Touch Score 3

Ten Pin Bowling Scoring System

Reference Guide

By A.K.Microsystems International

www.touchscore.com

IMPORTANT SAFETY WARNINGS !

The hardware devices described here are low voltage, low current devices and MUST NOT be connected or exposed to mains or hazardous voltages under any circumstances. Connect these devices only to other SELV (safe extra low voltage) circuits. All electrical work associated with this system must conform to the relevant local codes and must be carried out by suitably qualified persons only. It is the installer's responsibility to ensure the installation meets any applicable electrical safety and personal safety requirements. **See also Touch Score Machine Interface Unit**

The software and hardware devices described here may be installed in such a way as to facilitate control of the pinspotters and bumpers In this case, this software and these devices may activate and cycle the pinspotters and bumpers AT ANY TIME and WITHOUT ANY WARNING. It is therefore ESSENTIAL that other safety devices are installed to prevent personal injury from the pinspotters and bumpers.

This software and these devices can also be installed without this functionality, without affecting their ability to perform other functions.

The Touch Score lighting system is intended for control of safe lighting fixtures only. Any fixtures that have any risk of causing damage or personal injury (such as high intensity lasers) must NOT be used.

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Acknowledgements OpenMoko's dfu_util, LibUSB-Win32 (see licence.txt in drivers folder), LeafLabs bootloader www.leaflabs.com

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1. Overview

Touch Score 3 (TS3) is a Windows based scoring system for bowling centers.

It is intended primarily as an upgrade to legacy systems, although it can also be used for new installations.

When installed as an upgrade, TS3 can often retain and reuse much of the existing equipment such as bowler consoles, pinspotter interfaces, pin sensing devices and cabling.

Where new equipment is desired, TS3 uses standard hardware available from multiple third parties wherever possible. Examples include the scoring computers, cameras, and TVs.

TS3 connects directly to LCD flat screens without the need for convertors.

A.K.Microsystems supplies the software for the system, and also licences the manufacture of various accessory devices as listed below. These items are then integrated into a total scoring system by a system integrator.

- **Touch Score Machine Interface Unit (TS MIU)** – provides connections to the pinspotters, cameras, bumpers etc.

- **Touch Score Multi-port Adapter (TS MPA)** – provides ports for connection to the MIU, TV remote control, bowler consoles, legacy APS, data processors and pinsetter controllers.

- **Universal Bowler Terminal Board (UBT)** – interface board for keypads. Various adapters are available for legacy keypads. See the *Universal Bowler Terminal* guide for details.

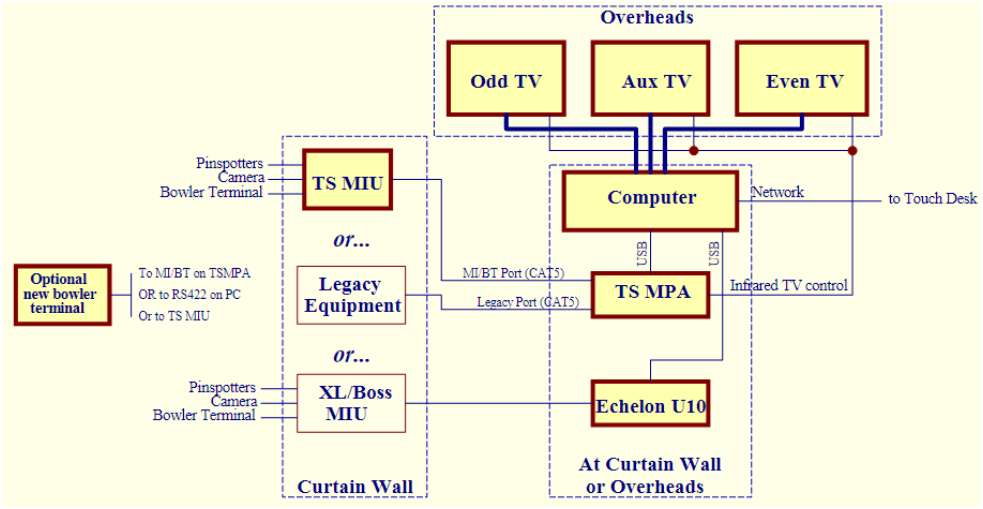
This manual covers only the software and devices listed above. Consult the relevant manufacturer's manual for more information on other devices in the system.

A customised keypad and stanchion is available from our US partners, such that everything the bowler sees can be new, even when retaining much of the back end scoring equipment such as cameras and pinspotter interface units.

Touch Score can be installed as a standalone scoring system or with a Touch Desk central management system. Touch Desk can manage both TS3 and legacy scoring side by side in the same center..

TS3 supports regular 10 Pin, Candlepin, 2 and 3 ball Duckpin and 5 Pin bowling.

A general overview of a Touch Score lane pair is shown below. Not all possible configurations shown. Not all equipment shown is need for all installations.



Touch Score 3 Overview

2. Compatible Equipment

TS3 can be installed in many different configurations and in conjunction with a wide variety of other equipment. For this reason, each individual installation of TS3 needs to be designed based on individual requirements.

This section details the equipment that can be used with TS3.

2.1 Computer

TS3 runs on a standard Windows computer as below. One computer is required per lane pair.

- Operating System – Windows 7, 10 or 11.
- RAM – 2GB required, 4GB recommended
- Graphics Display – 2 independent outputs are required for the 2 lanes, or 3 outputs if also driving an auxiliary screen. The resolution should match the native resolution of the screens (1920x 1080 recommended). The connection type must also match the screens (HDMI recommended).
- Processor speed. Any processor capable of running Windows will run Touch Score. However CPU intensive operations such as graphics transitions, animations or live TV will run smoother with better hardware. Choosing a processor/graphics combination will depend upon individual requirements. For example, 3 x HD screens with Windows TV and animated graphics will require higher performance than 2 x SD screens with no animations or TV. As a guide, a minimum Windows Experience score of 6 is recommended.
- Ethernet port for network connection is required
- Sufficient USB ports for the **TS MPA**, XL Lane Com adapter, TV tuners as required.
- A number of serial comports maybe required depending upon the equipment to be connected. These may be either built in or on USB adapters –

  1 or 2 x RS485 4 wire for MI and 1 or 2 Touch Score keypads as needed
  1 x RS485 2 wire for ADAM string pinsetter interface
  2 x RS232 for SES string pinsetters
  1 x RS232 or RS485 4 wire for a UBT (Universal Bowler Terminal)
  1 x RS485 2 wire for Universal MI GPIO and MI-x
  1 x RS485 2 wire for Frameworx on Com connection

See the Software ▸ Installation section for port settings.

Careful consideration should be given to the location of the TS3 computer. For centers with overheads, the preferred position is at the overheads, as this allows for optimal HDMI connection to the TVs. Also, the **TS MPA**, if used should be close to both the TVs and the computer.

Where there are only lower monitors, and no overheads, the TS3 computer is best located at the bowler's console.

However, TS3 may be located on the curtain wall, in which case the TVs should be connected using either VGA, or HDMI extenders. If IR remote control of the TVs is also required, the outputs of the **TS MPA** will need to be extended with CAT5 cable.

Where there are both upper and lower monitors, a suitable splitter and cabling will be required, as both the upper and lower monitors are driven from the same source.

2.2 Overhead TVs

Any monitor or TV that is compatible with the Windows computer can be used. TS3 will adapt to any resolution that the hardware supports.

The monitor should connect to the computer using either HDMI, or VGA.

HDMI gives the best quality, but is normally limited to short distances unless an extender device is used.

VGA cables can run the length of the bowling lane without problems, but the quality and maximum resolution may be reduced.

There are several options for controlling power to the TV and displaying other signals such as live TV, as detailed below. Any combination of these options can be used.

In order to choose a suitable TV and control option, consider how the system will be used. For example, will TV be displayed when the lane is off? Do all

TVs need to be able to display different channels or just a common feed? Do the TVs need to be powered down when not in use?

- **Windows Power Control**. TS3 can use Windows to put the TV or monitor into standby mode when not in use. All computer monitors should support this feature, and some TVs may also. No extra hardware is required as control is via the normal video cabling.

- **Windows TV**. USB TV Tuners can be fitted to the computer, such that any TV channel can be displayed full screen, or in a window within the score grid, or as a background to the score grid. This method is suitable for computer monitors that don't have their own built in tuner.

  Each screen requires its own USB Tuner, so that for 2 lanes a dual tuner is required. If live TV is also required on an auxiliary screen, 3 tuners are needed.

  Each screen can display a different channel.

  Bowlers can be given the option to choose their own channel.

  TS3 supports any tuner that has either an Analog WDM driver, or a digital BDA driver that is compatible with Windows Media Center.

- **Infra Red Remote Control**. The optional **TS MPA** (multi port adapter) allows control of the TV by emulating the TVs own handheld remote. It can turn the TV on and off, and change from score grid to TV or to any other input. It can control the volume, and any additional functions that are available on the remote.

  If supported by the TV, it can display the score alongside a TV picture using PIP (Picture-in-Picture) mode.

  Background display of TV, where the TV picture is behind the score grid, is not possible.

  Each screen can display a different channel.

  For more information, see the TS MPA reference, and the separate *TV Controller* document. Note that IR Control may not be possible with some TVs.

- **Legacy Control.** Basic power control and switching between score and TV is built into some legacy display systems, and their modern LCD replacements. Depending upon the type, the **TS MIU** may be able to use this legacy control equipment for simple power on/off, and score/TV switching. See the MIU Reference for more information.

  There is no channel control, so all lanes would display the same "channel" from a central distribution system.

- **Manual Control**. Some centers may find it acceptable to just use the TV's hand held remote to control the TV. The screens can be set to display advertising when the lane is not in use, or simply go black, but would always remain in the fully powered state unless the hand held remote was used.

  The hand held remote would be required to switch between score grid and TV, or to change channels.

- **Auto TV**. Some TVs have the ability to switch to an input when a signal becomes available, and then back to TV when that signal is lost. TS3 can use this ability to automatically switch from TV to score at check in, and back to TV at check out. However no channel control is possible without the use of the handheld remote.

  Likewise, some TVs will automatically power down when the signal is lost, and return to the fully on state when the signal returns. Unfortunately, many of these display "No Signal" or similar, and this is generally not desirable.

Many of these options require a suitable distribution system consisting of amplifiers and splitters to distribute the TV and/or video signal to each TV or TS3 computer. This distribution system is not part of TS3.

2.3 Lower Monitors.

TS3 does not currently support a separate output for lower monitors. Therefore when lowers are required, a suitable splitter/extender is required to duplicate the overhead output on the lowers.

However, TS3 does support using Windows Tablets for bowler consoles, and these do provide a lower scoring grid display.
If only lowers are required, then the TS3 computer can be mounted in the lower console and connect directly to the lowers as if they were overheads.

The same guidelines listed above regarding cable types, lengths and video quality for the upper monitors also applies to the lowers.

2.4 Machine Interface

The following options are available to connect the TS3 computer to the pinspotters and pin sensing equipment.

- **TS3 Machine Interface Unit**. The **TS MIU** has all the necessary connections for cameras and pinspotters, and connects to TS3 via the **TS MPA** or a serial port on the computer. Either a standard video camera or an AMF Accucam can be used for pinsensing. See the MIU reference for details.

- **Brunswick AS80/90 Data Processor**. A Brunswick data processor and camera can be connected to the TS3 computer using the **TS MPA**. See the TS MPA reference for detail.

- **AMF APS**. An AMF APS as used by Magicscore and Accuscore I systems can be connected to TS3 via the **TS MPA**. See the TS MPA reference for detail.

- **XL/Boss MI or Lane Com.** TS3 can connect to an XL/Boss lane com cable using an adapter. See XL Lane Com Adapter. This connection may include an MIU, camera and bowler terminal.

- **Frameworx**. TS3 can connect to a Frameworx LLAN and supports the following devices - Pinsetter Interface box and data processor, GSX(in Framewokrs mode) direct connection, Frameworx bumper controller, and Frameworx keypads. The LLAN is connected either via a **TS MPA** or a standard RS485 Com port. See the TS MPA reference for details. For systems using other MIs such as the **TS MIU** or **Universal MI**, this connection can also be used for controlling a Frameworx bumper controller only.

- **Adam Data Acquisition Modules** for String Pinsetters. TS3 uses off the shelf Adam interface 1/O modules to read the switches on a string pinsetter. See Adam Data Acquisition Modules for String Pinsetters.

- **SES Pinsetter Direct**. TS3 can connect directly to two SES String Pinsetters via two RS232 serial ports.

- **Funk/Spellmann direct**. TS3 can connect directly to two Funk string pinsetters with Spellman Modul Tech controllers, via two RS232 serial ports.

- **Vollmer/Ahlborn direct**. TS3 can connect directly to two Vollmer string pinsetters with Ahlborn controllers, via two RS232 ports.

- **Universal MI.** The Universal MI is built in to the TS3 software, and uses mostly general purpose I/O modules (GPIO) to connect to a wide range of pinspotting equipment. It offers similar functionality to the TS MIU. It can be used with an IP (network connected) camera, or an AMF A+ Accucam. It can also interface to generic string pinsetters using a camera and minimal connections.

  See the Universal MI reference for more details.

- **USB Bumpers**. Simple on/off relay control for bumpers can be obtained via a USB-RLY02-SN USB relay interface board. This board can be used in conjunction with most other MI types listed here.

2.5 Bowler Console.

The possible options for bowler terminals will depend upon the machine interface equipment in use as detailed below –

- **ALL Types**. The **Touch Score keypad** and stanchion can be used with any configuration of Touch Score. It is connected via the **TS MIU**, the **TS MPA** device, or directly via an RS422 com port on the TS3 computer. Both one keypad per pair, and one per lane (dual) are supported.

- **All Types**. The **Touch Score Console** is a program that runs on a windows tablet and can be used in place of a keypad. It requires a network connection to communicate with the TS3 computer. Both one console per pair and one per lane are supported. The console provides either a virtual

keypad display that functions the same as a normal keypad, or a fully interactive system including score grid display.

- **XL/BOSS MIU**. When connected to an XL/Boss MIU, then the existing single (1 per pair) or dual (2 per pair) XL/Boss keypad console can be used. No additional wiring to TS3 is required, as the keypads communicate over the same LANECOM connection as the MIU.

- **Frameworx Pinsetter Interface**. When connected to a Frameworx Pinsetter Interface via LLAN, a keypad based Frameworx bowler console can be used. The LLAN connections are shared between the Pinsetter Interface and the bowler terminal. Touch screen consoles are not currently supported.

- **TS MIU.** This MIU supports either a single Accuscore Plus bowler terminal or a **Universal Bowler Terminal** board with any of its supported keypad types, including dual keypads.

- **ALL Types.** A **Universal Bowler Terminal Board** can be used with any configuration and allows a variety of keypads to be connected either to the **TS MIU**, to the **TS MPA** device, or directly via a com port to the TS3 computer. Keypad support includes Magicscore single and triple, Accuscore 1, 2 and Plus (single or dual), AS80/90 and XL/Boss single or dual. See the **Universal Bowler Terminal** guide for more details.

- **No Bowler Console**. TS3 can be used without any bowler's console at all. The front counter is used to enter names and make score corrections, and the **Auto Next and End Game** function is enabled to advance to each new game.

- **All Types**. **Qubica Fly** keypads, single or dual

2.5.1 AS80/90 Keypad Re-labeling

The AS80/90 keypad does not have suitable keys for use with Touch Score. Therefore some keys must be relabeled with new stick-on labels. Contact your supplier for labels.

Original Key	New Label
Start	▸ (right arrow) and Menu
Correction	◂ (left arrow)

Skip Bowler	▲ (up arrow)
Special Features	▼ (down arrow)
Clear	Names
Print	Start
Bowl	Next Game
Enter	Enter

Although the Enter key is not relabeled, it is included in the new labels so that the entire column of keys matches.

2.6 Lighting

Touch Score can control the lighting fixtures on the lane, using the industry standard DMX512 protocol. Any fixture which supports this protocol can be used, and typically includes pin deck lighting, overhead lighting and chaser lights.

Touch Score can adjust the lighting depending upon whether the lane is checked in or not, the current game number and even the current bowler's chosen theme. Touch Score can also run light shows that are triggered by bowling. For example, it can run a chaser sequence down the lanes when a strike is bowled.

A centralized lighting controller or light desk can optionally be used to generate whole of house light shows, which are then merged with the light shows from Touch Score.

Touch Score requires one or two USB DMX lighting controllers to connect with the lights. The recommended controller is the **DMXKing ultraDMX2Pro**. This controller has the following connections –

- USB – connect to Touch Score at each lane pair. This device uses a com port driver which must be configured as COM16 for the first controller and COM17 for the second if used.
- DMX 1 or A – the DMX output for the odd lane
- DMX 2 or B – the DMX output for the even lane
- Ethernet – connect to the central controller (optional)

Note that if connection to a central lighting controller is not required, then any controller that is "**Enttech Pro**" compatible can be used. If the controller has only one DMX output, then two will be needed per lane pair.

Both Port A & B on the **UltraDMX2Pro** must be configured for **DMX output** mode, and the Universe for each port must be set as per the address configuration. The merge mode is typically **HTP** with **Time Out All Sources** enabled**.** Note that devices with firmware later than 3.5 will be setup automatically by Touch Score.

See the **Lighting** chapter in the Touch Desk manual for more information, including how to setup the addressing for the lighting fixtures, and whether 1 or 2 controllers will be required.

When using Touch Score in standalone, the default fixture addresses must be used.

2.7 Coin Acceptors & Ticket Dispensers

Touch Score can interface to coin acceptors and redemption ticket dispensers so as to operate as an arcade game on mini or full size bowling.

The interface allows for the reading of a signal for each coin inserted, and the output of a pulse for each ticket that is to be issued. These signals are similar to that used in the Universal Card Link specification, and should allow a wide range of coin acceptors, ticket dispensers and player card systems to be used.

For details of the interface hardware, see UCL Hardware.

2.8 Smart Card Readers (NFC)

Customers can be issued smart cards which they can use to identify themselves to the scoring system. These cards can also be used to purchase games via tokens, earn rewards via tickets, or order food and drink from prepaid credit. See the Touch Desk manual for more information on the use of smart cards.

The smart cards use NFC technology and require a suitable card reader to be connected to either the bowler's console computer, or the touch score computer itself.

If a single console is fitted to a pair, then a single reader must be connected to the console. Any readers connected to the TS3 computer are ignored.

If dual consoles are fitted, each must have its own reader attached. Any readers connected to the TS3 computer are ignored.

If no consoles are fitted, then a single reader must be connected to the TS computer, and can only be used for purchasing games with virtual tokens and earning rewards with virtual tickets.

