

SERIES 1|L

TOTAL MOMENT INDICATOR



INSTALLATION MANUAL

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1 INTRODUCTION

This manual contains the installation and set-up instructions for the Series 1-L Total Moment Indicator.

Installation should only be carried out by competent and trained staff as this product is a safety product.

During installation it is assumed that industry standards will be observed and all cabling will be protected against damage either from the movement of the machine or from collisions that may occur during

normal operations (trees & branches, etc.)

All welding or bare metalwork should be treated to ensure that rust does not form.

1.1 System Layout

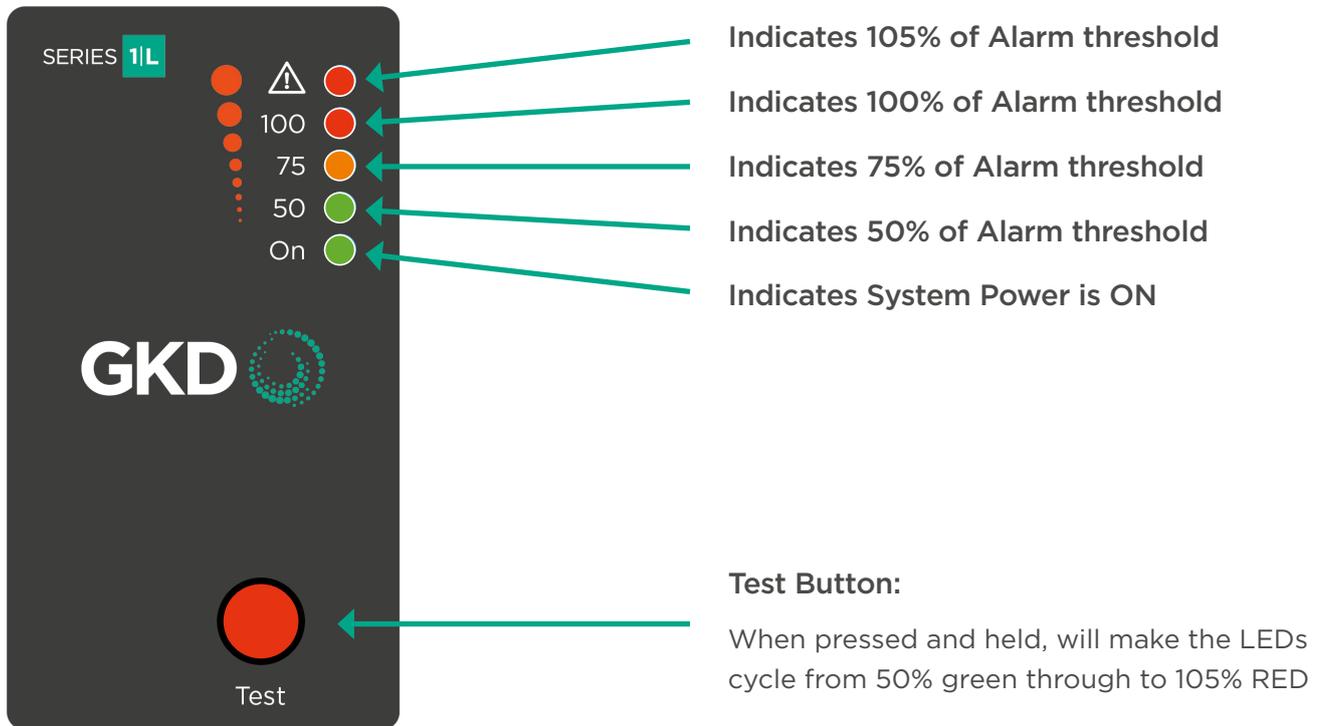
The system layout depends on which version of the Series 1-L is being installed.

- For the series 1 system layout, refer to page 9.
- For the series 2 system layout, refer to page 10.

2 COMPONENT IDENTIFICATION

2.1 Series 1-L Display

The display unit utilizes a 4 LED indication of tipping moment based on 50 to 105 % of the Alarm threshold. (As default, this is set to 66% of the hydraulic limit of the machine).



2.2 Angle Sensor



The Angle sensor should be fitted to the first excavator boom and connected to the pressure transducer that is fitted to the main lift rams. The sensor is connected to the display via a M12 OCAN bus cable. An LED on the Angle Sensor flashes green to show that it is powered and working correctly. Where possible, ensure that the green LED on the Angle Sensor is visible during operation to show the Angle Sensor is working correctly.

2.3 Pressure Transducer



A pressure transducer is used to monitor the forward hydraulic pressure in the boom lift ram. The pressure sensor connects to the angle sensor module by a 4 way M12 cable. The forward pressure reading directly relates to the load lifted by the machine. The sensor measures up to 400 Bar.

A second pressure transducer may be required to monitor the reverse side pressure (rod side) for additional pressure compensation.

2.4 CAN to USB Interface



A USB to CAN Converter Interface is used to allow a PC to communicate with the Series 1-L during initial set-up and for later monitoring purposes.

IMPORTANT NOTE: ENSURE USB DRIVERS ARE INSTALLED FOR THE USB TO CAN CONVERTER. SEE GKD USB DRIVER INSTALLATION NOTICE!

3 INSTALLATION

3.1 Series 1-L Display

The back of the display is fitted with a ball-joint mount. The joint base should be secured with 2 x M5 bolts on fixing holes at 48.5mm spacing, and can be mounted on a horizontal, angled, or vertical surface as appropriate. The display should be mounted within easy reach of the operator, in a position that avoids direct sunlight on the indicator LEDs and exposure to water ingress. Care should be taken to

ensure that the display is mounted to a surface or structure that is capable of supporting the display when travelling over rough terrain.

A 2m long cable carries the DC supply and Change-over relay contact signals. The DC Positive supply should be connected to an ignition switched power source and be protected by a 5A fuse.

A 4 core, M12 cable is supplied to connect the Series 1-L Control Unit to the Angle Sensor. Different lengths of cable, or extension cables are available as required on any particular machine. The cable should be protected from physical damage during machine operation.

