

Touch Score 2

Series I

Ten Pin Bowling Scoring Computer

User's Guide

By A.K. Microsystems International

www.touchscore.com

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2. Overview

Touch Score 2 is a scoring computer for ten pin bowling centres.

TS2 is a very flexible and versatile system, being compatible with a wide range of equipment, such as televisions, pin sensing cameras, pinspotters and bowler terminals. It is therefore very suitable for use in centres that already have some of this equipment. In many cases, it will directly replace the existing scoring computer chassis, and even connect directly to the existing wiring. It can also be used as the basis of a completely new scoring system.

TS2 is available in the following models –

- **STANDARD** – Includes all standard connections for a new installation.
- **MGS** – Includes all standard connections, plus connections to existing cabling for centres with **AMF Magicscore**
- **A1** - Includes all standard connections, plus connections to existing cabling for centres with **AMF Accuscore 1**
- **A2** - Includes all standard connections, plus connections to existing cabling for centres with **AMF Accuscore II**
- **A+** - Includes all standard connections, plus connections to existing cabling for centres with **AMF Accuscore Plus**
- **B*** – Special unit for centres with **Brunswick AS80/90/90C/K**.

Throughout this manual, some sections will apply only to a specific model. However, sections that refer to the **STANDARD** model will also apply to models, as these also have standard connections.

This manual applies to Series 1 TS2s. Series 1 TS2s can be identified by the 15 way J10 and J11 machine connectors, whereas Series 2 has 25 pin J54 and J55.

*Note: sections marked * refer to features currently under development at time of publication. Some features may not be available for all types of installation. Specifications subject to change without notice.*

3. Features

The following is a list of TS2's current features. Many new features will be added in the future, and available via a software update to existing users.

- Direct replacement of one or more Magicscore, Accuscore 1, Accuscore 2, or Accuscore Plus scoring chassis. Restrictions apply, see [Compatible Equipment](#).
- Compatible with a wide range of other equipment – TVs, monitors, cameras, pinspotters etc. See [Compatible Equipment](#)
- Many types of score grid, including 10 and 4 frame, shared screen, TV or live video in a window, background TV and background graphic.
- Graphics functions include score backgrounds, single strikes, multiple strikes, advertising and many more. Graphics format is standard, allowing owners to design their own graphics.
- On-screen 3D pindication with spare maker, even with APS pin sensing.
- Shortened strike cycle and other special cycles for AMF pinspotters with expander boards.
- Easy to use Bowler Menu
- Touch Screen Bowlers console
- Up to 8 bowlers per lane (with Touch Desk or Purrfect Desk only)
- Can be installed on a single pair alongside older scoring (with Purrfect Desk only)
- Bowlers can view scores from other lanes.
- Shows on-screen summary of a league series
- Automatic bumpers, can be individually set for each bowler
- On-screen messaging, including single line, scrolling line, full page and half page (half page Touch Desk only).
- Downloadable fonts
- On-screen clock for time bowling, practice time, time of day (Touch Desk Only)
- Easy software update from the front desk for future feature enhancements
- No unreliable Hard Drives. The only moving parts are the fans.

Features currently under development include:

- *Optional TV tuner, so bowlers can select their own TV channel.
- *Ball Speed trigger
- *Food & drink ordering system

4. Compatible Equipment

TS2, with the appropriate I/O module, provides a direct replacement for an existing scoring chassis as below. Except where noted, TS2 supports all the existing hardware and wiring for these systems.

- **MGS** – Magicscore, but no lane view monitor output
- **A1** - Accuscore 1 with external APS, no Accusconic support
- **A2** - Accuscore 2 but no Accusconic support
- **A+** - Accuscore Plus.

All systems require either a Touch Desk, Purrfect Desk or a Lane Control System as the front desk computer. Original AMF or Brunswick front desk systems are NOT supported.

TS2 also supports mixing and matching equipment. The following sections detail the type of equipment that can be used with each model of TS2 – **STANDARD**, **MGS**, **A1**, **A2** or **A+**.

Equipment that can be used with the **STANDARD** model can also be used with any of the other models.

Generally only the I/O modules will have the correct connector for original AMF or Brunswick wiring. The **STANDARD** model has non-compatible connectors.

For more information on actual connections, see the section on [Installation](#) and [Connection Specifications](#).

4.1. Front Desk

TS2 requires either a Touch Desk, Purrfect Desk or a Lane Control System for front desk control. In some cases, it is possible to mix TS2 and older scoring systems in the one centre.

- **STANDARD** – With the Purrfect Desk or Touch Desk, it can be mixed with Accuscore I or II.

- **MGS or A1** – With the Lane Control system, TS2 can be mixed with Touch Score 1. With the Purrfect Desk or Touch Desk, it can be mixed with Magicscore or Accuscore I.
- **A2 or A+** – With the Purrfect Desk or Touch Desk, it can be mixed with Accuscore I or II.

4.2. Bowlers Console

The bowlers' console can use either keypads or a touch screen. Alternatively, TS2 can be operated without a bowlers' console.

4.3. Keypads

Supported keypad types are:

- Magicscore triple keypad
- Magicscore single keypad
- Accuscore I
- Accuscore 2
- Accuscore Plus
- Brunswick AS80/90

Keypads may be connected directly to TS2, or via a bowler terminal board. The bowler terminal board may be an original AMF BT or an A.K.Microsystems Universal Bowler Terminal board (UBT).

The valid configurations for each model TS2 are shown below.

- **STANDARD** – UBT with any supported keypad or a touch screen.
- **MGS** – Any AMF keypad as above connected directly to the TS2 computer, not via a bowler terminal board. TS2 must be mounted in the bowler's console.
- **A1** – Accuscore 1 keypad and BT or UBT.
- **A2** – Accuscore 2 keypad and BT or UBT.
- **A+** - Accuscore Plus keypad and BT or UBT.

Note that some models support dual Accuscore Plus keypads as below.

- **Standard** – connect via a single UBT with dual adapter
- **A+** - connect via a single UBT with dual adapter on either the UBT port or the AMF bowler terminal port, or via two AMF BTs (later models only).

4.4. Touch Screen

The touch screen can be either a CRT or LCD type, fitted with a Microtouch capacitive or 5-wire resistive touch screen and a serial touch controller. Suitable models from Microtouch include the M150 serial, or the M170 serial.

As the touch screen will display score grids, overhead monitors are not essential, or if fitted can be used for TV.

4.5. Monitors

TS2 has 4 different types of video outputs to drive the overhead monitors – VGA, S-Video, Composite Video, and RGB.

VGA provides the best quality picture, followed by RGB, S-Video, and then composite.

Compatible monitor types are:

- **VGA.** Standard VGA computer monitors. Can also be used with plasmas or LCD screens, or any other screen with a VGA input. Resolution is 640x480.
- **S-Video.** Any TV or flat screen with an S-Video input. Signal is NTSC standard.
- **Composite.** Any TV or flat screen with an A/V input, including Accuscore monitors. Signal is NTSC standard.
- **RGB.** Accuscore Plus monitors via direct connection to Accuscore Plus ribbon cable. Accuscore 1 and 2 monitors can be connected via optional adapter cables to the VGA output connector. Alternatively, the video or TV input can be used.

Only one output may be used at any one time. Centres that have two monitors on each lane, for example overheads and lower monitors will require an optional splitter.

For centres with Accuscore Plus Lowboys, there is a special mode that allows the standard AMF lower monitors to be connected at the same time as overhead TVs using S-Video or Composite Video.

Many widescreen displays have the ability to display two pictures side by side. It is then possible to use a single monitor for both lanes.

TS2 supports TVs with auto A/V switching and auto standby function. See [Installation ► Monitor Control](#) for more information before choosing a monitor.

For all new installations, it is advisable to test a single monitor and cable of the required type before purchasing a large number. Some monitors and cables may not give an ideal picture quality when used with such long cable lengths. However, most combinations will perform satisfactorily.

4.6. Pin Detection

TS2 can use any of the following pin detection equipment as shown.

- **STANDARD** – AMF Accuscore Plus camera or standard video camera (CCD)
- **MGS and A1** – APS array system. A standard APS provides a scoring signal only. If on-screen pindication is also required, then an A.K. Microsystems APS update EPROM must be installed in the APS chassis.

Note that AMF Accusonic is NOT supported.

4.7. Pinspotters

TS2 is compatible with most pinspotters. The interface between the scoring and the pinspotter depends upon the type of pin sensing equipment used. Standard signals provided include:

- Start Detect
- Second Ball Detect
- Foul Detect

- RPO request
- RPO actuate
- MP data in and out.

TS2 supports short strike and other special cycles on AMF pinspotters.

4.8. Video/TV Inputs

TS2 has three video input connectors for displaying video or TV pictures on the screen, or for use by a pin detection camera.

*An optional TV tuner card provides a cable or antenna input, allowing the bowlers on each lane pair to choose a different channel.

5. Installation

SAFETY WARNING! TS2 is a low voltage, low current device and is not intended to control or connect to mains voltages. If you have any doubts about the installation and connection of this device, you should consult an authorised electrical contractor.

This section describes the installation of the TS2 computer.

In cases where a center is already wired for an existing AMF or Brunswick scoring system, installation may be simply a matter of connecting the existing cables. However, a description of each connection to TS2 is given below to allow for other configurations.

For exact cabling and connector pin outs, see [*Connection Specifications*](#).

5.1. Mounting

TS2 can be mounted in any convenient location, including on the curtain wall, between the overheads, or in the bowlers console. Before choosing a location, consideration must be given to:

- Ease of connecting cables to other equipment
- Availability of power
- Ease of access for maintenance
- Adequate ventilation. Ventilation grills must not be blocked.
- Free from dust, dirt, excessive temperatures or moisture.
- TS2 must not be placed close to flammable materials.

MGS - If using a direct connection to the keypads, then TS2 **MUST** be located in the bowlers console next to the keypads. These cables **CANNOT** be greatly extended without the use of a bowler terminal board.

5.2. Power

TS2 requires a suitable power pack or wall transformer to supply power from the mains.

DO NOT CONNECT MAINS POWER DIRECTLY TO TS2!

For most installations, 18VAC at 1.5 amps is required. TS2 is then able to power other equipment such as a bowler terminal board, drinks light, slow bowling lights etc.

However, if TS2 is to be installed in the score table, without a bowler terminal board, then a lower voltage may be used. It is recommend to use 12VDC at 1 Amp.

While the lower voltage will not affect the operation of TS2, it will slow the fans resulting in quieter operation. As TS2 is not supplying power to the bowler terminal board, it will generate less heat and therefore the slower fan speed will still provide sufficient cooling.

Fan noise should not be a problem when installed on the curtain wall. A power save mode (later models only) ensures that the fans are switched off when the lane is not in use.

The chassis of TS2 must also be connected to a suitable ground point.

See [Connector Specifications](#) for more details.

5.3. Front Desk

TS2 supports three front desk systems:

- Touch Desk
- Purrfect Desk
- Lane Control System.

TS2 supports two standard styles of interface to the desk:

- Accuscore 1 style , also used for MagicScore
- Accuscore Plus style, also used for Accuscore 2

Touch Desk can use either the Accuscore 1 or Accuscore Plus style interface.

Purrfect Desk can use either the Accuscore 1 or Accuscore Plus style interface. TS2 can be mixed with other AMF scoring types.

The DOS Lane Control system uses only the Accuscore I style interface. TS2 can be mixed only with Touch Score 1.

The Windows Lane Control System can use wither the Accuscore 1 or Accuscore Plus style interface. TS2 can be mixed with Touch Score 1 using the Accuscore I style only.

STANDARD –

Only the Accuscore Plus style interface is supported.

Each TS2 has a male and a female 9 pin D connector – **J41 Desk In** and **J42 Desk Out**. Standard 9 pin male to 9 pin female serial cables are used to connect all the TS2 scoring computers to the front desk in a daisy chain format:

- Desk to Lane 1/2 IN
- Lane 1/2 OUT to Lane 3/4 IN
- Lane 3/4 OUT to Lane 5/6 IN
- And so on.

Lanes can be connected in any order. The IN and OUT connectors are wired identically, and can be interchanged to suit the cabling. Terminators are not normally required at the end of the chain.

At the desk, the chain connects to the Accuscore Plus connector on an SIU, Lane Interface Card or Home Run box. For large centres with an SIU or a Homerun box, there may be more than one chain.

Although standard serial computer cables may be used, the interface is NOT electrically compatible with a normal serial port and should never be connected to one.

In the event it becomes necessary to isolate one TS2 computer from the chain, the two cables can be simply disconnected from **J41** and **J42**, and then connected together. Thus the chain remains unbroken.

If the desk is a Touch Desk or Purrfect desk, it should be configured for **Accuscore 2** or **Plus**. The desk will automatically identify those lanes that have been converted to TS2.

If the desk is a Lane Control System, it should be set to **Touch Score 2 on Accuscore II/Plus port**, and all lanes must be Touch Score 2

MGS -

This module provides an Accuscore 1 style desk interface through **J9**. This connector is fully compatible with Magicscore and can be simply connected to the existing cables.

These cables connect each lane to the Accuscore 1 connector on an SIU, or the Magicscore port on a Lane Interface Card, at the front desk.

Generally the cable is wired from the desk to the centre of the house, and then splits in two directions to each end of the house, connecting all lanes in parallel. The chain can however start at one end of the house and finish at the other.

The I/O board used in the leg of some Magicscores can be used with TS2, although it is not essential.

If the desk is a Touch Desk or Purrfect Desk, it should be set to **Magicscore**. The desk will automatically identify those lanes that have been converted to TS2.

