter an inactive or stand-by mode after a programmed time period of no activity from the driver control. The stand-by mode is indicated by STANDBY ON on the second line of the LCD and giving a very long tone from the beeper. Activating the emergency stop/reset switch will return the wheelchair to the previously active mode and give the appropriate visual and audible indication. The delay time before entering the stand-by mode is set by the STAND-BY TIME function. To select the stand-by mode, press the [↑] key. Use the [↓] key to disable the stand-by mode feature.
STAND-BY SEL	STAND-BY WITH MODE SELECTION provides the ability to select operating modes without the use of the emergency stop/reset switch. The stand-by mode is entered after a programmed time of inactivity from the driver control. The stand-by mode is indicated by displaying STAND-BY on the LCD and giving a very long tone from the beeper. The delay time before entering the stand-by mode is set by the STAND-BY TIME function. The operating mode is changed by moving the joystick in the direction of the desired mode and returning the joystick to neutral. Only those modes previously activated through the keypad may be selected. Driver commands will select the activated operating modes in the following manner: *FORWARD - Drive mode* *RIGHT - Remote Drive Selection mode* *LEFT - ECU/Recline Selection mode* The LCD will show the mode selected. One second after the driver control is returned to neutral the selected operating mode will become active. The emergency stop/reset switch may be used to enter the stand-by mode (except when RIM or 3 SPEEDS Momentary controls are used) without having to wait for the programmed inactive period to elapse. With RIM controls the emergency stop/reset switch allows the reverse direction to be selected. The emergency stop/reset advances the speed level when in drive mode and 3 SPEEDS in Momentary is active. To select the stand-by mode, press the [↑] key. Use the [↓] key to disable the stand-by mode feature.
STAND-BY TIME	The stand-by mode delay TIME is the programmed interval of driver control inactivity which must elapse before the control enters the stand-by mode. The adjustment range is from 2 seconds to 120 seconds. Use the [↑] and [↓] key to adjust the delay time.
STAND BY IN ECU	Allows the stand by timer to be turned off while the wheelchair is operating in an ECU or actuator mode. This mode can be useful when operating a computer mouse or telephone using the driver control. Select ON to keep the stand by time functioning all modes. Select OFF to disable the stand by timer when operating in an ECU mode. An emergency stop/reset switch activation will be required to exit the ECU mode and return to Stand by mode with selection.

MENU ITEM	DESCRIPTION
RIM CONTROL	The RIM mode is a 3 quadrant drive program for use with any driver input including S&P, hand operated joysticks, etc. It is usually used as a special proportional/switch control program for use with a headrest mounted RIM joystick. The forward and reverse functions of the driver control are inverted when selected with emergency stop/reset switch. In the normal mode, pushing the joystick forward or the forward switch causes the wheelchair to move forward. In the reversed mode, pushing the joystick forward or the forward switch causes the wheelchair to move backward. The reversed mode is indicated by reversing on the LCD. The audible indicator will beep on and off continuously to indicate Reverse mode. Special Solution: RIM normal and reversed drive modes can be accessed without using the emergency stop/reset switch when the drive is programmed as follows: *Stand-by Sel - ON* *Remote Sel - OFF* *Recliners, ECU's - OFF* After entering Stand-by Sel mode, a Forward command will select normal driving and a Left command will select reversed driving.
REMOTE SEL	REMOTE DRIVE SELECTION mode allows one of the four drive programs (DRIVE 1 - 4) to be selected through the driver control. When enabled the DRIVE SEL toggle switch is still active. The Remote Drive Selection mode is entered from the Drive mode by activating the emergency stop/reset switch. The LCD will display DRIVE SEL at a one second rate and if active the audible indicator will provide three short beeps. The joystick position, either switch-type or proportional will advance the drive program selector and light the appropriate drive indicator: *LEFT - Advance to next higher drive (e.g. DRIVE 2 to 3)* *LEFT - Advance to next higher drive (e.g. drive 3 to 4)* *LEFT - Wrap around to First drive* If REMOTE SEL is OFF in one drive, the control will skip over that drive and advance to the next drive that REMOTE SEL is ON. The Remote Drive Selection mode is exited by activating the emergency stop/reset switch or by activating Standby Select. Use the [↑] key to enable Remote Drive Selection capability. Use the [↓] key to disable the function. *NOTE: Either Invacare's proportional or switch (TASH) type joysticks can be used with REMOTE SEL.*
AUDIBLE IND	This function enables the audible indicator installed in MK5 option displays. When activated, the beeper sounds to indicate control module Mode and Level changes. The beeper code is: *2 SHORT beeps - Drive Mode active* *1 SHORT beep - Drive level advanced to the next higher level* *1 LONG beep - ECU ONE outputs or SAC, TAC, TRCM active* *2 LONG beeps - ECU TWO outputs active* *3 LONG beeps - ECU THREE outputs* *4 LONG beeps - ECU FOUR outputs active* *1 VERY LONG - Stand-by mode - wheelchair beep inactive* *3 SHORT beeps - Remote Drive, selection mode active* *CONTINUOUS ON/OFF - Reverse activated (RIM only)* Use the [↑] key to activate the audible indicator. Use the [↓] key to disable the audible indicator.
DISPLAY SELECT	Information Center Display Selection allows the user to change the function displayed on the LCD Display. Entering the Display Selection mode is performed by activating the emergency stop/reset switch or by activating Standby Select. When Display Select mode is active, LEFT commands from the driver control will advance through each of the Information Center functions. The function displayed when exiting the mode will remain on the LCD Display. Select ON to allow Display Select mode. Select OFF to remove the ability to change the Information Center displayed function.

MENU ITEM	DESCRIPTION
AXES SELECTION	Axes Selection redirects the driver input command to another axis. For example: The forward movement of the joystick can be changed to a reverse command. Each of the four input axes can be redirected to any output axis. Also, OFF can be selected which will disable any response from that axis. Use the [↑] and [↓] keys to point to that axis. Use the SELECT key to change the output axis. Axes Selection does not affect the attendant Control.
NO DRIVING	When ON, the drive mode is disabled and only the remaining programmed functions are enabled. Use this feature in conjunction with ECU's and augmentative communications where having a drive mode enabled is a hindrance for example when communications is most important and accidentally slipping into the drive mode could cause unintended wheelchair movement. If NO DRIVING is on in Drive 1 and the wheelchair is turned on, the control will automatically enter a functional mode in the following order of priority: Standby Select, Remote Drive Select, Recliner, Tilt/Recline, ECU 1, ECU 2, ECU3, ECU4, Display Select. If none of these functions are turned on, the drive will be skipped and the next drive will become active. Drive 1 cannot be skipped and allows creation of a drive in which no function is active.
ECU1	ECU1 selects the performance of the environmental control card in slot 1 of the accessory output module. The selections are: *OFF - Disable the environmental control outputs for this drive.* *MOM. MOTOR - Momentary motor control should be used when controlling recliners, motors or actuators on the wheelchair. The ECU relays are closed only when the driver command is active. Only one relay will be active at a time.* *LATCHED - changes the operation of the Forward and Reverse relays so that they stay engaged until released by an opposite direction command. This feature is especially useful when operating a powered back recliner with a pneumatic switch and the user has difficulty keeping the relay engaged for the time required to position the wheelchair back. Only the Forward and Reverse relays are latched. The Right and Left relays operate as momentary switches.* *COMM - In COMM mode, the relays respond very quickly as needed for use with computers and communication aids. Two relays are permitted to be closed at one time to allow use of the diagonal capability offered in many systems.* Refer to ECU1 and ECU2 on page 55 for a description of the Output Accessory module connectors for ECU1.
ECU2	ECU2 selects the performance of the environmental control card in slot 2 of the accessory output module. The selections are the same as for ECU1. Refer to ECU3 and ECU4 on page 55 for a description of the Output Accessory module connectors for ECU2.
ECU3	ECU3 selects the performance of the environmental control card in slot 3 of the accessory output module. The selections are the same as for ECU1. Refer to ECU1 and ECU2 on page 55 for a description of the Output Accessory module connectors for ECU3.
ECU4	ECU4 selects the performance of the environmental control card in slot 4 of the accessory output module. The selections are the same as for ECU1. Refer to ECU3 and ECU4 on page 55 for a description of the Output Accessory module connectors for ECU4.
SAC - SINGLE ACTUATOR	The Recliner function appears when the optional MK5 SAC Controller and a MPJ or A+ option joystick are installed. When the RECLINE mode is active the LCD will show SAC on the MPJ or A+ option display. The selections for driver control of the recliner through the joystick is as follows: *OFF - Disables joystick operation of the recliner control outputs for this drive. The independent or manual switch will function normally.* *MOM. MOTOR - Momentary motor control means that the up or down function is active only when the driver command is active.* *LATCHED - changes the operation of the up and down functions so that they stay engaged until released by an opposite direction command. This feature is especially useful when operating a powered back recliner with a pneumatic switch and the user has difficulty keeping the relay engaged for the time required to position the wheelchair back.* The up function is activated by giving a forward or right command. The down function is activated by giving a left or reverse command.

MENU ITEM	DESCRIPTION
TILT/RECLINE	This function appears when the MK5 Tilt Recline Control Module (TRECM, TRCM or TAC) is installed. There are six (6) operating modes in the TILT/RECLINE function. 1. 4-SW Four Switch mode uses all four quadrants of the joystick. Each command is momentary (a command is active only as long as the joystick is displaced in that direction). When the mode is active, the LCD display shows TILT/RECLINE. *FWD - will activate the TRCM Pin 1 function.* *REV - will activate the TRCM Pin 2 function.* *LEFT - will activate the TRCM Pin 3 function.* *RIGHT - will activate the TRCM Pin 4 function.* 2. 4SWL Four Switch Latched mode uses all quadrants of the joystick. The first command activates the function. When the command is released, the function stays active. Another command in any direction will deactivate the function. When the mode is active, the LCD Display shows Tilt/Recline. 3. 4SW-2 LEVELS Four Switch mode with two levels. Sequencing to each level is done through the emergency stop/reset Switch. Each command is momentary (a command is active only as long as the joystick is displaced in that direction) *Level 1:* *Display shows TILT/RECL 1* *LEFT - will activate the TRCM Pin 1 function* *RIGHT - will activate the TRCM Pin 2 function* *Level 2:* *Display shows TILT/RECL 2* *LEFT - will activate the TRCM Pin 3 function* *RIGHT - will activate the TRCM Pin 4 function* 4. 4SWL-2 LEVELS Four Switch Latched mode with two levels. Sequencing to each level is done through the emergency stop/reset switch. The first command activates the function. When the command is released, the function stays active. Another command in any direction will deactivate the function. *Level 1:* *Display shows TILT/RECL 1* *LEFT - will activate the TRCM Pin 1 function* *RIGHT - will activate the TRCM Pin 2 function* *Level 2:* *Display shows TILT/RECL 2* *LEFT - will activate the TRCM Pin 3 function* *RIGHT - will activate the TRCM Pin 4 function* 5. 1swM One Switch Momentary mode activates each quadrant individually. A RIGHT command is used to activate each command. The command is active only as long as the Right command is given. Sequencing to each function is done by through the emergency stop/reset switch. The LCD display shows which function is active. This mode is likely to be used with RIM and ASL switches where the Forward command is difficult and the Reverse command is non-existent. 6. 1swL One Switch Latched mode activates each quadrant individually. A RIGHT command is used to activate each command. The first Right command activates the function. When the command is released, the function stays active. A second Right command will deactivate the function. Sequencing to each function is done by through the emergency stop/reset switch. The LCD display shows which function is active (This function is not available with the A joystick.). This mode is especially useful with Sip & Puff users and when the command cannot be held for the time needed for the seating system to move to the required position.

MENU ITEM	DESCRIPTION
TILT/RECLINE WITH STANDBY SELECT	With this program selection the user does not have to use the emergency stop/reset switch to select the TILT/RECLINE function. First the user waits for Standby time-out. (Set by the TIME function.). By giving a LEFT command, the user selects ECU SELECT mode. Giving another LEFT command and holding it, will start the LCD scrolling through the TRCM and ECU modes that are available. The user then releases the Left command when the desired function is displayed. The function becomes active and the Audible Indicator beeps after the Left command is released for two seconds. Joystick commands will then be directed to the TRCM. To go back to driving or select another TILT/RECLINE function, the user must wait for the Standby time-out and start the process over again. The Standby time-out can be shortened by activating the emergency stop/reset switch.

SECTION 6—STANDARD VALUE SETTINGS

Standard Value Settings

The standard value settings are available as a reference point for initial set-up of the wheelchair, for final user setting or whenever major changes have been made in the performance and a known starting point needs to be reestablished.

A selection of seven (7) proportional and five (5) non-proportional programs are available. Select STANDARD VALUES from the main menu to display the standard value menu. Press [↑] or [↓] to select the standard program to be placed in the temporary memory. Press the SAVE key to store the program into a selected drive. Then make changes to specific functions as needed. The general capabilities of the standard programs are listed below:

The standard programs menu contains only those programs which are appropriate for the joystick or driver control connected to the wheelchair (Proportional programs will not appear if no proportional joystick is connected.).

MENU ITEM	DESCRIPTION
INDOOR JOYSTICK AVE.	An indoor program for the average joystick user.
MODERATE OUTDOOR	A medium speed program for rougher terrain.
SPEED/LEVEL TERRAIN	A high speed program for flat, smooth, hard surfaces.
RAMPS AND CURBS MODE	A medium speed program for maneuvering on ramps and climbing curbs.
INDOOR LEARNER	A learning or indoor performance settings.
VERY SLOW DRIVING	Very slow driving performance.
TREMOR DAMP MODE	A spasticity program.
LEARNER 3SPD MOM	A momentary switch input joystick (non-proportional) program with three speeds in forward and one in reverse.
ASL INDOOR/LEARNER	A momentary switch program for initial setup of Adaptive Switch Laboratories systems.
ASL OUTDOOR/FASTER	A momentary switch program for more experienced users of Adaptive Switch Laboratories systems.
LEARNER SIP & PUFF	A learning program for SIP & PUFF with cruise control and momentary reverse.
VERY SLOW 1 SPD S & P	A SIP & PUFF program with one latched speed in forward.
LEARNER FOR 1500RIM	A learner program for the RIM head control.

SECTION 7—CALIBRATION OF THE CONTROL MODULE

When to Calibrate the Control Module

The control module is fully calibrated at the factory and will not need further calibration by the dealer except when replacing the control module or the joystick with one that has not been matched to the wheelchair. Refer to Joystick Throw on page 25 when replacing a joystick.

What Functions Can Be Calibrated

The available calibration functions are the battery level, the left and right motor balance (BAL) for veer correction, the motor lock release time and the optional pneumatic switch (Sip & Puff). Only calibration of the battery level requires the use of any test equipment.

Calibrating the Control Module

Select CALIBRATIONS from the main menu to display the first functions in the calibration menu. Use the [↑] and [↓] keys to select the calibration function desired. The SELECT key will display the current calibration value and permit modification of the control module calibration. Always press SAVE after calibration changes are made. Calibrations are saved to all drive programs, so selection of a specific DRIVE is not necessary.