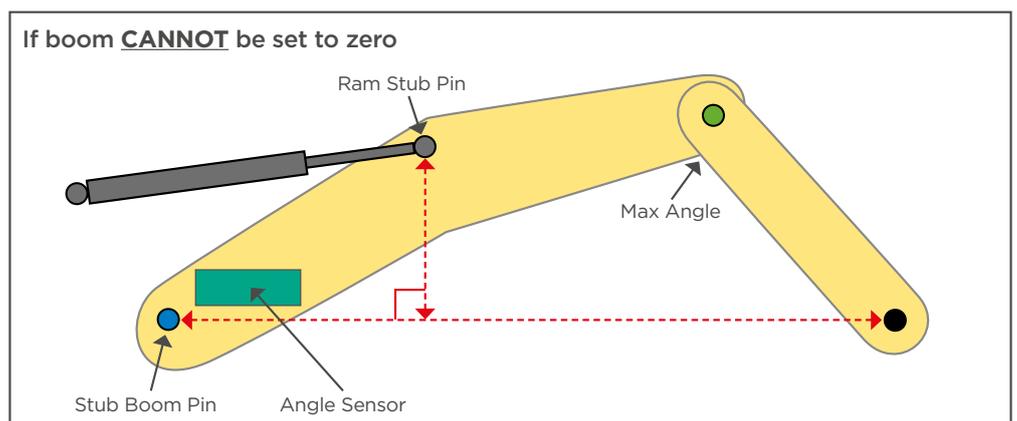
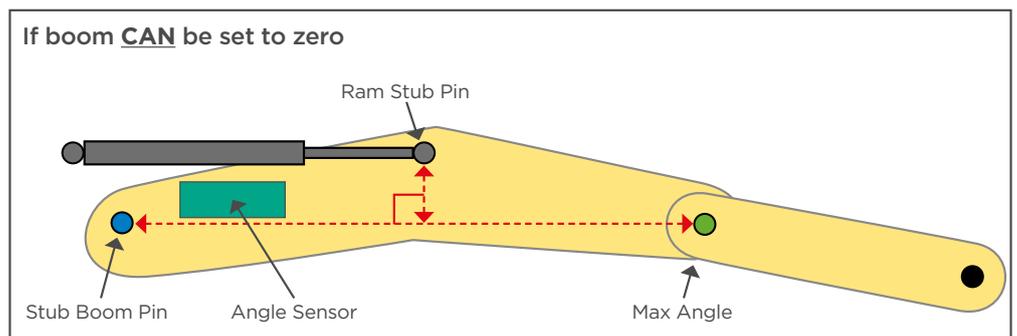
3.2 Angle Sensor

The sensor monitors the angle of an imaginary line drawn between the two articulation points of the boom. For the best operation the sensor should be installed with the long edge parallel to this imaginary line. Position and offset from the imaginary line should achieve the best location taking factors such as cable runs and protection into consideration.

The sensor is provided with a mounting bracket that should be welded to the boom and painted to the boom colour.

A green LED on the Angle Sensor flashes when it is working correctly. An M12 cable then runs from the Angle Sensor to the pressure sensor M12 connector.

Diagrams show typical angle sensor Pre-boom (stub) locations and orientations.

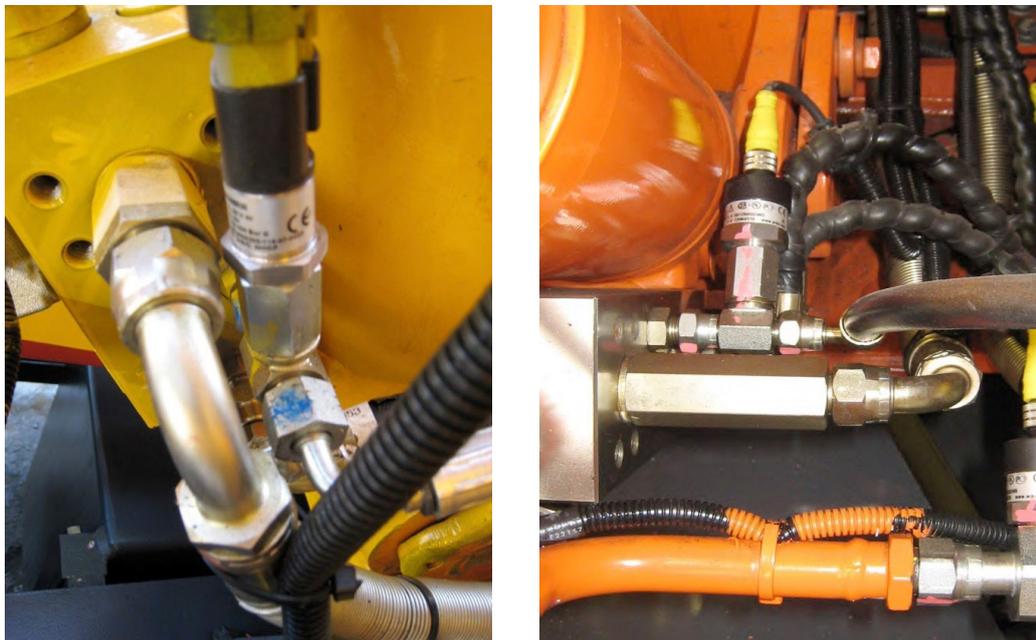


3.3 Pressure Sensor

Pressure sensors use a G1/4 hydraulic interface to the machine hydraulics.

The ram full side pressure transducer, and the optional reverse side (rod side) pressure transducer, must measure the pressure in the lift ram at all times. Therefore, the measuring point must be on the ram side of any hose burst check valves that may be fitted. This port is often designated with an 'E' stamped into the valve body. If in doubt check. [Note hoses should be fitted with restrictors (typically with a 0.75mm hole) to control the rate of descent of the boom in the event of failure of the balance hose].

The pressure sensors should be mounted in such a position that the electrical connector may be accessed and the cable securely routed. The mounting position should also protect against damage caused by persons climbing the machine or other objects striking the machine.



Typical pressure transducer installations.

3.4 Alarm

The alarm is wired as a relay change over contact output and uses 3 wires in the Series 1-L Display power cable. The output has a limited current capability of 1A. Any alarm that exceeds this current capability will need to be controlled via another relay.

4 SERIES 1-L GENERAL INFORMATION & WIRING (TYPE 1)

The Series 1-L Type 1 system is CAN based and requires only use of a four wired daisy chain interconnection to function. However, to facilitate the installation the CAN bus may be branched.

The system utilizes industry standard M12 connectors which are field serviceable. Cable looms can be provided to ensure plug and play installation.

Power connections to the system are as per the table below.