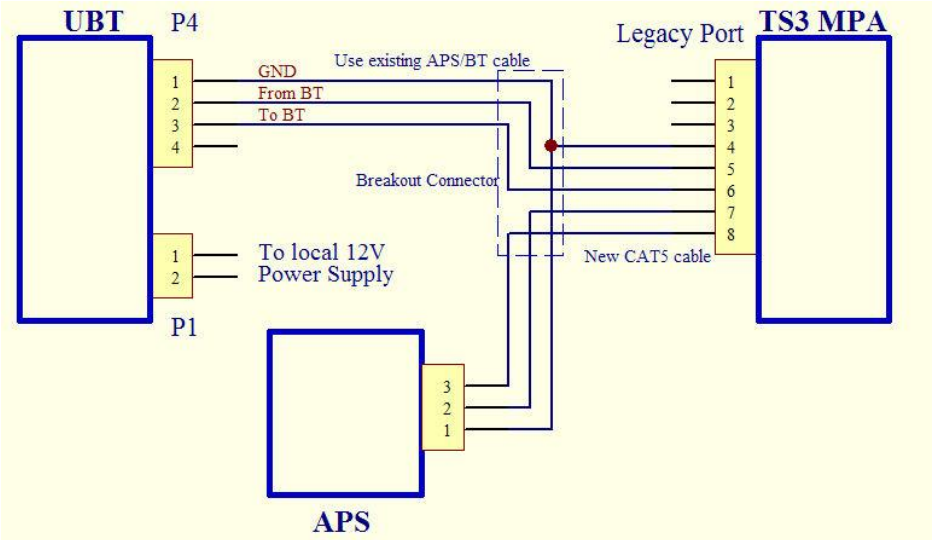
In the cases where a single reader is shared between a pair of lanes, Touch Score will intelligently use the reader for the appropriate lane based on the current context and prompts at each lane. Where either lane is available for check in, it will alternate each check in where possible.

The recommended card reader is Advanced Card Systems ACR-122U which connects via USB, although other types that support the standard windows driver may be used.

3. Standard Configurations

Following are some standard configurations used for both upgrading existing systems and for new installations.

3.1 Magicscore/Accuscore 1



A **TS MPA** is required at the TS3 computer. A shielded Cat5 cable then connects the MPA Legacy Port to a breakout connector at the APS on the curtain wall. This breakout connector then connects to both the APS and on to the *optional* **UBT** at the bowler's console.

The **UBT** is only required if the existing keypads are to be retained. Alternatively a **Touch Score keypad** can be connected to the **MI/BT** port on the **TS MPA,** and an optional second keypad (Right Lane) to **COM4** on the TS computer, or Touch Score Consoles (tablets) can be installed.

A shielded data cable is required to connect the breakout to the **UBT**. Often an existing cable can be used, such as the APS cable from Magicscore installations, or the old bowler terminal communications cable from Accuscore 1.

A power supply is required for the **UBT**. See the UBT manual for specifications.

3.2 XL/Boss.

The TS3 computer can be used as a replacement for the XL/Boss chassis, with most other components remaining the same. The computer can be mounted on the curtain wall, or at the overheads.

The original XL/Boss chassis uses VGA for connection to the overheads. So it is often convenient if the new computer and monitors also use VGA, as the existing cabling can be re-used. This is especially true if the new computer is on the curtain wall.

TS3 does not provide power control of the TVs as the original XL/Boss chassis does. Instead, use one of the alternative options such as IR control. If legacy power control is fitted it may need to be bypassed to power up the TVs.

If the TV Tuner function of the original chassis is to be duplicated, then TV tuners must be fitted to the TS3 computer, or an alternative method such as IR control must be used to provide a TV picture. See Windows TV and IR Control.

An Echelon U10 Network Interface device connects between a USB port on the TS3 computer and the existing LANECOM cable. This provides connectivity to the Machine Interface Unit (if present), camera and bowler terminal.

The two terminals on the Echelon U10 connect to pins 1&2 (usually Red & Black wires) of the existing LANECOM cable for XL centers that have the 4 pin SDL connectors.

For BOSS centers with RJ45 type connectors on the LANECOM cable, the required wires are on pins 7&8.

If the existing bowler terminal is not to be retained, there are two options –

- One or two **Touch Score keypad(s)** connected to an RS422 port (COM4/5) on the TS3 computer.

- One or two **Touch Score Consoles** (tablets)

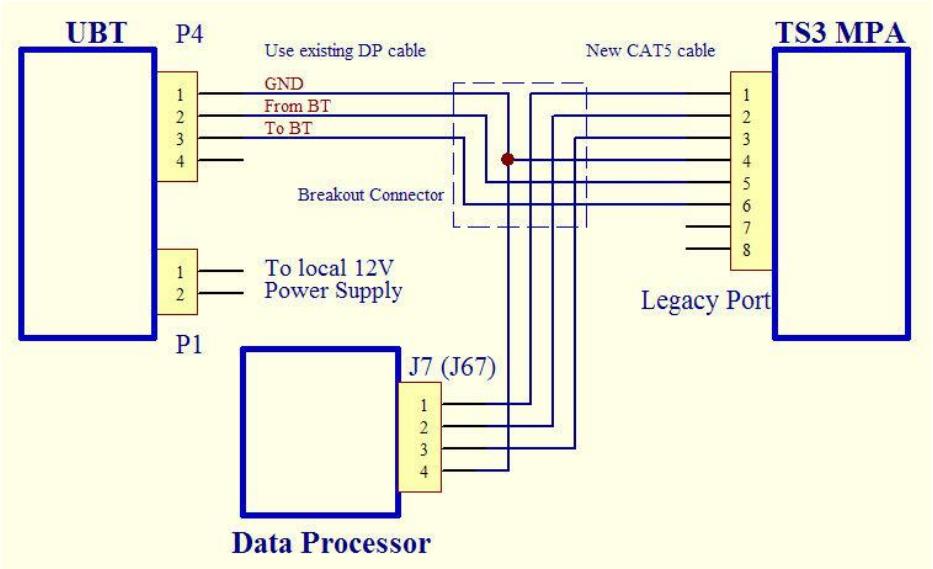
- A **Universal Bowler Terminal** with any supported keypad type, connected to com 4 on the TS3 computer.

The existing AMF camera can be retained, or an IP camera connected to TS3 via ethernet can be used instead.

The TS3 computer must be connected to the Touch Desk Windows network, not to the existing XL scoring network which may still be in use on other lanes.

The windows driver for the Echelon U10 must be installed.

3.3 AS80/90



A **TS MPA** is required at the TS3 computer. Shielded Cat5 cable then connects the MPA Legacy Port to a breakout connector at the data processor box. This breakout connector connects directly to J7 (J67) on the data processor board, and also uses the cable that was originally connected to J7 to connect to the *optional* **UBT** at the bowler's console.

The original I/O board and AC board from the bowler's console are no longer required. The console is typically replaced with one without lower monitors, or

the lowers can be retained and connected with additional cabling and splitters to the overheads.

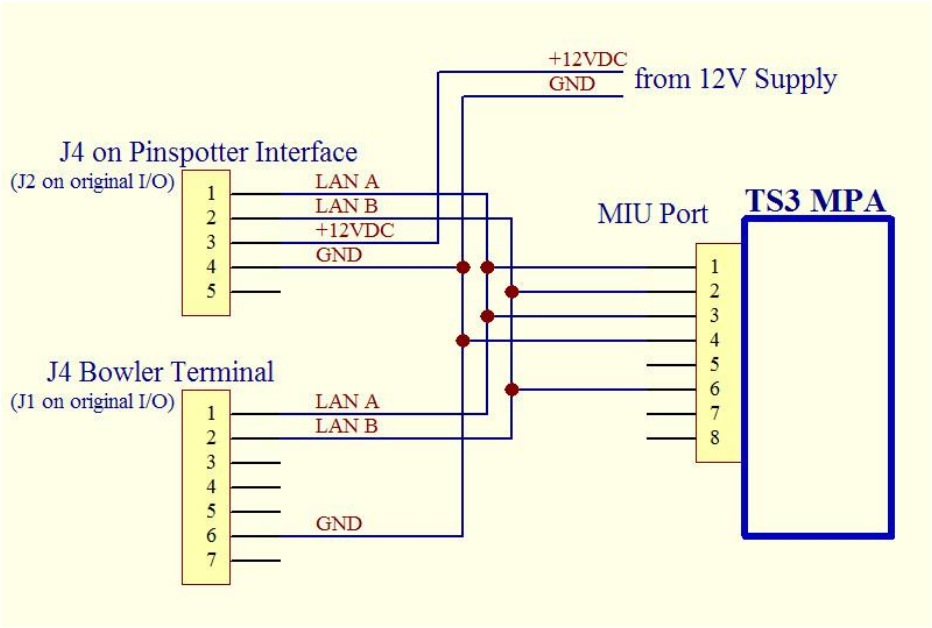
Note that the data processor box requires a 28VAC power supply. The transformer from the original console must therefore be retained, and wired directly to the data processor power cable, as the existing AC board will be discarded.

The **UBT** is only required if the existing keypads are to be retained. Alternatively a **Touch Score keypad** can be connected to the **MI/BT** port on the **TS MPA,** and an optional second keypad (right Lane) to **COM4** on the TS computer, or Touch Score Consoles (tablets) can be installed.

A power supply is required for the **UBT**. See the UBT manual for specifications.

For systems with lowers only, the TS3 computer can be located in the lower console rather than at the overheads. To simplify installation in this case, connect the UBT to the MIU Port on the **TS MPA** rather than splitting the legacy port cable.

3.4 Frameworx



The TS3 computer can replace the Frameworx CPU for a single pair. The computer can be mounted on the curtain wall or at the overheads. New overhead cabling will be required.

TS3 requires either an **RS485** serial port, or a **TS MPA** to connect to the Frameworx LLAN.

If using an **RS485** port, connect the data A, B and ground connections to J4 using the above diagram as a guide. Note that as the connector pinouts on RS485 ports are not standard, we cannot provide any further information here. See the manual for the serial port being used for exact pinouts. Be sure to also connect a 12V supply to pin 3 of J4.

For the **TS MPA**, see the diagram above. The MIU port on the MPA connects to the LLAN cables for both bowler terminals (originally J1 on the I/O PCB) and the Pinsetter Interface (originally J2 on the I/O PCB) in parallel.

The diagram above shows both the pinouts if using the existing cables (J1 and J2), and the actual connections used if re-cabling to the Pinsetter Interface box and the Frameworx bowler terminals.

Direct LLAN connection to GSX machines is also supported. The GSX must be set to Frameworks mode.

Touch screens are not currently supported.

Most devices require 12V from an external power supply as shown. Some older Pinsetter Interfaces may not require the 12V. To determine which type you have, open the box and look for a large IC labeled MAX1480BCP1 or similar. Boards with this IC do NOT require 12V.

TS3 also supports a Frameworx Bumper Controller connected via the same LLAN connections. The bumper controller may also require a 12v supply as above. See the bumper controller manual for details.

If the existing bowler terminal is not to be retained, there are three options –

- One or two **Touch Score keypad(s)** connected to an RS422 port (COM4/5) on the TS3 computer.

- One or two **Touch Score Consoles** (tablets)

- A **Universal Bowler Terminal** with any supported keypad type, connected to Com 4 on the TS3 computer.

The original Frameworx CPU supported video distribution from a central source. This function is not part of the TS3 computer, but can be duplicated by using suitable amplifiers and splitters to feed either a TV Tuner in the TS3 computer or the TVs directly. See Windows TV and IR Control.

The **TS3** computer must be connected to the Touch Desk Windows network, not the existing Frameworx scoring network which may still be in use on other lanes.

TS3 also supports using the Frameworx Pinsetter Interface box for switching the pinsetters on and off only, and collecting scoring data directly from the Data Processor box. To use this configuration wire the Pinsetter interface box as above, and disconnect the DP box from the Pinsetter interface box and connect it to the MPA as in the previous section. The MI Interface type must be set to **Frameworx** in either the Touch Score configuration menu or the

Touch Desk setup screen. Do not use the **Auto** or **Brunswick Data Processor** setting.

3.5 New Installations

New Installations require either a **TS MIU, Universal MI** or one of the direct connection options (Adam String, SES or FUNK pinsetter, XL, GSX etc)

See the MIU or Universal MI reference for more details.

4. Software

This chapter provides information on the installation and operation of the TS3 software.

4.1 Installation

To install the Touch Score software, run the *Touch Desk Setup* program and check **Install Touch Score**. For standalone only installations (no Touch Desk) then also check **Standalone Only.** If digital signage is to be displayed on the scoring monitors when not in use, then also check **Touch Desk Signs**. The following components can then be installed -

- **Firebird ODBC Driver**.
- **Touch Score software**.
- **Touch Desk Signs software**
- **TightVNC Remote Viewer**. (Allows viewing the Touch Score screen from Touch Desk, see the Touch Desk manual for more information)
- **USB Key driver** (required for standalone only)

At the end of the installation, both the Touch Score program and the Digital Signs program can be started immediately; otherwise they will start automatically at the next reboot.

If either program displays the message "Connecting to servers" for a prolonged period, make sure that the Lane Server is running and correctly configured. Check network connectivity (firewall settings etc)

Drivers for the **TS MPA** are installed with Touch Score. In addition, you may need to install drivers for –

- The Echelon U10 if used. Make sure the default network name of LON1 is left unchanged
- Any com port devices.
  Use Device Manager to set the port numbers as below –
  COM4 - For Touch Score keypad (RS485) or UBT (RS485 or RS232)
  COM5 - Second Touch Score keypad if required (RS485)
  COM6 – ADAM units for string pinsetters (RS485 two wire)
  COM7/8 – Odd & Even SES pinsetters (RS232)
  COM10 – AMF 90XL Pinspotter (used with Universal MI)

COM11 – Amf Camera (used with Universal MI)
COM12 – Universal MI Adam I/O modules (Advantech) and MI-X
COM13/14 – Odd and Even Funk Pinsetters (RS232)
COM15 – Frameworks LLAN on Com port
COM16/17 – DMX Lighting controller(s)
COM18 – AMF –X (requires FTDI drivers)
COM19/20 – UCL Coin/card acceptor (requires FTDI drivers)
COM21 – USB Bumper relays USB-RLY02-SN
COM22 - Universal MI I/O modules (MODBUS RTU)
COM23/24 – Odd and Even Vollmer/Ahlborn Pinsetters (RS232)
COM25 – XL MCU Daisy Chain
COM26/27 – Reserved for intercom relays on the console when the console is on the same PC as TS3.
COM28 – Qubica LCOM for Qubica keypads and six box

Any - the MI can be connected to any RS485 comport, as the software will search for it.
Any – the MPA is a USB device, but contains a virtual comport. It can be assigned to any com port as the software will automatically search for this also.

- Any TV tuners to be used for Windows TV.

As the Touch Score computer needs to operate unattended, there are some changes needed to the Windows Operating System as below –

- **User Account Control. IMPORTANT!** In order for the update manager to update the Touch Score software automatically, Windows User Account Control **MUST BE TURNED OFF**. Windows User Account control prevents any updates to programs without user confirmation. See **Control Panel ▸ User Accounts and Family Safety ▸ User Accounts ▸ Change User Account Control Settings**.

- **Group Policy**. Some changes to the default group policy are needed in order for the lane server to be able to update Touch Score automatically in large centres (>30 lanes or so) without violating Windows limits for the maximum number of network sessions. This step is not essential for smaller centers. Run gpedit.msc, go to Computer Configuration ▸ Windows Settings ▸ Security Settings ▸ Local Policies ▸ Security Options and make the following changes –

Set **Network Access: Let Everyone permissions apply to anonymous users** to **Enabled**

Set **Network Access: Shares that can be accessed anonymously** to **Touch Desk Signage, Touch Score.** Enter each on a separate line**.**

- **Auto Start Up**. Touch Desk can turn on the TS3 computer by sending a magic packet over the network, so long as the computer has been configured to allow for this. The computer should also be configured to boot up as soon as power is applied, as direct access to the ON switch may not be practical if the computer is mounted at the overheads.

  To shut the lane computer down, use the Lanes ▸ Setup ▸ Scoring Computer OFF command in Touch Desk, which will shutdown Windows and turn off the power. The BIOS should be configured so as to NOT restart immediately after a shutdown, but only once the power is removed, and then reapplied, or a magic packet is received.

- **Auto Log On**. A default user needs to be logged on at start-up, without waiting for the user to enter a name and password. The easiest way to do this is to ensure that only one user account is created, and that this account has no password created. For Windows 7 if this is not the case, then type **netplwiz** in the search box then press enter, select the user to be logged on, then uncheck **Users must Enter a User Name and Password.**

- **Sleep Modes.** The computer should not enter sleep mode, nor turn off the display when no user input is detected. For Windows 7, go to **Start ▸ Control Panel ▸ System and Security ▸ Power Options ▸ Change Plan Settings** and set **when to turn the display off**, and **when to put the computer to sleep** to **Never**.

- **Hide the Task Bar**. Right Click on the Task Bar, then **Properties**, and check **Auto-Hide**.

- **Remove all icons from the desktop**. Delete any shortcuts, then Right click on the desktop, then **Personalize ▸ Change desktop icons**, and delete the Recycle Bin etc.

- **Wallpaper**. When the scoring display is turned off, but the screens left powered then the desktop background or wallpaper will be displayed. Select a suitable image as the wallpaper, or just use a black screen. Note that you can also set up background displays from Touch Desk, using either the TS3 Logo graphic, or Touch Desk Signs.

- **Multi Monitor Setup**. Windows must be setup to use 2 or 3 screens, and to extend the desktop over all screens. Right click on the Desktop, then setup each screen as required and ensure the **Multiple Display** mode is set to **Extend these displays**. Screen 1 will be used for the odd lane, and 2 for the even lane, and 3 for an optional auxiliary digital signage display. If the desktop is set to one screen only, then both lanes will be displayed on this one screen.

- **Scale and Layout**. Windows display scaling can be used to enlarge the menu screens when used with high resolution monitors. The scoring grid itself is unaffected by scaling and will auto size to any resolution.

  The console tablet however, should remain at 100%. Any scaling changes can adversely affect the appearance of the console.

  For Windows 10 & 11, right click anywhere on the desktop, then Display Settings, and check **Scale and Layout** (Windows 10) or **Scale** (Windows 11) is set to 100%

4.2 Updates

The Touch Score computer does not need to be updated manually. Whenever a new update is loaded on to the Lane Server, simply restart all the Touch Score computers and they will copy the update from the Lane Server.

In some cases, depending upon the level of update, the manual restart is not needed, as Touch Score will detect and display the message “Incompatible Versions” before updating and restarting automatically.

Note: For standalone installations of Touch Desk, see the RESTART button in the Virtual Desk.

4.3 Startup

Upon initial startup, Touch Score will

1) Search for connected hardware devices. As below –

   - **TS MIU** on any com port
   - **TS MPA** on any com port
   - Echelon U10 Lane Com interface configured as Lon1 through 5
   - **UBT** or **Touch Score** keypad on COM4 (if not in use elsewhere)

   If a **TS MPA** is found then Touch Score will then search for –

   - Magicscore APS
   - AS80/90 Data Processor
   - Frameworks Pinsetter Controller

   If the type of Machine Interface device has been explicitly set, then TS3 will only search for that type of device.

2) Display "**Press Y for Setup**" to allow the basic setup menu to be run.

   Pressing **Y** for setup allows Touch Desk to determine the type of keypad being used. Touch Score may sometimes ask for additional keys to be pressed when further identification is needed.

   For dual keypads (2 per pair), press **Y** on the **LEFT** keypad to enter setup.

   If Touch Score has already been setup, or is connected to a lane server that can provide the setup, then this prompt will only remain for a few seconds, then normal operation will commence.

   If the setup has never been done (or the memory has been cleared), and no lane server is connected, then this prompt will remain until a valid **Y** key is detected.