MENU ITEM	DESCRIPTION
BATTERY LEVEL	Measure the battery voltage with a digital voltmeter. Press the SELECT key to display the current battery voltage value. Use the [↑] and [↓] keys to calibrate the display to match the volt meter reading.
MOTOR BALANCE (MK5 EX ONLY)	BALANCE corrects for veer when going straight on level ground. Veer is corrected by increasing or decreasing the voltage applied to the left motor as a percentage of that applied to the right motor. Use the [↑] key to correct for veer to the right and the [↓] key for veer to the left.
BRAKE TIME-OUT	The BRAKE TIME-OUT function determines the elapsed time for the motor locks to engage after the driver control is brought to neutral. The time displayed is in seconds. Use the [↑] key to increase the release time and the [↓] key to decrease the release time.

MENU ITEM	DESCRIPTION
CALIBRATE MOTOR (MK5 TT EX ONLY)	The MK5 TT EX is matched to the motors in order to attain smooth control and high efficiency. Re-calibration of the MK5 TT EX is required ONLY when a motor or controller has been changed on the wheelchair.

⚠ WARNING

Before and during calibration, the drive wheels MUST be raised off of the ground (base frame must be supported) to allow the wheels to rotate freely and attain an accurate reading. Calibration is not to be performed with an occupant seated in the wheelchair. Failure to raise the wheels could cause injury to the individual performing the calibration, by-standers or damage to the wheelchair and surrounding property.

Position supports under the frame to suspend the drive wheels. To calibrate or match the MK5 TT EX controller to the drive motors, press the SELECT key. The programmer will display:

WHEELS WILL MOVE!
DRIVE WHEELS RAISED?
YES
➜ NO

Confirm the wheels are raised by moving the arrow to YES and pressing the SELECT key. The programmer will display:

CHAIR WILL DRIVE!
ARE WHEELS RAISED?
YES
➜ NO

Reconfirm the wheels are raised by moving the arrow to YES and pressing the SELECT key. The programmer will display:

MOTOR CALIBRATION
-SELECT- TO START
WHEELS WILL DRIVE!
PRESS - MENU - TO EXIT

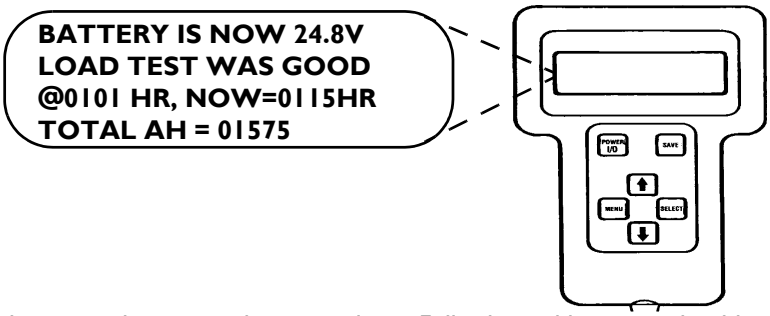
NOTE: This screen is a final reminder that the motors will turn while the calibration is performed. If the drive wheels are on the ground the wheelchair will drive and the calibration will be inaccurate.

⚠ WARNING

Proceeding with the wheels on the ground could cause injury or property damage. To cancel the calibration NOW, press the MENU key to return to the main calibration menu.

Press the SELECT key to start the motor calibration. When the process is complete, the screen will change to:

COMPLETED TEST
SAVING NEW VALUES

MENU ITEM	DESCRIPTION
DRIVE CONFIG.	Drive Configuration is used to match the control to the type of wheelchair being driven. The available selections CWD (center wheel drive) and RWD (rear wheel drive). Use the [↑] or [↓] keys to select the type of wheelchair being driven. The following defines differences between chairs to provide the optimum performance: *CWD - switches motor outputs without switching motor connectors and turning speed is modified to improve driving feel and control.* *RWD - operates normally for rear wheel drive chairs.*
SOFT START	Soft Start controls the wheelchair response to proportional joystick displacement. With Soft Start ON, small movements around neutral do not produce large speed changes. Beyond 40% of joystick throw, the response is greater. When Soft Start is OFF, joystick displacement will produce a linear speed increase.
BATTERY QUALITY	The battery quality screen displays the current condition of the battery, the total number of hours the wheelchair has been driven and the number of Amp-hours consumed while driving. Below is a sample of the display.  The first line gives the current battery voltage. Fully charged batteries should indicate 25.2V or above. The second line gives the load test condition of the battery. The possible results are: *GOOD - means the batteries are fine.* *POOR - means the batteries may affect the performance of the wheelchair under heavy loads, but do not need to be replaced yet.* *BAD - means the wheelchair performance will be affected even immediately after recharging and that they should be replaced.* *UNKWN (Unknown) - means that the conditions for a load test have never been met and the test has not been performed.* The third line shows the hourmeter reading when the load test was performed and the current value of the hourmeter. A comparison of the two values will give an indication of how recent (and therefore the validity) the load test was performed. The hourmeter indicates the number of hours that the wheelchair has been driven. Leaving the wheelchair on, but not driving does not add time to the hourmeter. The fourth line show the number of Amp-hours (AH) that have been consumed by driving the wheelchair. This value can be useful when checked at the beginning of the day and again when the batteries have become discharged to indicate battery capacity. If the AH value is much lower than the battery manufacturer's specification, the batteries may be bad or the charger could be undercharging. Independent checks should be made.

MENU ITEM	DESCRIPTION
FAULT LOG	The Fault Log shows all of the fault codes that have been detected by the diagnostic system since the control was built in the factory. The fault codes correspond to the Diagnostics Codes given in the next section. The Fault Log can be used by the service technician to uncover the cause of intermittent faults that are not evident when the wheelchair is being serviced. *NOTE: It is normal to have some codes in the Fault Log, even in a new wheelchair, because they are generated during factory testing and calibration.* Pressing the SELECT key accesses descriptions of the meaning of each error code. Scrolling through the code descriptions is performed by using the [↑] and [↓] keys. Use the MENU key to return to the fault log.
GLOBAL/BY DRIVE	Performance Menu parameters below TORQUE may be made Global parameters. Global parameters are parameters that are the same for all drives. A change to a global parameter in one drive changes that parameter to the same value in the remaining drives. When By Drive is selected, the parameters are independent in each drive. Use the [↑] to select Global and make all performance parameters below TORQUE the same value in all drives.
SET MILES/KM	The speedometer and odometer can be set to display in either mph and miles or kmh and kilometers. Use the [↑] key to select miles (English units) or the [↓] key to select kilometers (metric units).
SET WHEEL DIAMETER (MK5 TT EX ONLY)	Calibrates the speedometer and odometer of the wheelchair. The wheel diameter is measured in inches. Wheel diameter can vary with tire type, tire inflation or flat free insert. It is best to measure the diameter with the wheelchair fully loaded. Use the [↑] and [↓] keys to set the wheel diameter to the nearest 0.1 inch.
SET SPEED MAX. (MK5 EX ONLY)	Calibrates the speedometer and odometer of the wheelchair. The value is maximum speed of the wheelchair in mph or kmh. Refer to the wheelchair specification for this value, as motor type, gear ratio and wheel diameter all affect maximum speed. Use the [↑] and [↓] to set the value to match the wheelchair maximum speed.

SECTION 8—CURRENT STATUS DISPLAY

WHAT IS THE CURRENT STATUS DISPLAY?

The Current Status display is a diagnostics tool that shows the function of major systems within the MK5. The first screen(s) give type and performance of the driver input. Moving the driver control reveals its operation. A normally calibrated joystick will achieve nearly 100 in each axis direction. A short throw setting will show that 100 is achieved before the mechanical restrictor is reached. There is one screen per drive when BY DRIVE is selected in the Calibrations menu.

MENU ITEM	DESCRIPTION
NETWORK CONNECTIONS	Shows which displays or options are connected to the MK5 system. If one is missing, it means the control module cannot communicate to it. Check the connector and wiring to the device. It may need to be replaced.
SOFTWARE VERSION	Gives software version number(s) in the control module. MK5 EX displays one number. MK5 TT-EX displays two numbers.
BATTERY VOLTAGE	Displays the current battery voltage. A low voltage may indicate battery problems. Charge the batteries and recheck wheelchair performance.
LOAD TEST	Shows the results of the most recent battery load test. GOOD means the batteries are fine. POOR means the batteries may affect the performance of the wheelchair under heavy loads, but do not need to be replaced yet. BAD means the wheelchair performance will be affected even immediately after recharging and that they should be replaced. UNK (Unknown) means that the conditions for a load test have never been met and the test has not been performed.
DRIVE LOCK-OUT	Demonstrates the current state of the drive lock-out/charge inhibit input. The function of the input cannot be displayed when the programmer is plugged into the charger port. Move the programmer to the 5 pin connector input.
STOP/RESET SW.	Demonstrates the current state and function of the Emergency Stop/Reset switch. Activating the switch will change the display from OPEN to TRUE.
M2 ROLLBACK	Shows the value of the M2 motor current rollback parameter as a percentage of its maximum value. High values are indicative of recent high stress or load on the motor. Refer to Current Rollback on page 77 for causes and methods of reducing current rollback values.
M1 ROLLBACK	Shows the value of the M1 motor current rollback parameter as a percentage of its maximum value. High values are indicative of recent high stress or load on the motor. Refer to Current Rollback on page 77 for causes and methods of reducing current rollback values.
TEMPERATURE	Shows the internal control module temperature in degrees C. Room temperature is approximately 20-25° C. high values (above 50° C) indicate recent high stress or load on the control module.
READY TO DRIVE	Indicates YES if there are no current faults or error codes detected. The E code will be given if there is a current code.

SECTION 9—DIAGNOSTIC CODES

What Are Diagnostics Codes?

The joystick battery discharge indicator and the Remote Programmer give indications of the type of fault or error detected by the control module. When a fault is detected, the wheelchair will stop and not drive. For the DPJ joysticks, the two red bars of the BGD will begin to flash followed by a pause. An error code and a quick description of the fault will begin to scroll across the Remote Programmer and LCD display. If multiple faults are found, only the first fault encountered by the control module program will be displayed. Refer to the Power Wheelchair Service Manual for detailed troubleshooting and repair instructions. Below is a list of the diagnostics codes and their causes:

MK5 EX Controller Diagnostic Codes

NUMBER OF FLASHES	DIAGNOSTICS CODE	CAUSE OF ERROR
1	E 01	Joystick Reverse - too large
1	E 02	Joystick Forward - too large
1	E 03	Joystick Right - too large
1	E 04	Joystick Left - too large
2	E 05	M1 current sense amp - high
2	E 06	M1 current sense amp - low
2	E 07	M2 current sense amp - high
2	E 08	M2 current sense amp - low
3	E 09	M1 motor circuit open
3	E 10	M2 motor circuit open
4	E 11	Neutral reference voltage - high
4	E 12	Neutral reference voltage - low
5	E 13	Battery voltage - high
5	E 14	Battery voltage - low
5	E 28	Battery charger connected
6	E 15	M1 power stage
6	E 16	M2 power stage
7	E 17	Neutral calibration SPD
7	E 18	Neutral calibration DIR
7	E 19	Joystick calibration - Forward
7	E 20	Joystick calibration - Reverse
7	E 21	Joystick calibration - Left
7	E 22	Joystick calibration - Right

NUMBER OF FLASHES	DIAGNOSTICS CODE	CAUSE OF ERROR
7	E 23	RAM fault detected
7	E 24	M1 null offset
7	E 25	M2 null offset
7	E 26	Configuration register not programmed
7	E 27	EPROM error detected
7	E 30	CPU EEPROM fault detected
7	E 31	Isolation Relay is faulty
1	E 32	System communications error. Check connectors.
1	E 33	Network Fail bit
1	E 34	Sip & Puff output overrange
7	E 35	Control Neuron failure
7	E 36	Current Sense not calibrated
7	E 37	Motor Voltages Not Matched
7	E 38	General Power Stage Fault (MK5 TT EX Only)
7	E 39	Power Stage Communications Time-Out (MK5 TT EX Only)

MK5 TT-EX Controller Diagnostic Codes

MK5 TT-EX USER ADVICES

USER ADVICE	ACTION
0	NO ADVICE, CALL DEALER
1	SWITCH OFF AND ON, RETRY
2	GB CONTROLLER FAILURE
3	CHECK M1 MOTOR/CABLING
4	CHECK M2 MOTOR/CABLING
5	CURRENT CAL. JIG FAULT
6	CURRENT LIMIT TEST FAILURE
7	CONTROL SOFTWARE FAILURE
8	M2 MOTOR CAL., RETRY
9	M1 MOTOR CAL., RETRY
10	LOW BATTERY, RECHARGE
11	CHECK JOYSTICK CABLING
12	CURRENT NOT CALIBRATED
13	MOTOR NOT CALIBRATED
14	SHORT/OPEN IN CONTROL OR MOTOR
15	BATTERY VOLTAGE TOO HIGH, OVER CHARGED
16	CHECK DIRECT INPUT SIGNALS
17	OVER HEATED ALLOW COOL DOWN

MK5 TT-EX DIAGNOSTIC CODES

NO. OF BGD BARS FLASHING	DIAGNOSTICS CODE	USER ADVICE*	CAUSE OF ERROR
8	E 40	0	Unidentifiable error
8	E 41	1	Replace control only if fault repeats.
8	E 42	2	M2 Current Sensor Error
8	E 43	2	M2 Current Sensor Error
8	E 44	2	M1 Current Sensor Error
8	E 45	2	M1 Current Sensor Error
8	E 46	5	Current Calibration Error (Factory Only)
8	E 47	5	Current Calibration Error (Factory Only)
8	E 48	2	M2 Current Sensor Error
8	E 49	2	M2 Current Sensor Error
8	E 50	2	M1 Current Sensor Error
8	E 51	2	M1 Current Sensor Error
8	E 52	5	Current Calibration Error (Factory Only)
8	E 53	5	Current Calibration Error (Factory Only)
8	E 54	5	Current Calibration Error (Factory Only)
8	E 55	5	Current Calibration Error (Factory Only)
8	E 56	5	Current Calibration Error (Factory Only)
8	E 57	5	Current Calibration Error (Factory Only)
8	E 58	5	Current Calibration Error (Factory Only)
8	E 59	5	Current Calibration Error (Factory Only)
8	E 60	5	Current Calibration Error (Factory Only)
8	E 61	5	Current Calibration Error (Factory Only)
8	E 62	6	Current Calibration Error (Factory Only)
8	E 63	6	Current Calibration Error (Factory Only)
8	E 64	6	Current Calibration Error (Factory Only)
8	E 65	6	Current Calibration Error (Factory Only)
8	E 66	3	M2 Motor Over Current fault
8	E67	4	M1 Motor Over Current fault
8	E 68	8	M2 motor - too much drag/load
8	E 69	9	M1 motor - too much drag/load
8	E 70	8	M2 motor - too much drag/load
8	E 71	9	M1 motor - too much drag/load
8	E 72	7	Replace control - Software error
8	E 73	7	Replace control - Software error
8	E 74	7	Replace control - Software error
8	E 75	7	Replace control - Software error
8	E 76	7	Replace control - Software error
8	E 77	7	Replace control - Software error
8	E 78	11	Internal power supply fault - replace control

NOTE: Refer to MK5 TT-EX User Advices on page 39 for more information.