If the desk is a Lane Control System, it should be set to **Touch Score 2 on Magicscore/Accuscore 1 port**, and all lanes must be Touch Score (either Touch Score 1 or Touch Score 2)

A1 -

This module provides an Accuscore 1 style desk interface through **J3 Desk** and **J4 Next Accuscore**. These connectors are fully compatible with Accuscore I, and can be simply connected to the existing cables.

These cables connect each lane to the desk in a daisy chain format:

- Desk to Lane 1/2 Desk
- Lane 1/2 Next Accuscore to Lane 3/4 Desk
- Lane 3/4 Desk to Lane 5/6 Next Accuscore
- and so on.

At the desk the chain connects to the Accuscore 1 connector on an SIU, or the Magicscore port on a Lane Interface Card, at the front desk.

If the desk is a Touch Desk or Purrfect Desk, it should be set to **Accuscore 1**. The desk will automatically identify those lanes that have been converted to TS2.

If the desk is a Lane Control System, it should be set to **Touch Score 2 on Magicscore/Accuscore 1 port**, and all lanes must be Touch Score (either Touch Score 1 or Touch Score 2)

A2 and A+ -

These I/O modules use the Accuscore Plus style interface described above. However, they provide IN and OUT connectors that are compatible with the original AMF wiring.

It is possible to mix the use of the AMF connections and the **J41 Desk In** and **J42 Desk Out** on the **STANDARD** unit. For example, in a center using mainly AMF cabling, a faulty AMF inter-lane cable could be replaced with a standard serial cable from **J41** to **J42**.

If the desk is a Touch Desk or Purrfect Desk, it should be configured for **Accuscore 2** or **Plus**. The desk will automatically identify those lanes that have been converted to TS2.

If the desk is a Lane Control System, it should be set to **Touch Score 2 on Accuscore 2/Accuscore Plus port**, and all lanes must be TS2.

5.4. Bowler's Console

There are 4 basic bowler console configurations:

- Directly connect keypad/s
- Keypad/s with A.K. Microsystems Universal Bowler Terminal Board (UBT)
- AMF keypad and Bowler Terminal board (BT)
- Touch Screen

Each model supports configuration as shown below.

STANDARD – UBT with keypads, touch screen

MGS – directly connected keypads.

A1 – AMF Accuscore 1 keypad and Accuscore 1 BT or UBT

A2 – AMF Accuscore 2 keypad and Accuscore 2 BT or UBT

A+ – AMF Accuscore Plus keypad with matching BT or UBT.

Supported keypad types are:

- Magicscore Triple
- Magicscore Single
- Accuscore 1
- Accuscore 2
- Accuscore Plus
- Brunswick AS80/90

Not all configurations support all types. See below.

5.4.1. Directly connected keypad

The keypads are connected directly to the **MGS** I/O module in TS2. For triple keypads, the left keypad is connected to **JLEFT**, the right to **JRIGHT** and the center to **J14**. Single keypads connect to **J13**.

TS2 must be mounted in the bowler's console. It may be necessary to extend some of the keypad ribbon cables by a few inches. This can be easily achieved with standard ribbon cable and IDC connectors. The keypad can be any of the supported types shown above.

The keypad connectors are usually polarised so that they cannot be connected the wrong way round. However if the keypad is fitted with a non polarised connector, care must be taken to ensure that the stripe on the keypad cable that denotes pin 1, is aligned with the word STRIPE on TS2.

5.4.2. Keypads with Universal Bowler Terminal Board

The keypad is connected to an A.K.Microsystems Universal Bowler Terminal board. The jumper on the UBT should be set to **AKM**, and all the dip switches should be off.

P4 on the UBT connects to **J40** on the TS2.

The UBT can be powered from TS2 via this same cable, or the UBT can be powered with a plug pack connected to **P1** on the UBT. When a plug pack is used, the +12V wire in the cable to TS2 must NOT be connected.

The keypad can be any of the supported types shown above. An adapter is available to allow two Accuscore Plus keypads to be connected to a single UBT.

5.4.3. AMF keypad and Bowler Terminal board (BT)

When TS2 has either an **A1**, **A2** or **A+** I/O module installed, the original AMF keypads and bowler terminal boards can be connected using the existing wiring and connectors.

Only the matching keypad and BT can be used. For example, if the I/O module is **A1**, only an Accuscore 1 keypad and BT can be used.

It is also possible to use a UBT in place of the original AMF bowler terminal board. The jumper on the UBT should be set to **AMF**, and the switches set to the appropriate mode as shown in the UBT manual. The UBT is then connected as per the original AMF equipment. Do NOT connect **P4** on the UBT to **J40** on TS2. It may also be possible to use

alternate keypad types with this configuration. See the Universal Bowler Terminal Board manual for more information.

For dual keypads, later model A+ modules support the connection of two AMF bowler terminal boards, as per the original Accuscore wiring.

A single UBT can be connected to the odd lane AMF bowler terminal cabling, and then connected via an adapter to two A+ keypads. In this case, all the dip switches on the UBT should be OFF. The jumper should be in the **AMF** position.

5.4.4. Touch Screen

The touch screen requires two connections to TS2 – video and serial communications.

The touch video output on TS2 is a standard 15 pin VGA connector - **J49**. A standard VGA extension cable can be used to connect the screen to TS2.

The serial port of the touch screen connects to **J40** on TS2. This is a standard 25 pin serial connector. The serial interface on the touch screen is usually a 9 pin connector. The preferred solution is to use a standard 9 pin female to 25 pin male serial adapter on **J40**, then a use a standard 9 pin male to female serial cable to connect the screen. A Null Modem adapter may also be required.

5.5. Monitors

This section describes the monitors or screens that can be connected to TS2.

5.5.1. Upper Monitors

The overhead monitors all connect to the **STANDARD** TS2, no I/O modules are required. The following connectors are provided:

- J1+. An Accuscore Plus compatible ribbon connector.
- ODD & EVEN MONITOR 15 pin VGA connectors

- ODD & EVEN MONITOR mini-din S-Video connectors
- ODD & EVEN MONITOR BNC Composite Video connectors

Accuscore 1 & 2 monitors can be connected in either of two ways – via the 6 RGB cables as used for the original scoring, or via the video input usually used for television. Depending upon the type of monitor, the RGB connection may give only limited colour choices, but the best picture quality.

To connect the RGB inputs on Accuscore 1 or 2 monitors to TS2, use standard VGA to BNC adapter cables and connect to the VGA connector.

To connect Accuscore 1 or 2 monitors to TS2 using the video input on the monitor, use one of the existing BNC cables to connect from Video Out on TS2 to Video In on the monitor. Another of the existing BNC cables can be used to feed TV or VCR video in to TS2.

Standard cables can be used to connect all other monitor types, including non-original types.

If the monitor has multiple input options, the type of input that provides the best picture quality should be used:

- VGA (Best)
- RGB via VGA connector adapters or J1+ connector
- S-Video
- Composite Video (Worst)

When connecting a VGA monitor to an Accuscore Plus installation, the original ribbon cable can be used. Adapters are available from A.K.Microsystems to connect a standard 15 Pin VGA monitor to the ribbon cable. TS2 should then be configured for VGA.

TS2 must be configured for the correct monitor type, see [Operation & Maintenance ▶ Configuration Mode](#).

For all new installations, it is advisable to test a single monitor and cable of the required type before purchasing a large number. Some monitors and cables may not give an ideal picture quality when used with such

long cable lengths. However, most combinations will perform satisfactorily.

5.5.2. Lower Monitors

Lower monitors are connected in the same way as the overheads.

To connect both upper and lower monitors, a suitable splitter cable will be required. Upper and lower monitors must use the same interface.

However it is possible to connect standard AMF lower monitors (as used in Accuscore Plus Lowboys) via a ribbon cable, and overhead monitors via an S-Video or Composite Video cable at the same time.

5.5.3. Monitor Control

Monitor control refers to the ability of TS2 to -

- Control the power to the monitors
- Switch the monitors between the scoring and TV or external video input mode
- Control the audio from the monitors.

For AMF monitors, TS2 provides this control via the standard cabling.

For other types of monitors, there are various ways to achieve this control depending upon the type of monitors used.

Power Control.

Ideally the monitors should be powered down or enter a low power standby mode when not in use. There are two ways to achieve this – automatically or with a switch.

If TS2's power save mode is enabled, TS2 will not output any video signal when the lane is off. Many monitors will automatically detect the loss of signal and go in to standby mode, and automatically come back on when the signal is restored. This is the ideal solution, as no further hardware is required. Unfortunately, some monitors will also display a message in this mode (such as NO SIGNAL, or show the selected input) and this may not be acceptable.

Alternatively, a mains controller switch with a 12 V trigger can be used to switch the 110v supply to the TV on or off in response to a control signal from TS2. These devices are readily available and are commonly used in home or semi-professional sound systems. One example is the Zantech AC1.

Generally one switch per pair is sufficient with both monitors being powered up when either lane is in use, but a switch can be fitted to each monitor if desired.

For this function to work successfully, it is important that when the monitor is powered up it comes back on in the same mode it was in when the power was switched off. For example, some TVs always come up in standby mode, rather than displaying the same input as when they were powered down, and these are not suitable for use with a switch.

See [J44 Ad Channel](#) for details on connecting a switch.

If none of the above methods can be used with the chosen monitor, then the monitors must be left always on, or controlled with a remote.

Video Control.

In AMF monitors, an external video source can be fed to the monitors. The scoring system can then switch the monitors between scoring and video. While TS2 still supports this function, it is no longer needed, as TS2 has its own video input, and can display this on the monitor through the scoring channel.

TS2 also has an additional function called AUTO-TV. When AUTO-TV is selected, TS2 stops outputting any video signal at all. Some monitors will automatically switch to TV when this occurs and automatically switch back when the signal is restored. This allows each monitor to be switched to a different channel, rather than selecting a common feed from TS2.

Note that although TS2 does not output any video in both AUTO-TV mode and power save mode, these modes are not identical. In power

save mode, the Monitor Enable signal that can be used to control the power to the TV is OFF, whereas it remains ON for AUTO-TV.

Audio Control.

Except for AMF monitors, the audio output from the monitor or TV cannot be controlled by TS2 and must be controlled with the remote control. It is expected that most centres will have a central audio system, and will not wish to give bowlers control of local audio.

5.6. Pin Detection

This section describes the options for pin detection equipment.

5.6.1. APS

Only the **MGS** and **A1** model TS2 support the use of an APS for pin detection.

The APS connects to either **J10** on an **MGS** I/O module, or **J7** on an **A1** I/O module. Both connectors are fully compatible with the standard AMF wiring.

A standard APS signal to the scoring contains information on the number of pins standing, but not which pins are standing. Therefore, TS2 cannot provide on-screen pindication in this case. However, the APS can be fitted with an upgraded EPROM, which modifies the signal sent to TS2. TS2 must then be configured for **Extended APS Protocol**. See [*Operation and Maintenance Configuration Mode*](#).

5.6.2. AMF Camera

An Accuscore Plus style AMF camera requires two connections – communications and power.

The communications cable can be connected to either **J45** on a **STANDARD** TS2, or to **J9** on an **A+** I/O module. Note that only **J9** is compatible with the original AMF camera cable.

Power for the camera must be supplied from an external source. The camera requires approximately 18VAC at 1.2 Amps across pins 1 & 2. Do **NOT** connect the camera to the power supply used for TS2.

The camera chassis may be grounded to the same ground as the TS2 chassis.

5.6.3. Video Camera

TS2 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 in such a position, that it can “see” all ten pins on both lanes. No pin should be completely behind any other pin. 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 video format of the camera must be NTSC.
- The camera can be colour or black and white.

Basically any camera that gives an image of all 20 pins, with good contrast between a present pin and an absent pin is suitable.

The video output from the camera is connected to **J48** on TS2.

The camera will also require power. If 12VDC is required, this is available from the Ad Channel connector **J44**, the Bowler Terminal connector **J40**, or the Pin Sense connector **J45** (serial numbers 0026 or later only). If a different voltage is required, a separate power supply must be used.

The *Pin Camera Settings* option in the *Maintenance Menu* is used to set up the camera.

5.7. Pinspotters

This section describes the connection to the pinspotting machinery.

5.7.1. Pin Detection Support

TS2 may require connections to the pinspotters to support the detection of pinfall, and for controlling the pinspotter's special cycles, such as short strike cycle.

The following connectors are used:

- **STANDARD - J10+** and **J11+**. These connectors are compatible with Accuscore Plus wiring.
- **A2 - J9** and **J10**
- **A+ – J53** XL scoring port
- **With APS Adapter – P1 & P4** are compatible with an APS

The connections required depend upon the type of pin detection equipment used.

Standard APS – No connections are needed, but on-screen pindication will not be available.

Updated APS – When an APS with updated firmware is used for pin detection no connections are needed.

AMF Camera or Video Camera – These systems require TS2 to manage the machine interface, and generate the special cycle signals. The signals that need to be connected are contained in **J10+/J11+** and are detailed below.

- **Start** - an input that signifies the start of a machine cycle. It is usually connected to the sweep switch. The camera will record pin fall a set time after this signal.

- **Second Ball** – an input that signifies that the machine is on a second ball cycle.
- **Foul** – an input that signifies a foul has been bowled.
- **Data** – an output that sends data to the pinspotter for special cycles.
- **Clock** – the clock for the above data signal.

The **APS Adapter** is for use in a centre that has been wired for an APS, but is upgrading to cameras. The adapter fits any model TS2 and connects to **J10+/J11+**. The machine cables that would normally connect to **P1** & **P4** on an APS now connect to the adapter. These cables carry all the signals detailed above.

The adapter also provides pluggable screw terminals for RPO in and RPO out wiring.