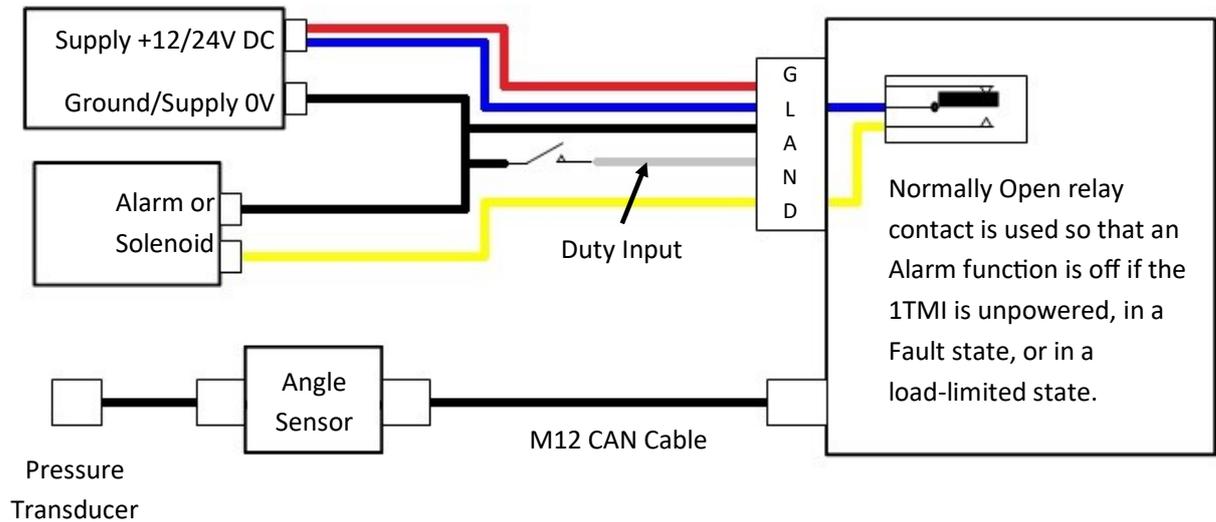
NOTE: THIS IS THE CABLE PROTRUDING FROM THE BASE OF THE DISPLAY UNIT NOT THE M12.

Supply Description	Wire	Fuse Rating
Switched Ignition (+12/24V DC)	Red	5A
System Ground (0V)	Black	5A
Duty Select (0V = Duty 2)	White	Not Required

4.1 Alarm

The alarm is wired as a relay change over contact output and uses 3 wires in the Series 1-L Display power cable. The output has a limited current capability of 1A. Any alarm that exceeds this current capability will need to be controlled via another relay.

Overload Alarm	Wire	Fuse Rating
COM	Blue	1A
N/O	Yellow	1A
N/C	Green	1A



5 SERIES 1-L GENERAL INFORMATION & WIRING (TYPE 2)

The Series 1-L Type 2 system is CAN based and requires only use of a four wired daisy chain interconnection to function. However, to facilitate the installation the CAN bus may be branched. The Series 1-L Type 2 Unit offers 2 Relay outputs and can be connected to a data Logger unit to monitor and store operation of the vehicle.

The system utilizes industry standard M12 connectors which are field serviceable. Cable looms can be provided to ensure plug and play installation.

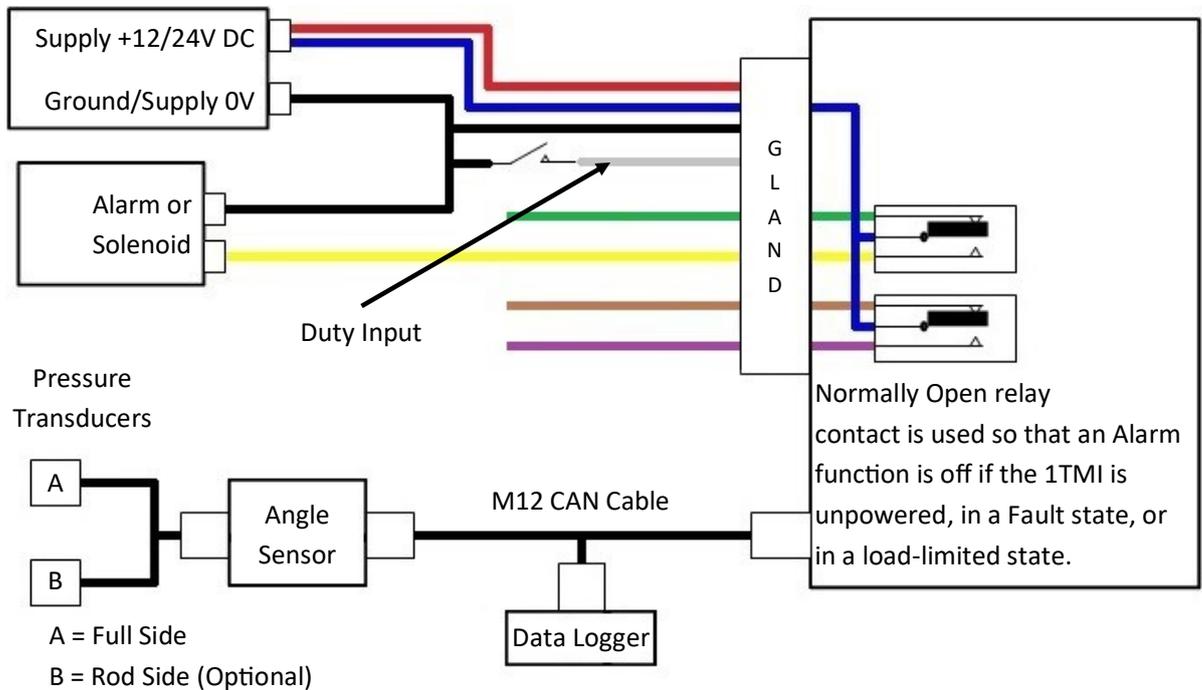
Power connections to the system are as per the table to the right.

Supply Description	Wire	Fuse Rating
Switched Ignition (+12/24V DC)	Red	5A
System Ground (0V)	Black	5A
Duty Select (0V = Duty 2)	White	Not Required

NOTE: THIS IS THE CABLE PROTRUDING FROM THE BASE OF THE DISPLAY UNIT NOT THE M12.