MK5 TT-EX DIAGNOSTIC CODES

NO. OF BGD BARS FLASHING	DIAGNOSTICS CODE	USER ADVICE*	CAUSE OF ERROR
8	E 79	11	Internal power supply fault - replace control
8	E 80	10	Low battery - recharge/check condition
8	E 81	15	High battery fault
8	E 82	3	M2 motor brake coil short circuit
8	E 83	4	M1 motor brake coil short circuit
8	E 84	2	Replace control - Hardware error
8	E 85	2	Replace control - Hardware error
8	E 86	2	Replace control - Hardware error
8	E 87	2	Replace control - Hardware error
8	E 88	2	Replace control - Hardware error
8	E 89	3	M2 motor hall sensor fault - replace motor
8	E 90	3	M2 motor hall sensor fault - replace motor
8	E 91	4	M1 motor hall sensor fault - replace motor
8	E 92	4	M1 motor hall sensor fault - replace motor
8	E 93	12	Current calibration lost - replace control
8	E 94	13	Re-calibrate motors
8	E 95	7	Current calibration lost - replace control
8	E 96	2	Replace control - Software error
8	E 97	2	Replace control - Software error
8	E 98	-	Replace control - Software error
8	E 99	2	Replace control only if fault repeats.
8	E100	14	Control/Motor short/open
8	E101	14	Control/Motor short/open
8	E102	14	Control/Motor short/open
8	E103	16	Direct Input Joystick Fault
8	E104	16	Direct Input Joystick Fault
8	E105	16	Direct Input Joystick Fault
8	E106	16	Direct Input Joystick Fault
8	E107	16	Direct Input Joystick Fault
8	E108	16	Direct Input Joystick Fault
8	E109	16	Direct Input Joystick Fault
8	E110	14	Motor/Control short/open-M2
8	E111	14	Motor/Control short/open-M1
8	E112	14	Motor/Control short/open-M2
8	E113	14	Motor/Control short/open-M1
8	E114	17	Rollback - Total current
8	E115	17	Rollback - M2
8	E116	17	Rollback - M1
8	E117	17	Rollback - Module Temperature too high

**NOTE: Refer to MK5 TT-EX User Advices on page 39 for more information.*

SECTION 10—OPTIONS

Display Unit

NOTE: For this procedure, refer to FIGURE 10.1 and FIGURE 10.2.

Some optional equipment is available with a display unit.

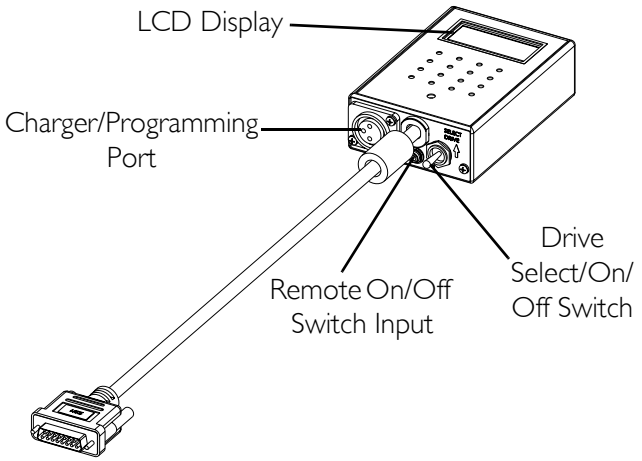


FIGURE 10.1 Display Unit

Drive Select and On/Off Switch

A three (3) position toggle switch is located on the display module in the lower right corner. The DRIVE SELECT position is momentary.

This switch allows the operator to select the type of operation or performance which best suits a particular control need or situation. The DRIVE 1 program uses performance values which are independent of those used for the DRIVE 2 or 3 or 4 program. As an example, an operator may have a control need for spasticity in the morning and a very different need in the afternoon. DRIVE 1 can be programmed for higher speeds and quicker response while DRIVE 2 can be programmed for slower speeds and less responsiveness. The remaining drive programs could also be used for indoor and outdoor versions of DRIVE 1 and DRIVE 2. Finally, when a powered seating system is installed, one of the remaining drives may be used to control the tilt, recline and/or elevate functions.

Selecting the Drive Mode

1. Move the toggle UP and release. DRIVE 1 will appear on LCD.
2. Move the toggle UP and release again. DRIVE 2 will appear on LCD.
3. Move the toggle UP and release again. DRIVE 3 will appear on LCD.
4. Move the toggle UP and release again. DRIVE 4 will appear on LCD.
5. Move the toggle UP and release one more time to select DRIVE 1.

LCD Display

The LCD Display is located on the display module and provides information on the status of the wheelchair through a 2 line by 12 character length back lighted display. The LCD display is readable in both bright sunlight and complete darkness.

During normal operation the active drive is displayed on the left half of the first line. The left half of the second line sees as the Battery Gauge Display (BGD). It provides information on the remaining charge in the batteries. At full charge solid blocks fill in all five segments between E (Empty) and F (Full). As the battery becomes discharged, the furthest right segments will progressively disappear a half bar at a time until no segments appear between E and F. At this level the word RECHARGE will appear on the second line to indicate that the user should charge the batteries as soon as possible.

The right half of the display is the Information Center. The Information Center displays current data on the wheelchair. FIGURE 10.2 shows the factory default odometer display. The top line shows the unit of measured MI (miles). The second line is the value, 0000 (total miles driven).

The Information Center can display:

ITEM	DESCRIPTION
Speedometer	Current Wheelchair Speed - MPH/KMH
Trip Odometer	Distance traveled since the wheelchair was last powered ON
Odometer	Total Distance Traveled (Factory Default) - MI/KM
Trip Amp-Hour meter	Battery Capacity consumed since the wheelchair was last powered ON - AH
Battery Volts	Current Battery Voltage - VOLT
Battery Current	Battery current being used - AMP
Load Test Results	Current battery condition based on a load test - BATT

If a fault is detected, the cause of the fault will be scrolled across the second line of the display.

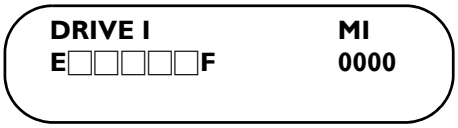


FIGURE 10.2 Display Unit - LCD Display

Remote On/Off

The remote on/off switch input allows the power switch to be operated by an ability switch (normally open momentary switch with mono plug). To use the remote on/off feature, the Drive Select/On/Off switch must be in the ON position. Each activation of the ability switch will alternately turn the joystick ON or OFF.

Special Purpose Indicators

There are sixteen (16) LED indicators below the LCD display. These indicators will not light until the particular function or mode is ACTIVE. Refer to Appendix on page 79 for the LED display information.

MK5 PSR/PSF Joysticks

NOTE: For this procedure, refer to FIGURE 10.3.

Joystick Overview

The MK5 PSR (Personalized Switch - Rear Mount) and PSF (Personalized Switch - Front Mount) provide proportional drive control of speed and direction through the joystick, located at the front or rear of the control.

There are several types of PSR joysticks. They are listed in the table below.

TYPE	ON/OFF	DRIVE SELECT	HORN	SPEED SELECT
MK5 Standard	Toggle	Toggle*	Push Button	None
MK5 PBOD	Push Button	Push Button	None	None
MK5 RHSS	Toggle	Toggle*	None	Rotary Knob
MK5 TOHSS	Toggle	None	Toggle*	Rotary Knob

**NOTE: Uses same toggle as On/Off.*

NOTE: In addition to the types listed above, OL = On/Off positioned on the left side of the joystick and OR = On/Off positioned on the right side of the joystick.

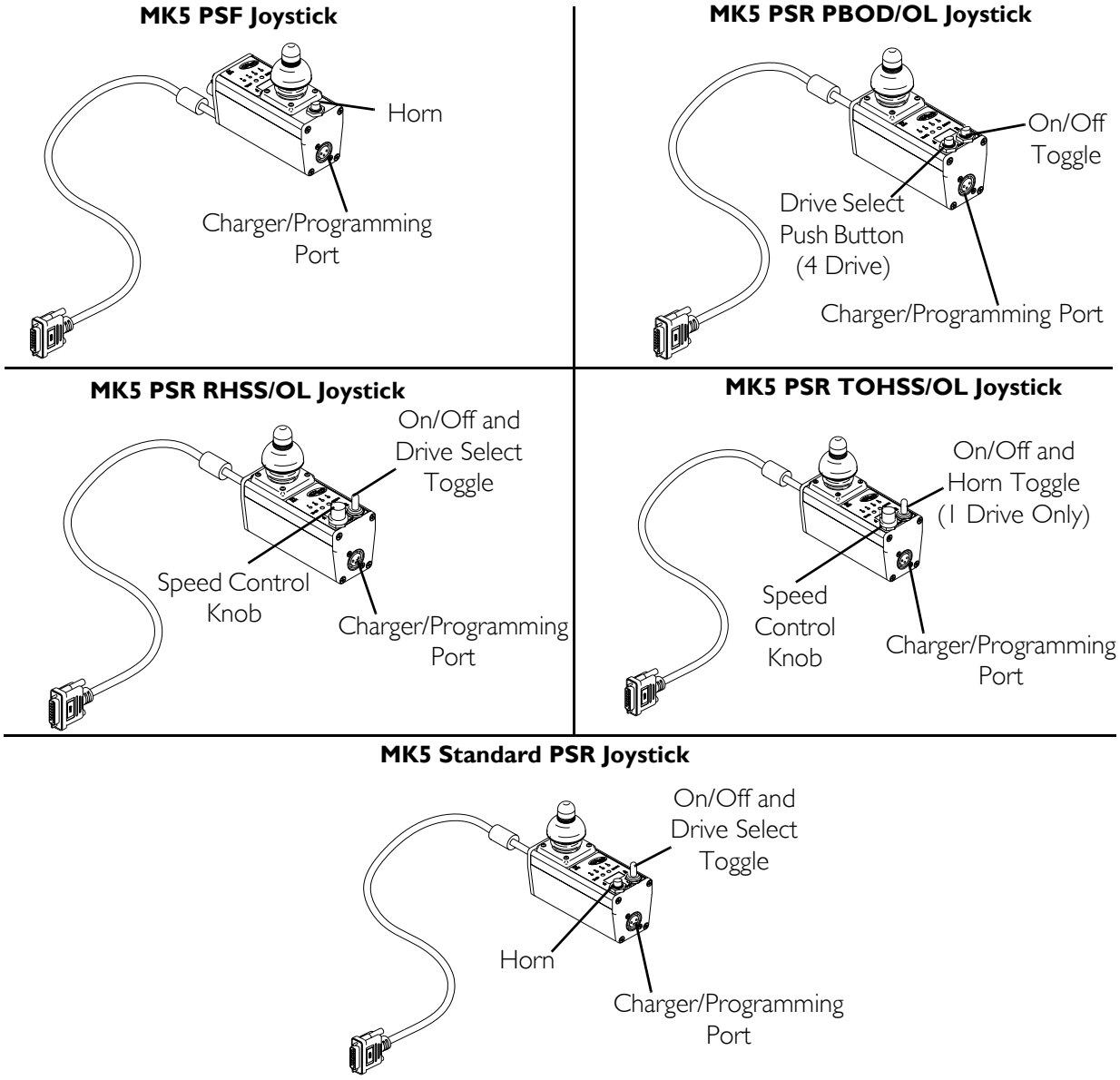


FIGURE 10.3 MK5 PSR/PSF Joysticks

Power/Drive Select Toggle Switch

A three (3) position power/drive select toggle switch is located on the side of the joystick housing. The DRIVE SELECT position is momentary.

This switch allows the operator to select the type of operation or performance which best suits a particular control need or situation. The DRIVE 1 program uses performance values which are independent of those used for the DRIVE 2 or 3 or 4 program. As an example, an operator may have a control need for spasticity in the morning and a very different need in the afternoon. DRIVE 1 can be programmed for higher speeds and quicker response while DRIVE 2 can be programmed for slower speeds and less responsiveness. The remaining drive programs could also be used for indoor and outdoor versions of DRIVE 1 and DRIVE 2. Finally, when a powered seating system is installed, one of the remaining drives may be used to control the tilt, recline and/or elevate functions.

Selecting the Drive Mode

1. Move the toggle up and release. The DRIVE 1 indicator lights up.
2. Move the toggle up and release again. The DRIVE 2 indicator lights up.
3. Move the toggle up and release again. The DRIVE 3 indicator lights up.
4. Move the toggle up and release again. The DRIVE 4 indicator lights up.
5. Move the toggle up and release one more time to select DRIVE 1.

Turning the Wheelchair Off

1. Move the toggle down to turn the wheelchair off.

Speed Control Knob

1. Rotate the knob clockwise to increase the speed of the wheelchair to the programmed max speed.

Battery Gauge Display (BGD)

Located at the front or rear of the joystick housing, the BGD provides information on the remaining charge in the batteries. At full charge, the two left segments and the farthest right segment of the bar graph are lit. As the battery becomes discharged, the farthest right segment will progressively move to the left until only the last two (2) bars are lit; at this level, the last two (2) bars will start to flash on and off to indicate the user should charge the batteries as soon as possible.

Mode and Level Indicators

Two (2) LED indicators are located on either side of the battery bar graph display.

The Mode light is On (operational) with no options attached and level indicators are only operational under the following conditions:

- the optional ECU/Recliner Control is used
- an optional joystick is used
- the Reset switch is activated

These indicators provide information of the status of the control system and the environmental controls. The green mode indicator shows one (1) of five (5) control states.

MODE (GREEN LED)	INDICATION
Drive	Continuously on
Attendant	Flashing (twice/second)
ECU or Recliner Control	Off
Stand-by	Flashing Rapidly (four times/second)
Remote Drive Selection	Slow Flashing (once/second)

The red level indicator provides information on the control level within each mode. Its operation changes with each mode:

MODE (RED LED)	INDICATION
Latched, Proportional or Attendant	**Off**
Momentary	**Speed Level** Off - Slowest Flashing - Medium Rapid Flashing - Fastest
ECU/Recliner Control	**Active Output** Off - ECU (level) One and Three On - ECU (level) Two and Four Flashing - Recliner Control
RIM	**Wheelchair direction for FORWARD command** Off - Wheelchair moves forward On - Wheelchair moves in reverse

1558M4 Compact Joystick

NOTE: For this procedure, refer to FIGURE 10.4.

NOTE: This option is available with a display unit. Refer to Display Unit on page 42 for more information.

The 1558M4 joystick consists of a display module and a joystick module.

Proportional drive control is independent of the display module and switches and provides smooth control of speed and direction.