5.7.2. Re-spot Pins

TS2 has an RPO input to connect to an external RPO button, and an RPO output to cycle the pinspotter. The pinspotter will be cycled when -

- a bowler presses the re-rack or re-spot key on the keypad
- a bowler presses the external re-spot button.
- the pinspotter is in 2nd ball mode after the 3rd ball in the tenth frame
- after a no-tap strike

There are three different modes of cycle –

- **Mode 1 – Single Cycle with Scoring.** This mode is used in the case where a ball has been thrown, yet the machine has failed to cycle. It is more common in older systems using a ball cushion switch rather than a light trigger. The machine will cycle and the pinfall will be recorded. Note that if the machine and the scoring system are not on the same ball (ie 1st or 2nd) then the score will not appear.
- **Mode 2 – No Scoring, New Deck.** This is used when the machine has failed to set up a full deck. Intelligent pinspotters will set up a new deck in a single cycle; other types will cycle twice if necessary to get back to back to first ball mode. No score will be recorded.
- **Mode 3 – Single cycle with No Scoring.** This mode simply cycles the machine once, and does not record the score.

Each mode is available as below –

- The RPO input which is often wired to a ball return switch uses –
Mode 3 – Single cycle with No Scoring
- The bowler menu on TS2 allows either
Mode 1 – Single Cycle with Scoring or
Mode 2 – No Scoring, New Deck to be chosen.
- Keypads with a **RE-RACK** key always use
Mode 2 – No Scoring, New Deck
- For keypads with **Enable RPO** and **Respot L & R** keys, press
Enable RPO then **Respot** for
Mode 2 – No Scoring, New Deck,
or just **Respot** for
Mode 1 – Single Cycle with Scoring.
- Touch Desk provide 2 cycling buttons –
Cycle: Mode 1 – Single Cycle with Scoring
Reset: Mode 2 – No Scoring, New Deck
- Other desk systems offer only –
Mode 2 - No Scoring, New Deck

The connectors used for RPO OUT and IN are:

- **STANDARD -J10+/-J11+**. These connectors are compatible with Accuscore Plus wiring.
- **A1 – J7**
- **A2** – RPO OUT is on **J9/10** and RPO IN is on **J11**
- **With APS adapter** – pluggable screw terminals, or **J9/10** as for Accuscore 2.

RPO IN is not normally required if there is a re-spot or re-rack key on the keypad. The exception is when an Accuscore 1 keypad & bowler terminal is used. Although the keypad has a re-spot key, it only enables a relay on the keypad and does not send a signal to the scoring chassis. Consequently, this relay must be connected to RPO IN. The original

Accuscore 1 wiring will make this connection via **J7** on an **A1** model TS2.

There are two ways to reset the pins following a no-tap strike or the extra ball in the tenth frame:

- Via the CLOCK & DATA outputs
- Via the RPO out

Use of the CLOCK and DATA outputs is preferred, as the pinspotter will perform a shortened strike cycle, and reset all 10 pins in one cycle. This method is only available with intelligent pinspotters. (ie. AMF machines fitted with MP or Omega Tek boards.)

If the pinspotters are not intelligent, then the pinspotter will cycle normally. Once it has finished its cycle, the RPO output will cause it to cycle again, respotting all 10 pins.

A front desk setting is available to control the timing of RPO pinspotter resets for these cases. Setting this time to 0 disables the RPO output, thereby relying on the CLOCK and DATA outputs.

5.8. Video/TV Inputs

TS2 provides three video inputs:

- **Pin Camera J48** – This input is for connection to a camera aimed at the pins, and used for pin detection. When not used for a pin camera, this input can be used as a general purpose video input signal similar to **J46**. This input is called Line-0 in the TS2 *TV Channel* menu.
- **Video J46** - This is a general purpose video input. It can be connected to any video source such as a DVD bowler, video bowler etc. If many lanes are to be connected to the same source, a video amplifier or splitter may be needed. This input is called Line-1 in the TS2 *TV Channel* menu.
- **Chained Video J47**- This is a general purpose video input similar to **J46**. However this input has not been terminated with 75Ohms as per a normal input. Thus many of these inputs can be chained together if fed from a single source. For example, **J47** on each TS2 can be fitted with a BNC Tee Piece. A cable from the video source (eg a VCR)

connects to the Tee Piece on the first TS2. Another cable connects this Tee Piece to the next TS2 and so on. At the last TS2, the other end of the Tee Piece should be fitted with a 75Ohm BNC terminator. This input is called Line-2 in the TS2 *TV Channel* menu. If TS2 is being installed in a Magicscore console, the existing wiring and connectors for the old video daisy chain to the front desk can now be used for chained video in.

All video inputs use standard BNC connectors. The video signal must be NTSC format. Some installations may require video amplifiers or distribution boxes to maintain signal quality.

5.9. Connecting Power

Once TS2 is installed and all hardware is connected, it can be switched on.

The *Clear* button should be used to force TS2 into configuration mode. Once configuration has been completed, the *Maintenance Menu* can be used to test all parts of the system.

See the section on [Operation and Maintenance](#) for more details.

If any problems are encountered, see the section on [Troubleshooting](#).

6. Operation and Maintenance

The section details the basic operation of the TS2 computer by the center management.

Operation of TS2 by the bowlers is detailed in later sections.

6.1. Start-up & Shutdown

TS2 has no special start up or shut down procedures. Once power is connected, TS2 is operating. The red RUN light will flash regularly to show the system is running normally.

It is recommended to turn off the power to TS2 when the centre is closed.

6.2. Switches and Controls

TS2 has two push buttons, two lane number switches, and a push button re-settable fuse.

6.2.1. Reset Button

The RESET button restarts TS2. No scores or settings are lost. The button must be held down until the red RUN light stops flashing. TS2 will restart and the normal display should reappear within a couple of seconds.

6.2.2. Clear Button

The CLEAR button completely clears all scores and settings from TS2. The button must be held down until the red RUN light goes out.

Once cleared, TS2 will restart and enter configuration mode. If a front desk is connected, it will quickly reconfigure TS2 and the normal display will reappear.

6.2.3. Run User/Core Function

If both the RESET and CLEAR buttons are held until the RUN light goes out, then TS2 will run the opposite software to that which it is currently running. For example: if it is currently running the CORE program, it will swap to USER. If it is currently running the USER program, it will swap to the CORE. See [Updating Software](#) for details. This function should not normally be needed.

6.2.4. Lane Number Switches

The Lane Number switches must be set so that the front desk can correctly communicate with TS2. The lane numbers are set by simply rotating the switches so that they display the correct lane number. Either the odd or even lane number may be used.

Lane numbers above 99 can be entered by using the hexadecimal digits on the left switch. For example:

- A0 = 100
- A4 = 104
- B1 = 111
- C1 = 121

6.2.5. Re-settable Fuse

TS2 has an internal re-settable fuse. The fuse is accessed through the hole in the lower side of the housing adjacent to the monitor connectors. To reset the fuse, ensure that the power is off at the mains, and then push a small thin object (e.g. a screw driver) through the hole.

6.3. Configuration Mode

TS2 will automatically configure itself for a wide range of connected hardware. However there are some settings that must be entered manually. These settings are for monitor type, keypad type, and APS protocol.

These settings only need be entered if TS2's battery backed memory has been cleared. They do not need to be re-entered every time power is lost.

These settings can be entered either at TS2 using the manual configuration mode, or at the front desk.

To enter manual configuration mode, press and hold the CLEAR button on TS2 until the RUN light goes out. All scores and settings will be lost. The following screens will appear. The screens vary slightly between keypad and touch screens

6.3.1. Keypads

The following screens will be displayed:

- **Monitor type.** TS2 will cycle through the available monitor types. When a stable display appears on the screen, and the correct monitor type is displayed, the **Y** key should be pressed. Available types are –
 - **VGA** – VGA computer monitor or LCD via VGA connector
 - **NTSC TV** – Normal TV via Composite or S-Video connector
 - **RGB Interlaced** – RGB via J1+ or VGA connector. With interlace.
 - **RGB Non-Interlaced** – as above, no interlace.
 - **RGB (+NTSC)** – drives both NTSC via Composite or S-Video and RGB via J1+ or the VGA connector. The Video Select control signal from TS2 will select the **RGB input** of Accuscore monitors during scoring.
 - **NTSC (+RGB)** – same as above, except that the Video Select control signal from TS2 will select the **Video input** of Accuscore monitors during scoring.

TS2 will choose a default brightness setting, based on the selected monitor type, but the brightness can be also be adjusted from the front desk. See the front desk manual for more information.

- **Keypad Type.** TS2 will prompt the user to press the **LEAGUE** key. TS2 monitors the response from the keypad and can then identify the type of keypad. This step may be skipped as TS2 can often identify the type of keypad from the **Y** key pressed in the previous screen.

Note that if dual AcuScore Plus keypads are present, be sure to use the RIGHT hand one as prompted.

- **APS Protocol.** If an APS pin sensing system is to be used, then there are 2 options for APS protocol – *Normal* or *Extended*. *Extended* only applies if the APS is fitted with updated firmware. See [Installation ▶ Pin Detection](#).

Once configuration is complete, TS2 will operate normally.

If TS2 has been configured wrongly, the CLEAR push button can be used to clear the memory and re-enter configuration mode. All scores and settings will be lost.

When manually configuring TS2, it is best to disconnect it from the front desk; otherwise the desk may overwrite any attempts to reconfigure.

These settings can also be entered at the front desk. For the Lane Control System or the Purrfect Desk, they must be entered as a configuration number. This number can be calculated as below. Alternatively, once a single TS2 has been manually configured, the number can be read and copied to all other lanes. See the front desk manual for details on reading and entering configuration numbers.

The configuration number is a hexadecimal number of up to 3 digits as below –

The first digit only applies to installation with dual keypads, and may be ignored if 0:

- **0** -Both keypads are connected to a UBT via an adapter
- **1** - Each keypad has its own AMF BT connected to TS2

The next digit is a combination of the monitor type and whether or not a touch screen is fitted:

- **0** -VGA, no touch
- **1** - NTSC TV, no touch
- **2** - RGB Interlaced, no touch

- **3** - RGB Non-Interlaced, no touch
- **4** - RGB (+NTSC), no touch
- **5** - NTSC (+RGB), no touch
- **6** - Not Used
- **7** - Not Used
- **8** - VGA, with touch
- **9** - NTSC TV, with touch
- **A** - RGB Interlaced, with touch
- **B** - RGB Non-Interlaced, with touch
- **C** - RGB (+NTSC), with touch
- **D** - NTSC (+RGB), with touch

The last digit is the keypad type and APS protocol :

- **1** – Magicscore Triple Keypad, normal APS
- **3** – Magicscore Triple Keypad, extended APS
- **5** – Magicscore Single, Accuscore 1 or Accuscore 2, normal APS
- **7** – Magicscore Single, Accuscore 1 or Accuscore 2, extended APS
- **9** – Dual Accuscore Plus, normal APS
- **A** – Dual Accuscore Plus, extended APS
- **D** – Accuscore Plus, normal APS
- **F** – Accuscore Plus, extended APS

For example, for single Accuscore Plus keypads with NTSC TV and no touch use **1D**.

6.3.2. Touch Screen

The configuration mode for touch screens is similar to that for keypads as described above.

The touch screen must be connected and switched on when configuration mode is started. TS2 will automatically detect the touch screen.

TS2 will then cycle through all the available options for overhead monitor type as for keypad systems. The touch screen will show the monitor type along with “Touch bowler screen if correct”. Touch anywhere on the screen when the correct monitor type is displayed.

If the touch screen shows “Touch Screen Not Enabled”, then TS2 did not correctly detect the touch screen. Check that the serial touch screen cable is correctly connected.

Once the overhead monitor type has been set, the type of APS protocol must be set. This step may be skipped for some versions of TS2. Touch **YES** or **NO** as shown.

Note that as the Touch Screen may not yet have been calibrated, you may have to touch somewhere near the YES or NO buttons, rather than right on top of them. See [Maintenance Menu ▶ Calibrate Touch Screen](#) for information on calibration.

6.4. Maintenance Menu

The Maintenance Menu is available from within the keypad Bowler Menu by pressing **RIGHT_ARROW** to bring up the Bowler Menu, then pressing **9** for More Options, then pressing **9** for Maintenance Menu. For Touch Screens, it appears in the Main Menu.

The Maintenance Menu provides several functions for checking the operation of TS2 and the connections to other equipment.

The Maintenance Menu is not intended for use by bowlers, and should be disabled by the front desk during normal play.

6.4.1. Show Current Configuration

This screen lists the current configuration of TS2. Each item is described below.

- **Serial** – The unique serial number of the TS2 computer
- **Hardware Type** – The type or revision of the hardware of the TS2 computer
- **Firmware Version CORE** – The version of the CORE software. See [Operation & Maintenance ▶ Updating Software](#) for an explanation of CORE and USER versions.

- **Firmware Version USER** – The version of the USER software currently loaded
- **Resets** – The number of times TS2 has been restarted since the memory was last cleared.
- **Keypad Type** – The type of keypad connected. Valid types are:
 - Magicscore Triple
 - Accuscore I, II, Magicscore single
 - Accuscore Plus
 - Dual Accuscore Plus
- **Monitor type** – The type of monitor. Valid types are:
 - VGA
 - NTSC TV
 - RGB Interlaced
 - RGB Non Interlaced
 - RGB (+NTSC)
 - NTSC (+RGB)
- **APS Protocol** – Normal for an unmodified APS, Extended for an APS with firmware upgrade.
- **I/O Board** – shows the type I/O module fitted, if any
- **TV Tuner** - Yes if the optional TV tuner card is installed

6.4.2. Key Pad Test/Touch Screen Configuration

6.4.2.1. Key Pad Test

This screen will display any key pressed on the keypad.

It also flashes each keypad light in turn.