5.1 Alarm

The alarm is wired as a relay change over contact output and uses 3 wires in the Series 1-L Display power cable. The output has a limited current capability of 1A. Any alarm that exceeds this current capability will need to be controlled via another relay.



6.1 CAN Bus

The CAN bus connections are as follows:

	CAN Lo	+V Supply	OV (Ground)	CAN High
CAN Bus M12 Connector	Pin 1 - Brown	Pin 2 - White	Pin 3 - Blue	Pin 4 - Black

The angle sensor and display connect to a CAN bus. Hi speed CAN bus is provided as an interface to exchange information within the system and may be used to set-up or monitor the system using the USB to CAN converter and special Series 1-L PC software.

The Hi-speed CAN is custom programmed during production.

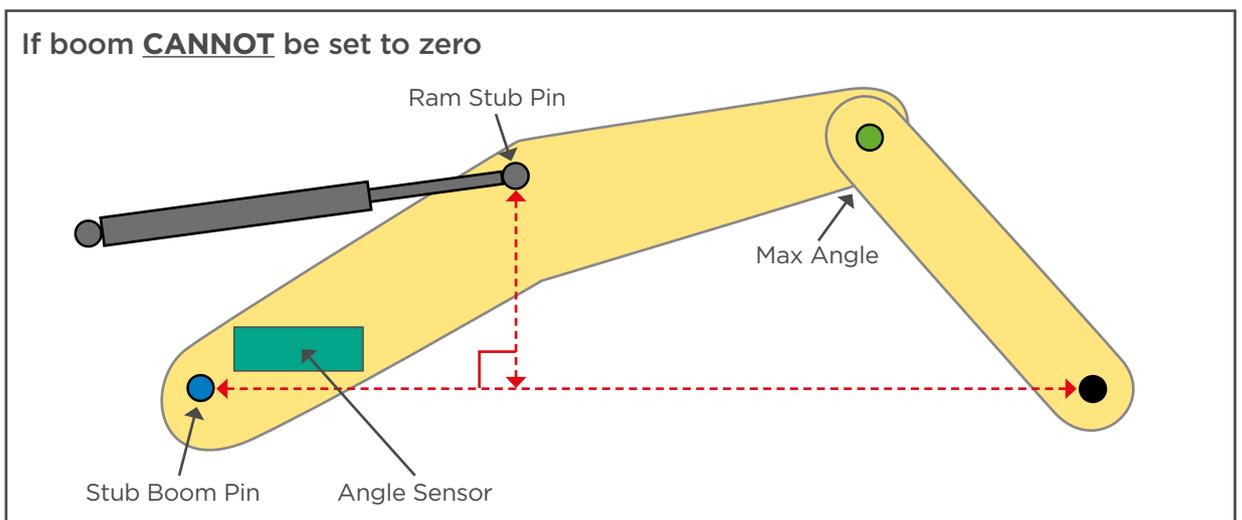
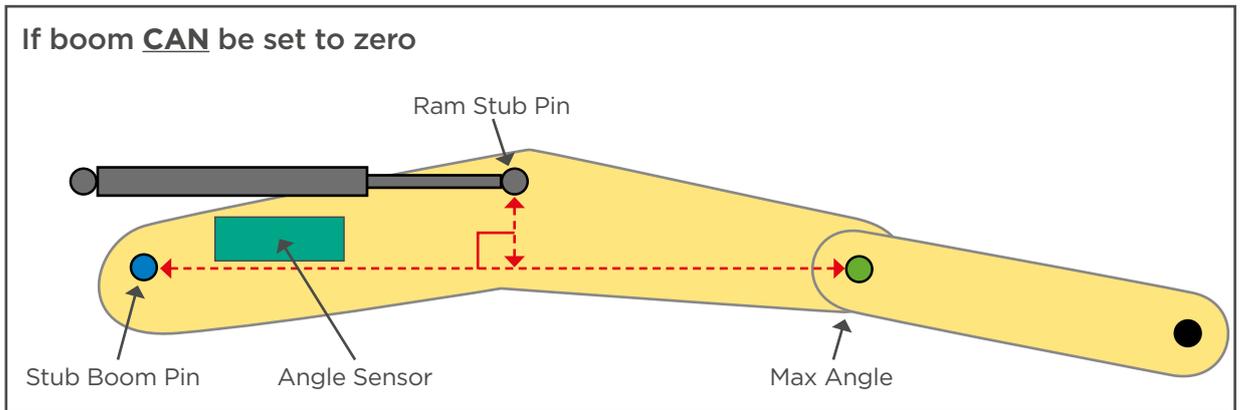
6.2 Pressure Sensor

NOTE: Pressure transducers do not use the same wiring as the CAN bus, where pressure transducers are being connected, the following applies:

	+V Supply	Signal 2	OV (Ground)	Signal 1
Single Pressure Switch	Pin 1 - Brown	Pin 2 - N/C	Pin 3 - Blue	Pin 4 - Black

7 INITIAL SETUP

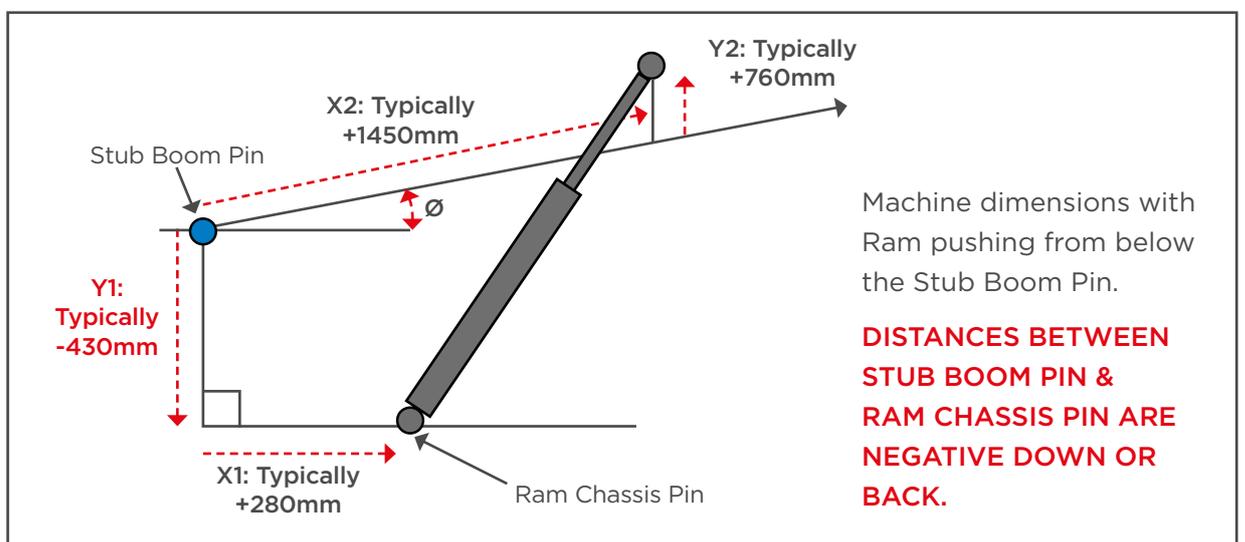
When all of the components have been installed then the system is ready for Calibration. Diagrams below show typical measurements for Stub with pulling Ram.