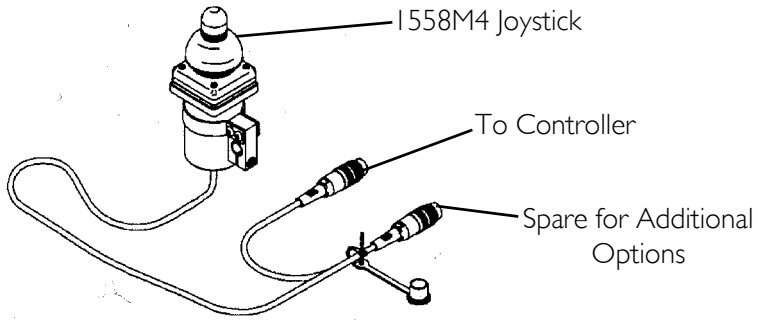


FIGURE 10.4 1558M4 Compact Joystick

1500M4 Rim Head Control

NOTE: For this procedure, refer to FIGURE 10.5.

NOTE: This option is available with a display unit. Refer to Display Unit on page 42 for more information.

The 1500M4 is a proportional three axis control for driving and controlling wheelchair functions with the head and a separate display module. Complete all-direction control is accomplished by switching between forward and reverse through the use of the emergency stop/reset switch.

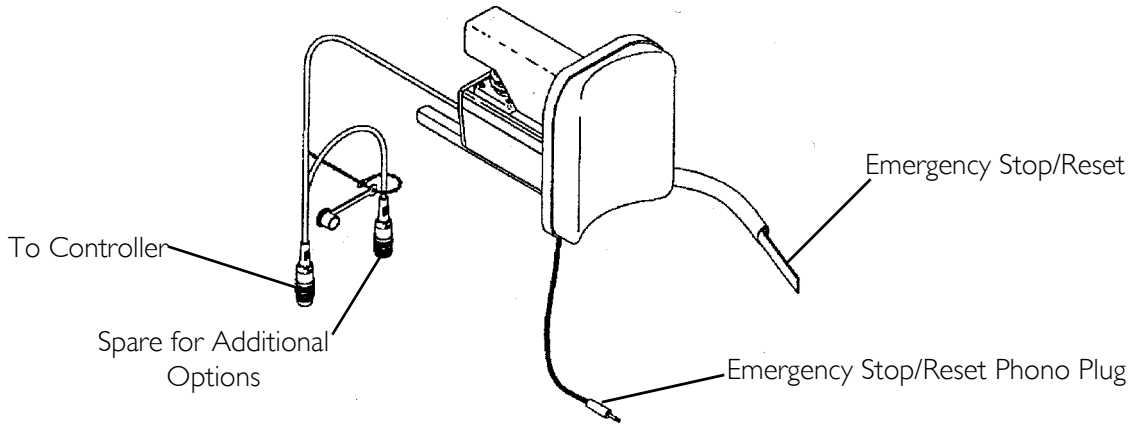


FIGURE 10.5 1500M4 Rim Head Control

1812M4 Dual Proportional Joystick

NOTE: For this procedure, refer to FIGURE 10.6.

The 1812M4 Dual Proportional joystick can be used in addition to any other main drive control device (standard or optional) except the 1558M4 Compact Joystick and the Touch Pad Driver Control. Selection of the active driver control is made during individual DRIVE programming with the Remote Programmer. Proportional drive control provides smooth control of speed and direction.

There are no switches or indicators on the 1812M4.

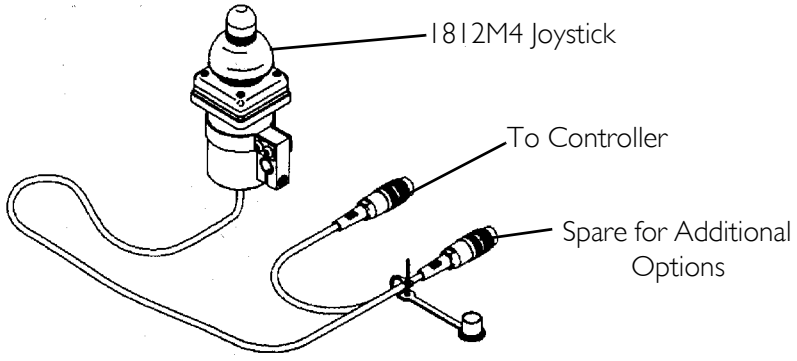


FIGURE 10.6 1812M4 Dual Proportional Joystick

1554M5 or 1554M4 Sip & Puff Switch Input

NOTE: For this procedure, refer to FIGURE 10.7.

NOTE: This option is available with a display unit. Refer to Display Unit on page 42 for more information.

The 1554M4 and 1554M5 are non-proportional input modules with built-in pneumatic pressure sensor and an independent display module. The switch input can operate as a pneumatic driver control (Sip & Puff) or as the input for variety of switch-type joysticks which use a 9 pin D-Subminiature connector.

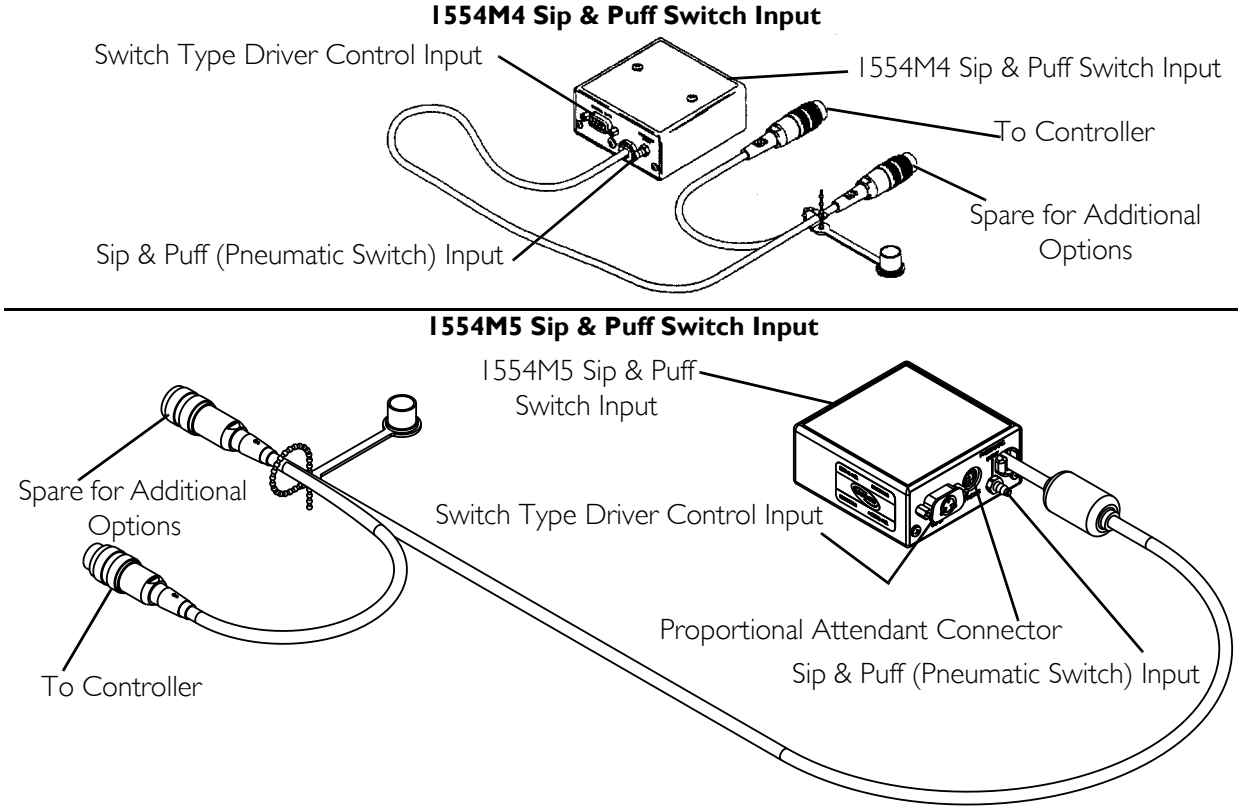


FIGURE 10.7 1554M5 or 1554M4 Sip & Puff Switch Input

Driver Control Input Connector

The input on the non-proportional input switch is a male 9-pin D-Subminiature connector:

PIN	DESIGNATION
1	FORWARD
2	REVERSE
3	LEFT
4	RIGHT
5	ATTENDANT OVERRIDE
6	EMERGENCY STOP/RESET
7	+5V (50 mA max.)
8	COMMON (B-)
9	+15V (500mA)

All driver controls must have normally open contacts with the switch commons connected together. The switch commons connect to pin 8 of the driver control input.

Proportional Attendant Connector

NOTE: The proportional attendant connector is on the 1554M5 only.

The proportional attendant connector is an 8 pin connector for use with the optional PACM5 proportional attendant control.

Sip and Puff (Pneumatic Switch) Input

The Sip and Puff input features a built-in solid state pressure transducer that is highly resistant to internal moisture damage. The transducer provides full drive control input by converting varying amounts of pressure and vacuum, applied through the mouthpiece to electrical signals. The following breath inputs provide driver control:

BREATH INPUT	DRIVER CONTROL
Hard Puff	FORWARD
Soft Puff	RIGHT
Soft Sip	LEFT
Hard Sip	REVERSE

Mounting Precautions and Maintenance

Various mounting methods can be used for the non-proportional input module. Invacare recommends the following:

1. Clear vinyl tubing should always be allowed to droop below the level of the input module to form a saliva trap to indicate when cleaning is required.

△ CAUTION

NEVER allow water to penetrate the input module case as this can result in damage to the internal electronics.

Excessive amounts of saliva residue in the mouth piece can degrade performance.

2. Flush the mouthpiece/breath tube occasionally with clean water to remove any residue. A respiratory saliva trap is recommended.
3. Check for blockages or air leaks if driving problems occur. These conditions can appear to be faults.

Selecting the Driver Input Type

In the PERFORMANCE ADJUST menu the INPUT TYPE? function tells the control module which driving input is to be used to control the wheelchair. The choices are SWITCH JOY for driver controls that are connected to the 9 pin connector and SIP & PUFF for control through a breath tube connected to the pressure transducer input. Use the [↑] or [↓] key to move the selection arrow to the desired input device type.

NOTE: The input type selection must be made for each drive program individually. This feature provides the ability to have two driver input controls for greater flexibility in meeting the needs of individual users. However, for single driver input chairs, failing to make a consistent selection in all drive programs will result in the wheelchair appearing to be inoperable in one or more drives.

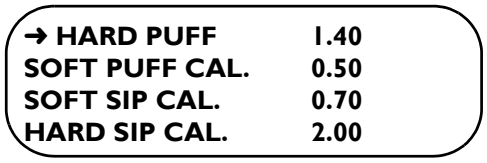
Calibrating the Sip & Puff Pressures

Calibration of the transducer pressure set points is performed under the CALIBRATIONS menu.

1. When the main menu is displayed, move the selection arrow down to CALIBRATIONS.
2. Press the SELECT key.

NOTE: The screen changes to the Calibration menu screen with each adjustable function and its current value. Sip & Puff calibrations are near the bottom of the menu.

3. Move the selection arrow down to point at the function that needs to be adjusted.

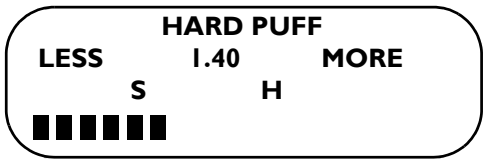


4. Press the SELECT key.

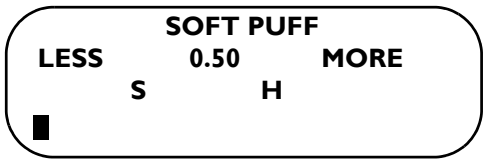
NOTE: The display screen changes to the adjustment screen. The top line shows the function. The second line shows the value. The third line shows the relative position of the function's set point (indicated by a H or S symbol) with respect to the LESS and MORE as well as the position of a related function (indicated by a H or S). At the bottom is a bar graph which shows the current value of pressure or vacuum at the pressure transducer.

5. Press the ↑ or ↓ key to adjust the value.

The screen shown below is an example of the Hard Puff adjustment screen. The top line is the function. The second line gives the value. The third line via the H symbol shows the relative position of the hard puff set point between the LESS and MORE. The "S" shows the relative set point for the Soft Puff. The bottom line shows the pressure being applied to the transducer. In this case it is above the Soft Puff set point and well below the Hard Puff set point.



The next screen shows the Soft Puff adjustment screen. The "S" symbol shows the set point for the Soft Puff and the "H" shows the set point for the Hard Puff. The bottom line shows that no pressure is being applied to the transducer.



The screens for the Soft Sip and Hard Sip are similar except that the bottom scale shows sipping pressure or vacuum at the transducer.

PACM5 Proportional Attendant Control

NOTE: For this procedure, refer to FIGURE 10.8.

The PACM5 proportional attendant control is used in conjunction with the 1554M5 Sip & Puff Switch Input. The proportional joystick provides directional control.

Override and Speed Control Knob

The override and speed control knob is located at the bottom of the proportional attendant control.

1. Rotate the knob clockwise (viewed from the top) to allow normal driver control operation using the main user interface (i.e. Sip & Puff, MPJ Joystick).
2. Rotate the knob counterclockwise to ON. This allows the attendant control to drive the wheelchair using the joystick.

NOTE: The position of the cable attached to the attendant control indicates the Forward direction.

NOTE: The LCD on the display unit will show ATTENDANT when the attendant control is active. The wheelchair will not respond to any user drive commands.Refer to Display Unit on page 42 for more information about the display unit.

3. Rotate the switch further counterclockwise to increase the maximum speed that the wheelchair can be driven.
4. Rotate the switch counterclockwise to the maximum position, and the wheelchair speed is limited to approximately half of the full speed of the wheelchair.

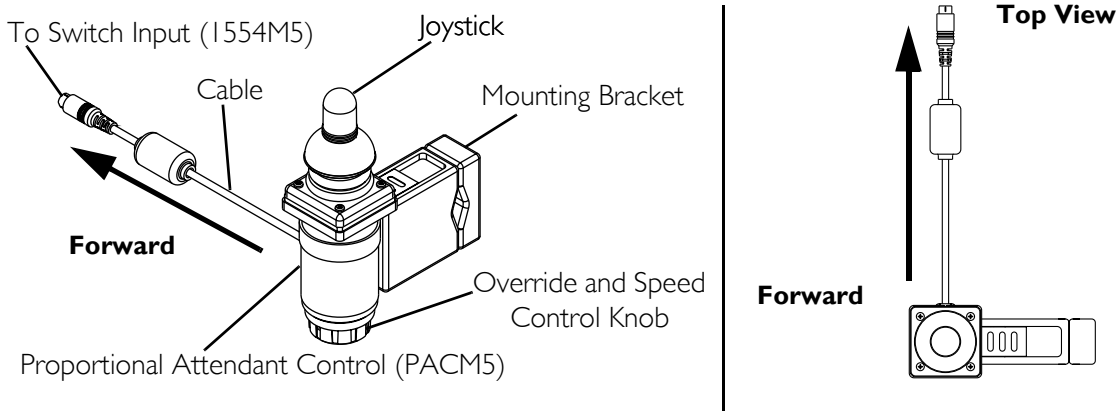


FIGURE 10.8 PACM5 Proportional Attendant Control

1552M Attendant Control

NOTE: For this procedure, refer to FIGURE 10.9.