If the keypad is not functioning, click on the startup screen with a mouse to bring up the start up menu.

Clicking on this screen can also be used to skip the search for an MI device, which can be useful if the MI device is not working and you wish to run the

scoring in manual scoring mode. This can also be achieved by setting the MI type explicitly in Touch Desk, rather than using AUTO search mode.

Note that Touch Score can be installed either with a Touch Desk, or in a standalone configuration with no management system.

When used without a Touch Desk, a USB key must be fitted to the Touch Desk computer. Without this key, there is a limit to how many times Touch Score will start up without a Lane Server being present. Therefore if Touch Score is being used with Touch Desk, and the Touch Desk computer or the network fails for any reason, do not restart the Touch Score computers unnecessarily until the connection to Touch Desk has been restored.

See Standalone mode for more information on operating Touch Score without Touch Desk.

4.4 Setup Menu

The setup menu contains the following options. These can also be set from Touch Desk in **Lanes ▸ Setup.**

- **Lane Number**. Set the lane number of the pair.
- **Machine Interface type** sets the type of equipment used to connect TS3 to the pinspotters. This can be set to AUTO and TS3 will automatically detect the equipment. However there are times when the auto detection will fail (for example if the attached equipment is not turned on or connected), so it is generally best to set the type explicitly. Note that the wrong setting may also prevent the keypad from working.
  Options are -
  - **None.** Manual scoring only
  - **Auto.** Auto detect connected devices
  - **AKMicro MI on COM.** Touch Score 3 MI connected to a com port
  - **AKMicro MI on MPA.** Touch Score 3 MI connected to the MI port on a TSMPA unit
  - **Brunswick Data Processor.** Brunswick data processor with scanners or ccd camera connected via the legacy port an MPA.
  - **Framework.** Frameworx Pinsetter Interface controller connected to the MI port on an MPA
  - **XL/Boss MI.** AMF XL MI as used for XL or Boss scoring connected via a LONWorks adapter.

- **Adam 5 or 9/10 pin.** Adam relay modules connected to 5 or 9/10 pin string machines
- **SES** SES pinspotters on com ports
- **FUNK** Funk pinsetters with Spellman controller on com ports.
- **Universal MI.**
- **Vollmer/Ahlborn.** Vollmer pinsetters with Ahlborn controller.

- **Pinspotter type.** AMF or Brunswick. This setting is used to control the operation of TS2, TS3, an XL or BOSS MI if connected. For TS3 MIs, also see the advanced settings in the Virtual Desk ▸ Setup Tab .

- **Game Type.** TS3 supports 10 pin, 5 pin, candle pin and 2 & 3 ball duck pin

- **Extended APS Protocol.** This option should be ticked only if an APS is being used for pinsensing, and the APS has been fitted with the updated A.K.Microsystems firmware which allows for pindication display. Normal APSs detects only total pinfall count.

- **Manual Scoring**. Allows bowlers to manually enter a score.

- **Clear Memory**. Clears all scorer memory including names, scores and settings, except for those settings on this setup screen.

4.5 Operation

Operation of the TS3 bowler menu is relatively straight forward, but the exact keys used will depend upon the keypads.

Generally the ENTER key is used to bring up the menu, or accept the current selection. However many keypads do not have an ENTER key, so the ▸ (right arrow) key is used instead.

The ◂ (left arrow) key is used to cancel or go back from the current operation.

Thus the right and left arrows go forward and back through the menu system, while the up and down arrows are used to select items from the menu.

When text is being entered, the ERASE or BACK SPACE or DELETE key will remove the last character entered.

When selecting from a number of available options, the SPACE key selects the next available option.s

Shortcut keys can often be used. For example, when setting the bowler type to blind, you can either press SPACE and cycle through all available bowler types until you get to blind, or just press B.

Many keypads have predefined keys, such as START BOWLING or NEXT GAME. These keys will generally either work as expected immediately, or display the relevant menu screen when pressed. They can be used when no menu is currently displayed, or the main menu is displayed, but may not work within other screens.

When Frameworx keypads are used, the menu prompts will be color coded and position matched to the 8 function keys at the top of the keypad, similar to the original Frameworx scoring.

4.6 Camera Setup

4.6.1 Touch Score Camera

This section details the setup procedure for a camera connected to either TS2, **TS MIU**, or a via a network. It is not used for AMF type cameras.

The camera setup screen is available in the **Maintenance Menu** at the bowler's console. For keypad systems, the maintenance menu must be enabled from Touch Desk or the Virtual Desk. (For Touch Desk, see Lanes ▸ Modify ▸ Other ▸ Enable Maintenance Menu)

The camera setup can also be performed at Touch Desk, see Lanes ▸ Setup ▸ Camera Tab.

Before using this function, there are several adjustments that must be made at the camera itself. For **TS2** or **TS MIU** connected cameras, these are best made by connecting a portable TV or monitor to the output of the camera, but can also be made using the TS3 screen.

- Adjust the orientation of the camera so that it can see all 20 pins on both lanes, and that no pin is completely behind any other. The camera should be level and at the same height as the neck of the pins.

- Adjust the camera zoom so that the pins are as large as possible on the screen (if available), yet still fit within the images displayed for each lane at TS3.
- Adjust the focus so that the pins are in focus (if available).
- Adjust the iris (if available) so that there is good contrast between the pins and the background under all light conditions (eg normal pit lights, black lights etc). Some cameras may have an auto iris and/or auto back light control to automatically adjust to the light level. Infra Red cameras with suitable IR illumination may also be used.

Then reconnect the camera to the **TS MIU** and bring up the *Pin Camera Setup* screen.

Press **O** to upload an **Old Image** from the MI. This image was taken the last time the MI scored a ball for this lane, and can be used to quickly determine the cause of any miss-scores. E.g. sweep in front of pins etc.

Press **R** to **refresh** the image with the current camera view.

Note that the images uploaded are low resolution, as the MI unit uses slow speed communications so as to retain compatibility with legacy systems. However the image processed internally by the MI unit is of a higher resolution. The low resolution of the displayed image is not a problem, as the image is only used to position the pin dots. However in cases where the pin dots are incorrectly positioned on the very edge of the pins, the difference in resolution may mean that the lane may interpret the number of pins standing slightly differently to what you see on this image.

Once the image is displayed, the following parameters can be set:

- Pin Position
- Neck Position
- Brightness Threshold
- Camera Delay
- Visual machine detection

Pin Position The position of the head of each pin must be set. TS3 will use the brightness at this position to determine if a pin is standing. Spots that are brighter than the brightness threshold will be interpreted as a pin standing and shown in green. Spots for absent pins are shown in red.

To set the pin positions:

- Press **P (Pin Position)**
- Press **0-9** to select a pin to setup. **0** or **Miss** can be used to select the 10 pin.
- Press **S (Small)** or **L (Large)** to select either small or large steps to move the pin position.
- Use the arrow keys to move each pin dot on to the center of the head of the pin.

Neck Position. The height of the neck of the pins must be set by positioning the neck line across the pin necks. When a pin is not detected in its usual position, TS3 searches along the neck line between the pin's usual position and the next pin rearwards. This enables TS3 to detect many off spot pins. The camera must be mounted level and at neck height so that the neck line lies across the neck of all pins. Note that no camera system can detect all off-spots all of the time, as pins can move behind other pins.

To set the neck position:

- **Press N (Neck Position)**
- Use the arrow keys to move the line on to the neck of the pins.

If the camera has been mounted correctly at neck height, then all necks should be in line.

The scanning for off-spots can be disabled by moving the neck line well above all the pin dots. This is often the best option when the necks are not at the same height, or other lighting factors cause the off-spot scan to detect phantom pins and thereby miss-score.

Brightness Threshold – When adjusting the brightness threshold, areas that are darker than the threshold are shown in black. Areas that are brighter are shown in white or light grey. Areas that are close to the threshold are shown in yellow. The threshold should be adjusted so that the area at the pin dots appears white when the pin is present and black when the pin is absent. If this area is yellow, then it is uncertain whether the pin will be detected or not.

Two different threshold levels can be set. One will be used for normal deck lighting, and the other for low level lighting conditions such as glow in the dark bowling. The appropriate lighting condition is then chosen when checking in the lane for bowling.

Use the **Normal** and **Low Level** buttons to set each brightness threshold independently.

To adjust the brightness threshold:

- Press **T (Threshold)**
- Use the up and down arrow keys to adjust

You can also view the image using the threshold colours at any time by pressing **Y (Show Threshold)**, and revert to a normal image with **H (Hide Threshold)**

Camera Delay – This is the delay between when a pinspotter cycle starts (sweep switch closes, or ball detector triggered) and the camera image is processed. It should be as short as possible, but must be long enough for the sweep to clear the camera's view of the pins.

This setting does **NOT** apply to Brunswick pinspotters using the 44/144 switch on **TSMIU**. However it does apply to this case when using the **Universal MI.**

To set the delay:

- Press **D** (Delay)
- Use the up and down arrow keys to adjust, or enter a value.

Different delays can be set for 1st and 2nd ball, but generally they should both be set the same. Use the left and right arrow keys to swap between 1st and 2nd ball.

To test the camera delay, **Cycle** the pinspotters then upload an **Old Image**. Examine the image and ensure that the sweep is clear or the pins. Test on both 1st and 2nd ball cycles.

To cycle the pinspotter:

- **P**ress **C (Cycle Pins)**

The **F (Factory Settings)** button restores all settings to default values. These settings are not intended for actual use, but simply to give approximate starting positions to ease the setup process.

Once setup, the camera settings are stored in TS3, and also at the front desk computer. If the TS3 is cold started (memory is cleared), then these settings will be lost and the camera will not function. However, if the front desk computer is connected, it will quickly reload the settings and the camera will function normally. If a TS3 is moved from one lane to another, it is important to cold start it, so that the settings for the correct lane are retrieved.

Machine Setup

The Visual MI can visually detect the state of the pinspotter, rather than using hard-wired switches. Use this screen to position the detection points on the pinspotter image, and to set the expected colour of each of the detection points.

Each detection point must first be enabled in the **Visual MI tab** in Touch Desk or the Virtual Desk. Then it can be positioned in a similar manner to the pin positions.

Once a detection point is positioned, click on the colour indicator for that point. Click **Yes** as prompted to use the current colour at that point in the image as the expected colour.

Each point will be considered "detected" only when its colour in the image matches that of the expected colour. The matching is fairly loose and allows for differing light conditions.

Note that black or dark colours can also be expected colours, and white or lighter colours will then be ignored. This is different to the pin detection method which will detect a pin for any colour above a certain brightness.

The detection points are –

Start 1 and 2. These points are used to detect the start signal, similar to the **Sweep Switch** or **0 Degree** switch on a normal MI.

If the **Start Signal** is set to **Sweep Switch** in the Setup Tab, then the detection point must be visible at all times that the machine is active (sweep has left the home position).

If the **Start Signal** is set to **0 degree switch**, then the detection point must be visible only when the machine is at 0 degrees.

Often neither of these is practical. In this case, set the detection points on the sweep when it is in the down position. Then set the **Extend Start Signal** to at least the time that the sweep will disappear from view of the detection point when it sweeps the pins. This will create a continuous "start" signal from the time the sweep drops, until a short time after it rises.

Note that both Start 1 and Start 2 must be detected. These can be placed on either end of the sweep to avoid false detections as a ball passes.

When detecting the sweep down position, make sure that the ball detector is not placed in such a way that it is triggered by the falling sweep before the lowered sweep is detected.

2nd Ball. Position this on the second ball light on the mask.

Foul. Position this on the foul light on the mask.

Ball Detect. This requires a ball detector that has an indicator light that is in view of the camera. Position the point on the indicator light. The indicator light should stay on for a second or so, to ensure it will be captured by the camera. This type of ball detector will not provide any speed information

Pan Image. This feature is used to pan the camera image on the setup screen so that the various pin locations etc can be set. It only applies when low resolution screens are in use and the entire image does not fit on the screen alongside the setting controls.

4.6.2 AMF Camera

For AMF cameras, see the relevant AMF documentation for aligning and setup.

Touch Score provides two functions to assist in setting up an AMF camera.

Calibrate. This sends a calibration command to the AMF camera. This is the same command that is sent automatically at the end of every 2nd ball machine cycle. All pins should be standing at this time, as the camera calibrates itself based on their position.

Scan Pin Deck. This command causes the camera to instantly scan the pin deck and the resulting pin count is displayed.

If an AMF camera is miss-scoring, yet this scan shows all pins correctly, then there is most likely a timing problem. For example, the rake or sweep is in the way when the camera scans during normal play.

4.7 Standalone Mode

Touch Score is normally installed with a **Touch Desk** management system. **Touch Desk** is then used to turn the lanes on and off, and to set the operating parameters.

Touch Score can also be used in standalone mode without **Touch Desk**.

A **Touch Score** system that is installed with Touch Desk will also automatically revert to standalone mode if the connection to **Touch Desk** fails for any reason.

In standalone mode, a new menu item called "**Scoring Mode"** will appear at the top of the bowler's menu. This screen contains basic settings that would normally be set by **Touch Desk**, such as League/Open Mode and Practice Mode.

To turn a lane on when operating in standalone mode, simply press the **LEFT LANE** or **RIGHT LANE** key on the keyboard.

For systems using a PC keyboard and mouse only, go to **Start ▸ Programs ▸ Touch Score ▸ Touch Score**. This will turn on both lanes.

For systems with a tablet as the bowler console, touch the left or right hand side of the screen when the Touch Score logo is displayed to turn on the left or right lane. If the logo is not displayed, run the Touch Score console app again.

To turn off a lane, use the **End Bowling** or **Finish Bowling** option on the bowler's menu.

It is always a good idea to have mouse and/or keyboard handy to access the TS3 computer, even though these are not required to operate the system

normally. There may be times when they are needed to deal with Windows maintenance etc.

See also the Virtual Desk screen, which provides additional settings when in standalone mode.

4.8 Virtual Desk

The **Virtual Desk** screen is used when **Touch Score** is being operated without **Touch Desk**. It is used to perform tasks and set parameters that would normally be achieved via **Touch Desk**.

- **For keypad systems**, the **Virtual Desk** screen can be accessed by clicking on the settings icon in the top right hand corner of the **Scoring Mode** screen in the bowler's menu. The **Scoring Mode** screen is only present in standalone mode.

  The **Virtual Desk** can only be accessed with a mouse, and is therefore not normally available to the bowlers in a standalone center. However, center staff can use a wireless mouse or a temporarily connect a mouse to setup these parameters initially. They do not need to be changed during normal day-to-day operation.

- **For Tablet systems**, the **Virtual Desk** screen can be accessed from the Maintenance Menu. Note that for the Touch Desk trial, the Maintenance Menu can be accessed directly from the icon at the top right of all menus.

Once all changes have been made, click **Apply** to apply the changes to the lane. The following options are also available before applying -

- **Apply to Both Lanes.** The settings will be applied to both the odd and even lanes. (Not applicable to Trial Version, always applied to both)

- **Use as turn On defaults.** The settings will be saved for use the next time the lane is turned on. If this option is not ticked, any changes will be lost when the lane is turned off.

Use the **Load Defaults** button to load up the factory settings for you configuration. Note that important machine delays and setups may be lost by applying these defaults!

4.8.1 Setup Tab (Standalone Only)

This screen contains all the items on the basic setup screen (accessed during startup by pressing Y) and some additional settings related to the equipment that Touch Score is using.

Settings on this tab are always applied to the turn on defaults, regardless of the option selected at the bottom of the screen. Many settings are also paired and will apply to both lanes.

- **Lane Number**. Set the lane number for this pair. Enter either the odd or even number.

- **Keypads**. Select the type of keypad connected. This is normally done automatically by hitting **Y** during the start up process, but can also be changed here. Make sure it is set to tablet if you are using tablets, otherwise bowler menus may still get displayed.

  Note that if set to tablet, but a tablet is not currently connected, clicking anywhere on the overhead screen brings up a bowler menu. This provides access to system in the event of a tablet failure.

- **Game Type**. Select the type of game supported by the pinspotters.

- **Pinspotter Type** is determines how XL/Boss and TS2/3 interfaces with the pinspotters but does not apply to all installations.

  For TS3 with XL/Boss MIU or camera, make sure the type set here is the same as set by the switches on the bowler terminal board if present.

  For TS3 with a TS3 MI or Universal MI –

  For AMF 8230/70/90 and Brunswick A2/Jetback, the advanced settings for Score Trigger and Start Signal as described below are used.

  For AMF 8800/8290XL/Xli, the MI connects directly to the machine and advance configuration is not possible.

  For TS3 with the Universal MI –

Generic String is for string pinsetters and uses similar logic to the Adam string interface for determining when to reset the pins after a ball is bowled. The camera is used for pin detection. The score trigger should be set to **Ball Detect**. A cycle output must be connected. A start signal is not required.

- **Machine Interface type** sets the type of equipment used to connect TS3 to the pinspotters. This can be set to AUTO and TS3 will automatically detect some equipment. However there are times when the auto detection will fail (for example if the attached equipment is not turned on or connected), so it is generally best to set the type explicitly. Note that the wrong setting may also prevent the keypad from working.

- **Score Trigger.** This setting determines when the score is recorded by the camera. The options are:

    - **Start + Delay.** The camera records the pinfall a fixed time after the start or sweep signal. This is the default for AMF pinspotters. The camera delay will be either the AMF Camera Delay for AMF cameras, or the CCD Camera delay set in the Camera Setup screen for CCD cameras.
    - **44/144.** The camera records the pinfall when the 44/144 input is activated, in accordance with the logic for early Brunswick scoring systems. This is the default for Brunswick A2s etc.
    - **Ball Detect.** The camera will record the pinfall a set time after a ball triggers the ball detector. The delay from when the ball detector is triggered to when the camera is triggered is equal to the sum of the Ball Detector Delay plus the Camera Delay. The camera delay will be either the AMF Camera Delay for AMF cameras, or the CCD Camera delay set in the Camera Setup screen for CCD cameras. Note that this input need not be a ball detector, but can be any other input that is used to trigger the score after a delay.

- **Start Signal.** This determines the type of signal that is connected to the START inputs on the MI. The options are:

    - **Sweep Switch.** The signal is active when the sweep is NOT at the home position.
    - **0 degree Switch.** The signal is active when the machine is at zero degrees.

Note that for the Universal MI, the start signal type can be set to **None** in the Universal MI Setup Tab and left unconnected. However, this is only useful when both of the following are true.

- Score triggering is set to **Ball Detect**
- Pinspotter type is Generic String or Non intelligent.

For other types, the precise timing of the machine cycle is required and is read via the **Start Signal**.

- **Cycle Delay.** (Applies to TS MIU and Visual MI only) For non-intelligent pinspotters, the scoring will cycle the pinspotters a second time to clear away the pins. For APS systems, Cycle Delay is the delay in seconds from when the score is taken, to when the machine will start its second cycle. For systems with a camera, Cycle Delay is the delay in seconds from when the sweep returns home to when the pinspotter will start its second cycle and should normally be zero.

- **AMF Camera Delay** (applies to TS MIU only) is the delay in 0.1Sec increments from when the sweep switch is activated to when an AMF camera is triggered. Normally AMF cameras have a suitable delay built in, so this setting can be 0. However if the camera has been sourced from a different type of installation, it may have a 0 delay and a suitable delay must be added here. For video type cameras, see the Camera Setup.