If a Universal Bowler Terminal board is fitted, the L, R and D keys will activate the Left Re-spot, Right Re-spot and Drinks relay on the UBT.

6.4.2.2. Calibrate Touch Screen

This screen is used to calibrate the touch screen. Calibration is needed to align the touch sensor with the image on the screen. If the calibration is not correct, then touching a button on the screen may cause an adjacent button to activate.

Calibration will be needed whenever a new touch screen is installed, or when ever the image on the screen is moved. For example, if the height or width controls on the monitor are used to move the image. Therefore these controls should not be accessible to the bowlers.

To calibrate the touch screen, select *Calibrate* from the main menu. Then touch each crosshair as accurately as possible as directed.

6.4.2.3. Test Calibration

This screen is used to test the calibration. The screen is filled with small buttons. Touch the screen in several different places and check that the correct button is activated.

6.4.3. Pin Sense Test

This screen will display the pinfall received from the pin detection equipment.

It will also show the Second Ball and the Foul signal. If an APS is used, these signals are read from the APS; otherwise they are read from the pinspotter interface on TS2 (**J10+** and **J11+**).

If pindication information is available, it will also be displayed.

A *Cam Loop* function is provided to continuously loop an attached AMF or video camera. The camera will repeatedly read the pin fall and display the results every 5 seconds.

To enable the Cam Loop:

- **Keypads** – Move the cursor to *Cam Loop* and press **Y** to start the cam loop or **N** to stop.

- **Touch Screen** – Touch the **Cam Loop** button to start or stop the cam loop.

An AMF camera must be reset when it can “see” 10 pins. Pins can then be removed and the camera checked for correct detection. If pins are then put back, the camera must first be reset while seeing 10 pins. In normal operation, the camera is reset at the end of the 2nd ball cycle, when all pins should be present.

To reset an AMF Camera:

- **Keypads** – Move the cursor to *Cam RST*, and press **Y**.
- **Touch Screen** – Touch **Cam Reset**.

The Pinspotters can be manually cycled to check the operation of the pin sensing equipment.

To cycle the pinspotter:

- **Keypads** – Move the cursor to *Cycle PS* and press **Y**.
- **Touch Screen** – Touch the **Cycle PS** button.

6.4.4. Pin Camera Settings

This function is used to setup the pin camera when a normal video camera is used. These settings are not used for an AMF type camera.

Before using this function, there are several adjustments that must be made at the camera itself. These are best made by connecting a portable TV or monitor to the output of the camera, but can also be made using the TS2 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 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)
- Adjust the focus so that the picture is 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.

Then reconnect the camera to TS2 and bring up the *Pin Camera Settings* screen.

The screen will show the view from the camera for the last pinspotter cycle. To show live video from the camera:

- **Keypads** – press **L**.
- **Touch Screen** – Touch the **Live** button

This screen is used to set the following three parameters:

- Pin Position
- Neck Position
- Brightness Threshold
- Sweep Delay

Pin Position The position of the head of each pin must be set. TS2 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:

- **Keypads** – Press **0-9** to select a pin to setup. **0** or **Miss** can be used to select the 10 pin. Use the arrow keys to move each pin dot on to the head of the pin. Press **F** (fast) to move the pin dots quickly or **S** (slow) for fine adjustment.
- **Touch Screen** – Touch **1-10** at the top of screen to select a pin, and then touch the head of the appropriate pin. Use the arrows buttons for fine adjustment of the pin position. Touch **Fast** to move the pin dots quickly, or **Slow** for fine adjustment.

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, TS2 searches along the neck line between

the pin's usual position and the next pin rearwards. This enables TS2 to detect many off spot pins. Note that no camera system can detect all offspots all the time, as pins can move behind other pins.

To set the neck position:

- **Keypads** – Press **N** then use the arrow keys.
- **Touch Screen** – Touch **Pin Neck** and either use the up and down arrows, or touch the new position on the screen

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.

To adjust the brightness threshold:

- **Keypads** – Press **T** then use the up and down arrow keys.
- **Touch Screen** – Touch **Threshold**, and then use the arrow buttons. Use the **Fast** and **Slow** buttons to change the effect of the arrow buttons.

Sweep Delay – This is the delay between the when pinspotter cycle starts (sweep switch closes) 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.

To set the delay:

- **Keypads** – Press **D** then use the up and down arrow keys
- **Touch Screen** – Touch **Delay**, and then use the arrow buttons. Use the **Fast** and **Slow** buttons to change the effect of the arrow buttons.

To test the sweep delay, cycle the pinspotters and examine the image. Ensure that the sweep is clear.

To cycle the pinspotter:

- **Keypads** – press **C**
- **Touch Screen** – Touch **Cycle Now**

These camera settings are stored in TS2, and also at the front desk computer. If the **CLEAR** button on TS2 is pressed, 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 TS2 is moved from one lane to another, it is important to press the **CLEAR** button to retrieve the correct settings. Otherwise TS2 will retain the settings from the previous lane.

6.4.5. General I/O Test

This screen is used to test various inputs and outputs attached to TS2.

The state of each input is displayed. The state of each output can be changed.

To change an output:

- **Keypads** – Move the cursor to the required output, and press **Y** or **N**.
- **Touch Screen** – Touch the appropriate button.

Each input is described below -

- **Start Switch** – this input signals the start of a pinspotter cycle. It is usually connected to the sweep switch. It will not be connected when an APS is in use.
- **2nd Ball** – this input signifies the pinspotter is in 2nd ball mode. It will not be connected when an APS is in use.
- **Foul** – this input is connected to the foul detectors and signifies a foul has been bowled. It will not be connected when an APS is in use.
- **RPO** – this input is connected to a bowler RPO button, or the Re-Spot relay on an Accuscore 1 keypad.

- **Count** – this input is used to count cycles when pin detection equipment is not installed. (i.e. manual scoring). It only applies to **MGS** and **A1** model TS2.
- **Speed** – this input is used for ball speed detection

Each output is described below -

- **Monitor Enable** – this signal is used to enable power to the monitors. It is normally only connected when original AMF monitors are used or to control the lower monitors in a Brunswick installation. For some installations it is a paired function, and operates on both lanes at once.
- **Video Enable** – this signal switches an AMF monitor to display its video input, rather than the input from TS2.
- **Audio Enable** – this signal enables the speakers in an AMF monitor. For **BRUNSWICK** model TS2, the odd lane Audio Enable enables the speaker and the even lane Audio Enable selects between intercom and VCR audio.
- **RPO** – this output causes the pinspotters to cycle.
- **Slow Light** – this output controls the Slow Bowling light if fitted. For **BRUNSWICK** model TS2 it controls the service light.
- **Bumpers** – this output deploys the bumpers, if fitted.

6.4.6. Memory Test

This screen is used to test the different types of memory within TS2. The tests are designed so that no scores or data will be lost, but this cannot be guaranteed if there is a loss of power during the test.

Tests may be run once, continuously, or set to run at start-up. If the tests are set to run at start-up, TS2 will immediately restart. At every restart, testing will automatically commence, until it is cancelled.

To enable a type of memory for testing:

- **Keypads** — move the cursor to that type and press **Y**.
- **Touch Screen** – Touch the orange label button.

To start the test:

- **Keypads** - Move the cursor to the bottom of the screen and press either **Y** to run the test once, **R** to run the tests repeatedly or **X** to setup TS2 for testing at start-up. Press the **LEFT ARROW** at any time to cancel a test.
- **Touch Screen** – Touch the appropriate option at the bottom of the screen. Touch cancel to cancel a test at any time.

Each memory type is described below:

- **Main RAM** – this is the main memory used by the processor
- **Non Volatile** – this memory is battery backed, and does not lose its contents when the power is lost. It is used for storing scores and settings.
- **File DRAM** – This is the memory used for storing files downloaded from the front desk. These files are usually used for graphics. These files are lost when the power is lost. DRAM size is 8Meg
- **File Flash** – This memory is also used for files. Unlike the DRAM memory, the contents are not lost when power is lost. FLASH size is 4Meg
- **Left Video** – this memory is used for displaying images on the left or odd screen.
- **Right Video** – this memory is used for displaying images on the right or even screen
- **Touch Video** – this memory is used for displaying images on the touch screen.

One type of memory that is not available for testing is Program Flash. This memory is used to store the TS2 CORE and USER versions, and is automatically tested when a new update is loaded and when TS2 starts up.

6.4.7. Test Patterns

This option is used to display a number of test patterns that may be useful for setting up or testing the monitors.

The **UP_ARROW** and **DOWN_ARROW** keys are used to change the pattern.

Note that the brightness of the TS2 output, and the brightness and contrast of any captured video can be adjusted from the front desk. See the front desk manual for more information.

6.4.8. List Files

This screen lists all the files that are currently stored in either DRAM or Flash memory.

The files are listed by type. Each type shows the following fields -

- **Type** – the type or function of the file
- **Time** – If the file is a graphic, this is the length of time it will be displayed. Not applicable to all file types.
- **Random Select** – If set to **YES**, TS2 will randomly select a file of the required type to display. If set to **NO**, TS2 will cycle through all the available files sequentially. Not applicable to all file types.

Each file of the listed type is then displayed, showing the following fields:

- **Name** – This is the name of the file. When used with a Touch Desk or a Purrfect Desk, it is the actual name of the file. When used with a Lane Control System, this will be a generic name only.
- **Index** – shown in brackets { }. The index determines the order for sequential selection.
- **Temporary** – If **YES**, this file is stored in DRAM memory and will be lost when the power is lost. If **NO**, then this file is stored in flash memory will not be lost.
- **Transparent** – If **YES**, this file is transparent, and will allow the score grid to be seen through its background colour.

- **Bowler** – If **YES**, the current bowlers name will be inserted into the graphic when it is displayed. If this file is used for a logo, the centre's name will be inserted.

Keypads – The **RIGHT_ARROW** key can be used to view any graphic file, and the **ERASE** key can be used to delete any file.

Touch Screen – To show or erase a file, touch the file, and then touch **SHOW** or **ERASE**. Use **Page Up** and **Page Down** to display more files.

6.4.9. Clear and Restart

This screen provides the following functions:

- **Clear DRAM** – Clears DRAM memory thereby deleting all temporary files.
- **Clear Flash** – Clears flash memory, thereby deleting all permanent or non-temporary files.
- **Clear NVR** – Clears the non volatile memory, deleting all scores, settings and configuration. After using this function it will be necessary to restart, and then re-configure TS2. This is identical to pressing the CLEAR push button on TS2.
- **Force CORE firmware to run** – This setting will force TS2 to run the CORE firmware rather than the USER. See [Operation & Maintenance ▶ Updating Software](#) for more information.
- **Restart Processor** – This function restarts TS2, similar to if the power had been turned off then on. No scores, settings, configurations or files are lost.

Keypads – To use any of these functions, move the cursor to that function and press **Y**.

Touch Screen – Touch any item to perform that function.

6.5. Front Desk Communication

TS2 is usually connected to a front desk computer; however it can operate in stand-alone mode if a front desk is not available.

The only difference between stand-alone mode and normal mode is that stand-alone allows the bowlers to perform most functions, such as turning on a lane, clearing a score, or changing from league to open play. In normal operation, these functions are often disabled by the desk. When in stand-alone mode, the lane number on the main scoring screen will be flashing.

When the CLEAR push button is used to clear TS2 of all scores and settings, TS2 is set to stand-alone mode. Once front desk communications are received, TS2 converts to normal operation. TS2 will remain in normal mode even if power is lost and TS2 re-starts.

However, TS2 will revert to stand-alone mode if either –

- desk communications are lost for more than 5 minutes

or

- no desk communications are received for 30 seconds after TS2 start-up

When in stand-alone mode, TS2 will save up to 4 score sheets from each lane. Once front desk communications are re-established, these score sheets will be uploaded to the front desk. Thus the front desk computer can be inoperative for up to 4 games without any score sheets being lost.

When in stand-alone mode, press **LEFT** or **RIGHT** to turn the screens on. Press **END_BOWLING** or **CLEAR** at the end of the game to turn the screens off.

For details on actual front desk operation, see the appropriate front desk manual – Touch Desk, Purrfect Desk or Lane Control System.

6.6. Updating Software

All desk systems provide a means of updating the software within TS2 from an update file stored on the front desk computer. This file is called TS.BIN and is supplied as part of these front desk programs.

- Updates to TS.BIN are available from www.touchscore.com . Some updates will also require an update to the front desk software.
- Updates to the Win Lane Control System are also available from www.touchscore.com .

- Updates to the DOS Lane Control System are available from your supplier.
- Updates to the Purrfect Desk are available from www.purrfectscore.com.
- Updates to Touch Desk are available at www.touchscore.com
- See www.touchscore.com for more details.

For the Lane Control System, see the Lane Control manual for updating instructions.

With Touch Desk and the Purrfect Desk, the update will occur automatically. TS.BIN must be placed in the **c:\touch score** folder.

Should the power fail at a crucial time during an update, it is highly unlikely but possible that TS2 will not start up correctly. If this occurs, use the following procedure.

- Ensure the TS2 CORE program is running. A message should be displayed on all screens. As the screen type is not known, TS2 will cycle through every screen type. The message may only appear for a few seconds.
- If the CORE message is not seen, press and hold both the CLEAR and RESET buttons on TS2 for a few seconds.
- Connect the front desk, and download an update as usual.

The following explanatory notes may assist.

TS2 is loaded with a CORE program and a USER program.

The USER program is the main scoring program, and can be updated from the front desk.

The CORE program does not provide any scoring functions, and is never changed or updated. However if the USER program becomes corrupted in any way (for example, if the power fails in the middle of an update), the CORE program is used to download a new USER program from the front desk.