The 1552M Attendant Switch Control Assembly is used in conjunction with the 1554M4 or 1554M5 Sip & Puff Switch Input. The assembly contains one toggle switch, a four directional switch and a 9 pin D-Subminiature connector that plugs into the 1554M4 or 1554M5 switch input.

On/Off Toggle Switch

The top switch is an ON and OFF toggle switch, which when in the OFF position, the driver control operates normally using the main user interface (i.e. SNP, MPJ Joystick). By moving the switch to the ON position, the Attendant Control can drive the wheelchair using the four directional switch on the 1552M module.

Four Directional Switch

Each position of the directional switch controls the wheelchair in a different direction (for example: Pushing the directional control forward will move the wheelchair forward).

PIN	DESIGNATION
1	Forward
2	Reverse
3	Left
4	Right
5	Attendant Override
6	N.C.
7	N.C.
8	Interface Common
9	N.C.

When used in conjunction with either the MK5 MPJ Joystick or the MK5 Display, the LCD will display the message ATTENDANT on the LCD itself. In the attendant mode, the control speed is limited to a fixed non-programmable low speed setting, less then 2 mph and will NOT respond to any other driver control commands.

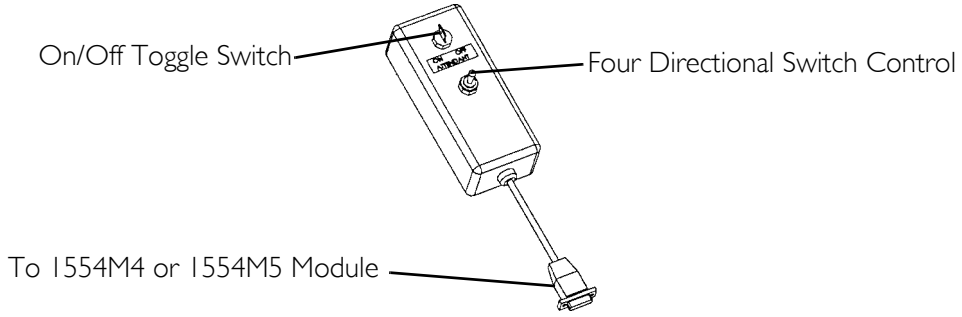


FIGURE 10.9 1552M Attendant Control

1556m Heavy Duty Joystick

NOTE: For this procedure, refer to FIGURE 10.10.

The Model 1556M Heavy Duty Joystick is a non-proportional control intended to be used with the Model 1554M4 or 1554M5 Sip & Puff Switch Input as a driver control in applications where inductive type joysticks cannot be utilized. The Heavy Duty Joystick connects to the 1554M4 or 1554M5 Switch Input via a 9 pin female D-Subminiature connector.

Using the Heavy Duty Joystick

To use the Heavy Duty Joystick, the MK5 Controller must be programmed to accept the non-proportional input option.

1. Enter the Performance Adjust Menu via the Remote Programmer.
2. Select the desired "Drive" (Drive 1, Drive 2, etc.).
3. Scroll down to the "INPUT TYPE?" message.
4. Select "SJOY" as the input driver control.
5. Press "SAVE" twice. This will allow the heavy duty joystick to be used in the Drive Selected.

NOTE: Refer to Display Unit on page 42 and 1554M5 or 1554M4 Sip & Puff Switch Input on page 49 for more information.

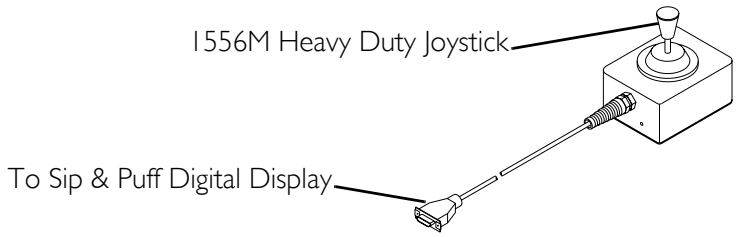


FIGURE 10.10 1556m Heavy Duty Joystick

AUX12 Eight Output Electronic Communications Module

NOTE: For this procedure, refer to FIGURE 10.11.

The COM12 has two (2) banks of four (4) outputs which can be controlled from the driver input device using the MPJ joystick or Display Unit. COM12 consists of an ECU card installed into Slot 1 and Slot 2.

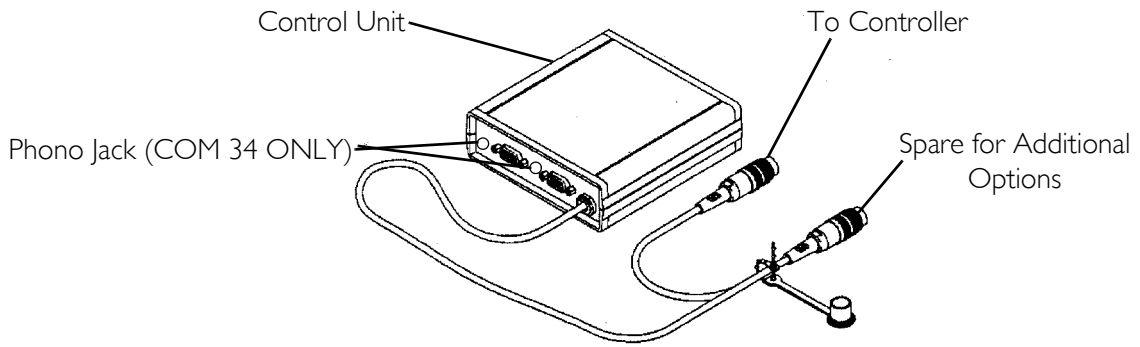


FIGURE 10.11 AUX12 Eight Output Electronic Communications Module

AUX34 Ten Output Electronic Communications Module

The COM34 has two (2) banks of five (5) outputs which can be controlled from the driver input device using the MPJ joystick or Display Unit. The fifth output is controlled by an ability switch (not supplied) that plugs into the phono jack next to the output connector.

ECU1 and ECU2

The first and second banks of four (4) outputs are referred to as ECU1 and ECU2 respectively. They can be programmed through the Remote programmer to be disabled (OFF), operate motor control input in momentary (MMTR) or latched mode (LTCH) or serve as a communications interface (COMM) for computers or communications aids.

ECU3 and ECU4

The third and fourth banks of five (5) outputs are referred to as ECU3 and ECU4 respectively. They can be programmed through the Remote programmer to be disabled (OFF), operate motor control input in momentary (MMTR) or latched mode (LTCH) or serve as a communications interface (COMM) for computers or communications aids.

Connector Description

Each Environmental Control Output connector is fed by four normally open relay contacts. Each contact is rated for a maximum of 0.2A at 120VAC or 0.5A at 24VDC. The COMMON for each connector is isolated from the wheelchair circuitry and from each other to 500VAC. The connectors on the ECU cards are female 9 pin D-Subminiature connectors:

PIN	DESIGNATION
1	FORWARD
2	REVERSE
3	LEFT

PIN	DESIGNATION
4	RIGHT
5	N.C. (COM12) Phono Jack (COM34)
8	COMMON
6,7,8	N.C.

MK5 Tilt, Recline and Elevate Control Module (TRECM)

NOTE: For this procedure, refer to FIGURE 10.12.

The MK5 TRECM (Tilt, Recline and Elevate Control Module) is a programmable actuator control which can operate up to five actuators of a full Tilt/Recline/Elevate/Power Leg system. Programming is performed with the MKIV™ Remote Programmer. Each actuator can be independently programmed for up speed or down speed. Actuators can be activated from a MK5 driver control or an independent user switch. Each of four switches can be assigned an actuator routine, as shown in the following table:

SWITCHES	SAMPLE ACTUATOR ROUTINE
Forward	Tilt Up
Reverse	Tilt Down
Left	Elevate
Right	Recline

Tilt and recline angle limits are adjustable. The TRECM has enhanced troubleshooting capability. Through the MKIV Remote Programmer, the TRECM can display the current status of all critical functions, such as actuator connections, limits and switches. Programming and troubleshooting can be performed remotely via the Invacare Laptop IVS Software.

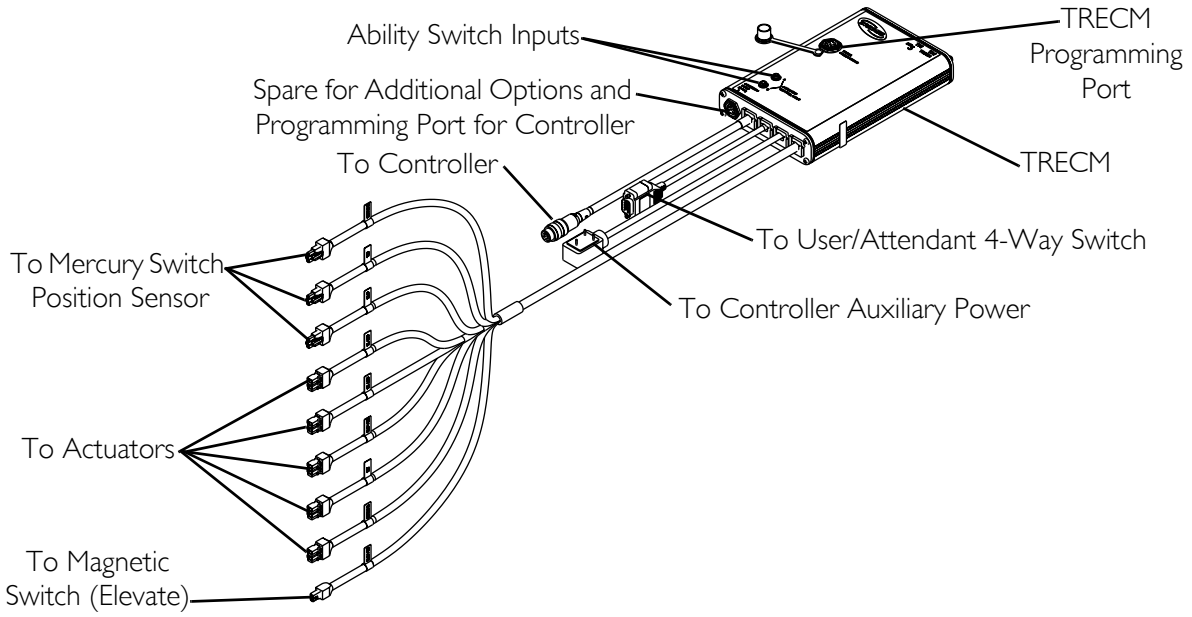


FIGURE 10.12 MK5 Tilt, Recline and Elevate Control Module (TRECM)

Programming the TRECM

Programming is performed with the MKIV Remote Programmer plugged directly into 5 pin connector in the case of the TRECM. The function of the display and keys of the Remote Programmer are given in Remote Programmer on page 18. When the programmer is turned on, the display shows the introduction screen and the version number of the TRECM software. After two seconds the main screen is displayed.

DRIVE LOCKOUT
ACTUATOR SELECTION
➜ ADVANCED MENU

Selecting the Advanced Menu will display:

➜ PERFORMANCE ADJUST
STANDARD PROGRAMS
ACTUATOR SELECTION
CURRENT STATUS

TRECM Performance Adjust Menu Description

MENU ITEM	DESCRIPTION
TILT UP SPEED	Adjusts the speed that the Tilt Actuator moves the seat toward the upright position.
TILT DOWN SPEED	Adjusts the speed that the Tilt Actuator moves the seat into the tilted position.
RECLINE UP SPEED	Adjusts the speed that the Recline Actuator moves the back into the upright position.
RECLINE DOWN SPEED	Adjusts the speed that the Recline Actuator moves the back into the reclined position.
ELEVATE UP SPEED	Not adjustable - 100%.
ELEVATE DOWN SPEED	Not adjustable - 100%.
LEG UP SPEED	Adjusts the speed that the power leg actuators extend the legrests.
LEG DOWN SPEED	Adjusts the speed that the power leg actuators retract the legrests.
LEGREST BALANCE	Adjusts the speed balance between left and right legrest actuators.
ACCELERATION	Adjusts the rate that all of the actuators approach their respective programmed speeds (Start up speed).
DECELERATION	Adjusts the rate that all of the actuators are brought to a stop (Braking speed.).
D/L BY DRIVE	Turns drive lock-out on or off for a chosen drive. **⚠ WARNING** **When drive lock-out is programmed OFF the wheelchair can be driven at any tilt/recline angle. The drive lock-out safety feature will be disabled for the drive that has been programmed OFF. It is recommended that drive lock-out only be turned off in a chosen drive for special driving situations.**

TRECM Standard Programs Menu Description

There are four standard programs. The standard programs are used to initially set up a wheelchair or bring all programmable parameters back to a known setting.

PROGRAM	MENU ITEM	DESCRIPTION
TILT-RECLINE-ELEV		
	FORWARD	Tilt Up/Down
	REVERSE	Recline + Power Legs Up/Down
	LEFT	Elevate Up/Down
	RIGHT	Power Legs Up/Down
TILT/RECLINE UP & DOWN		
	FORWARD	Recline + Power Legs Up
	REVERSE	Recline + Power Legs Down
	LEFT	Tilt Up
	RIGHT	Tilt Down
RECLINE ONLY		
	FORWARD	Recline + Power Legs Up
	REVERSE	Recline + Power Legs Down
	LEFT	Power Legs Up/Down
	RIGHT	Power Legs Up/Down
TILT ONLY		
	FORWARD	Tilt Up
	REVERSE	Tilt Down
	LEFT	OFF
	RIGHT	OFF

TRECM Actuator Selection Menu Description

The actuator selection menu allows individual setting of the actuators which will be activated with the four switch controls or the driver control. The four switches are designated Forward, Reverse, Left, Right and correlate to the four driving directions on the driver control. Each switch can be programmed to perform any of the following actuator functions. When designated as UP/DOWN, the function is toggling. Activating an actuator will move it UP first, after stopping for one second and activating an actuator, it will move in the DOWN direction.

MENU ITEM	DESCRIPTION
OFF	Disables all actuators in the direction selected.
TILT UP/DOWN	Enables the Tilt Actuator with the toggling function.
RECLINE UP/DOWN	Enables the Recline actuator with the toggling function.
ELEVATE UP/DOWN	Enables the Elevate actuator with the toggling function.
LEGREST UP/DOWN	Enables the Left and Right Legrest Actuators with the toggling function.
RECLINE & LEG UP/DOWN	Enables the Recline, Left Legrest and Right Legrest with the toggling function.
TILT UP	Enables the Tilt Actuator for bringing the seat to the upright position.
TILT DOWN	Enables the Tilt Actuator for tilting back the seat.
RECLINE UP	Enables the Recline and Power Leg Actuators to raise the seat back to the upright position.
RECLINE DOWN	Enables the Recline and Power Leg Actuators to move the seat back to the reclined position.
ELEVATE UP	Enables the Elevate actuator for moving upward.
ELEVATE DOWN	Enables the Elevate actuator for moving downward.
LEFT LEG UP	Enables the Left Legrest actuator to extend the legrest.