- **Invert String Pinsense –** if set an active signal on the Adam string inputs represents a pin down rather than a pin standing**.**

- **Extended APS Protocol. T**his option should be ticked only if an APS is being used for pinsensing, and the APS has been fitted with the updated A.K.Microsystems firmware which allows for pindication display.

- **Use IP Camera with MI.** When a **TS MIU** is selected, this option allows a network connected IP camera to be used for pinsensing, rather than a video camera connected directly to the TS MIU.

- **Intelligent Pinspotter** should be ticked when the scoring computer is connected to pinspotters that are capable of resetting pins in a single cycle after the 3rd ball in the tenth frame or after a no-tap strike.

  Examples are AMF pinspotters with MP or Mk expander boards, or Brunswick pinspotters with a New Pins Solenoid (NPS) installed.

If Auto Cycle on 10th frame or Auto Cycle on No-tap is enabled, intelligent pinspotters will reset a full rack in a single cycle when a second ball is not required in either the 10th frame or after a no-tap respectively. Non intelligent pinspotters however, will need to cycle a second time to reset the pins.

Note that it is not possible to do a single cycle in these cases if an APS with ultrasound arrays is used for scoring, as TS is not directly connected to the pinspotter and therefore has no control over the type of cycle.

The Auto Cycle on 10th frame and Auto Cycle on No-tap settings can be changed for different bowling styles. For example, league bowlers may expect the machine to cycle again, but open bowlers may not and regularly hit the rakes. So these settings can be enabled for league styles but disabled for open styles.

Not applicable to **Generic String**.

- **Ignore 2nd Ball signal**. The pinspotter provides a 2nd Ball signal to the scoring to indicate that it is in 2nd ball mode. Usually scores will only be recorded when this signal matches the players current ball. For example, if the player bowls the second ball of a frame, and the data received from the pinspotter indicates it is still in 1st ball mode, then the score will not be recorded. Setting this option causes TS3 to ignore the 2nd ball signal, and always record a score. This can have unintended consequences depending up on the particular pinspotter and machine interface equipment in use. In particular, fouls, fast cycles, no-tap, and the extra fill ball in the tenth frame may not work correctly without a valid 2nd ball signal. Frame counts may be off. Even normal frames may not score correctly with some equipment. Use this option only as a temporary measure until any problems with the 2nd ball signal can be rectified.

- **Dual CCD Cameras**. Use this setting when dual CCD cameras are used due to over lane ball returns for example. Applies to TS MI units only.

  The **Intelligent Pinspotter** setting can also be enabled if the pinspotters are NOT intelligent, but you do NOT want them to automatically cycle a second time under any circumstances.

- **Enable SES 2021 extensions**. SES added additional functionality to their pinspotters in their 2021 firmware update. Enable this option if you have the 2021 firmware installed and wish to take advantage of the extended features. Some additional settings are listed below, see the SES documentation for more information. Changes to these setting can only be applied when the pinsetter is off, so will only take effect the next time the pinsetter is turned on.
    - Disentanglement Time – time before disentanglement fails. Recommended = 5.
    - Elevator (On Mode) time – time until elevator turn off when pinsetter is on. Recommended = 5.
    - Elevator (Off Mode) time – time until elevator turn off when pinsetter is off. Recommend = 5.

  Training Mode requires that 2021 extensions are enabled

- **Ball Detector Functions** (applies to TS MIU and Visual MI only) Four separate functions of the ball detector inputs can be enabled as below.

  If **VALID** is enabled, then the unit will not record a score unless a valid ball detection signal is received prior to the cycle. Disable this setting if no ball detector is connected.

  If **CYCLE** is enabled, then TS3 will cycle the machines when a valid ball detection signal is received. This should be disabled if the machines are automatically cycled independently from the scoring to avoid double cycles.

  If **SAFETY** is enabled**,** then the machines will be shut off if anything passes the ball detectors while the sweep is not at the home position, or after a valid trigger has already occurred. This applies only to pinspotters controlled via TS3. Shutoff may not occur instantly depending upon the pinspotter. To restart the pinspotter, turn it off then back on again a few seconds later via the desk.

  Important note - This feature is provided as safety backup only, and must **NOT** be solely relied upon to prevent unwanted intrusion into the pinspotter by objects or persons.

  The ball detectors can always be used for speed indication, regardless of these settings.

- **Ball Detector Delay**

  For TS MIU or Visual MI -

  Sets the delay from when the ball has cleared the beam at the last detector to when the timers for the camera delay and machine trigger delay start.

  For non speed sensitive detectors this is a simple time delay in 200 millisecond increments.

  For speed sensitive detectors, this setting is the delay at a ball speed of 15MPH. The delay actually used is normally varied depending upon the actual speed. To use just the entered delay regardless of ball speed, tick the **Fixed** option.

  For Adam interface boxes on string machines –

  Sets the time in ½ second increments from when the ball detector is triggered to when the pin switches are read to determine the score.

- **Spacing**. For speed sensitive detectors with two sensors, enter the spacing between the sensors in inches to the nearest 10^{th} of an inch. Ball speed can then be calculated and displayed.

  For single non speed sensitive detectors enter 0. Display of ball speed is not possible.

  For single sensors whose output pulse width is equal to the time it takes the ball to pass, enter a value between 0.1 and 10 inches. This value represents the width of the bowling ball as it crosses the sensor. Ideally 8.5 is the correct value, but this value can be trimmed to allow for any non-ideal conditions such as the sensor not being at the height of the center of the ball or delays in the sensor electronics. This value is best set by experimentation. Time the ball to work out the actual speed, then enter a value that gives the correct indicated speed. This method of detection is generally less accurate than using two sensors.

- **Machine Trigger Delay**. This is the delay from the end of the ball detect delay until the cycle signal is asserted. As the ball detect delay is over,

further interruptions to the ball detector during this period will have no effect. For the TS MIU, this is always 0.

- **Manual Scoring** enables the bowlers to manually enter their pinfall. This should only be needed in the event of a camera breakdown, or where cameras are not fitted. Scores entered in this way do NOT show as edited scores.

- **Low Power mode.** If checked, the monitors will be switched off via Windows Power Control whenever neither screen is required. The exact operation of this function may vary depending upon the type of monitors being used. Some types may not support power control via Windows.

- **Enable Foul Line**. Enable the foul detection system.

- **Enable Arcade Mode.** Touch Score can interface to coin acceptors and redemption ticket dispensers so as to operate as an arcade game on mini or full size bowling.

  See also Arcade Mode and the Tokens & Tickets tab for more setup.

- **Coin Acceptor.** Select the interface for the coin acceptor and/or ticket printer. Current options are 1 x UCL, 2 x UCL. See UCL Hardware for more information.

- **Acceptor Message.** This setting affects the on-screen prompts when using the coin acceptor. If can refer to actual coins, tokens or swipe or touch cards.

- **Respot+Score**. Tick to enable the "respot with scoring" option in TS3 bowler menus. This function is not supported for all installation types. Unchecking this removes the option from the menu.

- **Cycle on Strike.** This setting **c**auses the cycle relays to fire after a strike. Applies only to the Universal MI. This option is only needed when there is a problem with the pinspotter; for example, faulty gripper switches or non functioning expander boards. Note that it requires a working 2nd ball signal, (Ignore 2nd Ball NOT enabled) or the arrows to be up in order to function.

- **Monitors** – Select a windows monitor (1,2 3 etc) to be used for each lane. The default is 1 for odd, and 2 for even. Note that Windows may renumber the monitors if one is missing or not connected. For example, if monitor 1 is missing, then 2 becomes 1, etc. The Console entry is only used when the console is run on the same PC as TS3 and the overheads in a multi-monitor setup.

4.8.2 Universal MI Tab (Standalone Only)

This tab allows setup of the **Universal MI** and any connected auxiliary hardware. It also sets the URL for the IP camera when used with either the **Universal MI** or a **TS MIU**.

The Universal MI is built in to the TS3 software, and uses mostly general purpose I/O modules (GPIO) to connect to a wide range of pinspotting equipment. It offers similar functionality to the TS MIU.

It can be used with an IP (network connected) camera, or an AMF A+ Accucam.

See the Universal MI reference for more details.

IP Camera URL. This is the URL of the camera video stream. Currently, only MJPEG streams over HTTP are supported, and the URL must be of the form –

http://{*username*:*password*@}address{:*port*}/command

Fields enclosed in {} are optional. The default username and password is blank. The default HTTP port (80) is used if the port is not specified.

For examples:

http://admin:admin@192.168.0.1:80/video.cgi
http://192.168.0.1/video.cgi

Note that this URL is used to access the camera from the TS3 computer only, and the camera is usually on a dedicated network adapter and subnet. Therefore this URL may NOT be valid for viewing the stream directly from elsewhere on the network, for example from Touch Desk. However the Camera Setup screen can retrieve images from the TS3 computer as usual, even though the stream cannot be accessed directly.

The resolution of the camera should be at least 640x480. However, for better quality replays 1920x1080 is recommended. A frame rate of 10 fps is normally sufficient. Note that higher resolutions and frame rates require more CPU power to process in a timely manner. If the videos are delayed or corrupted, or the pin sensing is failing due to delays in the image, then a faster CPU may be required, or lower the resolution and frame rate.

These delays could also be due to network issues, especially if the camera is NOT on its own subnet and adapter.

Reset stream periodically. For cameras with MJPEG streams than cannot run indefinitely, or that introduce lag when run for long periods, then select this option so that TS3 regularly resets the stream. This will only take place when neither lane is in a scoring cycle to prevent disruptions. Regardless of this setting, the stream is reset if a new frame fails to arrive at least once each second.

Use AMF Camera

Select this option when an AMF Accucam is connected to a com port on TS3. This camera supports only pin counting and does not support the visual detection of machine states. Therefore GPIO modules must always be used in this configuration. The camera should be configured as for Accuscore Plus.

Input Selection.

Select the source for each of the 4 inputs from the pinspotter as shown. The options are –

None - This input is not used.
Camera – The camera is used to detect this input. See the Machine Tab.
Wired GPIO – This input is wired to a GPIO (general purpose I/O) module.
Wired MI-X – This input is wired to an **MI-X (**or **MI-X2)**. The **MI-X** (MI Extender) is a small interface device used for signals that cannot be connected to GPIO modules.

Note that setting the start signal to NONE may limit some functions that rely on being able to detect the position of the machine. For example, auto cycling after completion of current cycle may not work correctly.

Ball speed measurements are only available when the ball detector is connected to the **MI-X**.

The **MI-X** is also required for intelligent fast cycles on 8270 pinspotters.

If the pinspotter type is set to 90XL, then the **Start**, **2nd Ball** and **Foul** inputs are derived from the pinspotter via a serial connection, and the settings here are ignored.

The **Ball Detector** and **RPO In** share the 4th wired input on the GPIO module and the only input on the **MI-X**, and therefore cannot be used together on the one device. Generally both are not required.

If a ball detector is connected, then the MI can automatically determine if the current cycle is a scoring cycle or not, by noting whether a ball has passed.

Without a ball detector, it is necessary to connect this input to any external cycle switches that are intended to initiate an RPO or non scoring cycle. Even when TS3 is not initiating the cycle (no relays connected) this input is still necessary to prevent a score being recorded on that cycle.

Also, only two of **FOUL, 44/144,** and **Ball Detector/RPO** can be connected to the GPIO due to limited inputs. If an MI-X is not in use, then the **Foul** can be detected visually, and the two available inputs used for **44/144** and **ball detect**.

Also note that when using **44/144** triggering with the **Universal MI**, the time the pinfall is recorded is delayed after the 44/144 switch closure by the value set in the Camera Delay. This is to allow for the fact that some IP cameras are slow to process images, and the image stream may be slightly delayed from reality. For ball detect or sweep triggering, simply length the existing delay slightly. For 44/144 triggering, add a small Camera Delay.

GPIO Relay Module is connected. Select this option to enable relay outputs (pinspotter on/off/cycle etc) on a GPIO relay module. Make sure this is NOT ticked if the output module is not fitted, as attempts to communicate with the missing module may interfere with the reading of inputs as both devices share the same communications port.

GPIO Pinfall Module is connected. Select this option if a Pinfall output module is connected to the comport. As for the GPIO Relay Module above,

selecting this option when this module is NOT connected may cause the reading of inputs to be delayed.

GPIO Ball Speed Detector. Select this option if a Ball Speed device is connected to the com port. As for the GPIO Relay Module above, selecting this option when this device is NOT connected may cause the reading of inputs to be delayed.

MI-X is connected. Select this option if an MI-X or MI-X2 device is connected. As for the GPIO Relay Module above, selecting this option when an MI-X is NOT connected may cause the reading of inputs to be delayed.

ModBus

These settings apply only when using ModBus RTU communication protocol for external devices.

Modbus GPIO shares a single address. Normally the output module is at address 1 and the input module is address 2. However, if using a combined input/output module then set the module to address 1 and enable this option.

Relays start at address #17. Typical relay modules will number their relays from 1-8. However, an Adam 4068/9 in Modbus mode assigns its relays to numbers 17-24. Enable this option when using Adam 4068/9 in Modbus mode.

4.8.3 Scoring Tab (Trial Only)

- **Game Type**. Select the type of game to be played. For example, 10 pin, 5 Pin Duckpin etc.

- **Scoring Method**. Depending upon the game type, various scoring methods can be selected here, such as no tap, or the flexi frame game in 10 pin.

- **Practice Mode.** Enabling practice mode prevents scores from being recorded.

- **Enable League Extensions**. This enables the display of bowler handicap, and enables BLIND and PACER bowlers to be entered.

- **Load Default Bowler Names** will enter “Bowler 1”, “Bowler 2” etc as the bowler names when the lane is turned on.

- **Bring up Bowler Arrows** will bring up the player arrows so that the system is ready for scoring without any further intervention from the bowlers.

4.8.4 Display Tab

- **Grid Type** sets the type of display on the overheads. The available types are:

  TV. Display a TV picture only. Requires a Windows TC tuner to be fitted, else the Windows desktop will appear.

  Logo. The graphic that has been defined as the Logo will be displayed. If multiple graphics have been defined, TS3 will cycle through them. This feature can be used for advertising when a lane is off. See the Touch Desk manual for more information on TS3 graphics.

  Digital Signs. Not available with Trial or Standalone modes.

  10 Frame. A normal 10 frame grid.

  5 Frame. A large text grid that displays only 5 frames at once.

  Tournament 10 Frame. This grid features large bowler names, and no team total and is useful for singles and doubles tournaments.

  Tournament 5 Frame. As above, but only 5 frames in larger text.

  TV in a Window. A TV picture will be displayed within a window in the score grid. Requires a Windows TC tuner to be fitted, else the Windows desktop will appear.

  Off. Overheads are off.

- **Style**. The style of the grid can be either filled in blocks in, or a classic lined grid.

- **Show/Hide unused frames**. Frames not yet bowled can be hidden to reveal the background image or TV picture.

- **Dual**. Both lanes can be displayed on one screen, either side by side or one above the other. Not available in Trial Mode.

- **Lower Grid Type**. For systems using a tablet as a bowler console, this sets the type of scoring grid displayed there. The options are similar to the overhead grid type described above. **Keypad Only** sets the tablet to display a virtual keypad rather than the score grid. This keypad can be used like a normal keypad. All user menus will then appear on the overheads.

- **In a window**. For Standalone systems using a tablet as a bowler console, this setting will cause the console to run in a window rather than full screen. This window can be easily minimized, making it easier to run other software on the tablet. While this is generally not desirable in a bowling center, in can be useful in home installs.

  Note that the scoring grid, both overhead and tablet will also be displayed with the task bar rather than over it. To use full screen, set the task bar to Auto Hide.

- **Background TV**. Display a TV picture behind the score grid. Requires a Windows TC tuner to be fitted, else the Windows desktop will appear.

- **Pindication**. Display an image of the pins still standing after the first ball. The time that the image remains can also be set.

- **Spare Maker.** Display the suggested line to bowl to make the spare on the pindication image.

- **Show Game Frame Count**. Show the count of games and frames bowled in the lower right hand corner of the grid.

- **Enable Ball Speed**. Display the ball speed when appropriate ball triggers are fitted.

- **KPH?** Displays ball speed in kilometres per hour rather than miles per hour.

- **Allow Bowlers to Cast to TV**. Enables the "Cast to TV" menu item at the tablet. This brings up the Windows Connect dialog allowing the screen to be cast to a compatible device. Applies to Windows 10 & 11 only.

- **Show Max possible score**. Display the maximum score possible, given what has already been bowled for each player.

- **Show Cumulative Total**. Displays the combined total for each frame at the bottom of the screen.

- **Display Marks.** Shows the number of marks (spares and strike) for each frame at the bottom of the screen. **Marks** and **Cumulative total** cannot both be enabled at once.

- **Large Frame Totals**. Displays the running total for each frame in large text. The individual ball scores are not shown for completed frames.

- **Basic Exciters.** Enable basic exciters (images) to be displayed after strikes etc. New images can be added if desired. See the Touch Desk manual for more information**.**

4.8.5 Other Tab

- **Enable Keypad**. Enable the bowlers keypad.
- **Enable Arrows**. Allow bowlers to bring up the player arrows. If the arrows are up when this is disabled, they will disappear.
- **Enable Intercom**. Enable the intercom menu selection.
- **Enable Service Light**. Enable the Service Light menu selection. When the service light is enabled, a bar appears at the top of the screen to summon a waitress.
- **Enable Maintenance Menu**. The **Maintenance Menu** allows access to setup items such as camera alignment, and can be disabled here to prevent bowlers interfering with these settings.
- **Auto Cycle on 10th Frame.** When this option is set, the pinspotters will automatically clear away the remaining pins when the second ball of a frame is not required in the 10th frame. The pinspotter may either clear away all the pins in a single cycle, or perform an extra cycle, depending upon the pinspotter type.

- **Auto Cycle on No Tap**. When set, the pinspotters will automatically clear away the remaining pins when a no tap strike is bowled. See **Auto Cycle on 10th Frame** above for more details.
- **Auto 1st Ball on Arrows Up**. This will cause the machines to cycle and reset the pins if the machine is on second ball when the player arrows are bought up.
- **Low Level Pin Lighting**. The pin sensing camera of TS3 can be setup with different light thresholds for different pin deck lighting situations. For example, normal lighting or low level lighting such as UV or glow in the dark bowling. Ticking this box will use the low light level threshold.
- **Print Scores**. Standalone systems can print the current score sheet. There are three possible modes –

    - Automatically print when a game is cleared.
    - Prompt to print when a game is cleared.
    - Only print on demand using the "Print" menu button.

  Printing is always to the default printer, and uses the default printer settings. These settings, such as paper size and orientation, can be setup in the Windows Control Panel.

  The default printer could be a network printer on another computer, or a "print to file" system to save the scores for later.

  The printout is a copy of the current screen, however some adjustments are made prior to printing such as ensuring all 10 frames are displayed and disabling any full page messages.
- **Black and White**. Set this option to print only in black and white to save on printer ink.
- **Allow Completed Games to be cleared**. Allow the bowlers to advance to the Next Game when the game is over.
- **Allow Incomplete Games to be cleared**. Allow bowlers to advance to the next game when the game is incomplete.
- **Allow name and scores to be cleared**. Allow the bowlers to End Game (clear names as well as scores).
- **Allow Score Correction**. Allow the bowlers to correct the scores.
- **Allow bowlers to edit names.** Allow bowlers to enter, correct and move bowler names.
- **Allow bowlers to add/remove names**. Allows bowlers to add or remove names from the existing line up. Requires **Allow bowlers to edit names** as above.