On start up, TS2 searches for a USER program and attempts to run it. If no USER program is found, or if the USER program is corrupt, TS2 will

run the CORE program. While the CORE is running, TS2 will display a message on all screens. As the screen type is not known, it will cycle through every possible screen type. The message may only appear for 5 seconds or so.

In addition, by pressing and holding both the CLEAR and the RESET buttons, it is possible to force TS2 to run the CORE, even though a USER program is present. Pressing the buttons again reverts to the USER code. This function should never be required but is provided as a fail safe option. See the section on *Run CORE Function*, or on the *Maintenance Menu* above. The Maintenance Menu can also be used to display the current versions of CORE and USER.

6.7. Other Maintenance

The only other regular maintenance TS2 requires is to be kept free from dust and dirt. In particular, the fans and vents may need occasional cleaning if operated in a dusty environment.

If a filter is fitted to the fans, the filter cover can be gently prised loose and the filter removed for washing.

If no filter is fitted, then a light jet of compressed air can be used to remove dust from these areas.

7. Main Scoring Screen

The main scoring screen is displayed while bowling is in progress. While there are many different scoring screens, all share some common elements. A sample scoring screen is shown below.

Name	1	2	3	4	5	6	7	8	9	10	Handicap Total
AMY	27	8/9	X								39
BOB	X	6-	◀◀								22

Summary: ◀BOB Games: 0.5 61

1) **Lane Number** – this is the lane number as set by the lane switches on TS2. It must be correct for proper front desk communications. It will be flashing if communications with the front desk have been lost.

2) **Line Message Area** – this area is used to display the center name, team name, line messages, or scrolling messages. This area will be flashing if the **DRINKS** key or the Bowler Menu has been used to request service.

3) **Clock** – the front desk can set up a clock which can be used for many different purposes. For example, it can be used to show elapsed or

remaining time for a booking, or elapsed or remaining practice time, or simply to show the time of day.

4) Bowler Initials – Each bowler’s initials or the first three letters of their name are displayed here. Absent bowlers are marked with a *B* or *BLD* for blind, and pacers are marked with a *P* or *PAC*.

5) Pinfall – the pinfall for each ball is shown here. If the score has been edited, it is shown underlined. If the ball bowled was a split, a dot is shown under the score. If it is both a split and an edited ball, a broken under line will be displayed.

6) Running Frame Totals – the running total for each frame is displayed here. Note that with some score grid types and certain numbers of bowlers these totals are omitted as there is not enough room to display them.

7) Arrows – the arrows show which bowler is up next, and point to the lane that bowler should bowl on. The bowler’s name is also shown in the prompt area at the bottom of the screen

8) Team Totals – the scratch and handicap total for the team is shown here

9) Games – This shows the number of games and frames bowled on this lane.

10) Prompt Area – this area is used as a general prompting area. Prior to bowling it is used to prompt bowlers to press the **LEFT** or **RIGHT** key then the **RIGHT_ARROW** key to access the menu. During bowling, it shows which bowler is up next on this lane. This area is also used to edit names in classic operation. The word “WORKING” will be shown here if TS2 is waiting for names from the front desk or scores from another lane.

8. Bowler Operation

TS2 provides three main ways for a bowler to use the system.

- **Classic Operation** – The system is operated using the special keys on the keypad in a manner similar to the original AMF or Brunswick scoring system. For example to enter a bowler, use the **LEFT**, **BOWLER_NAME**, etc.
- **Bowler Menu** – Pressing the **RIGHT_ARROW** key activates the Bowler Menu. The menu provides all the functions a bowler might require. The Bowler Menu can be disabled by the front desk.
- **Touch Screen** – When a touch screen is fitted, all bowler interaction is via the touch screen.

Each type of operation is described below.

8.1. Classic Operation

Classic Operation is mostly identical to the original scoring system, but there are some minor differences.

There are also differences between the different types of keypad. The following abbreviations are used :

- **MGS** keypad - Magicscore single keypad
- **MGS Triple** keypad - Magicscore triple keypad - centre plus left and right
- **A1** keypad - Accuscore 1 keypad
- **A2** keypad - Accuscore 2 keypad
- **A+** keypad - Accuscore Plus keypad

8.1.1. Selecting League or Open play

Normally the front desk sets the mode of play to either league or open, and locks the mode so that the bowlers cannot change it. However, if the front desk is not operating a bowler can change the mode by pressing the **LEAGUE** or **OPEN** key.

The mode cannot be changed if any bowler is in the middle of a frame.

8.1.2. Enter or change a bowler's name

For **MGS Triple** keypads, press –

- LEFT** or **RIGHT**
- Number of bowler to edit – **BOWLER-1** to **BOWLER-6** on the centre keypad.

For **MGS** keypads, press –

- LEFT** or **RIGHT**
- BOWLER**
- The number of the bowler to edit - **1** to **8**

For **A1** and **A2** keypads, press –

- LEFT** or **RIGHT**
- BOWLER_SELECT**
- The number of the bowler to edit - **1** to **8**.

For **A+** keypads, press –

- LEFT** or **RIGHT**
- BOWLER_NAME** to edit the first bowler.
- ENTER** to go to the next bowler

A cursor will appear at the bottom of the screen. Enter or change the bowler's name. To correct a mistake, use the **ERASE** key.

For **A+** keypads, to erase the entire name, press **ERASE_NAME**.

When **TS2** is used with Touch Desk or a Purrfect Desk, the maximum number of bowlers is 8. When used with a Lane Control System, the maximum is 6.

8.1.3. Remove a bowler

To remove a bowler prior to the start of play, proceed as for entering a bowler. Then use the **ERASE** key to completely remove the name.

For **A+** keypads, use the **ERASE_NAME** key to erase the name in one key stroke.

8.1.4. Enter or change a bowler's handicap

To enter or change a bowler's handicap, select the bowler to edit in the same way as for entering the bowler's name, then press **BOWLER_HANDICAP**.

Enter the new handicap. Use the **ERASE** key to remove any wrong digits.

If the team handicap was equal to the sum of the bowlers' handicaps prior to this bowler's handicap being changed, then it will be updated to equal the new sum of the bowlers' handicaps.

The front desk can prevent bowlers from entering or changing a handicap.

8.1.5. Enter or change a Blind Score

To enter or change a blind score, select the bowler to edit in the same way as for entering a bowler's name, then press **BLIND**.

If the bowler is not currently a blind bowler, they will become blind and a blind score can be entered. If they are already blind, they will revert to a normal bowler.

A bowler cannot be made blind if they have already started bowling or the arrows are up for that bowler.

The front desk can prevent bowlers from entering a blind score or making bowlers blind.

8.1.6. Enter or change a Pacer

To change a normal bowler into a pacer, or a pacer into a normal bowler, select the bowler to change in the same way as for entering a bowler's name, then press **PACER**.

The front desk can prevent bowlers from becoming a pacer.

8.1.7. Enter or change a Team Name

To enter a team name, press –

- LEFT** or **RIGHT**
- TEAM**

Then enter the team's name. Use the **ERASE** key to correct any mistakes.

8.1.8. Enter or change a Team Handicap

The team handicap will normally default to be the sum of the bowler's handicaps. However it is possible to enter a different handicap. Press –

- LEFT** or **RIGHT**
- TEAM_HANDICAP,**

Then enter the new handicap. Use **ERASE** to correct any mistakes.

8.1.9. Start Bowling

Once all the bowlers' names have been entered, the arrows must be brought up so that play can commence. The arrows indicate which bowler should bowl next.

For **MGS Triple** keypad, press –

- The number of the bowler to bowl - **BOWLER_1** to **BOWLER_6** on the left or right keypad

For **MGS, A1** or **A2** keypads, press –

- L_SCORE** or **R_SCORE**
- BOWLER** or **BOWLER_SELECT**
- The number of the bowler to bowl - **1** to **8**

For **A+** keypads, press –

- LEFT** or **RIGHT**
- SELECT_BOWLER**
- The number of the bowler to bowl – **1** to **8**

The arrows will not appear if TS2 is in practice mode, or if the arrows have been inhibited by the front desk.

8.1.10. Bowling out of turn

If the arrows are pointing to a particular bowler, and this is not the bowler who will bowl next, then the arrows must be moved to the correct bowler.

To move the arrows to the correct bowler, use the same procedure as for bringing up the arrows at the start of bowling. See above.

8.1.11. Correct a score

Bowlers can correct a score that the system has recorded incorrectly. It is also possible to undo a correction, and to erase a frame so that it can be re-bowled.

The basic steps are shown below -

- Press **CORRECT** (or **CHANGE_SCORE**) to start. A flashing cursor will appear on the last ball bowled.
- Use the **ARROW** keys to move the cursor to the ball to be corrected. The cursor can only be moved to balls that have been bowled, or to the next frame to be bowled.

Either -

- Enter a the new corrected score

or -

- Press **RESTORE** (or **ERASE_FRAME**) to undo a previously corrected score, or to re-bowl the last ball bowled. See below.

or -

- Press **CORRECT** (or **CHANGE_SCORE**) to finish editing without making changes

All corrected scores are shown underlined, to indicate that they are not the original score.

The **RESTORE** (or **ERASE_FRAME**) key works as follows -

- If this key is pressed when the cursor is on an edited score, the original score will be restored. This original score is **NOT** underlined.
- If this key is pressed when the cursor is on an original score, and the score is the last ball bowled by that bowler, then the score will be erased and the arrows returned to that bowler. When the bowler re-bowls the ball, it will be shown underlined to indicate that it is not the original score.
- In some cases, such as in the tenth frame or after editing strikes, it may be necessary to press this key twice to return the arrows. The first press removes the score and displays a miss, the second returns the arrows.

To enter a score into an empty frame, it is first necessary to bring the arrows to the bowler, and then use the **CORRECT** key to bring the cursor to the arrow, and then enter the correct score.

The front desk can prevent bowlers from correcting scores.

8.1.12. Next game

At the end of a game, the bowlers need to remove the old score so that they can bowl their next game.

For **MGS Triple**, **MGS**, **A1** or **A2** keypads, press –

- LEFT** or **RIGHT**
- REMOVE_SCORE**

For **A+** keypad, press –

- LEFT** or **RIGHT**
- NEXT_GAME**

The **REMOVE_SCORE** or **NEXT_GAME** key must be pressed immediately after a **LEFT** or **RIGHT** key, otherwise the score will not be removed. This ensures the bowlers do not accidentally clear the wrong lane.

Note that the front desk can prevent the bowlers from removing their score.

8.1.13. End bowling

At the end of the bowlers' last game, both the score and the bowlers' names can be cleared.

For **MGS Triple**, **MGS**, **A1** or **A2** keypads, press –

- LEFT** or **RIGHT**
- CLEAR_SCORE**

For **A+** keypad, press –

- LEFT** or **RIGHT**
- END_BOWLING**

The **CLEAR_SCORE** or **END_BOWLING** key must be pressed immediately after a **LEFT** or **RIGHT** key, otherwise the score will not be cleared. This ensures the bowlers do not accidentally clear the wrong lane.

Note that the front desk can prevent the bowlers from clearing their score.

8.1.14. Cycling the Pinspotters

There are two different types of pinspotter cycle available –

- **With Scoring.** This is used in the case where a ball has been thrown, yet the machine has failed to cycle.
- **Without Scoring.** This is used when the machine has failed to set up a full deck. The machine will set up a new deck.

For **A1** and **A2** keypads, to respot with scoring, press -

- ENABLE_RESPOT_ONLY**
- RE-SPOT_L** or **R**

To respot without scoring, just press –

- RE-SPOT_L** or **R**

For A+ keypads, only respot without scoring is available, press

- LEFT** or **RIGHT**
- RE-RACK**

For all other keypad types, press

- LEFT** or **RIGHT**
- C**

8.1.15. Getting a team from the front desk

Prior to normal league or tournament play, the front desk program will send the team and bowler details to the lanes automatically. In some circumstances, it may be necessary for the bowlers to request a team from the desk.

To request a team from the desk, enter a team code as the team name. A team code consists of 3 numbers followed by X, Y or Z. For example, 123X is a valid team code.

For details on the team code to enter, consult the front desk manual.

For all keypads, press –

- LEFT** or **RIGHT**
- TEAM**
- Erase any team name that is there with the **ERASE** key
- Enter a valid team code

When the last letter of a valid team code is entered, the word **WORKING** will appear on the screen as TS2 waits for the team from the front desk.

8.1.16. Shortcut keys

The following keys have special shortcut functions that are not marked on the key pads -

- **C** – Cycle pinspotter (not available for A+ keypads)
- **D** – Request drinks or service. The top section of the screen will flash. Press **D** again to cancel. This key is identical to the **DRINKS** key on some keypads.

- **G** – Change score grid type. Press **G** again to try another type. This function can be inhibited by the front desk.
- **L** – Show League Recap screen. The screen will show a summary of the current league series for both teams on this pair. Press **L** again to cancel.
- **P** – Show last pinfall. For systems with pindication, the pindication for the last ball bowled on this lane will be re-displayed.
- **V** – View another lane. Enter a lane number to view. Press **V** again to cancel view.

8.2. Bowler Menu

The bowler menu can be displayed at any time by pressing **LEFT_LANE** or **RIGHT_LANE** then **RIGHT_ARROW**. The **ARROW** keys are then used to navigate the menu as below –

- UP_ARROW** and **DOWN_ARROW** keys to move the cursor to the desired function.
- RIGHT_ARROW** key to proceed.
- LEFT_ARROW** key to go back to the last screen

The **NUMBER** keys (**1-9**) can also be used for selecting a function.

The **LEFT_ARROW** key can also be used when the score grid is displayed to go back to the last menu screen used.