MENU ITEM	DESCRIPTION
LEFT LEG DOWN	Enables the Left Legrest actuator to retract the legrest.
RIGHT LEG UP	Enables the Right Legrest actuator to extend the legrest.
RIGHT LEG DOWN	Enables the Right Legrest actuator to retract the legrest.
LEFT LEG UP/DOWN	Enables the Left Legrest actuator with the toggling function.
RIGHT LEG UP/DOWN	Enables the Right Legrest actuator with the toggling function.

TRECM Current Status Menu Description

This screen shows the status of all major inputs and outputs of the TRECM. It is used as a diagnostics tool to determine causes for electrical malfunctions of the Tilt/Recline/Elevate system.

MENU ITEM	DESCRIPTION
ACTUATOR STATUS	The first 5 lines of the Current Status screen shows connection state of the actuators (Tilt, Recline, Elevate, Left Leg and Right Leg). If the connection to the actuator is correct, it will be indicated as OK. A disconnected actuator (or one that is not present in the system) will be shown as OPEN. The state of the connection is tested approximately every two seconds. Connecting an open connector to an actuator will change the indicated state to OK. *NOTE: If a command is given to move the seat and it starts moving but then stops immediately, the motor may be getting hot. HOT will be displayed if the actuator has been running under a heavy load for a long period of time. This feature keeps the motor from overheating. Allow the actuator to cool down for about five (5) minutes; the display will show OK once the motor has cooled down.*
24V POWER	Shows the state of the battery connection for power to the TRECM. The actuators will not function unless the battery connection is made.
TILT LIMIT SWITCH	Tests the connection to the Tilt position limit switch. If connected, the indication will be OK. If the connection is not made, the indication will be OPEN. If the indication is OPEN on the Tilt Limit Switch AND the Recline Limit Switch, the system WILL NOT function.
RECLINE LIMIT SWITCH	Tests the connection to the Recline position limit switch. If connected, the indication will be OK. If the connection is not made, the indication will be OPEN. If the indication is OPEN on the Tilt Limit Switch AND the Recline Limit Switch, the system WILL NOT function.
ELEVATE LIMIT SWITCH	Tests the connection to the Elevate position limit switch. If connected, the indication will be OK. If the connection is not made, the indication will be OPEN. If the indication is OPEN on the Tilt Limit Switch, Recline Limit Switch, and the Elevate Limit Switch, the system WILL NOT function.
DRIVE LOCKOUT	Shows the status of the drive lockout limit switch. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
TILT DOWN LIMIT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
RECLINE DOWN LIMIT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
FORWARD SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
REVERSE SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
LEFT SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
RIGHT SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.

MENU ITEM	DESCRIPTION
MK5 COMM LINK	Shows the status of the communications link to the MK5 control module between the MPJ or DPJ joysticks. OK indicates communication has been established. UNKWN indicates that control has not given a command to the TRECM. Controls provided by separate 4 way switch will not be recognized BAD indicates chip failure, loose connection, or other issue in the TRECM.

MK5 Tilt and Recline Control Module (TRCM)

NOTE: For this procedure, refer to FIGURE 10.13.

The MK5 TRCM (Tilt Recline Control Module) is a programmable actuator control which can operate up to five actuators of a full Tilt/Recline/VSR/Power Leg system. Programming is performed with the MKIV Remote Programmer. Each actuator can be independently programmed for up speed or down speed. Actuators can be activated from a MK5 driver control or an independent user switch. Each of four switches (Forward, Reverse, Left and Right) can be assigned an actuator routine (e.g. Tilt Up). Tilt and recline angle limits are also programmable. The TRCM has enhanced troubleshooting capability. Through the MKIV Remote Programmer, the TRCM can display the current status of all critical functions, such as actuator connections, limits and switches. Programming and troubleshooting can be performed remotely via the Invacare Virtual Service modem kit.

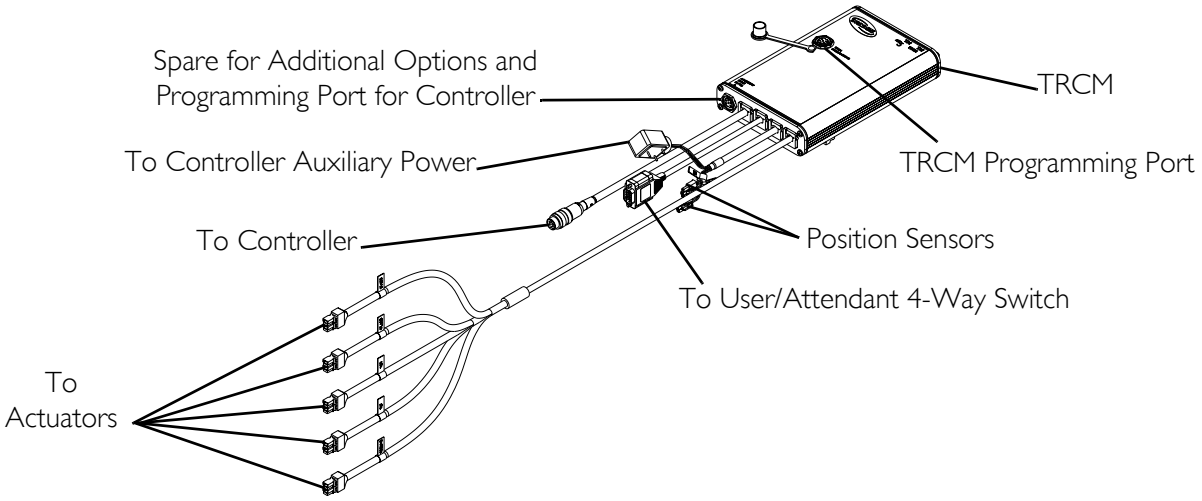


FIGURE 10.13 MK5 Tilt and Recline Control Module (TRCM)

Programming the TRCM

Programming is performed with the MKIV Remote Programmer plugged directly into 5 pin connector in the case of the TRCM. The function of the display and keys of the Remote Programmer are given in Remote Programmer on page 18. When the programmer is turned on, the display shows the introduction screen and the version number of the TRCM software. After two seconds the main screen is displayed.

DRIVE LOCKOUT
ACTUATOR SELECTION
→ ADVANCED MENU

Selecting the Advanced Menu will display:

➜ PERFORMANCE ADJUST
STANDARD PROGRAMS
ACTUATOR SELECTION
CURRENT STATUS

TRCM Performance Adjust Menu Description

MENU ITEM	DESCRIPTION
TILT UP SPEED	Adjusts the speed that the Tilt Actuator moves the seat toward the upright position.
TILT DOWN SPEED	Adjusts the speed that the Tilt Actuator moves the seat into the tilted position.
RECLINE UP SPEED	Adjusts the speed that the Recline Actuator moves the back into the upright position.
RECLINE DOWN SPEED	Adjusts the speed that the Recline Actuator moves the back into the reclined position.
VSR UP SPEED (2G)	Adjusts the speed that the Vernier Shear Reduction (VSR) actuator moves upward.
VSR DOWN SPEED (2G)	Adjusts the speed that the VSR actuator moves downward.
LEG UP SPEED	Adjusts the speed that the power leg actuators extend the legrests.
LEG DOWN SPEED	Adjusts the speed that the power leg actuators retract the legrests.
LEGREST BALANCE	Adjusts the speed balance between left and right legrest actuators.
ACCELERATION	Adjusts the rate that all of the actuators approach their respective programmed speeds (Start up speed).
DECELERATION	Adjusts the rate that all of the actuators are brought to a stop (Braking speed).
LIMIT SELECTION	There are two types of limits. Potentiometers are capable of measuring seat angles directly. Switches are mercury switches which are mechanically adjusted to provide the limit function. Select the type of limit that is installed on the seating system; POT for potentiometer or M.Sw for mercury switches. If POT limit type was selected, there are five limit angles which can be adjusted. All angles are measured from horizontal being 0°.
DRIVE LOCKOUT LIMIT	Adjusts the maximum angle that the back can be tilted or reclined and still allow driving of the wheelchair. In Tilt only systems, the back angle is assumed to be 90° greater than the seat angle. Range 90° - 110°.
D/L BY DRIVE	Turns drive lock-out on or off for a chosen drive. **⚠ WARNING** **When drive lock-out is programmed OFF the wheelchair can be driven at any tilt/recline angle. The drive lock-out safety feature will be disabled for the drive that has been programmed OFF. It is recommended that drive lockout only be turned off in a chosen drive for special driving situations.**
TILT UP LIMIT	Adjusts the angle that the Tilt Actuator will stop when moving to the upright position. Range 0° - 50°.
TILT DOWN LIMIT	Adjusts the angle that the Tilt Actuator stops tilting back the seat. Range 0° - 50°.
RECLINE UP LIMIT	Adjusts the back angle at which the Recline Actuator will stop raising the seat back to the upright position. Range 90° - 170°.
RECLINE DOWN LIMIT	Adjusts the maximum reclined back angle for the Recline Actuator. Range 90° - 170°.

TRCM Standard Programs Menu Description

There are four standard programs. The standard programs are used to initially set up a wheelchair or bring all programmable parameters back to a known setting.

PROGRAM	MENU ITEM	DESCRIPTION
TILT-RECLINE-VSR-LEGS (2G)		
	FORWARD	Tilt Up/Down
	REVERSE	Recline + VSR + Power Legs Up/Down
	LEFT	VSR Up/Down
	RIGHT	Power Legs Up/Down
TILT/RECLINE UP & DOWN (2G)		
	FORWARD	Recline + VSR + Power Legs Up
	REVERSE	Recline + VSR + Power Legs Down
	LEFT	Tilt Up
	RIGHT	Tilt Down
RECLINE ONLY (2G)		
	FORWARD	Recline + VSR + Power Legs Up
	REVERSE	Recline + VSR + Power Legs Down
	LEFT	Power Legs Up/Down
	RIGHT	Power Legs Up/Down
TILT ONLY		
	FORWARD	Tilt Up
	REVERSE	Tilt Down
	LEFT	Off
	RIGHT	Off

TRCM Actuator Selection Menu Description

The actuator selection menu allows individual setting of the actuators which will be activated with the four switch controls or the driver control. The four switches are designated Forward, Reverse, Left, Right and correlate to the four driving directions on the driver control. Each switch can be programmed to perform any of the following actuator functions. When designated as UP/DOWN, the function is toggling. Activating an actuator will move it UP first, after stopping for one second and activating an actuator, it will move in the DOWN direction.

MENU ITEM	DESCRIPTION
OFF	Disables all actuators in the direction selected.
TILT UP/DOWN	Enables the Tilt Actuator with the toggling function.
RECLINE UP/DOWN	Enables the Recline and VSR Actuators with the toggling function.
VSR UP/DOWN (2G)	Enables the VSR actuator with the toggling function.
LEGREST UP/DOWN	Enables the Left and Right Legrest Actuators with the toggling function.
RECLINE & LEG UP/DOWN	Enables the Recline, VSR, Left Legrest and Right Legrest with the toggling function.
TILT UP	Enables the Tilt Actuator for bringing the seat to the upright position.
TILT DOWN	Enables the Tilt Actuator for tilting back the seat.
RECLINE UP	Enables the Recline, VSR and Power Leg Actuators to raise the seat back to the upright position.
RECLINE DOWN	Enables the Recline, VSR and Power Leg Actuators to move the seat back to the reclined position.
VSR UP (2G)	Enables the VSR actuator for moving upward.
VSR DOWN (2G)	Enables the VSR actuator for moving downward.
LEFT LEG UP	Enables the Left Legrest actuator to extend the legrest.
LEFT LEG DOWN	Enables the Left Legrest actuator to retract the legrest.
RIGHT LEG UP	Enables the Right Legrest actuator to extend the legrest.
RIGHT LEG DOWN	Enables the Right Legrest actuator to retract the legrest.
LEFT LEG UP/DOWN	Enables the Left Legrest actuator with the toggling function.
RIGHT LEG UP/DOWN	Enables the Right Legrest actuator with the toggling function.

TRCM Current Status Menu Description

This screen shows the status of all major inputs and outputs of the TRCM. It is used as a diagnostics tool to determine causes for electrical malfunctions of the Tilt/Recline system.

MENU ITEM	DESCRIPTION
ACTUATOR STATUS	The first 5 lines of the Current Status screen shows connection state of the actuators (Tilt, Recline, VSR, Left Leg and Right Leg). If the connection to the actuator is correct, it will be indicated as OK. A disconnected actuator (or one that is not present in the system) will be shown as OPEN. The state of the connection is tested approximately every two seconds. Connecting an open connector to an actuator will change the indicated state to OK. *NOTE: If a command is given to move the seat and it starts moving but then stops immediately, the motor may be getting hot. HOT will be displayed if the actuator has been running under a heavy load for a long period of time. This feature keeps the motor from overheating. Allow the actuator to cool down for about five (5) minutes; the display will show OK once the motor has cooled down.*
24V POWER	Shows the state of the battery connection for power to the TRCM. The actuators will not function unless the battery connection is made.

MENU ITEM	DESCRIPTION
TILT LIMIT POT/M.SW	Tests the connection to the Tilt position potentiometer or the drive lock-out mercury switch. If connected, the indication will be OK. If the connection is not made, the indication will be OPEN. If the indication is OPEN on the Tilt Limit Pot/M.Sw AND the Recline Limit Pot/M.Sw, the system WILL NOT function.
RECLINE LIMIT POT/M.SW	Tests the connection to the Recline position potentiometer or the down limit switch. If connected, the indication will be OK. If the connection is not made, the indication will be OPEN. If the indication is OPEN on the Tilt Limit Pot/M.Sw AND the Recline Limit Pot/M.Sw, the system WILL NOT function.
DRIVE LOCKOUT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
TILT DOWN LIMIT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
TILT UP LIMIT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
RECLINE UP LIMIT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
RECLINE DOWN LIMIT	Shows the status of the limit as programmed in the Performance Menu. If the limit has been reached, the status will be TRUE. If the seat or back is not at a limit, the status will be FALSE.
TILT ANGLE	Shows the actual angle of the seat in degrees as measured by the Tilt potentiometer.
RECLINE ANGLE	Shows the actual angle of the back as measured by the Recline potentiometer.
FORWARD SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
REVERSE SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
LEFT SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
RIGHT SWITCH	Shows the state of each of the user/attendant switch inputs. When the switch is released, it will show OFF. When activated, it will show ON.
MK5 COMM LINK	Shows the status of the communications link to the MK5 control module between the MPJ or DPJ joysticks. OK indicates communication has been established. UNKWN indicates that control has not given a command to the TRCM. Controls provided by separate 4 way switch will not be recognized BAD indicates chip failure, loose connection, or other issue in the TRCM.

MK5 Two Actuator Controller (TAC)

NOTE: For this procedure, refer to FIGURE 10.14.

The MK5 TAC (Two Actuator Control) is a programmable actuator control which can operate two actuators for use on the following seating systems: Tilt Only, Recline Only, Power Legrests Only, Tilt with Elevate and Elevate Only.