- **Allow bowlers to set bumpers.** Allow bowlers to enable bumpers on a bowler by bowler basis.
- **Allow bowlers to set no-tap.** Allow bowlers to set no-tap scoring mode on a bowler by bowler basis.
- **Allow bowlers to set grid type.** Allow the bowlers to change the type of score grid display. For example to change from 10 frame to 5 frame.
- **Allow Restore previous game.** Bowlers can restore a game if accidentally cleared.
- **Allow bowlers to bowl out of turn**. Bowlers can change the bowling order, or skip a bowler.
- **Allow bowlers to set TV channels.** Enables the channel change screen for systems with option TV tuner fitted.
- **Show Recaps at End Bowling**. Automatically displays the recap screen when **End Bowling** is pressed. The recap screen can always be shown manually via the menu regardless of this setting.
- **Team Handicap is sum of Bowlers**. If set, the team handicap is equal to the sum of the bowlers handicaps. If not set, then any value can be input for the teams handicap.

4.8.6 Color Tab

This tab sets the screen colours used to display the grid, along with an optional background image and font type and optional lane lighting.

Three different colour schemes can be setup for use with Game 1, 2 and 3. If more than 3 games are bowled, the cycle repeats. ie Game 4 uses Game 1 colour and so on.

Click on one of the 3 game buttons, then setup the desired colours, font and image for that game.

The score grid is drawn with 10 different colours, and each may be set by clicking on the appropriate button.

Some sample colour schemes are provided, and can be applied by selecting one from the list.

Touch Score can also control the background lighting. The three options are –
- None
- Fixed. The colours as shown on the adjacent colour buttons are displayed on the pin deck lights, lane lights and lighting areas 1 and 2.

- Wallpaper. A dmx file associated with the wallpaper is displayed.

See the Touch Desk manual for more information on lighting options.

4.8.7 Messages Tab

A simple text message can be displayed as either a single line at the top of the screen, or a full page message the contains several lines. The page message can be a full screen type that overlays the grid, or a half screen one that condenses the grid so that both message and grid can be displayed at once.

To clear a message simple delete the text from the box and click **Apply**.

4.8.8 Tokens & Tickets Tab

This screen is for setting up arcade mode. See Arcade Mode for a description of Arcade mode and Setup ▸ Arcade mode to enable arcade mode.

Tokens per bowler per game. Sets the number of tokens or coins required per bowler per game. Usually set to one.

Slow Bowling Timeout. If a ball has not been bowled for this many seconds, a message will appear asking the players to bowl a ball. If the inactive timeout is also set, this message will count down to the game being cancelled. Set to 0 to disable the message and wait forever.

Inactive Timeout. If a ball has not been bowled for this many seconds, the game will be cancelled. Set to 0 to disable. This function can only be used with the **slow bowling time** as above, and should be set to something greater than the **slow bowling time**. For example, if the **slow time** is 120, and the **inactive time** is 150, then after 2 minutes of no bowling a message will show that the game will be cancelled in 30 seconds. The message will count down to 0, then the game will be cleared and the lane will turn off.

Note that the **inactive timeout** and **slow bowling timeout** described here are applicable to standalone systems only. Systems with Touch Desk use Touch Desk settings to perform checkouts.

Tickets

Touch Score can award tickets to players based on the settings below. The accumulated tickets for each player are shown on screen below their name. When a ticket dispenser is connected, the tickets will be dispensed as they are awarded. For multiple players, it is up to the players to distribute the tickets amongst themselves. When Touch Desk player cards are used, the tickets will be automatically awarded to the correct player.

Bowler total from 0 to xxx. Tickets can be awarded based on the player's total. Up to 4 different ranges can be specified and a different number of tickets awarded for each range.

Spares, Spared Splits, Strikes. Additional tickets can be awarded for these events. Note that the tickets are awarded as the event occurs, and are not affected by editing scores.

Daily Count. The current daily count of coins inserted and tickets awarded is displayed here. Click **History** to view previous day's totals. The history file can also be accessed directly over the network at

Touch Score computer name\Touch Score Programs\Arcade Log.txt

Where ***Touch Score computer name*** is the actual name of the Touch Score computer.

4.8.9 Update Tab (Standalone Only)

There are two methods to update a standalone installation of Touch Score.

- Run the Touch Desk master setup program, and install the Touch Score component again. This is the same procedure as when installing Touch Score for the first time.

- Insert a USB thumb drive with the **Touch Score Update** folder in the root directory. Touch Score will search for and load this update whenever the computer starts up. To load the update without rebooting, click RESTART which will restart the Touch Score program only and also load the update.

4.9 Arcade Mode

Touch Score can interface to external coin acceptors and redemption ticket dispensers so as to operate as an arcade game on mini or full size bowling.

Systems with Touch Desk can also use virtual tokens and tickets stored on customer smart cards.

The external interface allows for the reading of a signal for each coin inserted, and the output of a pulse for each ticket that is to be issued. These signals are similar to that used in the Universal Card Link specification, and should allow a wide range of coin acceptors, ticket dispensers and player card systems to be used

Players are automatically added to the game for each coin (or coins) inserted. The lane automatically switches on when the first coin is inserted, and off 20 seconds after the end of the game.

An additional input is provided on each lane for a push button to enable or disable bumpers for the current player.

A bowler console is not required. If present, it should either be disabled completely, or the following settings disabled as bowlers must not be allowed to add bowlers without inserting a coin, or clear games unexpectedly.

Allow Bowlers to add/remove bowlers
Allow completed games to be cleared
Allow incomplete games to be cleared
Allow names and scores to be cleared.

See the arcade options in the Setup ▸ Arcade Mode and Token & Tickets tab in the **Virtual Desk** (standalone) or Lane Modify screen (Touch Desk) for options. See UCL Hardware for connecting devices.

4.10 Accessing Touch Score remotely

It is often necessary for maintenance or setup reasons to access the TS3 computer full a normal Windows board and mouse. The recommend way to do this is remotely from another device on the same network, using a remote access program.

For Touch Desk, TightVNC as supplied in the Touch Desk install package can be used and TS3 can be accessed directly from within Touch Desk.

TightVNC can also be installed on standalone systems, but will need to be run manually from the PC being used for access.

Once remote access is established, you can turn on TS3 by clicking on the TS3 desktop icon, or finding it in Programs. If the desktop is not visible because the logo is being shown, then click anywhere on the logo. TS3 will turn on the lane, and allow the menu system to be used as usual.

If the "menu" button is not displayed on the scoring grid (as will be the case if Keypad type is set to none or console), then click anywhere on the background to bring up the menu.

Once any setup has been completed, use **End Bowling** to turn the lane off again.

4.11 Console

The Touch Score Console program allows 1 or 2 windows tablets to be used as bowler consoles for Touch Score. The tablets must be connected to the same network as Touch Score.

The console program can be installed on the tablets, using similar guidelines above as when installing Touch Score itself.

Note that the install program does not automatically set the tablet up for kiosk use. Various other settings such as hiding the taskbar and automatic login etc will need to be performed manually so that the system is suitable for use by the bowlers without allowing them access to other programs.

Note that Touch Score itself can also be run on a windows tablet, and this same tablet can then be used as a bowler's console. Overheads cannot be connected in this case, but it is possible to cast the console screen to any suitable TV.

4.11.1 Connecting to Touch Score.

Once installed, the console must be configured to connect to the correct Touch Score computer. This is done via the **Console Setup** screen.

While not connected, the virtual Touch Score keypad will be displayed with no lane numbers.

To connect to Touch Score –

- Touch the left then right lane icons, or the single lane icon and then the Touch Score logo if only one lane is displayed.

- Enter the password. For systems connected to a Lane Server, the password will be that setup in the Lane Server configuration.

- Enter the computer name or IP address of the desired Touch Score computer. For systems with a Lane Server, you can just select the lane number from the drop down list. If Touch Score is installed on the same tablet as the console, use the IP loopback address (127.0.0.1) or just leave it blank.

- Select the type of console (single lane, dual lane etc).

- Enter a new password if the password is to be changed. Warning! If you forget the password, you will need to contact support for assistance.

4.11.2 Maintenance Menu

When in interactive mode (not virtual keypad mode) there is a hidden maintenance menu that performs similar tasks to the overhead maintenance menu, such as camera setup and access to the virtual desk.

To access the menu, bring up any console menu then touch the lane number at the top left of the screen followed by the date at the top right. Then enter the password.

The **Maintenance Menu** also allows access to the **Setup Menu** used to enter Touch Score connection details.

You can also access the **Maintenance Menu** from the Logo Screen that appears when both lanes are off. Touch the four corners of the Logo screen in the following order within one second of each other, then enter the password –

Top Left
Top Right
Bottom Right
Bottom Left

4.11.3 Standalone

For standalone installs, the “Touch Score” logo screen will be displayed whenever the lane is off. Touch anywhere on the screen to turn on a lane.

If the console is for a pair of lanes, touch on the left or right side of the screen to turn on the appropriate lane. You can then turn on the other lane from the menu of this lane if needed.

To turn off a lane, use the Finish Bowling menu item.

4.11.4 Updates

If any updates are installed on the Touch Score computer, the console will automatically update itself from there.

4.11.5 Windowed Mode

The Touch Score console is designed to start automatically and take over the screen, and not allow easy access to any other programs. This is generally desirable in a bowling center, but may be less so in a home install.

The console supports a “windowed” mode, whereby the console program runs in a window that can be minimized and closed easily, and this allows easier access to other programs on the console.

To enable windows mode, see the Virtual Desk ▸ Display screen.

To prevent automatic startup, remove the shortcut from the start menu. Note that this will also disable automatic updates from Touch Score.

4.11.6 Intercom Relays

Relays for enabling the intercom can be connected to the console PC via a serial (or USB) port using the LCUS-1 protocol.

Use COM26 when the console serves one lane only and there is a separate intercom for each lane. The relay will only be enabled for that lane.

Use COM27 when the intercom is shared for both lanes and only one relay is required. This can be used when the console is serving a single lane in the pair, or both lanes of the pair.

5. Hardware Reference

This section provides information on each ancillary hardware device.

5.1 XL Lane Com Adapter

The XL LANECOM adapter connects the LANECOM cable from an existing XL/Boss installation to the TS3 computer. This provides data communication to the MIU, camera and keypads.

The recommended device to use as a lane com adapter is an Echelon U10 USB Network Adapter. Cut the plug from the LANECOM cable and connect the two wires to the screw terminals on the U10, either way round.

The driver supplied with the U10 (OpenLDV Network Driver) must be installed on the TS3 computer. Do not change the default network name for the U10 from "LON1", although TS3 will accept any name from LON1 through to LON5.

For some installs, the driver install has been known to fail to modify the system path as required. This results in the interface not working and the message "**LDV exception. Echelon drivers possibly not installed**" appearing the in TSLog file. The Lonworks control panel applet may also give errors when accessing a device. To fix, modify the system path to include "**C:\Program Files (x86)\LonWorks\Bin**".

TS3 will automatically detect the presence of the drivers and the connected hardware, no additional setup is necessary.

As of 2021, information on the U10 can be found at www.dialog-semiconductor.com , previously www.echelon.com

5.2 Touch Score Multi-port Adapter

The Multiport Adapter (MPA) is a low voltage, low current device and MUST NOT be connected to mains or hazardous voltages under any circumstances. Connect only to other ELV (extra low voltage, <28VAC) circuits. All wiring must

be installed by an authorised electrical contractor in accordance with the relevant safety codes at your location.

- **All connections to the MPA must be ELV. If any connected device does not provide guaranteed ELV connections then additional isolation is required to avoid an electric shock hazard.**
- **All wiring to the MPA must be isolated both physically and electrically from any hazardous voltages so as to ensure the connections are ELV only, as per relevant safety codes.**

The **TS MPA** is connected to the TS3 via USB, and is powered by USB. It provides a number of ports, as listed in the following chapters.

The drivers for the TSMPA are included with Touch Score and will be installed when running the Touch Score installer. Two drivers are included, one is a DFU mode driver used for programming the device (shows as TSMPA in Device Manager), and the other is a virtual comport used for normal communications (shows as a serial port in Device Manager). The TSMPA starts up in DFU mode, then swaps to serial mode if no programming commands are detected.

Normally, Windows will automatically load the appropriate driver depending upon which mode the **TS MPA** device is in. However, Windows 11, and some later versions of Windows 10 have been observed to only load the DFU driver and fail to load the serial driver, even after the **TS MPA** has changed to serial mode.

In this case, **Device Manager** will list only the **TS MPA** as a disconnected device (as it has now swapped to serial port mode), and no serial port entry. This can be fixed by manually selecting the serial driver once the **TS MPA** is in serial mode. In **Device Manager**, right click on the **TS MPA** (enable display of hidden devices if necessary), **Update Driver**, then **Browse for Driver** and browse to the **Program Files (x86)\Touch Score\Drivers\serial** folder. This needs only be done once, and Windows will now correctly load each driver as required.

It may also be necessary to force the serial driver, by selecting **Let me pick from a list**, and then selecting USB Serial Device.

During normal operation, the LED on the **TS MPA** will flash as follows:

- On Reset – A few fast flashes then continuous flashing approx twice per second.
- After startup of the firmware – a sequence of 3 flashes every 4 seconds
- After connected to the TS3 software – a sequence of 1 flash every 4 seconds
- When being programmed – very fast flashes

After a Touch Score software update, or whenever new infra red remote codes have been setup, TS3 will reprogram the **TS MPA** automatically.

There is a small chance that this programming may fail, for example if there is a power failure during programming. **TS MPA** will most likely recover from this failure and simply be reprogrammed at the next retry, or the next reboot.

In the VERY unlikely event that this does not occur, the LED will remain in the continuous flashing at twice per second, or some other random sequence and the following procedure can be used to recover the **TS MPA**.

- Run **fix_ts3mpa.bat** from either the **Program Files\Touch Score** folder, or the **Program Files\Lane Server** folder.

If **fix_ts3mpa** fails to restore normal operation, then

- Remove the two screws from one end of the device and remove the end plate.
- Slide out the circuit board.
- Reconnect the USB cable.
- Press S1 (Reset), then release and press S2 quickly. Hold S2 for at least 6 flashes of the LED, then release. The LED should remain flashing at approximately twice per second.
- Run **fix_ts3mpa** again.

If this still fails, return the **TS MPA** to your supplier for reprogramming.

5.2.1 MI/BT Port

Pin	Function	Direction
1	TX+	Out
2	TX-	Out
3	RX+	In

4	Ground	
5	n/c	
6	RX-	In
7	n/c	
8	n/c	

This port can be used for any one of the following functions.

- **Touch Score keypad.** This keypad connects to the **TS MPA** using a standard RJ45 CAT5 *shielded* cable, with a POE *shielded* splitter at the **TS MPA** end. See Touch Score keypad for more information

- **TS MIU**. Connects to a **TS3 Machine Interface Unit** using a straight-through (not crossed) RJ45 cable, as used for normal networking.

- **UBT**. Connects to a Universal Bowler Terminal board, using a straight-through (not crossed) RJ45 cable, as used for normal networking. See Universal Bowler Terminal

- **Frameworx LLAN**. Connects to LLAN connections for both the keypads and the pinsetter interface in parallel. Can also be used for a Brunswick bumper controller without a pinsetter interface, ie with an AK MIU. See Configurations ▸ Frameworks

5.2.2 Legacy Com Port

Pin	Function	Direction
1	Data Processor IN	In
2	Data Processor OUT	Out
3	Data Processor Clock	In
4	Ground	
5	RS232 RX	In
6	RS232 TX	Out
7	APS -	In
8	APS+	Out

This port provides connections to an AMF APS, Brunswick Data Processor, and a **Universal Bowler Terminal** board. See the Standard Configurations chapter for usage.

5.2.3 IR Transmitter

3 x 3.5mm phone jacks are provided for infra-red LEDs to control the overhead TVs. Standard IR LEDs (sometimes referred to as blasters, or IR transmitters) are available that adhere over the IR receiver on the TV, so that the signal from the LED is picked up by that one TV only. The transmitters should also be the transparent type, so that the hand held remote can still be used.

Usually the TS3 computer and therefore the **TS MPA** are located at the overheads, so only short cable lengths are needed on the IR LEDS. However, if the computer is located on the curtain wall, then these cables will need to be extended to the overheads. A single CAT5 cable is suitable for extending all three outputs. Make sure a matching pair within the cable is used for each output to minimize interference.

5.3 Touch Score Machine Interface Unit

IMPORTANT SAFETY WARNING!

The Machine Interface Unit (MIU) is a low voltage, low current device and MUST NOT be connected to mains or hazardous voltages under any circumstances. Connect only to other SELV (safe extra low voltage, <28VAC) circuits. All electrical work associated with this device must be carried out by qualified persons only and be in accordance with the relevant safety codes at your location.

- **All connections to the MIU, including those from the pinspotter, must be SELV. If the pinspotter or any other device does not provide guaranteed SELV connections then additional isolation is required to avoid an electric shock hazard. Maximum voltage on any circuit connected to the MIU is 28VAC. with respect to ground. Lower limits apply for some connections. See Connection Reference for more details.**
- **All wiring to the MIU must be isolated both physically and electrically from any hazardous voltages so as to ensure the connections are SELV only, as per relevant safety codes.**
- **All MIU relay contact circuits must be protected by a fuse or circuit breaker with a tripping current of 3.5 Amps or less.**
- **The MIU chassis MUST be securely connected to a suitable ground point.**

- **Power must be switched off to both the MIU and the pinspotters when connecting or disconnecting cables.**
- **The terminal cover plate of the MIU must be in place when the unit is operating or power is connected to any external device, including the pinspotters.**
- **The MIU may activate and cycle the pinspotters AT ANY TIME and WITHOUT ANY WARNING. It is therefore essential that power is otherwise disconnected from the pinspotter before entering or working on the pinspotter. The MIU must NEVER be relied upon to keep the pinspotter in an unpowered or non-active state.**
- **Always install anti-intrusion protection to ensure that no person can inadvertently or otherwise come in to contact with the pinspotter while it is connected to power.**
- **Always install an additional manual switch or safety interlock to remove power from the pinspotters instantly in case of emergency. Do NOT rely on the scoring system, or front desk computer, or MIU for this function.**
- **Use only an approved SELV power supply for the MIU.**

The **TS MIU** provides interconnection between the pinspotters, a pinsensing camera, the bowler terminal and other equipment. It is required for any installation of TS3 except those with a –

- Magicscore/Accuscore 1 APS
- XL MIU
- AS80/90 Data Processor
- Frameworx Pinsetter Interface
- Brunswick Pinsensor board for string machines
- GSX series pinsetters
- Using the Universal MI

The **TS MIU** is located on the curtain wall.

The function of each LED on the MIU is listed below.

- **Run.** Flashes regularly to indicate that the MIU is running. Flickers when communicating with the TS3 computer.

- **Machine**. Indicates the pinspotters are switched on. Slow flashing indicates instructomat (practice) mode. Fast flashing indicates the machines are being cycled by the MIU. Only applies to installations where the pinspotters are controlled by the MIU.