7.1 Machine dimensions with Boom Ram pushing from below the Stub Boom Pin

Measure and record the vital machine dimensions X1, X2, Y1, Y2 in mm as shown below.

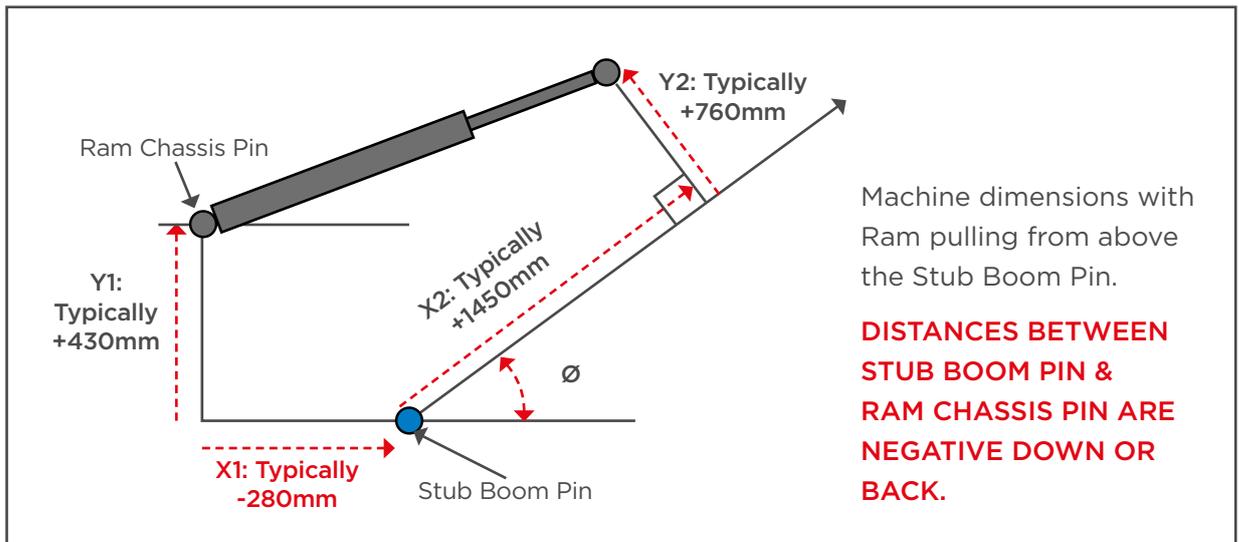
Note that the measurements may need to be entered as Positive or Negative values, depending on the precise geometry of the machine.



7 INITIAL SETUP (CONT.)

7.2 Machine dimensions with Boom Ram pulling from above the Stub Boom Pin

Measure and record the vital machine dimensions X1, X2, Y1, Y2 in mm as shown below.



7.3 CAN Bus Connections

Connect the USB to CAN Converter interface to a USB port of a PC and through an M12 “T” connector into the CAN bus of the Series 1-L system. This ensures that the Angle Sensor M12 connection is still made during the set-up and calibration process.

IMPORTANT NOTE: ENSURE USB DRIVERS ARE INSTALLED FOR THE USB TO CAN CONVERTER. SEE APPENDIX - GKD USB DRIVER INSTALLATION NOTE.

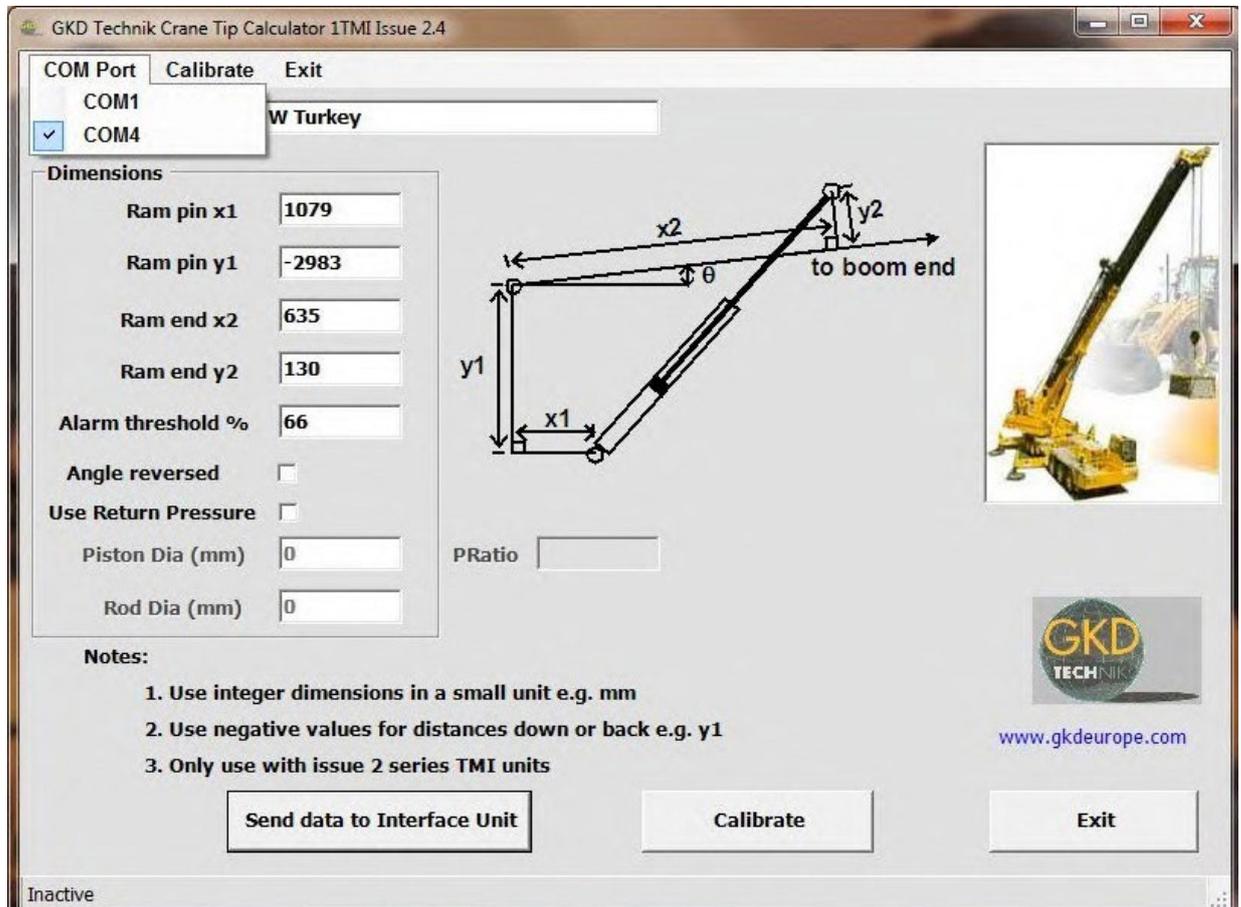
Apply power to the Series 1-L System.