Programming is performed with the MKIV Remote Programmer. Each actuator can be independently programmed for up speed or down speed. Actuators can be activated from a MK5 driver control, an independent user switch (4-Way Switch Box) or user defined switches through the A/B phono jacks. Each of the four switches (Forward (A), Reverse (B), Left and Right) can be assigned an actuator routine (e.g. Tilt Up). Tilt and/or recline angle limits are also programmable. The TAC has enhanced troubleshooting capability. Through the MKIV Remote Programmer, the TAC can display the current status of all critical functions, such as actuator connections, limits and switches. Programming and troubleshooting can be performed remotely via the Invacare Virtual Service modem Kit.

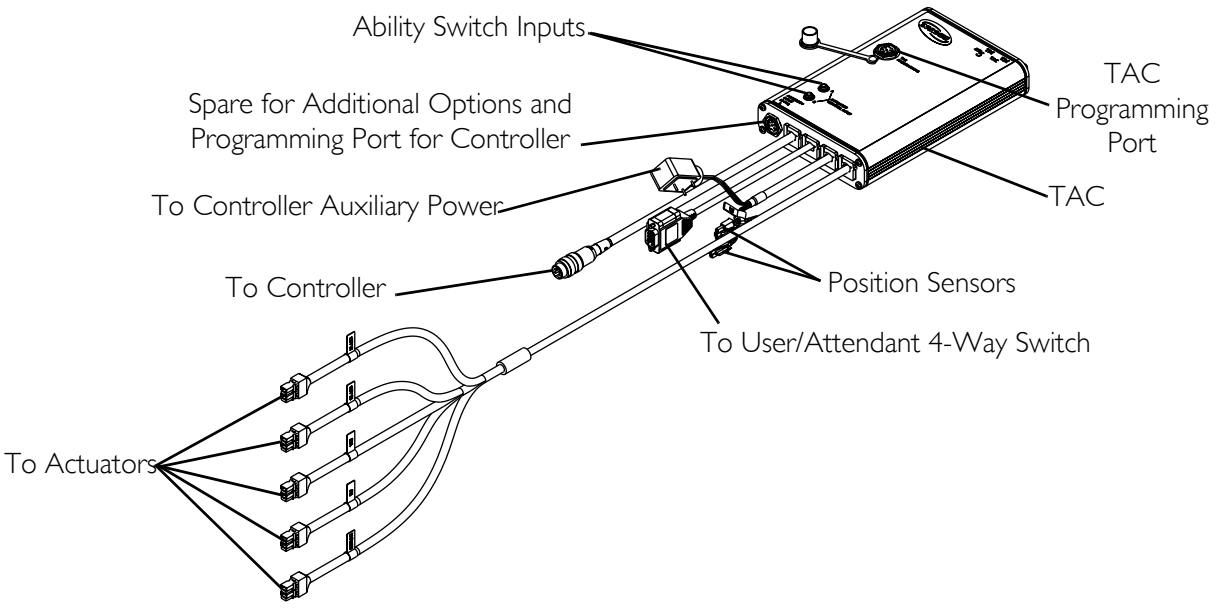


FIGURE 10.14 MK5 Two Actuator Controller (TAC)

Programming the TAC

Programming is performed with the MKIV Remote Programmer plugged directly into the 5 pin connector on the case of the TAC. The function of the display and keys of the Remote Programmer are given in Remote Programmer on page 18. When the programmer is turned on, the display shows the introduction screen and the version number of the TAC software. After two seconds the main menu screen is displayed.

DRIVE LOCKOUT
ACTUATOR SELECTION
➜ ADVANCED MENU

Selecting the Advanced Menu will display:

➜ SYSTEM TYPE
PERFORMANCE ADJUST
ACTUATOR SELECTION
CURRENT STATUS
CALIBRATIONS

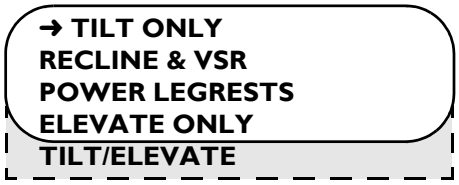
NOTE: The display will only show four lines at a time; therefore CALIBRATIONS will not be seen until the selection arrow reaches the bottom of the screen and the menu starts to scroll.

TAC System Type Menu Description

Selecting System Type from the main menu will display the System Type Menu. The system type need only be set once for the configuration of the wheelchair.

NOTE: The system type that is selected will be the one that the selection arrow is pointing at upon exiting the System Type Menu. However, the system type will not be saved to User Memory until the save key is pressed.

The system type must be the first selection made when programming the control since all other menus will change to correspond to the system type selected.



TAC Performance Adjust Menu Description

SYSTEM TYPE	MENU ITEMS
TILT ONLY SYSTEM	
	TILT UP SPEED
	TILT DOWN SPEED
	ACCELERATION
	DECELERATION
	LIMITS TYPE
	DRIVE LIMIT ANGLE/DRIVE LOCKOUT
	TILT UP LIMIT
	TILT DOWN LIMIT
RECLINE & VSR SYSTEM (2G)	
	RECLINE UP SPEED
	RECLINE DOWN SPEED
	VSR UP SPEED
	VSR DOWN SPEED
	ACCELERATION
	DECELERATION
	LIMITS TYPE
	DRIVE LIMIT ANGLE/DRIVE LOCKOUT
	RECLINE UP LIMIT
	RECLINE DOWN LIMIT
POWER LEGRESTS SYSTEM	
	LEG UP SPEED
	LEG DOWN SPEED
	LEGREST BALANCE
	ACCELERATION
	DECELERATION
ELEVATE ONLY SYSTEM	
	There are no performance adjustments necessary for an elevate only system.

SYSTEM TYPE	MENU ITEMS
TILT/ELEVATE SYSTEM	
	TILT UP SPEED
	TILT DOWN SPEED
	ACCELERATION
	DECELERATION
	LIMITS TYPE
	DRIVE LOCKOUT
Refer to TRCM Performance Adjust Menu Description on page 61 for a description of each performance function	

TAC Actuator Selection Menu Description

Refer to TRCM Actuator Selection Menu Description on page 63 for a description of the Actuator Selection Menu.

TAC Current Status Menu Description

Refer to TRCM Current Status Menu Description on page 63 for a description of the Current Status Menu.

MK5 Single Actuator Control (SAC)

NOTE: For this procedure, refer to FIGURE 10.15.

The MK5 SAC is a single output actuator that can be controlled from the driver control or a single ability switch (not supplied). When attached to the MK5 system, SAC - Single Actuator Controller will appear in the Performance Menu and provide the programming features of the SAC. Note the DPJ joystick has no programmable actuator functions.

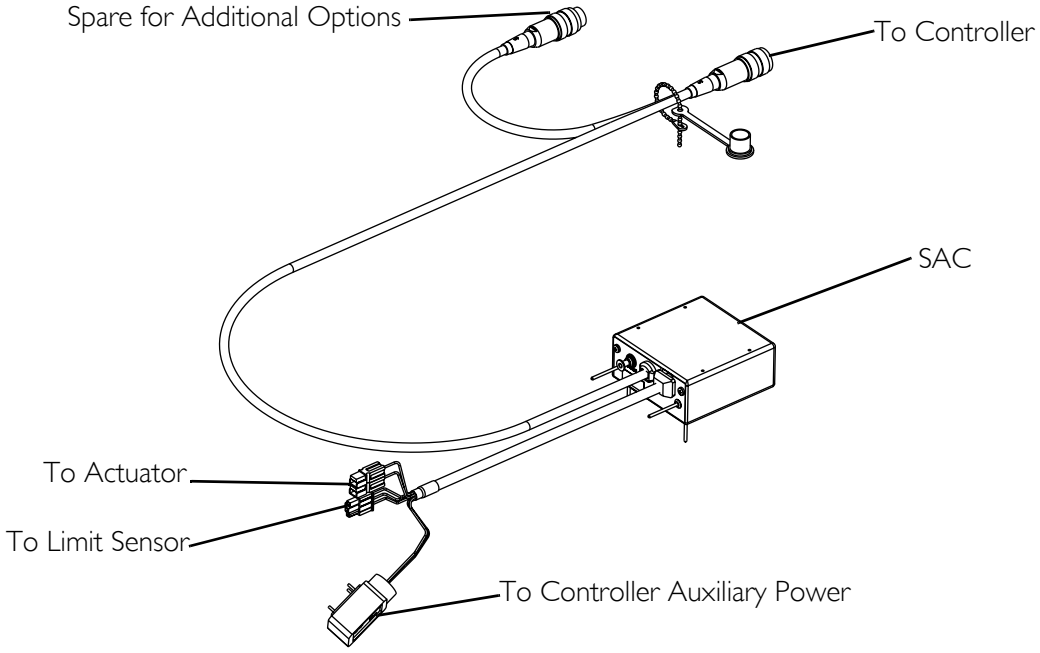


FIGURE 10.15 MK5 Single Actuator Control (SAC)

Operation through the joystick or driver control:

DRIVER COMMAND	ACTUATOR MOTION
Forward/Right	UP
Reverse/Left	DOWN
Neutral	STOP

Operation with a separate ability switch: The SAC performs a toggling function with each activation of the switch. The first activation causes the actuator to move. Release the switch for more than one second and activate the switch, the actuator will move in the opposite direction.

Lockout

Lockout is for Tilt and Recline systems. When the seat is tilted or reclined beyond the factory preset lockout limit, drive lockout will be engaged and the wheelchair cannot be driven.

Slow

Slow is for elevating seats. When the seat is raised, the slowdown function is engaged and the wheelchair can be driven, but only at a reduced speed.

SECTION 11—CALIBRATING POTENTIOMETERS

NOTE: This procedure applies to 2G Tarsys® Powered Seating Systems only.

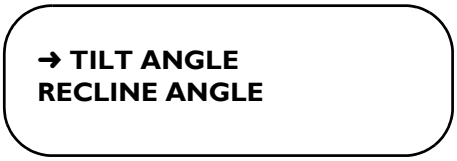
Preparing to Calibrate Potentiometers

This screen allows you to calibrate the tilt and recline position feedback sensors (potentiometers). **The potentiometers are adjusted at the factory, so this calibration should only be necessary if a potentiometer or TRCM/TAC Controller is damaged and must be replaced.**

1. Rotate the potentiometer shaft completely clockwise (looking at the end of the shaft).
2. Rotate the shaft counterclockwise no more than 1/8 turn.
3. Tighten the set screw. The TRCM/TAC may now be calibrated using the Remote Programmer.

Potentiometer Calibration for 2GTR Systems

1. Select CALIBRATIONS from the main menu. The calibrations menu will be displayed.



2. Select the menu item that corresponds to the potentiometer to be adjusted. The up angle adjustment screen will then be displayed.

Tilt Angle Potentiometer Calibration

1. Position the seat back in the fully upright position.
2. Using a protractor or angle pitch calculator, measure the actual angle of the seat with respect to the floor. This measurement should will range from 0° to 10°.
3. Adjust the tilt up angle setting on the programmer to the measured angle.
4. Press the SELECT key on the programmer to proceed to the tilt down adjustment screen.

5. Tilt the seat until the measured angle is approximately 50° and adjust the tilt down angle setting on the programmer to the measured angle. The range is 45° to 55°.

6. Press the SAVE key on the programmer to store both the up and down angle adjustments in the user memory.

TILT DOWN ANGLE
50
PRESS SAVE
TO SET ANGLES

Recline Angle Potentiometer Calibration

1. Position the seat back in the fully upright position.
2. Using a protractor or angle pitch calculator, measure the actual angle of the back with respect to the seat pan. This measurement will range from 85° to 95°.
3. Adjust the recline up angle setting on the programmer to the measured angle.
4. Press the SELECT key on the programmer to proceed to the recline down adjustment screen.

RECL UP ANGLE
90
PRESS SAVE
TO CONTINUE

⚠ WARNING

If the wheelchair is equipped with a vent tray, the head rest MUST be removed before reclining the seat.

5. Recline the seat back until their is a ¼-inch gap between the VSR shroud and the rear shroud.
6. Using a protractor or angle pitch calculator, measure the actual angle of the back with respect to the seat pan. This measurement will range from 165° to 175°.
7. Adjust the recline down angle setting on the programmer to the measured angle.
8. Press the SAVE key on the programmer to store both the up and down angle adjustments in the user memory.

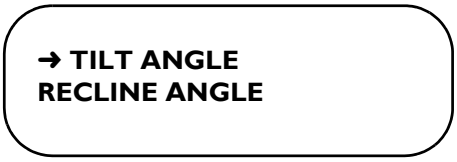
RECL DOWN ANGLE
170
PRESS SAVE
TO SET ANGLES

9. After calibrating the potentiometers check the actual tilt and recline angle readings on the CURRENT STATUS screen to verify the calibration was successful.

10. One of the following may occur:
    A. Calibration was successful.
    B. Calibration was unsuccessful. If an error occurred during the calibration procedure an E06 or E07 warning message will scroll across the bottom of the programmer screen and the calibration values in user memory will be restored. Perform the following:
        i. Try the calibration procedure again.
        ii. If the warning message does not go away contact Invacare Technical Service for assistance.

Potentiometer Calibration for 2GT Systems

1. Select CALIBRATIONS from the main menu. The calibrations menu will be displayed.



2. Select the menu item that corresponds to the potentiometer to be adjusted. The up angle adjustment screen will then be displayed.

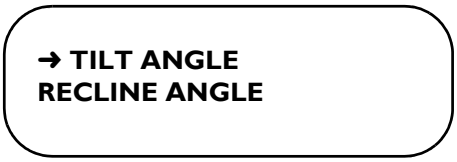
Tilt Angle Potentiometer Calibration

1. Position the seat back in the fully upright position.
2. Using a protractor or angle pitch calculator, measure the actual angle of the seat with respect to the floor. This measurement should will range from 0° to 10°.
3. Adjust the tilt up angle setting on the programmer to the measured angle.
4. Press the SELECT key on the programmer to proceed to the tilt down adjustment screen.

5. Tilt the seat until the measured angle is approximately 50°.
6. Adjust the tilt down angle setting on the programmer to the measured angle. The range is 45° to 55°.
7. Then press the SAVE key on the programmer to store both the up and down angle adjustments in the user memory.

Potentiometer Calibration for 2GR Systems

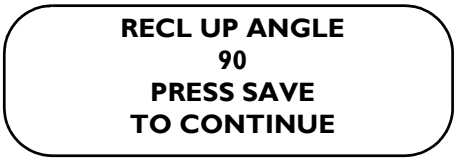
1. Selecting CALIBRATIONS from the main menu. The calibrations menu will be displayed.



2. Select RECLINE ANGLE. The recline up angle adjustment screen will then be displayed.

Recline Angle Potentiometer Calibration

1. Position the seat back in the fully upright position.
2. Using a protractor or angle pitch calculator, measure the actual angle of the back with respect to the seat pan. This measurement will range from 85° to 95°.
3. Adjust the recline up angle setting on the programmer to the measured angle.
4. Press the SELECT key on the programmer to proceed to the recline down adjustment screen.



⚠ WARNING

If the wheelchair is equipped with a vent tray, the head rest MUST be removed before reclining the seat.

5. Recline the seat back until their is a ¼-inch gap between the VSR shroud and the rear shroud.
6. Using a protractor or angle pitch calculator, measure the actual angle of the back with respect to the seat pan. This measurement will range from 165° to 175°.
7. Adjust the recline down angle setting on the programmer to the measured angle.
8. Press the SAVE key on the programmer to store both the up and down angle adjustments in the user memory.