If a safety machine shutoff has been triggered by the ball detector, or the inactivity timeout has expired, then both the **Machine** and **Ball Detect** will be flashing together, and the pinspotter will be switched off. See the ball detector section for more information.

- **Ball Detect.** Fully On indicates that a valid ball detect signal has been detected. If the signal is invalid (ie too fast or too slow when using speed detectors) then the LED will flash to indicate an error. It will also flash if configured for 2 sensors, and only one pulse has been received.

- **Sweep**. Indicates that the sweep switch has been activated by the sweep leaving the home position, or the 0 degree switch opening for Brunswick pinsetters.

- **44/144**. Indicates that the 44/144 degree switch has been activated. Brunswick pinsetters only.

- **2nd Ball.** The second ball signal is active. This is required to score 2nd balls.

- **Foul**. Indicates that the foul detector has been triggered.

- **Score.** Indicates when a score is actually recorded. Flashing indicates that the score has triggered a fast cycle (ie strike, 7 10 pick off in AMF machines, extra ball in the tenth, etc)

- **Bumper**. The bumpers are active.

The LED functions as listed above require the MIU to be connected to a TS3 and configured with the appropriate setup. However, when it is not configured, the following LEDS simply indicate the presence of an input signal, without any regard to correct timing, signal polarity etc. This can be used to verify connections during installation.

- Machine (detects RPO input)
- Ball Detect
- Sweep (also 0 degree switch)
- 44/144
- 2nd Ball

- Foul

The following sections give an overview of the connections required. See the Connector Reference for further details.

5.3.1 Power Supply

The MIU requires a 12 VDC @ 1A regulated power supply. This power supply needs to comply with local safety regulation for a class II device.

The MIU should be powered from the same circuit as the TS3 computer.

The camera and bowler terminal board can also be powered from the MIU using the 12VDC AUX terminal on J17/J18 or J14. This supply is enabled only when either lane is turned on (checked-in).

5.3.2 Connecting to TS3

The MIU provides two ports for connection to the TS3 computer. **J5** is an RS232 port, and **J6** is an RS422 port. Either may be used.

The RS232 port is primarily used when the TS3 computer is mounted adjacent to the MIU on the curtain wall.

For all other cases, the RS422 port is preferred. It can be connected via the **TS MPA** device, or to any RS422 port on the computer.

5.3.3 Pinsensing

The MIU can use either a standard video camera, or an AMF Accucam.

Video Camera

TS3 can use a standard video camera for pin detection, similar to those used in security and monitoring systems. The following points should be noted when choosing and installing a camera.

- The camera should be mounted on the ball return capping in such a position, that it can “see” all ten pins on both lanes. No pin should be completely behind any other pin. There should be space between each pin at the neck level. In order to achieve this, the distance from the camera lens

to the back row of pins should be approximately 160inches, but this will depend upon the distance between the lanes. Adjust the camera position to maximise the separation between the pins.

- A 6mm lens should give a sufficiently wide angle of view.
- The height of the camera should be the same as the neck of the pins.
- The camera must be mounted securely, so that the position of the pins as seen from the camera doesn't change. If it is mounted on the capping, the capping must be firmly secured.
- The camera must be suitable for the different light conditions used in the bowling centre. Some cameras have automatic back light adjustment, some also have automatic iris adjustment. Often just a standard inexpensive fixed iris lens will suffice.
- The output video format of the camera must be NTSC composite video.
- The camera can be colour or black and white.

The camera should provide an image of all 20 pins, with separation between the pins at neck height, and with good contrast between a present pin and an absent pin under all light conditions.

The composite video output from the camera is connected to **J4**. If the camera requires 12V power, it may be powered from **J3**, else it will need its own power supply.

AMF Accucam

An AMF Accucam compatible with Accuscore Plus can be used for pin detection. The camera data cable connects to **J8**.

An adapter is available to allow the existing cabling from both the camera and an Accuscore Plus bowler terminal to connect to **J8**.

Note that the AMF camera can NOT be powered from the **TS MIU**. It needs a separate 18VAC power supply.

J8 can also be used for direct connection to a 90XL pinspotter.

5.3.4 Bowler Terminal

The **TS MIU** supports the following types of bowler terminal. Other types such as Frameworx are only supported when the corresponding machine interface system is in use, not by a **TS MIU**.

Touch Score Keypad.

The Touch Score keypad connects directly to **J7**, using a shielded RJ45 CAT5 cable. This cable provides both power and communications to the keypad.

Universal Bowler Terminal.

The **UBT** connects to the RS422 port of **J7**. Any of the keypad types supported by the **UBT** may be used. **J7** also provides power to the **UBT**.

Accuscore Plus Bowler Terminal

An Accuscore Plus terminal can be connected to either **J7** or **J8**.

An adapter is available for **J8** so that the existing cabling from both the camera and the bowler terminal can be used.

Only a single keypad and bowler terminal are supported. To connect dual keypads, use a **Universal Bowler Terminal** with the appropriate adapter.

5.3.5 Connecting to Pinspotters via data link

Applies to AMF 8800/8290XL/Xli pinspotters only. The **J8 Pinsense** connector on the MI is connected to the **SCORING** connector on the machine chassis. All interaction between the scoring and the pinsetter takes place via this data link. There is no need to connect sweep switches, second ball detection, etc.

For Xli, the pinspotters can also be switched on and off via this link. 8290XL and 8800 do not support this, and an alternative means must be used. Usually a serial link from the Lane Server computer to the MCU controlling the center is used. Alternatively, the relays on the MI can be used as usual.

Touch Score emulates a BOSS scoring computer when using this data link, so the machine chassis should be setup as if for BOSS.

BOSS cannot trigger a scoring cycle, and therefore requires AMF ball detectors connected directly to the machine. Touch Score can provide a trigger signal using its own ball detects. However, because this is not supported by

BOSS, it cannot be done via the data link. Therefore the cycle relays on the MI must be used instead.

When Touch Score is configured for triggering from ball detects, then all types of machine cycles will be initiated via the relay connections rather than the data link. When not configured for ball detect triggering, all types of cycles are initiated via the data link, and the relays are not used.

Note that an AMF camera cannot be used when using this data link on these pinspotters, as this port on the MI is shared between the camera and the pinspotter.

5.3.6 Connecting to Pinspotters via switches

The **TS MIU** provides 2 sets of pinspotter interface connectors, to simplify connection to legacy cabling.

J10/J11 are compatible with those on an Accuscore Plus chassis. They provide basic machine connections such as the sweep switch and 2nd ball, serial pin-fall data for intelligent cycles (i.e. short strike) and contacts for cycling the machines. **J10/J11** are most suitable for use with AMF machines, although they can be used with Brunswick machines with the addition of tower switches etc.

J17/18 are screw terminals, which provide additional machine connections not included in **J10/J11**. These include the 44/144 degree switch and New Pins Solenoid connection for Brunswick machines, and relays to turn the pinspotters on and off.

5.3.7 Ball Detector

The ball detector input (**J14**) allows TS3 to provide machine triggering from simple sensors without any additional hardware. If other methods are already in place to trigger the machines, then **J14** is not used.

The ball detector sensors should provide a 12V signal across Ball Detect +/- whenever a ball breaks the detector's beam.

For precise triggering, TS3 needs to determine the speed of the ball. It does this in one of three ways –

- For dual sensors wired in parallel and mounted some distance apart, TS3 can calculate the speed accurately without any further hardware. Note that the sensors must be far enough apart so that the ball has cleared the first sensor and the output has de-activated, before the ball trips the second sensor.
- For a single sensor, whose output corresponds exactly to the time taken for the ball to pass a single point, then the length of this pulse can be used to determine speed. This method is not very accurate.
- Some ball detectors can calculate the speed internally, and then output a signal the length of which accurately reflects the ball speed. TS3 treats this as a single sensor, but the speed calculations will be far more accurate.

Ball detectors should have a minimum response time of 10ms.

See Lanes ▸ Setup ▸ Ball Trigger in the Touch Desk manual or Virtual Desk for more information.

5.3.8 Connection Reference

See Important Safety Warning before making any connections!

J1 12VDC

Pin	Function	Direction
1	Ground	
2	12 VDC	In

J1 is used to power the MIU, and also auxiliary devices such as camera and bowler terminals.

The power supply should be 12 VDC **REGULATED**. While the MI itself requires less than 0.6 Amp, additional capacity may be required if an external camera, bowler terminal board, ball triggers or other devices are also to be powered from the MI. Typically a 1.5-2 Amp power supply would suffice. The MI has an internal 2 Amp circuit breaker, so the total consumption of all connected devices cannot exceed 2 Amps.

The power supply must also have suitable overload protection to prevent damage to the MIU in the event of failure of the MIU or connected devices.

The MIU chassis should be connected to a local ground point.

J2 12VDC Out

J2 can be used to power auxiliary equipment such as bowler terminals or a camera. This supply is switched off when the lane is not in use to conserve power.

Pin	Function	Direction
1	Ground	
2	12 VDC	Out

J4 Camera

J4 is a BNC connector for composite video from a CCD camera for pin-sensing**.**

If the camera requires 12VDC for power, this can be sourced from the **12VDC AUX** terminal on **J2**. This 12V supply is only available when either lane is turned on (checked-in).

For dual cameras, **J4** is the EVEN machine, **J9** is odd.

J5 Host

Pin	Function	Direction
1	n/c	
2	TXD	Out
3	RXD	In
4		
5	Ground	
6	DTR	Out
7	CTS	In
8	RTS	Out
9	n/c	

J5 is used to connect the MIU to the TS3 host computer when a **TS MPA** device is not being used. **J5** is a standard RS232 port and connects to any serial port on the computer using a standard straight serial cable.

J6 Host

Pin	Function	Direction
1	RX+	In
2	RX-	In
3	TX+	Out
4	Ground	
5	n/c	
6	TX-	Out
7	n/c	
8	n/c	

J6 connects to the MIU port on the **TS MPA** device at the TS3 host computer. A straight (not crossed) RJ45 cable should be used.

Where there is no **TS MPA** device, **J5** can be used instead.

J7 Bowler Terminal

Pin	Function	Direction
1	TX+	Out
2	TX-	Out
3	RX+	In
4	Ground	
5	TXD	Out
6	RX-	In
7	RXD	In
8	+12VDC	Out

J7 provides both an RS232 data port (TXD/RXD) and an RS422/485 data port for use with various types of bowler terminals.

A **Universal Bowler Terminal** will connect here with a straight (not crossed) RJ45 cable. The **UBT** will be powered from the MIU.

An Accuscore Plus bowler terminal will connect to **J8** via an adapter using the existing plug, or can connect here to **J7** with custom wiring as below. Note that the pin numbering for the existing cable is the same at both ends of the cable. The colors shown may not be the same on every cable.

J7 Pin	Function	Existing J7 Plug on A+ BT Cable
1	TX+	3 (Red)
2	TX-	4 (Green)
3	RX+	1 (White)
4	Ground	
5	RXD	
6	RX-	2 (Yellow)
7	TXD	
8	+12VDC	

J8 PinSense

Pin	Function	Direction
1	Ground	
2	BT TX+	Out
3	BT RX+	In
4	Pins TX+	Out
5	Pins RX+	In
6	BT TX-	Out
7	BT RX-	In
8	Pins TX-	Out
9	Pins RX-	In

J8 provides an RS422/485 port for connection to either an Accuscore Plus camera or directly to 8800/8290XL/XLi pinspotters.

J8 also includes connections to the bowler terminal port from **J7**. An adapter is available for **J8** that accepts both the original camera and bowler terminal cabling from an Accuscore Plus installation.

When connecting an AMF camera here without an adapter, make the following connections.

Pin	Function	Existing J9 Plug on camera cable
1	Ground	
2	BT TX+	
3	BT RX+	
4	Pins TX+	3
5	Pins RX+	1
6	BT TX-	
7	BT RX-	
8	Pins TX-	4
9	Pins RX-	2

For connection to the scoring connector on 8800/8290XL/Xli pinspotters -

Pin	Function	Scoring
1	Ground	Housing
4	Pins TX+	4
5	Pins RX+	5
8	Pins TX-	8
9	Pins RX-	9

An AMF camera cannot be used when connected to a pinspotter as above.

J9 Camera 2

For dual camera installations, **J9** is for the ODD lane. For single camera installations, use only **J4**. See **J4** for details.

J10/J11 Machine

Pin	Function	Direction
1	Data	Out
2	Clock	Out
3	Common	
4	Reserved	
5	Ball 2 +	In
6	Ball 2 -	In
7	RPO Out +	Out
8	RPO Out -	Out
9	Foul +	In
10	Foul -	In
11	RPO In +	In
12	RPO In -	In
13	Start Sw +	In
14	Start Sw -	In
15	Reserved	

J10 and **J11** provide connections to the pinspotters, and are compatible with **J10** and **J11** on an Accuscore Plus chassis. These connectors should be wired the same as for Accuscore Plus.

All input signals shown with +/- terminals are fully isolated inputs, and will trigger with any voltage above 12VDC. Input may be DC or AC, with a maximum of 28VAC.

For AMF machines, the **Start** signal is normally connected to the sweep switch. A signal should be present whenever the sweep has left the home position, and be zero volts at the home position.

For Brunswick machines, the **Start** signal is normally connected to the 0 degree switch. This signal will be present when the machine is at 0 degrees, and be zero volts at other times. This is the opposite of a sweep switch.

The **Start Signal** setting allows the start signal to be set to either the **Sweep** or the **0 Degree** switch, regardless of pinspotter type. For Brunswick pinsetters where the 0 degree switch is used, but the NC terminals are connected instead of the usual NO, then set the start signal type to **Sweep**.

Ball 2 should be present whenever the machine is on a 2nd ball cycle.

The **Foul** signal should be present whenever the foul light is tripped. If this signal is present at any time within 10 seconds prior to the sweep leaving the home position, then a Foul will be recorded.

The **RPO Out** terminals are relay contacts used to cycle the pinspotter. Although labeled **RPO Out** for compatibility with the AMF connector labeling, this relay is also used for scoring cycles.

Note that maximum voltage across any input or relay output, and between any pin and ground, is 28VAC. Except for DATA and CLOCK which are 5volts.

The relays ***MUST NOT BE USED TO SWITCH MAINS or HAZARDOUS VOLTAGES!*** Maximum voltage is 28VAC. Maximum load current is 1A. All circuits switched by the relay contacts must have over-current protection of 3.5 Amps or less.

J14 Ball Detect

Pin	Function	Direction
1	12VDC AUX +	
2	Even Ball Detect +	In
3	Even Ball Detect -	In
4	Odd Ball Detect +	In
5	Odd Ball Detect -	In
6	Ground	

The Ball Detector should provide a 12V signal across Ball Detect +/- whenever a ball breaks the detector's beam.

Where two sensors are used to provide ball speed, the sensors should be wired in parallel so that two pulses are sent to the MIU, one as the ball passes each sensor. The distance between the sensors can be configured in Touch Desk.

The **12 VDC Aux** terminal supplies 12 volts whenever either lane is on (checked-in).

See the notes for J10/11 regarding maximum voltage and current limits.

J15 Aux

Pin	Function	Direction
1	Even AUX+	Out
2	Even AUX-	Out
3	Odd AUX+	Out
4	Odd AUX-	Out

The AUX outputs are opto-coupler outputs that can be assigned a number of different functions. One example is to provide monitor input switching for legacy monitor setups. Contact A.K.Microsystems for more details.

See the notes for J10/11 regarding maximum voltage and current limits.

J16 Bumpers

Pin	Function	Direction
1	Even Bumpers n/o	Out
2	Even Bumpers n/o	Out
3	Odd Bumpers n/o	Out
4	Odd Bumpers n/o	Out

J16 provides 2 normally open relay contacts that close when the bumpers are to be deployed. These contacts ***MUST NOT BE USED TO SWITCH MAINS or HAZARDOUS VOLTAGES!*** Maximum voltage is 28VAC. Maximum load current is 1A. All circuits switched by the relay contacts must have over-current protection of 3.5 Amps or less.

J17/J18 Machine

Pin	Function	Direction
1	Play Switch N/O	Out
2	Practice Switch N/O	Out
3	Play/Pract Common	
4	44/144 +	
5	44/144 -	

These screw terminals provide additional machine connections that are not included in **J10/J11**.

Play and **Practice** are N/O relay contacts to **Common** that are used to turn the pinspotters on and off, and to turn on practice mode.

These contacts ***MUST NOT BE USED TO SWITCH MAINS or HAZARDOUS VOLTAGES!*** Maximum voltage is 28VAC. Maximum load current is 1A. All circuits switched by the relay contacts must have over-current protection of 3.5 Amps or less.

44/144 + and – is used to detect the closure of the 44/144 cam switch on Brunswick machines. A voltage should appear across the +/- terminals when the machine reaches 44/144 degrees. Maximum allowable voltage is 28VAC. These signals MUST be connected if the pinspotter type is set to Brunswick.

See the notes for J10/11 regarding maximum voltage and current limits.

J19 NPS

Pin	Function	Direction
1	GND	
2	NPS Even Lane +	Out
3	NPS Odd Lane +	Out

NPS + and – (GND) provide power for a new pins solenoid for Brunswick machines. The terminals will drive 5 volts at up to 100mA.

5.4 Universal Bowler Terminal

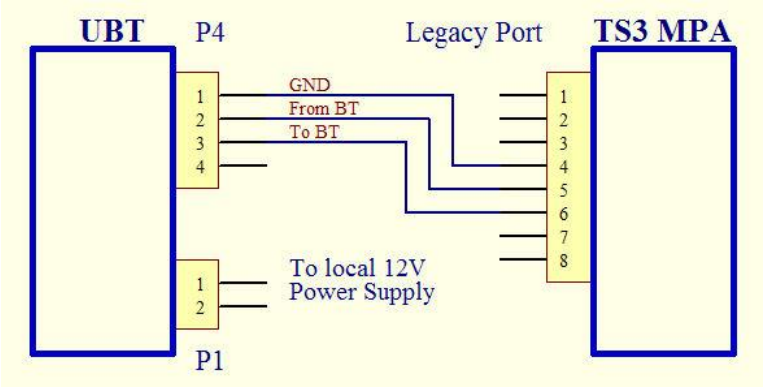
The **Universal Bowler Terminal** board provides a serial port interface to the keypad/s.

When used with TS3, all DIP switches on the **UBT** should be OFF. The jumper should be set as below.

For supported keypad types and other information, see also the separate document on the **Universal Bowler Terminal**.

The **UBT** can be connected to TS3 in any of the following ways –

5.4.1 Legacy Port on TS MPA .



Set the jumper to the RS232 (AKM) position on the UBT. Use shielded data cable.

The power supply is 12 volts AC or DC, and connected either way round. The power supply can also be located remotely (for example at the TS3 MPA).

5.4.2 MIU Port on TS MPA.

Use a standard RJ45 patch lead (NOT crossover) to connect **P10** on the **UBT** to the **MIU** port on the **TS MPA**.

Connect a power supply (12V, AC or DC) to **P1** on the **UBT**.

Set the jumper to the RS422 (AMF) position on the **UBT**.