8 PC CONNECTION & SOFTWARE

IMPORTANT NOTE: ENSURE GKD USB DRIVERS ARE INSTALLED FOR THE USB TO CAN CONVERTER. SEE APPENDIX - GKD USB DRIVER INSTALLATION NOTE.

On a laptop PC create a new directory named with the Machine Type/Serial Number of the crane on which the Series 1-L system is to be installed. Copy the latest GKD Series 1-L PC software supplied (e.g. GKD1TMI2.xx.exe) into the new directory and double click on that file to run the software. The following screen appears:-



Click the COM Port selection and the dropdown menu shows active USB ports. Select the port that is connected to the GKD USB to CAN Interface. A message “USB-CAN Found” appears at the bottom left of the screen.

Enter the values X1, X2, Y1 & Y2, in mm, for the machine being calibrated. Set the required Alarm Threshold as a % of the maximum allowed capacity. Set Angle Reversed if the Angle sensed seems to decrease as the boom rises (depends on the Angle Sensor orientation as fitted on the boom).

When the data is complete, click “**Send Data to Interface Unit**” to download the data via the interface unit into the Series 1-L controller. A message “**Data Transmitted**” appears at the bottom left of the screen.

IMPORTANT: WRITE DOWN & KEEP A CAREFUL RECORD OF THE CALIBRATION DATA!

The Series 1-L is now set up ready for calibration..

9 CALIBRATION

Set up & Calibration of the Series 1-L is achieved in 4 stages:

- 1) Zero Angle sensor setting (75% LED Lit in Calibrate mode).
- 2) Zero Pressure sensor setting for no-load condition (100% LED Lit in Calibrate mode).
- 3) Data logger function On or Off control (75 & 100% LEDs lit in Calibrate mode).
- 4) Maximum Tipping Moment setting (50% LED Lit in Calibrate mode).

Make sure the machine data has been entered into the Series 1-L as described on the previous page. Ensure that there is a clear area around the machine and that there is no danger to personnel.

Position the magnet supplied, as shown, on top of the display box using adhesive tape or Blu-Tac to enable Calibration to be performed (Stops inadvertent setting changes).



9.1 Stage 1 - Zero Angle Sensor

Place the machine on level ground. Lower the boom to the Horizontal position with No load. The position of any Dipper or Extending Boom fitted does not matter at this stage as it only zeros the Angle Sensor reading at Horizontal.

Ensure the magnet is fitted on the top of the display as shown above. The Display will be in Indicator mode. (Probably just bottom green “Power On” indicator lit.)

Press and hold the RED test button for more than 3 seconds to enter the Calibrate mode. All the LEDs come on to show it is now in Calibrate mode. Release the Red button and the top ! Red and bottom green Power On LEDs are lit, as well as the 50% Green LED.

!! DON'T REMOVE THE MAGNET !!

REMOVING IT, OR NO ACTIVITY FOR 100 SECS WILL EXIT THE CALIBRATE MODE.

Press the Red button momentarily. The 75% LED lights to show “Zero Angle Sensor” mode. Press & hold the Red button for over 2 secs to make the Series 1-L Acquire and Store the Angle Sensor reading representing the Horizontal Boom position.

Now release the button. All the LEDs should come on momentarily, then all but the Green Power On LED go off before all the LEDs come on momentarily again to confirm the Zero Angle has been acquired and stored. The unit will then go from Calibration mode to Indicator mode with just the Green Power LED lit.

9 CALIBRATION (CONT.)

9.2 Stage 2 - Zero Pressure Sensor

With No Load and the machine set to the minimum radius combination of the boom, dipper or any extending boom fitted, the hydraulic ram pressure will be at the minimum value supporting the weight of the boom etc. but no load.

Ensure the magnet is fitted on the top of the display as shown on page 14. The Display will be in Indicator mode. (Probably just bottom green “Power On” indicator lit.)

Press and hold the RED test button for more than 3 seconds to enter the Calibrate mode. All the LEDs come on to show it is now in Calibrate mode. Release the Red button and the top ! Red and bottom green Power On LEDs are lit, as well as the 50% Green LED.

!! DON'T REMOVE THE MAGNET !!

REMOVING IT, OR NO ACTIVITY FOR 100 SECS WILL EXIT THE CALIBRATE MODE.

Press the Red button twice. The 100% LED lights to show “Zero Pressure Sensor” mode. Press & hold the Red button for over 2 secs to make the Series 1-L Acquire and Store the Pressure Sensor reading representing the No Load pressure.

Now release the button. All the LEDs should come on momentarily, then all but the Green Power On LED go off before all the LEDs come on momentarily again to confirm the Zero Angle has been acquired and stored. The unit will then go from Calibration mode to Indicator mode with just the Green Power LED lit.