SECTION 12—CONNECTOR DESCRIPTIONS

Driver Control Input Connector (1554M4 or 1554M5)

The connector is a male 9-pin D-Subminiature connector:

PIN	DESIGNATION
1	FORWARD
2	REVERSE
3	LEFT
4	RIGHT
5	ATTENDANT OVERRIDE
6	EMERGENCY STOP/RESET
7	+5V (50 mA MAX.)
8	COMMON (B-)
9	+15V (500mA max.)

All driver controls must have normally open contacts with the switch commons connected together. The switch commons connect to pin 8 of the driver control input.

Environmental Control Outputs - ECU 1, 2, 3 and 4

Each Environmental Control Output connector is fed by four normally open relay contacts. Each contact is rated for a maximum of 0.2A at 120VAC or 0.5A at 24 VDC. The COMMON for each connector is isolated from the wheelchair circuitry and from each other to 500VAC. The connectors on the ECU board are female 9-pin D-Subminiature connectors:

PIN	DESIGNATION
1	FORWARD
2	REVERSE
3	LEFT
4	RIGHT
5	N.C. (COM12) or Phono Jack (COM34)
8	COMMON
6,7,9	N.C.

Emergency Stop/Reset Switch

The emergency stop/reset switch is used to stop the wheelchair and to select the operating mode for the wheelchair. The input is located on the controller next to the joystick input. An emergency stop/reset switch is needed whenever any of the following operating modes are programmed:

- Environmental Controls (E.C.U.)
- 3 Speed Mode in Momentary
- Latched Modes
- Pneumatic Control
- Stand-by Mode
- RIM Control
- Remote Drive Selection Mode
- Information Center Display Selection (does not require Reset activation at power up)

If any of the above modes are selected, the control will require activation of the switch immediately after the power switch is turned on in order to enter the drive mode. The second line of the LCD will display - PRESS RESET.

Emergency Stop/Reset Input

NOTE: For this procedure, refer to FIGURE 12.1.

The input accepts a 1/8-inch diameter Phono plug. The emergency stop/reset switch must be an open contact for normal driving and a closed contact to activate the emergency stop/reset function.

PIN	DESIGNATION
TIP	Emergency Stop/Reset
RING	COMMON (B-)

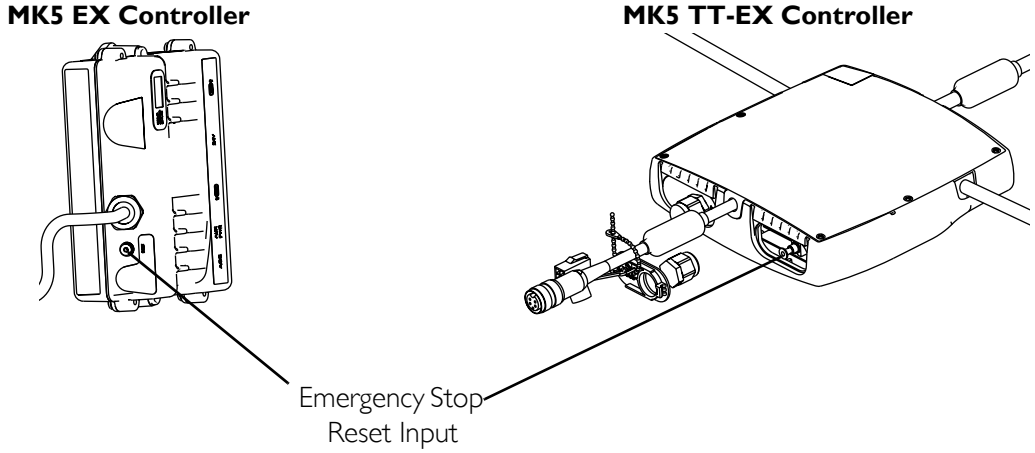


FIGURE 12.1 Emergency Stop/Reset Input

15-pin D-Subminiature on Control Module

PIN	DESIGNATION
1	+15v Switched
2	+15v
3	N.C.
4	Serial Data 1
5	N.C.
6	Common B-
7	N.C.
8	N.C.
9	N.C.
10	Serial Data 2
11	Common (B-)
12	Common (B-)
13	B+ PTO (Charger Input)
14	B+ PTO (Charger Input)
15	Charger Inhibit/Serial Programmer

5-Pin Connector on Control Module

PIN	DESIGNATION
1	SERIAL DATA 1
2	SERIAL DATA 2
3	N.C.
4	COMMON (B-)
5	15V SWITCHED

Battery Connector - Anderson SB50

PIN	DESIGNATION
1	BATTERY POS (B+)
2	BATTERY NEG (B-)

MI and M2 Motor Connectors

4-Pin (MK5 EX)

PIN	DESIGNATION
1	M-
2	BRAKE
3	BRAKE
4	M+

13-Pin D-Sub (MK5 TT EX)

pin	DESIGNATION
A1	PHASE A
A2	PHASE B
A3	PHASE C
1	SENSOR +5V
2	SENSOR GND
3	SENSOR SIN
4	EEPROM data
5	SENSOR COS
6	EEPROM CLOCK
7,8	N.C.
9	BRAKE
10	BRAKE

5-Pin Connector on Control Module

PIN	DESIGNATION
1	SERIAL DATA 1
2	SERIAL DATA 2
3	N.C.
4	COMMON (B-)
5	15V SWITCHED

PTO/Charge Input (MK5 EX)

PIN	DESIGNATION
1	Charge Inhibit
2	B+ PTO (Charge Input)
3	Common (B-)
4	N.C.

Remote On/Off Input On MPJ or Display unit

The input accepts a 1/8-inch diameter phono connector. The activating switch is a momentary normally pen type (N.O.)

PIN	DESIGNATION
TIP	ON/OFF
RING	COMMON (B-)

SECTION 13—CURRENT ROLLBACK

What Is Current Rollback?

Current flows from the batteries, through the controller into the motors. In simple terms, current relates to power (Amps is a measure of current). As speed, load, rolling resistance and terrain angle increases so does the amount of current flowing through the system. Current generates heat. If the heat is excessive for too long, it can lead to component failure. To protect the system, all MK5 controllers have been programmed to limit the amount of current drawn through the system to prevent damage to the circuitry and motors. This feature is called Current Rollback.

If the internal temperature of the controller reaches the current rollback setting, the controller will automatically reduce the output which will cause the wheelchair to slow down or stop, depending upon the load and operating terrain. The controller has an internal timer that keeps the operating system at this reduced output until the system has had ample time to cool down. Once it counts down, full power output is restored to the system.

What Increases the Likelihood of Current Rollback?

- Weight
- Rolling Resistance
- Terrain Angle
- Speed

Weight

Weight includes the weight of the user, all accessories mounted to the wheelchair and any additional weight accompanying the user such as back packs etc. (It takes more energy to move a wheelchair that is equipped with a power tilt/recline seating system and a ventilator than a wheelchair that is equipped with a standard seat only).

Rolling Resistance

The surface that the wheelchair is operating on makes a difference to how hard the wheelchair has to work. Sand or deep grass offers more rolling resistance than pavement.

Terrain Angle

Inclines require the system to work harder as you fight gravity. Ramps are obvious but the land terrain (slopes, hills) are not as obvious, but play a part in current rollback.

Speed

A system at 100% forward speed requires more power than one programmed at 75%. Combine high-speed settings with factors described above and you increase the likelihood of going into current rollback.

How to Solve It?

Electronic Adjustments

1. Load the standard proportional performance or learner indoor program. These have moderate torque levels that should provide adequate power on a well-balanced wheelchair.
2. Be certain the user is selecting an appropriate drive mode for the intended environment. In other words, Learner Indoor programs - unmodified - are not intended to be used over rough outdoor terrain.
3. If the wheelchair feels like it needs more power, then FIRST check the power level setting in EACH drive. Most are set at 80% or lower. Simply increase this parameter and re-save. If more power is still needed, then the torque parameter can be increased. Torque should never need to be maxed out. If it is then there is another problem (i.e. front loading or a drive motor that is not powerful enough for the task).
4. With power level at 100% a very high Torque setting and fast speeds, you could be going into current rollback more quickly because of the amount of current being allowed into the system.

Drive Motors

The standard 4 pole and 2 Pole are rated for loads up to 300 lbs and the heavy duty 4 pole and gearless/brushless motors are rated for loads up to 400 lbs. If the standard 4 pole or 2 pole is not providing enough power once the above has been done, then the user would be a candidate for the heavy duty 4 pole or gearless/brushless motor. Remember heavy duty drives are not just for users over 300 lbs, but also for user's who are very ACTIVE. If the provider knows that the user is a very hard user, then they are better served going to the heavy duty 4 pole or gearless/brushless from the start.

Common Mistakes

The most common mistake and aggravation to current rollback is that the user or provider turns the wheelchair off to cool down. The controller has a counter in it that begins to count up when the current reaches a high or extremely high level. Once the wheelchair current is normal again, then it needs to count down. It can only do this with the wheelchair turned ON.

If the user claims to be in a state of constant current rollback, then chances are that they are turning their wheelchair off and the counter is remaining high, so that it only takes a little bit of driving to go back into rollback. Good advice is to ask the user to recharge the batteries with the wheelchair electronics turned on. This ensures the "Internal Timer" in the controller resets and the batteries are full.

NOTE: Use the charger that is supplied with the Invacare wheelchair.

SECTION 14—APPENDIX

Special Purpose Indicator Description for LCD Display

NOTE: When the display is initially turned on, the system will check for faults. If no faults are detected, the LED's for one (1) of the following three (3) modes will be illuminated: DRIVE, ATT'D or STDBY, depending on the user's individualized program. If a fault is detected, the fault will scroll across the bottom of the LCD Display.

NOTE: ECU 3 and ECU 4 are not available at this time.

NOTE: The light sensor opening MUST be kept clear. It is used to automatically adjust the LED brightness.

FUNCTION	LCD MESSAGE	LED'S ILLUMINATED
DRIVE MODE 1	DRIVE 1 and Battery Level	DRIVE and DRIVE 1 LED's lit
DRIVE MODE 2	DRIVE 2 and Battery Level	DRIVE and DRIVE 2 LED's lit
DRIVE MODE 3	DRIVE 3 and Battery Level	DRIVE and DRIVE 3 LED's lit
DRIVE MODE 4	DRIVE 4 and Battery Level	DRIVE and DRIVE 4 LED's lit
ATTENDANT MODE	*DRIVE ? and ATTENDANT	*DRIVE ? and ATT'D LED's lit
STANDBY SELECT MODE	*DRIVE ? and STANDBY ON	*DRIVE ? and STD BY LED's lit
DRIVE SELECT MODE	*DRIVE ? and DRIVE SELECT	*DRIVE ? and DRIVE SEL LED's lit
ECU SELECT MODE	*DRIVE ? and ECU SELECT	*DRIVE ? and ECU SEL LED's lit
SAC	*DRIVE ? and SAC	*DRIVE ? and SAC LED's lit
TRCM MODE - 4 SWITCH	*DRIVE ? and TILT/RECLINE	*DRIVE ? and TRCM LED's lit
TRCM MODE - 1 SWITCH	*DRIVE ? and ? TRCM Function	*DRIVE ? and TRCM LED's lit
ECU MODE 1	*DRIVE ? and ECU 1	*DRIVE ? and ECU 1 LED's lit
ECU MODE 2	*DRIVE ? and ECU 2	*DRIVE ? and ECU 2 LED's lit
ECU MODE 3	*DRIVE ? and ECU 3	*DRIVE ? and ECU 3 LED's lit
ECU MODE 4	*DRIVE ? and ECU 4	*DRIVE ? and ECU 4 LED's lit

**NOTE: The ? in the LCD Message or the LED Indication is used to indicate which DRIVE (1-4) or ECU (1-4) has been selected. The ? TRCM Function in the LCD Message can be one (1) of seventeen (17) variations of movement (example: Tilt, Recline, VSR.etc.).*

LIMITED WARRANTY

PLEASE NOTE: THE WARRANTY BELOW HAS BEEN DRAFTED TO COMPLY WITH FEDERAL LAW APPLICABLE TO PRODUCTS MANUFACTURED AFTER JULY 4, 1975.

This warranty is extended only to the original purchaser/user of our products.

This warranty gives you specific legal rights and you may also have other legal rights which vary from state to state.

Invacare warrants the MK5 Controls to be free from defects in materials and workmanship for a period of one (1) year from date of purchase. If within such warranty period any such product shall be proven to be defective, such product shall be repaired or replaced, at Invacare's option. This warranty does not include any labor or shipping charges incurred in replacement part installation or repair of any such product. Invacare's sole obligation and your exclusive remedy under this warranty shall be limited to such repair and/or replacement.

For warranty service, please contact the dealer from whom you purchased your Invacare product. In the event you do not receive satisfactory warranty service, please write directly to Invacare at the address at the bottom of the back cover. Provide dealer's name, address, date of purchase, indicate nature of the defect and, if the product is serialized, indicate the serial number. Do not return products to our factory without our prior consent.

LIMITATIONS AND EXCLUSIONS: THE FOREGOING WARRANTY SHALL NOT APPLY TO SERIAL NUMBERED PRODUCTS IF THE SERIAL NUMBER HAS BEEN REMOVED OR DEFACED, PRODUCTS SUBJECTED TO NEGLIGENCE, ACCIDENT, IMPROPER OPERATION, MAINTENANCE OR STORAGE, COMMERCIAL OR INSTITUTIONAL USE, PRODUCTS MODIFIED WITHOUT INVACARE'S EXPRESS WRITTEN CONSENT INCLUDING, BUT NOT LIMITED TO, MODIFICATION THROUGH THE USE OF UNAUTHORIZED PARTS OR ATTACHMENTS; PRODUCTS DAMAGED BY REASON OF REPAIRS MADE TO ANY COMPONENT WITHOUT THE SPECIFIC CONSENT OF INVACARE, OR TO A PRODUCT DAMAGED BY CIRCUMSTANCES BEYOND INVACARE'S CONTROL, AND SUCH EVALUATION WILL BE SOLELY DETERMINED BY INVACARE. THE WARRANTY SHALL NOT APPLY TO PROBLEMS ARISING FROM NORMAL WEAR OR FAILURE TO ADHERE TO THESE INSTRUCTIONS.

THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY OTHER WARRANTIES WHATSOEVER, WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND THE SOLE REMEDY FOR VIOLATIONS OF ANY WARRANTY WHATSOEVER, SHALL BE LIMITED TO REPAIR OR REPLACEMENT OF THE DEFECTIVE PRODUCT PURSUANT TO THE TERMS CONTAINED HEREIN. THE APPLICATION OF ANY IMPLIED WARRANTY WHATSOEVER SHALL NOT EXTEND BEYOND THE DURATION OF THE EXPRESS WARRANTY PROVIDED HEREIN. INVACARE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES WHATSOEVER.

THIS WARRANTY SHALL BE EXTENDED TO COMPLY WITH STATE/PROVINCIAL LAWS AND REQUIREMENTS.

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Rev D- 11/04

Yes, you can.™