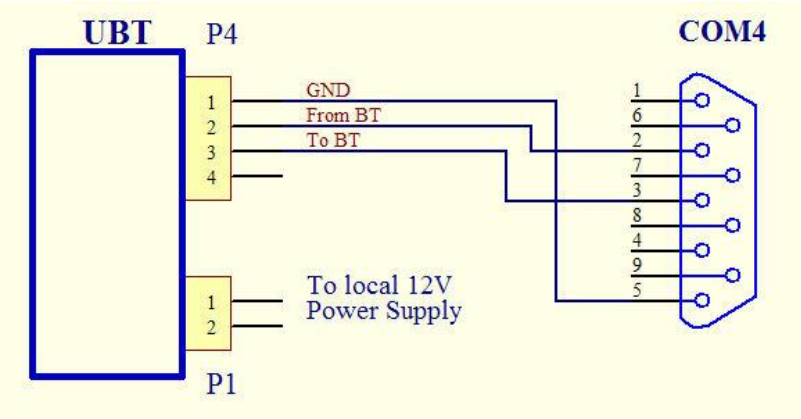
5.4.3 BT Port on TS MIU.

Use a standard RJ45 patch lead (NOT crossover) to connect **P10** on the **UBT** to the **J7** on the **TS MIU**.

The **UBT** will be powered from the MIU, a local power supply is not required.

Set the jumper to the RS422 (AMF) position on the **UBT**.

5.4.4 RS232 COM Port on TS3 computer.

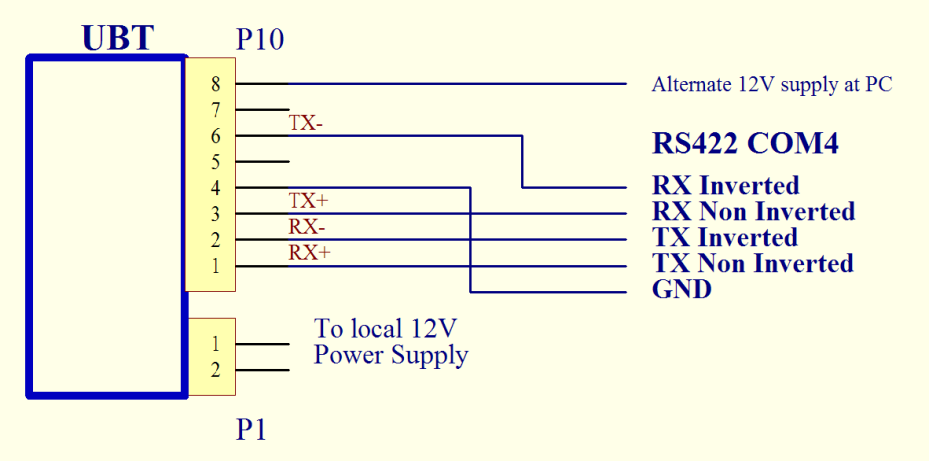


The **UBT** can be connected to a standard serial port or USB to serial convertor. The serial port must be configured as COM4.

Set the jumper to the RS232 (AKM) position on the UBT. Use *shielded* data cable with the shield grounded at the PC connector.

The power supply is 12V AC or DC and can be connected either way round. The power supply can also be located remotely (for example at the TS3 Computer).

5.4.5 RS422 COM Port.



The **UBT** can use a standard RS422/485 port on the computer. The port must be configured as COM4, full duplex.

There is no universal standard for the RS422 connector, the wiring will depend upon the type used.

Set the jumper to the RS422 (AMF) position on the UBT. Use twisted pair cable, shielding is optional. RX+/- must be paired, TX+/- must be paired.

The local power supply is 12V AC or DC and can be connected either way round. Alternatively, the power supply can be located at the PC and connected to the CAT5 cable on pin 8.

5.4.6 Machine Cycle and Intercom Relays on the UBT

The **UBT** has 3 on-board relays. When used with TS3 these relays are used to cycle the two pinspotters (odd and even) and to enable an intercom.

When the cycle relays are connected, TS3 can cycle the machines from the bowler menu, or automatically when needed. The machines can also be cycled from Touch Desk.

TS3 may have the ability to cycle the pinspotters through other means (for example through the **TS MIU**), in which case these relays need not be connected.

The cycle relays can normally be connected across the bowler's reset switch.

The intercom relay is used to connect a combination speaker/microphone onto a common audio cable from the front desk intercom system as used for AS80/90 and Frameworks.

The relays contacts are connected via **P9** on the **UBT** as below.

Pin	Function
1	Odd Machine N/O
2	Odd Machine N/O
3	Even Machine N/O
4	Even Machine N/O
5	Intercom N/O
6	Intercom N/O
7	Ground

These contacts ***MUST NOT BE USED TO SWITCH MAINS or HAZARDOUS VOLTAGES!*** Contact ratings are 28VAC @100mA. Suitable over current protection devices must be installed.

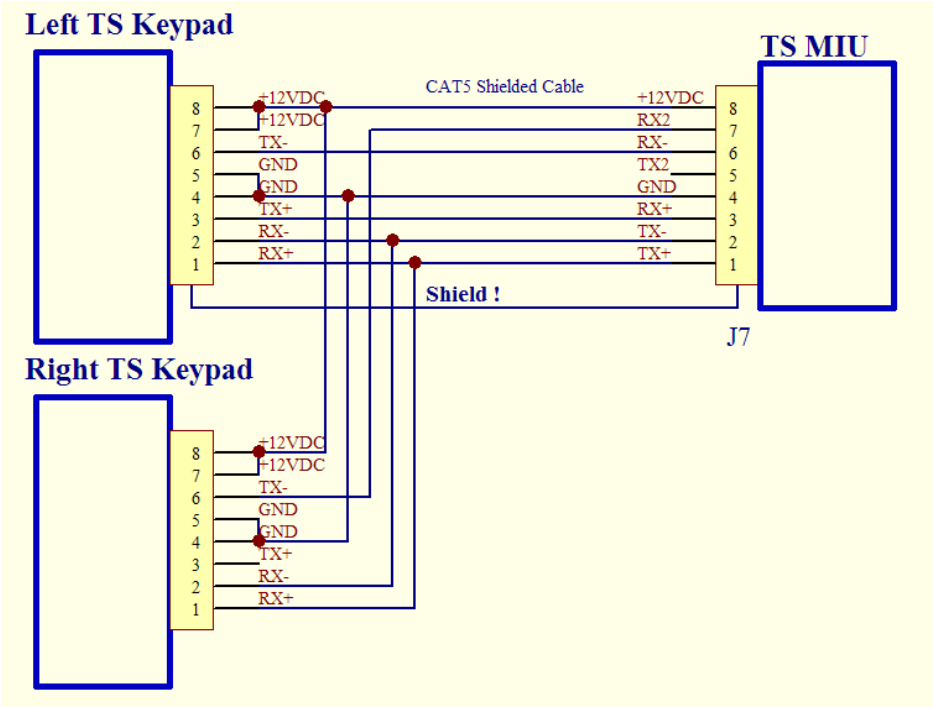
5.5 Touch Score keypad

The Touch Score keypad can be used on all TS3 configurations, and can be connected to the TS3 computer in any one of the following ways. Either a single (LEFT) keyboard or dual (LEFT & RIGHT) keypads can be used.

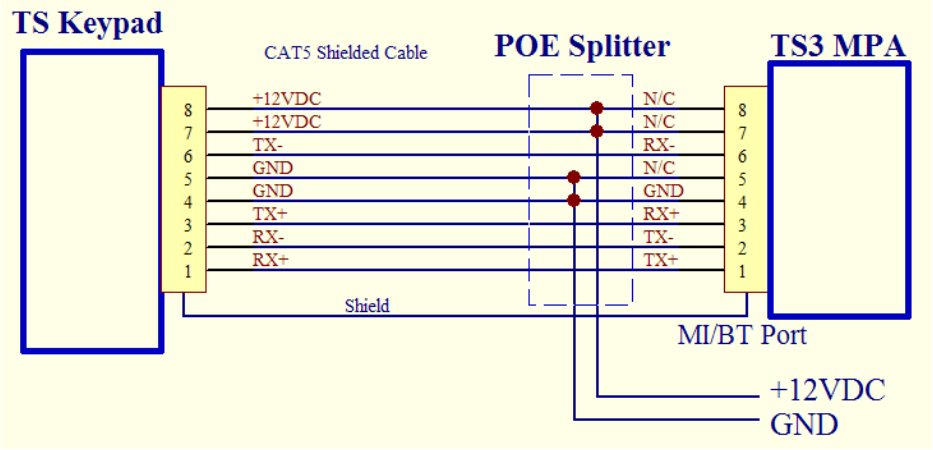
5.5.1 TS MIU J7

For a LEFT or single keypad only connect directly to J7, using a *shielded* RJ45 CAT5 cable**.** Both power and communications are connected by this cable**.**

For dual keypads a splitter cable is required as below.



5.5.2 TS MPA MI/BT Port

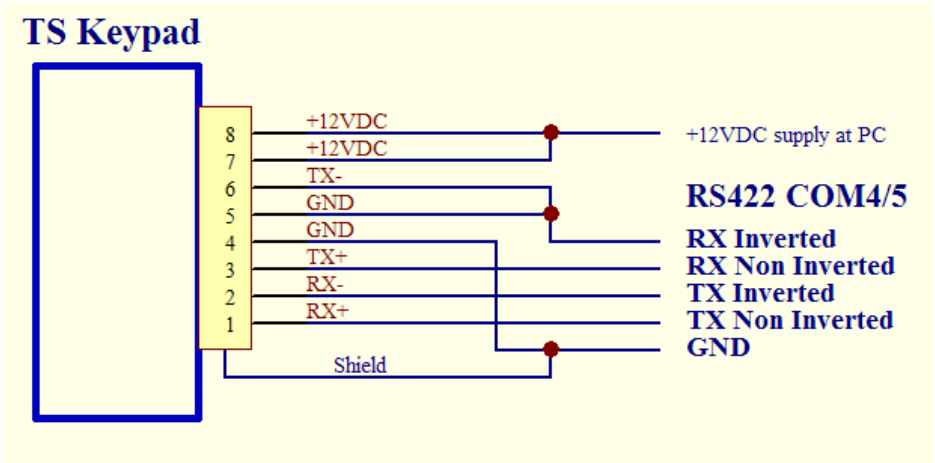


Use a *shielded* RJ45 CAT5 cable in conjunction with a *shielded* POE splitter at the **MPA** end. The POE splitter is used to inject +12V into the cable. The TS3 computer will often have 12 volts available for this purpose, or a separate

power supply can be used. The splitter should use pins 4 & 5 for ground, and 7 & 8 for +12VDC. (Note that many splitters will use the opposite polarity to this). The splitter must be shielded to ensure the cable shield connects through to the **MPA**.

This MPA port can only be used for a LEFT or single keypad.

5.5.3 RS422 Com Port on TS3 Computer



The keypad can be connected to an RS422 com port that is configured as COM4 or 5, full duplex. It is not possible to give the wiring for this port, as there is no standard connector for RS422 ports. However, the function of each wire is shown above.

COM4 can be used for a single keypad. For dual keypads, COM4 will be either -

- The LEFT keypad if an MPA is not detected, or the keypad port on the MPA is not available as it is in use for a FW pinsetter controller
- The RIGHT keypad otherwise.

COM5 is for the RIGHT keypad in dual keypad installations.

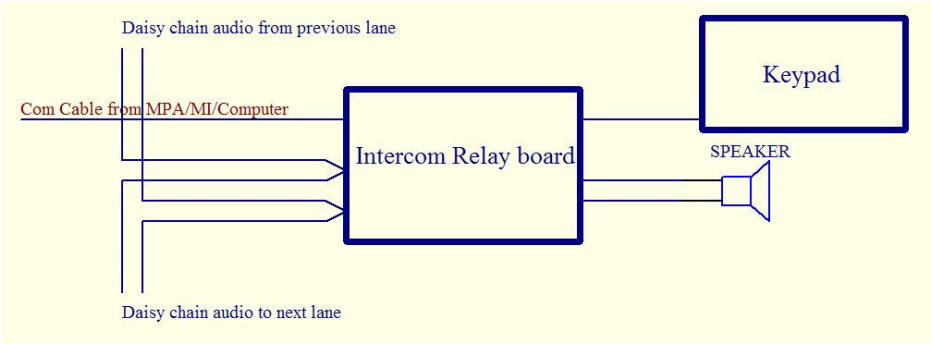
5.6 Intercom Relay board

The **Intercom Relay board** is used to retain the bowler's intercom when TS3 is used to upgrade an AS80/90 installation with a Touch Score keypad.

The **Intercom Relay board** is mounted in the bowler's console, and connects in-line with the LEFT or single keypad. The board has 2 RS45 jacks, one for the keypad and the other for the keypad cable. It replaces the inline coupler that is usually used to connect the keypad to the cable.

The board also has two sets of screw terminals. One is for connection to the speaker in the console, which also doubles as a microphone. The other connects to the intercom daisy chain from the AV box at the front counter. A relay on the board connects the speaker/microphone to the daisy chain when the intercom for this pair is enabled by the front desk.

A LED on the board confirms that 12volts is present for powering both the intercom board and the keypad. Be sure to connect the board the correct way around or the keypad will not function.



The **Intercom Relay board** also contains transient suppressor devices to protect both itself and the keypad in the event of large voltage transients being present on the cable. This can occur during severe electrical storms, or due to the failure of nearby electrical devices. In the unlikely event that these transients are very powerful, then the **Intercom Relay board** will fail in such a way as to continue to protect the keypad, as the **Intercom Relay board** is less costly to replace than a keypad.

Note that the **Universal Bowler Terminal** board also contains a relay that can be used for the intercom.

5.7 Adam Data Acquisition Modules for String Pinsetters.

Adam Data Acquisition modules can be used to interface TS3 with string pinsetters that have mechanical switches to determine the pinfall.

The modules required are –

Adam 4068/9 Relay output module. One module required per pair. Provides two relays per lane as below –

- Power Relay - Controls power to the pinspotter.
- Set Relay - Sets a full deck by cycling the pinspotter whenever pins are left standing at the end of a frame.

This relay module is optional and may be omitted if neither of the above functions are required.

The 4069 is a heavy-duty version of the 4068. Electrical requirements of the specific pinsetter will determine the required type.

Adam 4051 Digital Input module. For 9 or 10 pin machines, two modules are required.

For 5 pin machines, one module per pair is required. However, if this is not practical (for example if the machines do not share a common ground) then two modules may be used as per the 9/10 pin case. Set the MI type **to Adam 9/10 pin** in this instance.

Inputs supported are –

- Pin Switches (up to 10 per lane)
- Ball Detector Input (1 per lane)
- Foul Detector Input (1 per lane)
- Cycle Input

A ball detector is required and must provide a signal of at least 500ms regardless of ball speed. Ball speed detection is not supported.

The pin switches will be read at the expiry of the ball detect timeout after the ball detect has been triggered, or immediately if a cycle signal is received during this period. An active signal on the pin inputs indicates that the

corresponding pin is left standing. There is however a setting to invert this if needed.

The cycle input is used to detect that the machine has cycled due to one or more pins being knocked down. The presence of this signal during the ball detect timeout period will cause an instant read of the pins. If all pin inputs are high (all standing) this will be interpreted as a strike or spare rather than a miss. The machine is not expected to cycle if no pins have been hit, therefore all pins standing indicates a reset and therefore a strike or spare has occurred.

Only the ball detect delay in setup is used. All other machine settings are ignored.

All Adam modules must be connected to a shared two wire (half duplex) RS485 port on the TS3 computer. This port must be configured as COM6.

See the ADAM documentation for electrical specifications of the I/O connections. If the machine signals are not within the specifications of the ADAM device, for example AC voltages are used, then additional components such as diodes may be required.

Prior to use, each Adam module must be configured using the software supplied with the module. See the Adam manuals for more information.

The required configuration parameters are –

Baud Rate = 9600
Checksum = Enabled
Protocol = Advantech (if available to be set)

The 4068/9 output module must be set to ID=1.

The 4051 input module(s) are then set to IDs 2 (odd lane) and 3 (even lane)

5.7.1 Function List

Below is a list of each I/O port on the modules and their function.

This document does not provide details on how to connect each port to the pinspotters, as requirements will vary widely from machine to machine. The

Adam modules provide several ways to connect the inputs, and the best solution will again depend upon the particular machine.

It is the installer's responsibility to ensure the installation meets any applicable electrical safety and personal safety requirements.

Relay Outputs -

Relay 0 - Odd lane. Machine on
Relay 1 - Odd lane. Set deck.
Relay 2 - Not Used
Relay 3 - Odd lane bumper
Relay 4 - Even lane. Machine on
Relay 5 - Even lane. Set deck.
Relay 6 - Not Used
Relay 7 - Even lane bumper

Digital Inputs for 5 pin machine

DI 0 - Odd Lane Pin 1
…
DI 4 - Odd Lane Pin 5
DI 5 - Odd Lane Ball Detector
DI 6 - Odd Lane Foul
DI 7 – Odd Lane Cycle In

DI 8 - Even Lane Pin 1
…
DI 12 - Even Lane Pin 5
DI 13 - Even Lane Ball Detector
DI 14 - Even Lane Foul
DI 15 – Even Lane Cycle In

Digital Inputs for 9/10 pin machines

Two modules per pair are required. The module configured at ID=2 is for the odd lane, and the module at ID=3 is for the even lane.

DI 0 - Pin 1
…
DI 9 - Pin 10

DI 10 - Ball Detector
DI 11 - Foul
DI 12 – Cycle In
D13-15 - Not Used

5.8 Universal MI

IMPORTANT SAFETY WARNING!

The devices described here are low voltage, low current devices and MUST NOT be connected to mains or hazardous voltages under any circumstances. Connect only to other SELV (safe extra low voltage, <28VAC) circuits. All electrical work associated with this device must be carried out by qualified persons only and be in accordance with the relevant safety codes at your location and the manufacturer's instructions.

- **This equipment may activate and cycle the pinspotters AT ANY TIME and WITHOUT ANY WARNING. It is therefore essential that power is otherwise disconnected from the pinspotter before entering or working on the pinspotter. This equipment must NEVER be relied upon to keep the pinspotter in an unpowered or non-active state.**
- **Always install anti-intrusion protection to ensure that no person can inadvertently or otherwise come in to contact with the pinspotter while it is connected to power.**
- **Always install an additional manual switch or safety interlock to remove power from the pinspotters instantly in case of emergency. Do NOT rely on the scoring system, or front desk computer, or the devices described here for this function.**
- **It is the installer's responsibility to ensure the installation meets any applicable electrical safety and personal safety requirements.**

The **Universal MI** is built in to the TS3 software and uses mostly general purpose I/O modules (GPIO) to connect to a wide range of pinspotting equipment. It offers similar functionality to the **TS MIU**.

It can be used with an IP (network connected) camera, or an AMF A+ Accucam.

When used with an IP camera, the Universal MI can use visual clues to determine the state of the machine and therefore record the score without any physical connection to the pinspotter. The addition of GPIO modules provides further functionality such as triggering and controlling the pinspotter (on/off/cycle/respot etc)

All the devices described here (Adam Modules, MI-X, AMF-X can be mounted inside a standard din-rail enclosure for a tidy installation. It is

recommended that an external power supply be used, rather than bringing mains voltages into the enclosure.

AMF 90XL pinspotters can be connected directly to an RS422 port on TS3 configured as COM10. In this configuration, the state of the machine is read via this interface, and neither visual detection nor GPIO is required.