9.3 Stage 3 - Data Logger On/Off Control

Ensure the magnet is fitted on the top of the display as shown on page 14. The Display will be in Indicator mode. (Probably just bottom green “Power On” indicator lit.)

Press and hold the RED test button for more than 3 seconds to enter the Calibrate mode. All the LEDs come on to show it is now in Calibrate mode. Release the Red button and the top ! Red and bottom green Power On LEDs are lit, as well as the 50% Green LED.

!! DON'T REMOVE THE MAGNET !!

REMOVING IT, OR NO ACTIVITY FOR 100 SECS WILL EXIT THE CALIBRATE MODE.

Press the Red button three times. The Red 100% & Yellow 75% LEDs will light to show the unit is in Data logger Control Mode (If both 100% & 75% LEDs don't light the unit may not be equipped with the Data logger control function, and may need to be upgraded).

If the Red “!” LED is lit as well as the 100% & 75% LEDs the Data logger is enabled. If the Red “!” LED is NOT lit but the 100% & 75% LEDs are lit the Data logger is disabled (If you don't want to change the Data logger status, remove the magnet at this point).

With the magnet in place, to swap the Data logger function from On to Off, or Off to On, press and hold the Red button for more than 2 seconds. All the LEDs then come on momentarily, All but the Green LED then go Off, All the LEDs then come On momentarily to show the Data logger function has changed. The unit will then go from Calibration mode to Indicator mode with just the Green Power LED lit.

9 CALIBRATION (CONT.)

9.4 Stage 4 - Set Maximum Moment

With the machine set to the maximum radius combination of the boom, dipper or any extending boom fitted, and apply the maximum load rated for that machine at the maximum radius position. This represents the Maximum Moment allowed.

Ensure the magnet is fitted on the top of the display as shown on page 14. The Display will be in Indicator mode. (Probably just bottom green "Power On" indicator lit.)

Press and hold the RED test button for more than 3 seconds to enter the Calibrate mode. All the LEDs come on to show it is now in Calibrate mode. Release the Red button and the top ! Red and bottom green Power On LEDs are lit, as well as the 50% Green LED. This indicates that it is in "Maximum Moment" set-up mode.

!! DON'T REMOVE THE MAGNET !!

REMOVING IT, OR NO ACTIVITY FOR 100 SECS WILL EXIT THE CALIBRATE MODE.

Press & hold the Red button for over 2 secs to make the Series 1-L Acquire & Store the "Maximum Moment" pressure, showing the MAXIMUM MOMENT state.

Now release the button. All the LEDs should come on momentarily, then all but the Green Power On LED go off before all the LEDs come on momentarily again to confirm the Zero Pressure has been acquired & stored.

The unit will then go from Calibration mode to Indicator mode with all the LEDs lit as the machine is in a maximum moment condition. Reduce the load to return normal operation.

Repeat with Duty Input set to Duty 2 (Duty input, white wire, grounded or connected to 0V) if a second duty is to be used.

THE Series 1-L IS NOW CALIBRATED.

NOTE: REMOVE THE MAGNET SO THAT THE CALIBRATION CANNOT BE MODIFIED.

9.5 Verification

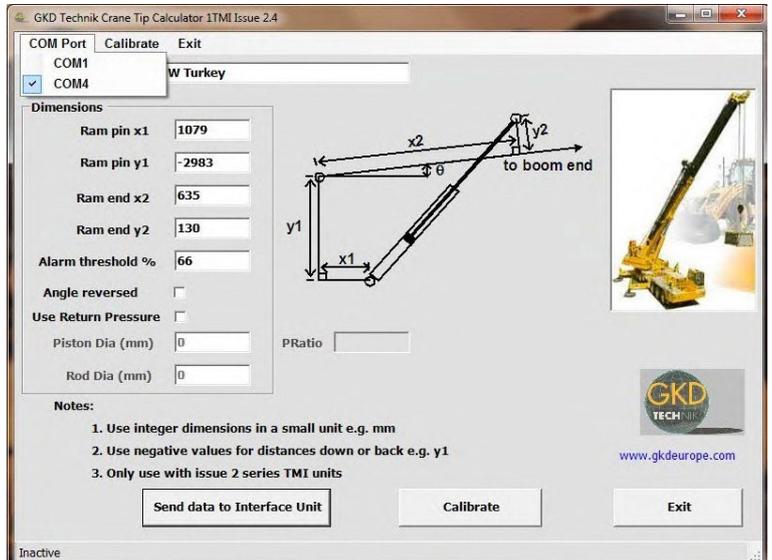
To verify the calibration, select random positions & lift duties. Check overload warning against tip load.

10 PC SETUP & MONITOR

The PC software is used to enter the initial machine data, X1, X2 etc. but can also be used to monitor the condition of the machine, store the calibration settings and even adjust the calibration settings as required.

10.1 PC Connection

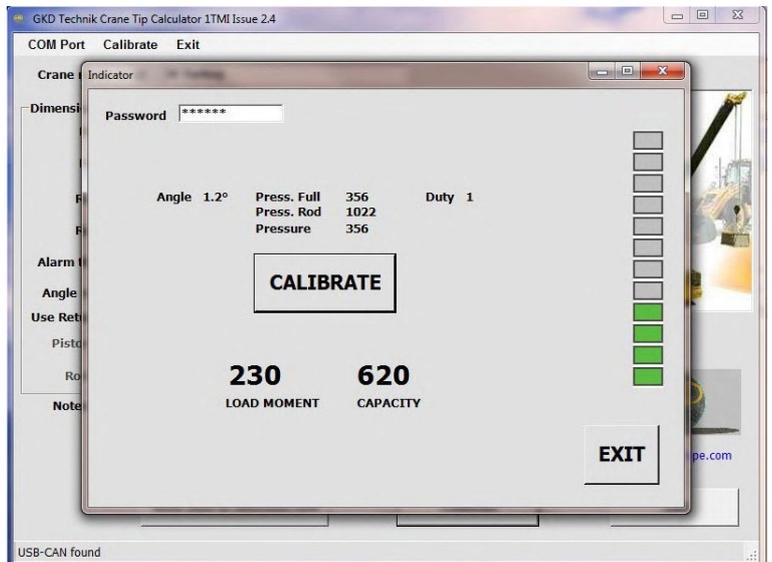
The machine data etc. is entered and sent to the Series 1-L Control unit as described in the Initial set-up section on page 13.