If a mistake is made when entering a name or some other detail, the **ERASE** key can be used to take out the last character entered. The **LEFT_ARROW** key cannot be used for this purpose, as it will return to the previous screen.

When first entering the menu, the main menu will normally be displayed. Under certain circumstances, TS2 will skip the main menu and go directly to another screen as below:

- If there are no bowler names entered, the *Enter Bowler* screen will be displayed.

- If bowler names have been entered, but the game hasn't started (i.e. the arrows are not up) then the *Start Bowling* screen will be displayed.
- If the game is finished, the *End Game* screen will be displayed.

In all cases, the **LEFT_ARROW** key can be used to go back to the main menu and choose another function.

Some functions can be disabled by the front desk. In this case the relevant function either doesn't appear on the menu, or the message "*Not available! See the front desk*" will be displayed if a bowler attempts to use it. The entire Bowler Menu can also be disabled from the desk.

8.2.1. Enter Bowlers

This screen lists all bowler positions. To enter or change a bowler, move the cursor to the desired position and press **RIGHT_ARROW**, or press the number for that bowler.

The screen will display the following fields for the bowler:

- **Name** – bowlers name, up to 16 characters
- **Bumpers** – if automatic bumpers are fitted, this field will determine if they are to be deployed for this bowler. The front desk can overwrite this setting by deploying bumpers for ALL bowlers.
- **Scoring Method** – the scoring method can be *normal*, *8 notap*, *9 notap*, or *3-6-9 notap*. This setting can be overwritten by the front desk setting a notap mode for all bowlers. Press **SPACE** to see all the available choices.
- **Blind Score** – the blind score for league play
- **Handicap** – the handicap score for league play
- **Bowler Type** – may be *normal*, *blind* or *pacers*. Press **SPACE** to see all the available choices.

Not all these attributes may be displayed, as some can be disabled by the desk.

Press **RIGHT_ARROW** to advance to the next bowler or **LEFT_ARROW** to return to the bowler list.

To move a bowler to a different position in the bowler list press –

- UP_ARROW** or **DOWN_ARROW** to select the bowler to be moved
- 9**
- UP_ARROW** or **DOWN_ARROW** to move the bowler
- LEFT_ARROW** when done

If Touch Desk or a Purrfect Desk has been used to download the bowler's names, then the bowler list may also contain a list of reserve bowlers for this team.

To replace a bowler with a reserve, move the cursor to the bowler to be replaced, and then press the letter corresponding with the desired reserve (**A-H**).

8.2.2. Start Bowling

This function is used to bring up the bowler arrows to start the game. Press –

- Y** or **RIGHT_ARROW** to start the game
- N** or **LEFT_ARROW** to return to the *Main Menu*.

8.2.3. End Game

This function should be used at the end of each game. The bowlers can choose whether or not another game is to be bowled. Press –

- Y** or **RIGHT_ARROW** to bowl another game. The current scores will be removed, and the arrows brought up ready for the next game
- N** to end bowling. All scores and names are cleared.
- LEFT_ARROW** to return to the *Main Menu*. Nothing is cleared.

8.2.4. Bowl Out of Turn

This function is used to temporarily move the arrows to a different bowler. If the bowling order is to be changed permanently, use *Enter Bowlers* to move the bowlers in to the correct order.

Press –

- UP_ARROW** or **DOWN_ARROW** to move the cursor to the next bowler to bowl.
- RIGHT_ARROW** to go on to the score grid

or

- LEFT_ARROW** to return to menu

8.2.5. Correct a Score

This function is used to correct a score. It operates identically to *Classic Operation*, except that prompts are shown below the score grid to assist the bowler. See *Classic Operation, Correct a Score*.

8.2.6. Re-spot Pins

This function is used to cycle the pinspotters. There are two options:

- **Re-spot Pins and record score** – this option is used when the pinspotter has failed to cycle after a ball has been thrown. The pinspotter will cycle and the pinfall will be recorded.
- **Re-spot pins and do NOT score** – the pinspotters are cycled to set up a new deck of pins, but no score is recorded.

Press –

- UP_ARROW** or **DOWN_ARROW** key to select the correct option
- RIGHT_ARROW** to cycle the pinspotter

or

- LEFT_ARROW** to go back to the menu without cycling.

8.2.7. Order Food or Drinks

Bowlers can use TS2 to place orders for food and drinks from the snack bar.

To order an item, use the arrow keys to browse through the menu system, pressing the **RIGHT ARROW** key to add an item to the order.

At any time, press **V** to view the current order. This screen also allows the following commands:

- **Add** – Add more items to the order
- **Delete** – Delete an item from the order
- **Delete All** – Delete the entire order
- **Place** – Place order

Once the order is correct, select **Place** (or press **P**) to place the order. The next screen requires the user to enter their name, or select their name from a list of bowlers currently bowling. This screen is followed by a final confirmation screen, after which the order is automatically sent to the snack bar. The order number is displayed.

Items can also be added by entering their own unique code. This code is displayed at the bottom of the screen when an item is added. Bowlers who regularly order the same item should quickly become familiar with the code and be able to place an order in seconds.

While a bowler is placing an order, other bowlers can continue to bowl. TS2 will continue to keep score.

Should the bowler need to return to the scoring screen or other menus before they have finished entering their order, they may do so without losing any of the items already entered.

Food and Drink ordering is only available with Touch Desk and Purrfect Desk, and may be disabled by the desk.

8.2.8. Call for Service

This function is used by the bowlers to call for service. It is identical to pressing the **DRINKS** key. The top row of the score grid will flash, and the front desk computer will be notified.

To cancel the call for service, select the function again, or press the **DRINKS** key.

8.2.9. Enter Team Details

Use this screen to enter or change a team name and handicap.

If the team handicap is the sum of the bowlers' handicaps, then it should not need to be changed here, as it will remain the sum of the bowlers' handicaps even if the bowler handicaps are changed.

This function can be disabled by the front desk.

8.2.10. Show League Recap

This screen shows the scratch and handicap totals for all bowlers and the team for up to 6 games, and the series scratch and handicap totals.

It can be used at the end of a league match to view the results.

Whenever a bowler or team has scored higher than the opposing lane, the score is shown highlighted.

Only 3 games can be displayed at once. Press –

- RIGHT_ARROW** to show the next game
- LEFT_ARROW** to show the previous game or, if already at game 1, to return to the menu.

8.2.11. Show Last Pinfall

This function will re-display the last pinfall recorded for this lane. Press –

- RIGHT_ARROW** to go on to the score grid

LEFT_ARROW to return to the menu.

8.2.12. Change Score Grid Type

This function allows the bowlers to change the type of score grid. The available options are:

- 10 Frame, no TV
- 4 Frame, no TV
- 10 Frame, background TV
- 4 Frame, background TV
- 10 Frame Tournament
- 5 Frame Tournament
- Scores with TV in a window
- Scores on Left, TV on Right

Press –

UP_ARROW or **DOWN_ARROW** to move the cursor to the desired grid type

RIGHT_ARROW to go on to the score grid

or

LEFT_ARROW to return to menu

The grid types that refer to TV can only be used when a TV or video signal is connected directly to TS2. Systems that use other methods to view TV cannot use these grid types.

Some grid types may not be available depending upon the number of bowlers. For example, it is not possible to display 8 bowlers using the large text used in the 4 frame grids. In these cases, TS2 will automatically change the grid type to one that can be displayed. Also, the number of bowlers and the grid type will determine whether frame by frame sub-totals can be displayed

The basic tournament grids can display only 2 bowlers. If there are more than two, a standard grid type will be used but without team totals.

The Scores on Left Screen, TV on Right Screen option is only available during league play.

The front desk system can be used to set other types of grid other than shown here. The front desk can also disable this function so that bowlers cannot change the grid type. The front desk can also prevent handicap totals from being displayed.

8.2.13. Change TV Channel

This function allows the bowlers to select the video source when a grid type with TV has been selected. The choices are:

- Line 0 - the signal connected to J48 – Pin Camera
- Line 1 - the signal connected to J46 – Video Input
- Line 2 - the signal connected to J47 – Chained Video Input
- Channels 0-127 – pre-tuned channels on the optional TV tuner board, if fitted.

Press –

- UP_ARROW** or **DOWN_ARROW** to choose a channel.
The chosen channel will be displayed in the background.
- RIGHT_ARROW** to go on to the score grid
- LEFT_ARROW** to return to the menu

This function can be disabled by the front desk.

8.2.14. View another Lane

This function will display a score from another lane. Enter the lane number to view then press –

- RIGHT_ARROW** to view lane
- LEFT_ARROW** to go back to menu

8.2.15. Get Names from Desk

The bowlers' names and details for leagues are normally downloaded automatically by the front desk prior to the start of bowling. However there may be times when the bowlers may wish to request that the names be sent again.

Some front desk programs require the bowlers to enter a 4 character team code. The purpose of this team code depends upon the front desk program; see the front desk manual for more information. The team code may be left blank in some cases.

Once the code has been entered, press –

- RIGHT_ARROW** to request the names
- LEFT_ARROW** to return to the menu without requesting names.

While TS2 waits for the front desk to send the names, “WORKING” will appear in the score grid’s lower left corner. The *Get Names from Desk* option in the menu will be changed to *Cancel Names Request*, and can be used to stop the request if the front desk has not already responded.

8.2.16. Show Shortcut Keys

This screen simply lists the shortcut keys that can be used from the score grid for various functions. As these functions are not standard to AMF or Brunswick systems, they are not labelled on the keypads.

The shortcut keys are:

- **D** - Request drinks or service.
- **G** – Change score Grid type.
- **L** – Show League Recap.
- **P** – Show last pinfall.
- **V** – View another lane.

8.2.17. Maintenance Menu

This menu is for use by bowling center staff to test the operation of the system. It is not intended for bowlers. It should be disabled by the front desk during normal bowling.

The Maintenance Menu is described fully in the *Operation and Maintenance* section.

8.3. Touch Screen

The main scoring display on the touch screen consists of one or two scoring grids, and three buttons long the bottom of the screen. These buttons are the left lane shortcut button, the **Menu** button, then the right lane shortcut button.

Touching the **Menu** button, or anywhere on the screen without a button will bring up the main menu. All functions can be performed from this menu.

The shortcut buttons provide a short cut into the main menu function that is most likely required at any time. These buttons operate as below:

- If no bowlers have been entered, the button will display **Enter Bowlers**. Touch the button to go directly to the Enter Bowlers screen.
- If bowler names have been entered, but the player arrows are not yet up, the button will display **Touch to Start**. Touch the button to bring up the arrows.
- During bowling, the button displays the name of the bowler up next on this lane. Touch the button to change the bowler up next. Note that if manual scoring has been enabled, for example due to a camera breakdown, this button will enable the bowlers to manually enter their score. To change the bowler up next, they must then use the main menu.
- Once the game is complete, the button will display **End Game**. Touch the button to clear the current game and start the next, or clear the screen completely.

For more detail on each of these functions, see the appropriate section in the main menu descriptions below.

8.3.1. Enter Bowler Details

This screen is used to enter or change a bowler's details, such as name and handicap score, and also to move a bowler to a different position in the line up.

The screen will display the name of each bowler in each position in the line up, or blank if no bowler has been entered.

- Touch a position to select a bowler.
- Touch either **Edit this Bowler** to change this bowlers' details

Or

- Touch a new position to move this bowler to.

The edit screen will display one or more of the following items, depending upon front desk settings:

- Bowler's name
 - Bowler's Type – Normal, Pacer, or Blind
 - Bowler's Handicap Score
 - Bowler's Blind Score
 - Bowler's Score Method – Regular, 9 Pin No Tap, 8 pin No Tap
 - Bowler's Bumpers – Yes to enable bumpers for this bowler
-
- Touch an item to edit, and then enter the new information.
 - Touch **Next** or **Previous Bowler** to edit another bowler.
 - Touch the **QWERTY** or **ABC** button to change the layout of the letter keys from standard QWERTY to alphabetical.
 - Touch **DONE** when finished. If the player arrows have not yet been brought up, the Start Bowling screen will now be displayed.

If a team containing reserves has been downloaded from the front desk, then the original bowler list will also show these reserves. Reserves may be moved into and out of the line up in the same way as moving a regular bowler -

- Touch the reserve
- Touch the new position for this reserve

8.3.2. Start Bowling

This screen is used to bring up the player arrows and commence the game.

- Touch **YES** to bring up the arrows.

The front desk can prevent bowlers from bringing up the player arrows.

8.3.3. End Game

This screen is used at the completion of a game, and has two options.

- Touch **Yes** to bowl another game. The scores are cleared and the arrows positioned ready for the next game.
- Touch **No** to finish bowling. Both the scores and bowler names are cleared.

The front desk can prevent bowlers from clearing scores and names.

8.3.4. Bowl out of Turn

This screen allows the player arrows to be moved to a different bowler.

- Touch the bowler who will bowl next.

This screen should only be used if a bowler is to bowl out of turn for this frame only. If they are to bowl in a different order for the remainder of the game, the bowler should be moved to the correct position in the line up by using the Enter Bowlers screen.

The front desk can prevent bowlers from bowling out of turn.

8.3.5. Correct a Score

This screen allows a bowler to correct a score that has been recorded incorrectly. It is also possible to undo a correction, and to erase a frame so that it can be re-bowled.

The basic steps are –

- Touch the score to be changed. It should now be flashing
- Touch **1st Ball**, **2nd Ball** or **3rd Ball** if needed to position the cursor on the correct ball.

Either -

- Touch the new correct score

or -

- Touch **Restore Score** to undo a previously corrected score, or to re-bowl the last ball bowled. See below.

All corrected scores are shown underlined, to indicate that they are not the original score.