However, TS3 has the option to use a relay for cycling the machine rather than via this data link. This may be necessary if TS3's ball detectors are to trigger the chassis, and the chassis does not support scoring cycles via the data link, or the default delay in this mode is too short. To use this configuration, configure the TS3 ball detector to trigger a cycle and enable the GPIO Relay Module. All machine cycles, whether a scoring cycle or not, will now be initiated via the relay.

Most of the setup options available with a normal **TS MIU** are also available with the **Universal MI**.

In addition, the **Universal MI** supports using an IP camera for string pinsetters, by setting the pinsetter type to **Generic String**. An IP camera is used for detecting pins. A ball detect input is required to trigger the score. The cycle output is used to reset a full deck when needed. A Foul input may also be connected. Other options are not compatible with **Generic Strings.**

See the Universal MI Tab and Camera Setup for setup options and more information.

5.8.1 Camera

The Universal MI requires either –

- A network camera that supports MJPEG over HTTP. See Universal MI Tab for supported types and URLs
- An AMF Accuscore Plus camera on COM11, RS422 required.

The network camera should ideally be connected only to its TS3 computer on a separate network adapter and subnet from the main network.

For IP Cameras, diagnostic images can be found in the **Camera\Score 0** and **1** folders. **Score 0** is for the odd lane, **Score 1** is for the even lane. Files are named according to where the arrows were at the time as follows –

L***ll***_G***g***_P***p***_B***bb***_***XXX***.bmp

ll is the lane of the arrow (0 =even, 1=odd)
g is the game number
p is the player number
bb is the ball number
XXX is one of –

SCR Ball was scored from this image
SWP Sweep or Start switch change detected
RPO Non scoring cycle

5.8.2 Input Module

Where hardwired inputs are required, an ADAM 4052 input module is connected to a shared two wire (half duplex) RS485 port on the TS3 computer. This port must be configured as COM12.

Prior to use, the Adam module must be configured using the software supplied with the module. See the Adam manuals for more information.

The required configuration parameters are –

Baud Rate = 9600
Checksum = Enabled
Protocol = Advantech (if available to be set)

The 4502 must be set to ID=2.

Alternatively, any general purpose input module that supports MODBUS RTU can be connected to COM22. It should be set to address 2. If the input module is combined with the output module at a single address, then set the unit to address 1 and enable **Modbus GPIO shares a single address** in Touch Desk or the Virtual Desk.

The inputs on the module are detailed below. See the Universal MI Tab to enable each input.

D0 – Odd Lane Sweep/0 Degree switch
D1 – Even Lane Sweep/0 Degree switch
D2 – Odd Lane 2nd Ball
D3 – Even Lane 2nd Ball

D4 – Odd Lane Foul or 44/144
D5 – Even Lane Foul or 44/144
D6 – Odd Lane Ball Detect or RPO In or 44/144
D7 – Even Lane Ball Detect or RPO In or 44/144

Note that D0-D5 are fully isolated inputs with both + and – connections. However D6 and D7 share a single common. This is not usually a problem with ball detectors, but may require additional wiring or relays when used for **RPO In** or **44/144** switch.

See the ADAM documentation for electrical specifications of the connections. If the signal voltages are not within the specifications of the ADAM device, for example AC voltages are used, then additional components such as diodes may be required.

The **Ball Detector** and **RPO In** share the D6/7 and therefore cannot be used together on the one device. Generally both are not required.

If a ball detector is connected, then the MI can automatically determine if the current cycle is a scoring cycle or not, by noting whether a ball has passed.

Without a ball detector, it is necessary to connect this input to any external cycle switches that are intended to initiate an RPO or non scoring cycle. Even when TS3 is not initiating the cycle (no relays connected) this input is still necessary to prevent a score being recorded on that cycle.

Note that this Ball Detector input is NOT speed sensitive and cannot be used for ball speed display. There must be a valid signal for at least 500ms whenever a ball passes, regardless of ball speed. This will require a detector with a programmable OFF DELAY, or a delay circuit will need to be added. Minimum response time of the detector should be 10mS. See MI-X below for if ball speed detection is required.

The **44/144** switch will be on D4/5 if **Foul** is not enabled else it will be on D6/7. If both **44/144** and **Foul** are enabled then neither **Ball Detect** nor **RPO In** can be used. **Foul** can often be easily triggered visually, in which case a wired connection is not needed.

5.8.3 Output Module

Where hardwired outputs are required, an ADAM 4068 or 4069 relay module can be setup and connected in the same way as for the input module above. The relay module must be set to ID=1.

Alternatively, any general purpose relay module that supports MODBUS RTU can be connected to COM22. It should be set to address 1.

Note that an Adam 4068/9 can also be configured for Modbus and connected to COM22. Note also that the first relay in these units is at Register #17, rather than #1 which is typical. Therefore, for Adam 4068/9 in Modbus mode only, enable **Relays start at address #17** in Touch Desk or the Virtual Desk.

The relay module must be enabled in Universal MI Tab.

Each output is listed below.

RL0 – Odd Lane Pinspotter On
RL1 – Even Lane Pinspotter On
RL2 – Odd Lane Instructomat/NPS/Strike
RL3 – Even Lane Instructomat/NPS/Strike
RL4 – Odd Lane Cycle Pinspotter
RL5 – Even Lane Cycle Pinspotter
RL6 – Odd Lane Bumpers/Gutter
RL7 – Even Lane Bumpers/Gutter

The function of RL2 and RL3 depends upon the type of pinspotter selected. **Instructomat** is only available on AMF, whereas the **New Pins Solenoid** is only used for Brunswick, **Strike** for Xima and Via.

The function of RL6 and RL7 also depends on the pinspotter type. It is **Gutter** for Xima and Via, **Bumpers** for all others.

See the ADAM documentation for electrical specification of the connections.

5.8.4 Ball Speed Detector

This module is used to read the ball speed from a suitable detector. In order to coexist on the comline with Adam modules, it uses the same protocol as an

Adam 4053. It is intended for use by custom hardware rather than an actual Adam 4053.

The 16 bits of data read from this module represent the ball speed in 1/10ths of a MPH.

Note that this input alone cannot be used to trigger a ball detected signal. A valid signal is still required either from a GPIO input or from a visual detection. Upon receipt of this signal, Touch Score will read the Ball Speed Detector for speed information.

The Ball Detector uses ID=5/6 for the odd/even lane.

See the Adam 4053 documentation for protocol information.

5.8.5 Pinfall Output Module

This module outputs pinfall data after each cycle to allow the machines to intelligently react to the last pinfall.

In order to coexist on the comline with Adam modules, it uses the same protocol as an Adam 4056. It is intended for use by custom hardware rather than an actual Adam 4056.

The 10 lower bits of the 16 bits of data output represent the pins. A 1 represents that the pin is still standing.

The Pinfall Output module uses ID=3/4 for the odd/even lane.

See the Adam 4056 documentation for protocol information.

5.8.6 Training Pins Output Module

This module outputs the requested training pins pattern. The patterns is sent at machine switch on and upon any changes to the pattern.

In order to coexist on the comline with Adam modules, it uses the same protocol as an Adam 4056. It is intended for use by custom hardware rather than an actual Adam 4056.

The 10 lower bits of the 16 bits of data output represent the pins. A 1 represents that the pin is still standing.

The Training Pins Output module uses ID=5/6 for the odd/even lane.

See the Adam 4056 documentation for protocol information.

5.8.7 Qubica Six Box.

A Qubica Six Box connected to COM28 can provide inputs for second ball and foul, and outputs for the power and cycle relays.

5.8.8 MI-X

There are two functions that are not available with GPIO modules, and require additional specialist hardware -

- Pinfall data for fast cycles on AMF 82-70s with MP expanders
- Ball Speed detection from suitable ball detectors (see TS MIU)

The **MI-X** (MI Extender) provides both these functions. For AMF pinfall data only, see also the **AMF-X**.

In addition, the **MI-X** provides the following outputs –

- Relays to cycle the pinspotters on each lane.
- NPS outputs for the New Pins Solenoid on Brunswick machines.

These extra functions allow the **MI-X** to be the only device required (no Adam modules) in many cases, including providing machine triggering. In particular where the following conditions can be met -

- Start, 2nd Ball, and Foul signals can all be detected visually, or derived from an XL90 pinspotter.
- There are no bumpers, or there is a FW bumper controller for the bumpers.
- Pinspotter On/Off control can be provided by a central controller on the lane server, or is not required.

Note that the **Ball Detector** input can be used for **RPO In** instead**.** See the Input Module section for details on why only one of these signals is ever required (not both).

The **MI-X** connects to the same two wire serial interface as the Adam modules on COM12.

The **MI-X** requires both 12V and 3.3 Volts power supplies. As the MIX is usually used with Adam modules which require 12V, then only an additional 12V-3.3V din rail mounted supply is required.

Note that maximum allowed voltage across any input or relay output, and between any pin and ground, is 28VAC. Except for DATA, CLOCK and NPS which are 5volts.

The relays ***MUST NOT BE USED TO SWITCH MAINS or HAZARDOUS VOLTAGES!*** Maximum voltage is 28VAC. Maximum load current is 1A. All circuits switched by the relay contacts must have over-current protection of 3.5 Amps or less. If contacts with a higher rating are required, then an additional DIN mounted relay should be added.

5.8.8.1 Jumpers

There are two jumper positions inside the MI-X. Neither should be present during normal use.

JP1 – initiates self test mode
JP1&JP2 – initiates self recovery mode.

5.8.8.2 LEDs

There are two LEDs on the Ethernet connector.

The yellow LED indicates the Ethernet link is connected.

The green LED will –

Flash once every second once the MI-X software has initialized.
Flash quickly to indicate activity on the Ethernet connection.
Flash quickly to indicate activity on the serial connection.

During normal use while connected to TS3, the green LED should be flashing quickly.

5.8.8.3 J1 Ethernet

The Ethernet connection is presently only used for programming the device.

5.8.8.4 J2 Power & Comms

The MI-X requires a two supply voltages, 3.3V & 1A for the processor, and 12V @ 0.5A for I/O. Connect to pins 3,4 & 5 as shown.

The MI-X communicates with TS3 via an RS485 half duplex com port. Use **D+**, **D-** and **Ground** to connect to the com port.

Pin	Function
1	Data +
2	Data -
3	+12V Supply
4	GND
5	+3.3V Supply

5.8.8.5 J3 Ball Detect

The ball detector should provide a 12V signal across **Ball Detect +/-** whenever a ball breaks the detector's beam.

Where two sensors are used to provide ball speed, the sensors should be wired in parallel so that two pulses are sent to the MI-X, one as the ball passes each sensor. The distance between the sensors can be configured in Touch Desk.

For ball speed detection using one sensor, the length of the pulse must equal the time the ball takes to pass the sensor.

Pin	Function
1	Odd Ball Detect +
2	Odd Ball Detect -
3	Even Ball Detect +
4	Even Ball Detect -

5.8.8.6 J4/J7 Cycle

Each 2 pin connector provides a normally open relay contact to cycle the pinspotter. The contacts are rated at 28VAC 1Amp. **DO NOT CONNECT TO MAINS VOLTAGES!**

5.8.8.7 J5/J6 Pinspotter

Pin	Function
1	Data
2	Clock
3	Data/Clock Common
4	NPS +
5	NPS- (GND)

These connectors provide either the data/clock/common signals needed for intelligent cycles on AMF 8270 type pinspotters, or a 5V output used to drive the New Pins Solenoid relay for Brunswick pinspotters.

Note that the 5V output is NOT isolated and maximum current is 100mA. It is intended to drive an NPS relay as per Brunswick CCD processor boards, not the NPS directly.

5.8.9 MI-X2

MI-X2 is an upgraded MI-X that includes additional inputs. Normally only a relay output module is required in addition to the MI-X2 to provide all the necessary I/O.

MI-X2 uses the MODBUS protocol and must be connected to COM22. Ideally the relay module would also use MODBUS and be connected to the same port, but an Adam module on COM12 can also be used.

MI-X2 provides the following connections per lane -

- 4 isolated inputs, configurable as START, B2, FOUL, 44/144 or RPO IN
- Speed Sensitive Ball Detector isolated inputs
- AMF Data/Clock outputs for intelligent AMF chassis.

5.8.9.1 LEDs

The LEDs on the MI-X2 function as below –

Power/Com – A slow flash indicates that power is present. It will flash quickly when communicating with the HOST. Slow flashing when connected to the host indicates a problem, such as the HOST is configured for additional modules which are not connected or not communicating.

Start/Ball2/Foul/Aux – these LEDS indicate the status of the 4 inputs directly.

Ball – This LED is held on for a second when a valid ball detect is received. When configured for dual sensors, the LED will flash if only one pulse was received.

5.8.9.2 J1 Power/Com

Pin	Function
1	Data +
2	Data -
3	+12V
4	GND

Data +/- is the RS485 communications link to the host TS3. GND should also be connected to the host.

A +12V DC regulated power supply is required. Maximum current draw is 200mA

5.8.9.3 J2 Ball Detect

Pin	Function
1	Left Ball Detect +
2	Left Ball Detect -
3	Right Ball Detect +
4	Right Ball Detect -

The ball detector should provide a 12V signal across **Ball Detect +/-** whenever a ball breaks the detector's beam. Either single or dual ball detectors can be used as for the MI-X above.

5.8.9.4 J3 Pin Data

Pin	Function
1	Left Data
2	Left Common
3	Left Clock
4	Right Data
5	Right Common
6	Right Clock

This connector provides the data signals for intelligent AMF chassis.

5.8.9.5 J4/5 Left/Right Inputs

Pin	Function
1	Start +
2	Start -
3	Ball 2 +
4	Ball 2 -
5	Foul +
6	Foul -
7	Aux +
8	Aux -

J4/5 provide isolated, AC tolerant inputs for reading the machine switches. AUX is configurable and can be used for a 44/144 switch or RPO-IN. Maximum voltage is 28VAC.

5.8.10 AMF-X

There are two functions that are not available with GPIO modules, and require additional specialist hardware -

- Pinfall data for fast cycles on AMF 82-70s with MP expanders
- Ball Speed detection from suitable ball detectors (see TS MIU)

The **AMF-X** (AMF Extender) provides the pinfall data for AMF machines only.

See **MI-X** for both AMF pinfall and ball speed detection.

The AMF-X connects to the TS computer using a USB to RS232 convertor set to COM18. The convertor requires extra functionality compared with a standard RS232 port –

- The recommended device is part number Chipi-X10 from FTDI, although other devices based on the same or later chipsets from FTDI may be suitable. Note that some older chipsets from FTDI have known problems with clocking and may not work.
- The FTDI D2XX device driver must be installed.
- The device must include full hardware handshaking lines as well as TXD & RXD.

The connections to the AMF-X are described below.

5.8.10.1 J1 Host

J1 connects to the Chipi-X10 device.

J1 Pin	Function	Chipi-X10 DB9 Pin
1	RTS	7
2	DTR	4
3	TXD	3
4	GND	5

5.8.10.2 J2&3 Machine

J2 & J3 are 3 way screw terminals, supplying the data signals to each machine

Pin	Function
1	Data
2	Clock
3	Data/Clock Common

5.9 UCL Hardware

This section describes connecting TS3 to coin acceptors and ticket dispensers when TS3 is operated in Arcade Mode.

Connection is made via USB to RS232 convertors. The convertor requires extra functionality compared with a standard RS232 port –

- The recommended device is part number Chipi-X10 from FTDI, although other devices based on the same or later chipsets from FTDI may be suitable. Note that some older chipsets from FTDI have known problems with clocking and may not work.
- The FTDI D2XX device driver must be installed.
- The device must include hardware handshaking lines as well as TXD & RXD

Three configurations are possible as below.

- **1 x UCL (pulse)** - One RS232 device (COM19) is shared between both lanes. The **Coin Inhibit** output is not provided. The ticket dispensers must be **Pulse** type.
- **2 x UCL (pulse)** - Two RS232 devices (COM19 & COM20) are required, one for each lane. The ticket dispensers must be **Pulse** type.
- **2 x UCL (notch)** - Two RS232 devices (COM19 & COM20) are required, one for each lane. The ticket dispensers must be **Notch** type.

The following signals are provided on the RS232 port. Note that the voltage levels and drive capability of these signals are in accordance with the RS232 specification only, and may require additional components to connect to the coin acceptors and ticket dispensers.

Coin Input. A positive pulse on this pin indicates a coin has been inserted. The pulse must be a minimum of 150mS duration.

Bumper Input. A positive pulse on this pin indicates that the **Bumper** push button has been pressed. This will toggle the bumper setting for the player that is currently up. The pulse must be a minimum or 250mS duration.

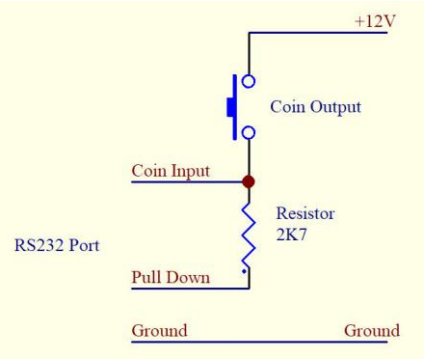
Ticket Dispenser. Two types of ticket dispenser are supported – **pulse** and **notch**.

Pulse types have one input. Each pulse on this input dispenses one ticket. TS3 will drive the **Pulse** pin positive for 250mS for each ticket that is to be dispensed, at a maximum rate of 2 tickets per second.

Notch types have one input and one output. TS3 sets the **Drive** input high to start dispensing tickets. As each ticket is dispensed, the dispenser pulses the **Notch** output high. TS3 counts these pulses and disables the **Drive** output once the desired number of tickets have been dispensed. The **Notch** pulse must be at least 20mS in duration.

Coin Inhibit Output. This output is driven positive whenever a game is in progress, as any additional coins entered at this time will be ignored. The coin acceptor should return all coins entered while this signal is high. If this function is not used, then any coins entered midgame will have no effect until the game is over, at which time a new game will start.

Pull Down. This output is maintained at a negative voltage, and can be used to pull down unconnected inputs. It is not advisable to leave any input pin unconnected, as this is susceptible to unwanted noise and false signals. For example, if the coin acceptor has an isolated contact output, then it should be wired as below.



Note that an external 12V supply may be needed if none is available. The RS232 spec also allows for a minimum of 5 volts, although 12V is preferred.

The pin-out for the RS232 port for each type is shown below.

1 x UCL (pulse)

DB9 Pin	DB25 Pin	I/O	Function
1	8	In	Coin 1
2	3	In	Coin 2
6	6	In	Bumper 1
8	5	In	Bumper 2
3	2	Out	Ticket Pulse 1
4	20	Out	Ticket Pulse 2
7	4	Out	Pull Down
5	7		Ground

.

2 x UCL (pulse)

DB9 Pin	DB25 Pin	I/O	Function
1	8	In	Coin
6	6	In	Bumper
3	2	Out	Ticket Pulse
4	20	Out	Coin Inhibit
7	4	Out	Pull Down
5	7		Ground

.

2 x UCL (notch)

DB9 Pin	DB25 Pin	I/O	Function
1	8	In	Coin
6	6	In	Bumper
9	22	In	Ticket Notch
3	2	Out	Ticket Drive
4	20	Out	Coin Inhibit
7	4	Out	Pull Down
5	7		Ground

.