10.2 PC Indicator Monitoring

Click on the Calibrate heading on the command line and the Indicator screen, shown below, appears.

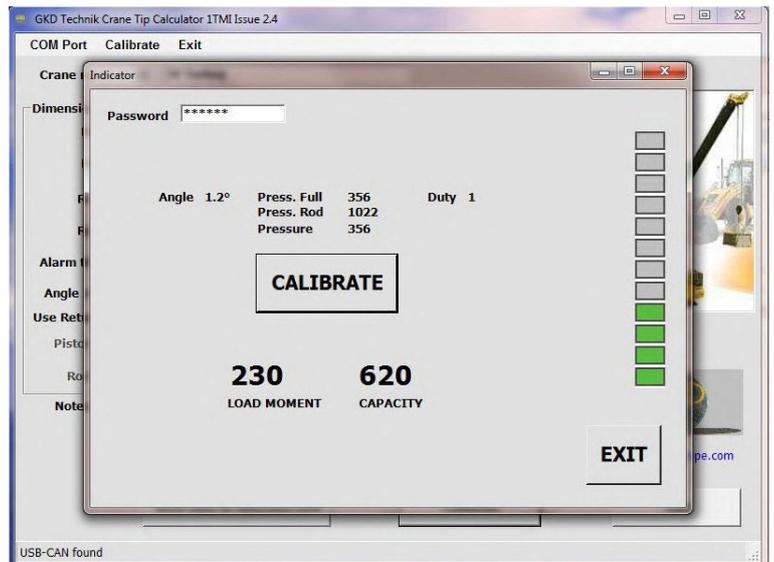
The Calibrate box is inactive ("Greyed Out"). The current values of the Series 1-L Angle & Pressure are shown, with numbers representing the current Load Moment and the Capacity (Maximum Moment) of the system. A Bar Column on the left mimics the Green, Amber & Red LEDs on the Series 1-L Display unit. Increasing the load will be shown as an increase in Load Moment. Increasing the boom angle (decreasing the radius) will be shown as a decrease in Load Moment.



10 PC SETUP & MONITOR (CONT.)

10.3 PC Advanced User

In the Indicator screen, enter the Password **861961**. The central Calibrate box now becomes active (not greyed out). Click the Calibrate box and enter the Calibrate screen.

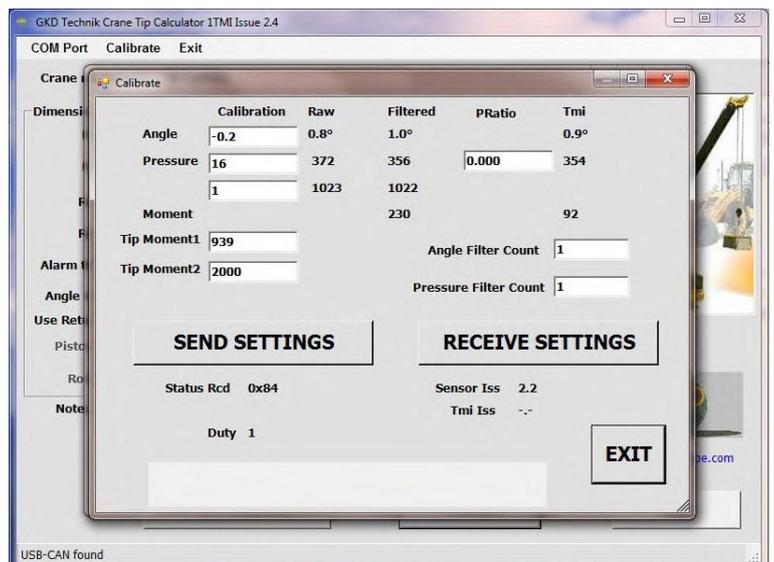


10.4 Calibrate Screen

In the Calibrate screen, click “**Receive Settings**” to download the Series 1-L Calibration values of Angle, Zero Pressure and Maximum Moment set up in the calibration process conducted on the machine in the Calibration section on page 15. A message is shown to confirm data received.

The Received data is stored in a data file held in the same directory as the GKD1TMI.exe file, which can be viewed by a PC text editor. The Calibrate data can be recovered from the

stored file or edited on the screen as necessary for fine adjustments to be made. The data can be uploaded back to the Series 1-L by clicking “**Send Settings**”.



APPENDIX - GKD USB DRIVER INSTALLATION

Introduction

The GKD USB to CAN Converter includes an FTDI USB interface chip and a special Windows driver is needed to allow the GKD Series 1-L PC software to use a USB port to talk to the Series 1-L Display Unit. This note details how the driver software can be installed.

Windows version

The version of USB Driver required for a particular PC may depend on which version of Windows operating system is installed on that PC. Many modern computers with Internet access may automatically search for a suitable driver on the internet and install it for you. Older PCs, or where there is no Internet access, may require the drivers to be available on the PC already and a Windows Driver Installation Wizard told where to look for the driver. Note that ONLY Windows XP, Vista & Windows 7 are supported.

Plug in USB to CAN Converter and install drivers

Plug the USB to CAN converter into a USB port and a Found New Hardware report is seen indicating a USB Serial port. A Found New Hardware Wizard appears, as shown below:



If the PC has Internet Access you may be able to set the “Yes, this time only” button and click Next for the PC to find and install the right driver. Advice may also be obtained from the FTDI website on how to obtain a suitable VCP driver for their USB chip.

If there is no Internet Access, or a driver can’t be found then at this stage click the “No, not this time” button and Next. A new screen appears asking for the location of the driver file.

If Windows can’t find a driver load driver interface files onto PC

If windows can’t find a driver, or there is no internet access, GKD supplies driver files on a CD. Create a new “USB Driver” folder on the PC, typically entitled C:\USB Drivers, and load GKD’s driver folder from the CD into that folder. The folder is typically called “USB FTDI Drivers”.

In the “USB FTDI Drivers” folder there should be two .pdf files that give instructions for Windows XP and Windows 7 Computers Installations. Typically run the setup file:

CDM 20814_ Setup.exe to run the installation file & load drivers.

The USB to CAN Converter should now work correctly with the GKD Series 1-L PC software.

DISCLAIMER

Incorrect installation of any part and or incomplete calibration will affect the correct operation of the Series 1-L.

If in doubt contact GKD Technologies.

GKD Technologies reserve the right to change these instructions in line with the policy of continuous improvement.