The **Restore Score** button works as follows:

- If the cursor is on an edited score, the original score will be restored. This original score is NOT underlined.
- If the cursor is on an original score, and the score is the last ball bowled by that bowler, then the score will be erased and the arrows returned to that bowler. When the bowler re-bowls the ball, it will be shown underlined to indicate that it is not the original score.
- In some cases, such as in the tenth frame or after editing strikes, it may be necessary to touch this button twice to return the arrows. The first press removes the score and displays a miss, the second returns the arrows.

To enter a score into an empty frame, it is first necessary to bring the arrows to the bowler using the Bowl Out of Turn screen, and then use the Correct a Score screen to enter the correct score.

The front desk can prevent bowlers from correcting scores.

8.3.6. Re-Spot pins

This function is used to cycle the pinspotters. There are two options –

- Touch **Re-spot Pins and record score** to cycle the pinspotter and record the pinfall. This option is used when the pinspotter has failed to cycle after a ball has been thrown.
- Touch **Re-spot pins and do NOT score** to cycle the pinspotters without recording the pinfall. This option is used when the pins have not been correctly set up for the next ball.

8.3.7. Show Last Pinfall

This function will show the pins standing after the last ball was thrown.

- Touch either pin deck to display the pin deck on the overhead monitors.

8.3.8. View another Lane

This screen allows the bowlers to view the score from another lane.

- Touch the lane pair to be viewed.

The front desk can disable lane viewing.

8.3.9. League Menu

The league menu consists of various functions required only during league play.

The front desk can disable this menu.

8.3.9.1. Edit Team Details

Use this screen to enter or change a team name and handicap.

- Touch an item to edit

If the team handicap is the sum of the bowlers' handicaps, then it should not need to be changed here, as it will remain the sum of the bowlers' handicaps even if the bowler handicaps are changed.

8.3.9.2. Get Names from Desk

The bowlers' names and details for leagues are normally downloaded automatically by the front desk prior to the start of bowling. However there may be times when the bowlers may wish to request that the names be sent again.

Prior to requesting that the front desk send the names again, the bowlers may enter a 4 character team code. The purpose of this team code depends upon the front desk program; see the front desk manual for more information. The team code may be left blank in some cases.

- Touch a team code box to be entered
- Enter the team code
- Touch **Download Now** to get the names from the desk

While TS2 waits for the front desk to send the names, "WORKING" will appear in the score grid's lower left corner.

- Touch **Cancel Download** to stop a download in progress

8.3.9.3. Show Recap

This screen shows the scratch and handicap totals for all bowlers and the team for up to 6 games, and the series scratch and handicap totals.

It can be used at the end of a league match to view the results.

Whenever a bowler or team has scored higher than the opposing lane, the score is shown highlighted.

Only 4 games can be displayed at once.

- Touch **Next Game** or **Previous Game** to view other games.

8.3.9.4. Set Play Mode

This option is used to set the play mode to either league play (cross lane) or open play.

The play mode is normally set by the front desk. This button only appears when TS2 is not connected to a front desk.

8.3.10. Display Options

Use this screen to set the type of score display on each overhead monitor and the touch screen.

The currently set options are shown in either blue (left lane), red (right lane) or orange (touch screen).

The options are -

Grid type:

- Normal
- TV in a window
- Tournament Style

Frames:

- 10 frame with small text
- 4 or 5 frame with large text

Style:

- Classic – standard line type grid
- Blocks – the grid consists of filled-in blocks for easier visibility with background images
- Show empty frames – shows all frames even if not yet bowled
- Hide empty frames – frames not yet bowled are hidden for better visibility of background images

TV :

- Off
- On
- Background

TV Channel:

- Line 0, 1 or 2
- Channel from optional TV tuner card

Scores on Left TV on Right:

- Yes or No

The grid types that refer to TV can only be used when a TV or video signal is connected directly to TS2. Systems that use other methods to view TV cannot use these grid types.

Some grid types may not be available depending upon the number of bowlers. For example, it is not possible to display 8 bowlers using the large text used in the 4 frame grids. In these cases, TS2 will automatically change the grid type to one that can be displayed. Also, the number of bowlers and the grid type will determine whether frame by frame sub-totals can be displayed

The basic tournament grids can display only 2 bowlers. If there are more than two, a standard grid type will be used but without team totals.

The Scores on Left Screen, TV on Right Screen option is only available during league play.

The front desk can disable Display Options. The front desk can also prevent handicap totals from being displayed.

8.3.11. Order Food & Drink

Bowlers can use TS2 to place orders for food and drinks from the snack bar.

The order screen shows the current order on the left, and the menu from which items can be ordered on the right.

To order an item –

- Touch the item in the menu

To navigate the menu –

- Touch the **Back** button to go to a previous menu
- Touch **Main Menu** to go back to the main food & drink menu

To delete an item from the order –

- Touch the item in the order. Use the Arrow buttons to scroll if the item is not on the screen.
- Touch **Delete Item**

To clear the entire order –

- Touch **Clear Entire Order**

To place the order once all items are correct –

- Touch **Place**
- Touch your name in the list of bowlers. If your name is not in the list, touch **Enter Name** and then type your name.
- The order will be displayed again. Touch **Yes** to confirm you wish to place the order.

The order is then sent to the snack bar. The order number will be displayed.

While a bowler is placing an order, other bowlers can continue to bowl. TS2 will continue to keep score on the overheads.

Should the bowler need to return to the scoring screen or other menus before they have finished entering their order, they may do so without losing any of the items already entered.

Food and Drink ordering is only available with the Touch Desk and the Purrfect Desk, and may be disabled by the desk.

8.3.12. Call for Service

This function is used by the bowlers to call for service. It is identical to pressing the **DRINKS** key. The top row of the score grid will flash, and the front desk computer will be notified.

- Touch **Yes** to call for service
- Touch **No** to cancel the call for service

8.3.13. Maintenance Menu

This menu is for use by bowling center staff to test the operation of the system. It is not intended for bowlers. It should be disabled by the front desk during normal bowling.

9. Graphics

9.1. Overview

TS2 supports the display of graphics or pictures for a wide variety of uses. For example they can be used as backgrounds for scoring screens, excitors when a strike is bowled, for advertising or for messaging.

These graphics are stored as files on the front desk computer. They are then downloaded to TS2, where they are also stored. They can then be displayed either by a command from the front desk, or automatically in response to an event.

The events for which a graphic can be automatically displayed are:

- **Logo** – displayed when lanes are off. Can also be used for advertising. The Logo may be called **Message of the Day** in some desk systems.
- **Open Strike** – displayed when a single strike is bowled in Open play
- **Strikes** – displayed when more than one strike in a row is bowled. A different graphic can be used depending upon the number of strikes from two to twelve.
- **Open Spare** – displayed when a frame is spared in Open play.
- **Split Spare** – displayed when a split frame is spared.
- **End of Game** – displayed at the end of a game. A different graphic can be used for Open and League play
- **Middle of Game** – displayed after the 5th frame.
- **Score Background** – used as the background to a score grid. A different graphic can be used for Open and League games, and also for Game 1, Game 2 and Game 3. Game 4 re-uses Game 1 graphic and so on.
- **Pindication** – a special graphic used to display the pins left standing.
- **Slow Bowling** – displayed when there has been no bowling for 3 minutes, and will be re-displayed every 3 minutes thereafter until bowling resumes.
- **Stop Bowling** – displayed when TS2 is about to cycle the pinspotters, and requests that the bowlers stop bowling.
- **Foul** – displayed when the foul detector is triggered.

- **Menu Background** – displayed as the background when ordering food or drink
- **Font** – this is not actually a graphic, but a special font file that is used to change the appearance of the characters. If a font file is loaded, it will always be used. If no file is loaded, the default font will be used.
- **Message Background** – displayed as the background to page messages
- **Touch Background** – displayed as the background to scores and menus on the touch screen
- **End Practice** – displayed when practice mode is reset.

More than one graphic can be downloaded for each event. When an event occurs, TS2 will then either randomly choose one for display, or choose the next graphic in sequence.

Graphics can also include the name of the current bowler. For example, if John bowls a strike, the displayed graphic could include the words “Well bowled John”. The graphic file includes only the words “Well bowled”, TS2 inserts the bowler’s name, in this case “John”.

TS2 can also insert the name of the bowling centre, as entered at the front desk, into the Logo graphic.

For details on downloading graphics from the front desk, and controlling the features of the graphics system, see the manual for the front desk. Note that not all the features described above are supported by the Lane Control System.

9.2. Creating and Using Graphics

9.2.1. Basic Graphics

TS2 uses a standard GIF file format for graphics. The resolution is 640x480 pixels; the colour depth is 256 colours.

Any graphics design program that supports this file format can be used to create a graphic. Colour depths less than 256 are also supported.

Once the graphic file has been created, it should be copied to the appropriate folder at the front desk. For the Touch Desk and the Purrfect Desk this folder is *c:\touch score*. For the Lane Control System it is *c:\usr\lcs\pict*.

The filename should be 12 characters or less, and have the extension *.GIF*.

The file then needs to be sent to TS2 before it can be used. See the front desk manual for details.

9.2.2. Transparent Graphics

When a transparent graphic is displayed, the score grid is visible behind the graphic. The background of the graphic is transparent.

A transparent graphic differs from a basic graphic in that only the first 246 positions of the 256 colour palette should be used. The last 10 positions are used by the score grid for its own colours. This means that while the graphic can contain any colour, it can contain only 246 *different* colours. If these last 10 positions in the palette are used in the graphic, they will take on the colours of the score grid at the time, NOT the colours they are assigned in the graphic.

For Touch Screen backgrounds, only the first 230 colours may be used.

In addition, the background of a graphic which is to appear transparent **MUST** use palette position 0.

For more information on colour palettes, see the documentation for your graphic design program. Note that some basic programs such as MS Paint may not support palette manipulation. Paint Shop Pro by Jasc Software allows palette manipulation and can also automatically compress a 256 colour palette into 246 (or 230) colours.

When downloading the graphic to TS2 with Touch Desk or the Purrfect Desk, the *TRANSPARENT* option must be enabled. See the desk manuals for more information.

Colour 0 is always transparent when using the Lane Control System, except for score backgrounds. To make a graphic non transparent, do not use colour 0.

9.2.3. Background Graphics

Background graphics are used for *Score Backgrounds* only, and appear behind the score grid.

The same colour palette restrictions as for transparent graphics apply, except that palette position 0 may be used. Position 0 should be set to the predominant background colour, as this will be used as the background colour when other graphics (such as exciters or pindication) are displayed on this screen.

If the background graphic is for the touch screen menus, then only colours 0-229 may be used.

9.2.4. Graphics and Background Video

If both background video & a background graphic are enabled, only the video signal will be displayed.

9.2.5. Inserting a Name

Graphics used for bowler events such as strikes can have the name of the bowler inserted into the graphic. If the graphic is a logo, the name of the bowling centre will be inserted.

The name will appear horizontally centred on the screen. The top of the name will be 300 pixels from the top of the screen. The name will use either a 64x32 pixel font, or a 32x16 pixel font depending upon the length of the name.

When downloading the graphic to TS2 with Touch Desk or Purrfect Desk, the *ADDNAME* option must be enabled. See the desk manual for more information.

With the Lane Control System, the centre name is always added to the logo. No other type of graphic can have a name inserted.

9.2.6. Multiple Files

More than one graphic file can be sent to TS2 for each graphic type.

With the Lane Control System, the files can have any name and TS2 will randomly choose one to use each time.

With the Touch Desk or Purrfect Desk, the files must all have similar names, and there are two options for choosing a file – RANDOM or SEQUENTIAL.

For example, if the file name for the three strikes graphic is set to TURKEY, then the actual graphics files should be named TURKEY_00.GIF, TURKEY_01.GIF, TURKEY_02.GIF, etc. In this way up to 100 files can be used for each graphic type.

Note that:

- One or two digits can be used in a file name. For example TURKEY_01.GIF is treated the same as TURKEY_1.GIF.
- The name TURKEY.GIF with no digits is treated the same as TURKEY_00.GIF.
- It is not necessary for every file in the sequence to be present.

If the RANDOM option in the file map is set, then TS2 will randomly choose a graphic for display. If RANDOM is not set, then TS2 will choose the next numbered file. For example, TURKEY_00 will be displayed first then TURKEY_01 etc.

9.2.7. Display Time

Most graphic types are displayed for a preset time then cleared. The exceptions are Logo graphics, and Score Background graphics.

With the Lane Control System, the display time is preset to 7 seconds.

With the Touch Desk and Purrfect Desk, the display time is programmable. Set to 0 to display forever, or until a bowler press a key or bowl a ball.

Score Background graphics remain displayed for as long as the score grid is on.

The Logo graphic will also remain displayed for as long as it is enabled. However, if more than one Logo file is present, TS2 will display each file for the set display time, and then display another file. Therefore, the Logo graphic can be used for advertising, by displaying a number of advertisements in either random or sequential order, with each advertisement being displayed for a settable time.

9.2.8. Storing Options

Graphics files can be stored in TS2 in either DRAM or FLASH memory.

DRAM memory is 8Mbytes, and all contents are lost when the power is lost.

FLASH memory is 4Mbytes, but the contents are retained even if power is lost.

With the Lane Control System, all files are stored in FLASH.

With the Touch Desk and Purrfect Desk, there is an option in the file list to store the files in either memory. See the desk manual for more information.

10. Troubleshooting

This section contains some hints for troubleshooting various problems that may arise during installation or operation of a system with TS2.

See the section on *Installation* for details of the interface between TS2 and the rest of the system.

Some basic techniques that can be used for many different problems are:

- Press the RESET button on TS2
- Turn the power to TS2 off, wait a few seconds, then ON again
- Press the CLEAR button and reconfigure TS2 (all scores will be lost).
- Disconnect the desk from TS2, press CLEAR and reconfigure. If the problem is now gone, but reappears as soon as the desk is reconnected, then the desk is most likely sending a wrong configuration number or option setting.
- Disconnect any unnecessary cables while solving a problem.
- Use the *Maintenance Menu* to check the interface between TS2 and the external hardware
- Isolate faulty equipment by swapping with adjacent lanes or pairs.
- Check that the power supply is delivering the correct voltage.

10.1. General

Symptom: RUN light not pulsing

- Check the power is connected
- Check the re-settable fuse which can be accessed through the small hole near the *Left VGA* connector.
- Turn off the power, disconnect all connectors except the power supply, and then turn the power on. A possible short in an external device may be disrupting TS2. Reconnect each cable one by one to determine the faulty device. Be sure to turn the power off while reconnecting or disconnecting cables.
- Attempt to run the CORE software by holding down both the RESET and CLEAR buttons for several seconds.
- Check that the RESET or CLEAR buttons have not been jammed on

Symptom: TS2 fails to operate after downloading a software update.

- Attempt to run the CORE software by holding down both the RESET and CLEAR buttons for several seconds. The update may have been corrupted during programming. For example, by a power failure at a critical time. Once the core program is running successfully, try the update again.

Symptom: A new TS2 fails to work on an older front desk. TS2 is online to the desk , but the screens, bowler terminals, and fans remain off.

- This will occur if the desk software includes an old version of the TS2 firmware that does not support power saving mode. Update the entire front desk software, including the TS2 firmware

10.2. Screens

Symptom: Screens are black when a score grid is expected

- Check TS2's Run light is pulsing
- Check the screens are powered up
- Check the screens are set to the correct source. For example, if TVs are used, are they set to the correct input source (S-Video, Line 1 etc)?
- If AMF monitors are used check the MON ENABLE and VIDEO ENABLE signals. The monitor may be set to off or set to display video. There may be a fault in the cable for these signals.
- Check the lane is ON at the front desk. Turn the lane off then on again at the desk. If no desk is connected, press the LEFT or RIGHT key to bring up a score grid.
- Disconnect the desk. Press and hold the CLEAR button. (All scores will be lost) and reconfigure. If the screens are now ok, reconnect the desk. If they now go off then it is a problem with the settings at the desk. Check the configuration number at the desk, colour settings, brightness settings etc.

Symptom: S-Video TVs show only black & white picture

- Check the S-Video cable. This cable contains two cores, one for a black and white image, and the other for the colour signal.
- Check the source setting on the TV. Many TVs combine S-Video & Composite Video into one input, so that an incorrect source selection results in a black and white picture.

Symptom: Screens are scrambled (no sync), or flashing (wrong interlace type)

- Check that TS2 has been configured for the correct monitor type, by disconnecting the desk, pressing CLEAR and reconfiguring. If the screen now looks ok, but loses sync as soon as the desk is reconnected, then the desk is sending a wrong configuration number.

Symptom: Screens too dark or too bright

- Check brightness setting at desk
- Check colour settings at desk
- Check brightness and contrast settings on the screen
- Check TS2 is configured for the correct monitor type.
- If too dark, check that only one device is connected to TS2's video output. For example, if upper and lower monitors are to be used, a splitter must be fitted.

Symptom: No On-screen Pindication

- Check that pindication has been enabled at the desk.
- If an APS is used for pinsensing it must be fitted with updated firmware and the APS protocol set to Extended. When set to normal, pindication is NOT available.
- Use the Maintenance Menu to check that a pindication graphic has been loaded.

10.3. Keypads

Symptom: Keypad not working correctly or not at all. Lights on keypad may also be wrong.

- Check that the keypad is enabled at the desk.

- Check keypad is connected correctly. Some keypad connectors are polarised and will only plug in one way. On others, the stripe on the keypad ribbon must be matched to pin 1 (often marked with a “1” or a stripe) on the bowler terminal board or on TS2.
- Check TS2’s configuration. Press CLEAR and reconfigure.
- If using a bowler terminal board, check that it has power and check the communication cable
- If using a Universal Bowler Terminal board, check the switches and jumpers on the UBT. Check the run light on the UBT.
- Running the *Keypad Test* in the *Maintenance Menu* may help isolate a problem.

10.4. Touch Screen

Symptom: No picture on touch screen

- Check that the touch screen has power and that the VGA cable is connected to TS2
- Check that the lanes are on or checked in, and that the overhead screens are on. If both lanes are off, the touch screen will also be off.

Symptom: Touch screen does not respond to touches

- Check that the keypad is enabled from the front desk. Disabling a keypad in a touch screen system is the same as disabling the touch screen.
- Restart TS2. TS2 initializes the touch screen at start up. If the screen is not switched on and connected at that time, it will not be configured correctly and will not subsequently work. However, TS2 will attempt to reinitialize the touch screen approximately every 30 seconds from the main scoring screen
- Check the RS232 serial cable form the touch screen to TS2.

Symptom: The Touch Screen is not accurate. When a user touches an area on the screen, an adjacent area is activated. For example, when entering a bowler’s name, different letters appear to those that were touched.

- The touch screen needs calibration. See [Maintenance Menu ▶ Calibrate Touch Screen](#) .

10.5. Scoring

Symptom: AMF type camera won't score at all

- Check that the arrows are up and that scoring is enabled at the desk.
- Check that the lane is not in practice mode.
- Run *Pinsense Test* in the *Maintenance Menu*, and enable the camera loop. If the pinfall is correctly received, then the camera communications are working. The problem is most likely in the machine interface.
- To check the machine interface, run the *General I/O Test* in the *Maintenance Menu*, and check that the start switch, second ball, and foul detection inputs are all ok.
- If camera communications are not ok, check both power and communication cabling to the camera.

Symptom: AMF type camera scores incorrectly

- Check all items above as for not scoring at all
- Check the camera delay that is set by the desk. Usually the delay should be set to 0. This is the default and may not be changed on some desks. Press the CLEAR button and reconfigure to set the delay back to the default.
- Refer to the camera manual for details on alignment, timing etc.

Symptom: APS won't score or scores incorrectly

- Check that the arrows are up and that scoring is enabled at the desk.
- Check that the lane is not in practice mode.
- Restart the APS and try again
- Press CLEAR and reconfigure TS2. Ensure that the APS protocol is set to *Normal* for APS units with standard AMF firmware (EPROMs), or *Extended* for APS units with A.K. Microsystems firmware.
- Check the signal cable from the APS to TS2
- Use the *Pin Sense Test* in the *Maintenance Menu* to see if the correct signal is being received from the APS. Check that the second ball and foul signals are correct. Note that these signals come from the

APS and NOT from the inputs on TS2. They will not be displayed in the *General I/O Test*.

Symptom: Pin Camera won't score or scores incorrectly

- Check that the arrows are up and that scoring is enabled at the desk.
- Check that the lane is not in practice mode.
- Immediately after a mis-score, go to *Pin Camera Settings* in the *Maintenance Menu* and view the static camera image. It should be obvious why it mis-scored. For example, a pin dot is not on a pin, or there is a bright area behind a missing pin, the threshold is wrong, etc. Check all settings.
- To check the machine interface, run the *General I/O Test* in the *Maintenance Menu*, and check that the start switch, second ball, and foul detection inputs are all ok.

Symptom: Pinspotters do not perform special cycles (short strike etc)

- If an APS is being used, then the special cycle signals come from the APS and not from TS2. Refer to the APS documentation for details.
- If a camera is being used, then these signals are generated by TS2 and connected to the pinspotters via J10+ and J11+. Check the cabling on these connectors.
- Check that the camera is scoring correctly, and without delay.

10.6. Desk Communications

Symptom: Desk will not communicate with TS2.

- Check that ALL lanes are set to the correct lane number.
- Check the configuration of the desk.
- Isolate all lanes but one pair, and then reconnect each pair one by one until a faulty pair is found.
- Check that all lanes are correctly grounded.
- Check the COMM LIGHT on TS2. It will flicker whenever a valid signal is received from the desk.

Symptom: Desk communications are erratic.

- Check all cabling, particularly the grounds and shields.
- Check that all lanes are correctly grounded.
- Check for a faulty pair by isolating as above.

10.7. Pinspotters

Symptom: Pinspotter cycles continuously, or unexpectedly.

- If your centre was originally wired for Magicscore, there may be one or more resistors connecting the respot switch in the bowlers console to ground. These resistors are no longer required and may be removed

Symptom: In the tenth frame or after a no tap strike, the pinspotter sweeps away all the pins as expected, but then cycles again.

- This will happen if the pinspotters are intelligent (AMF with expander boards or MP boards) and TS2 is configured for non-intelligent pinspotters. To set TS2 for intelligent pinspotters, set the Machine Cycle delay to 0. In the LCS, see *Set Machine Cycle Delay* in the *Pinspotter Control Menu*.

11. Connection Specifications

This section details the connector pin outs and cable wiring for each model of TS2.

Where the wiring is fully compatible with existing AMF or Brunswick scoring, the full cabling specifications are not shown here. See the appropriate AMF or Brunswick manual.

Generally it is not possible to insert the wrong plug into a connector. Where there are two or more connectors of the same type, they will be keyed differently. There are some exceptions as shown below:

- All VGA connectors are identical
- All S-Video connectors are identical
- All composite video in & out connectors are identical
- The keypad connections for Left, Right and Centre keypad on the MagicScore I/O board are all identical.

11.1. Standard Model

This section details the connections available on the **STANDARD** model TS2. All these connections are also available on models **MGS**, **A1**, **A2**, and **A+**, but **NOT** on **Brunswick**.

Some connectors on the standard model are fully compatible with Accuscore Plus. These connectors are marked with a + sign. For example, J1+ is compatible with J1 on an Accuscore Plus.

11.1.1. J1+ Monitors

This connector is a 26 pin double row IDC header, and is used to drive both left and right RGB monitors. It is compatible with Accuscore Plus J1.

J1+	
<u>Pin</u>	<u>Function</u>
1 _____	Right Red
3 _____	Right Green
5 _____	Right Blue
7 _____	Right H Sync
9 _____	Right V Sync
11 _____	N/C
13 _____	Left Red
15 _____	Left Green
17 _____	Left Blue
19 _____	Left H Sync
21 _____	Left V Sync
23 _____	N/C
25 _____	N/C
2,4,6,8,10,12,14,16,18,20,22,24,26 ____	Ground

11.1.2. J2+ Bowler Terminal Power

This 4 way Mate-n-Lok female connector provides power to an Accuscore Plus bowler terminal. Although the voltage supplied is slightly different to that on an Accuscore Plus , it can be used as a direct replacement for an Accuscore Plus **J2**.

J2+	
<u>Pin</u>	<u>Function</u>
1 _____	+12VDC
2,4 _____	Ground
3 _____	N/C

11.1.3. J10+ Odd Machine & J11+ Even Machine

These connectors are used to connect to the pinspotters. Both connectors are wired identically, except that **J10+** is a male DB15 connector for the odd (left) pinspotter, and **J11+** is a female DB15 connector for the even (right) pinspotter. Both are compatible with Accuscore Plus **J10** & **J11**.

J10+ & J11+		
Pins	Function	Direction
1	Data	in or out
2	Clock	in
3	Common	N/A
4	Reserved	N/A
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 +	in
14	Start -	in
15	Reserved	N/A

Each signal is isolated from TS2 internal circuits. Each function is described below –

Data & Clock – these signals are outputs used to control the special cycles (short strike etc) on an AMF pinspotter.

Common – the common or ground for the data and clock signals.

Start +/- The presence of 12-30 Volts AC or DC on these wires is used to detect the start of a pinspotter cycle and trigger the camera. Not used for APS pin detection.

Ball 2 +/- The presence of 12-30 Volts AC or DC on these wires is used to detect that the pinspotter is in second ball mode.

Foul +/- The presence of 12-30 Volts AC or DC on these wires is used to detect a foul.

RPO In +/- The presence of 12-30 Volts AC or DC on these wires is used to detect the request for a pinspotter cycle from a push button or elsewhere.

RPO Out +/- These two wires are connected to N/O relay contacts that close when TS2 requires a pinspotter cycle. Maximum voltage is 30V AC or DC @ 0.5 A.

11.1.4. J20, J23, J49 Odd, Even and Touch VGA

These connectors are standard DB15HD VGA type connectors as found on PCs, and are used to connect to the odd (left), even (right) and touch monitors. Standard VGA cables can be used for these connections.

These connectors can also be used with suitable adapters to connect Accuscore 1 and 2 monitors. The adapters provide separate BNC connectors for R, G, B, H & V signals to suit the original AMF wiring.

J20, J23, J49	
Pin	Function
1 _____	Red
2 _____	Green
3 _____	Blue
4 _____	N/C
5 _____	GND
6 _____	Red Return
7 _____	Green Return
8 _____	Blue Return
9 _____	+5VDC
10 _____	Ground
11 _____	N/C
12 _____	N/C
13 _____	H Sync
14 _____	V Sync
15 _____	N/C

11.1.5. J21 & J24 Odd and Even S-Video

These 4 pin female Mini-Din connectors are wired as standard S-Video outputs. Standard S-Video cables can be used to connect to the odd (left) and even (right) monitors.

J21 & J24	
<u>Pin</u>	<u>Function</u>
1, 2 ___	Ground
3 ___	Luminance
4 ___	Chrominance

11.1.6. J22 & J25 Odd and Even Composite Video

These BNC female connectors provide composite video out, suitable for connection to the A/V input on a television. Standard cables can be used.

11.1.7. J40 Bowler Terminal

This 25 pin female DB connector is wired as a standard RS232 serial port, and is used to connect to a Universal Bowler Terminal Board, or to a touch screen. One pin is also connected to +12VDC, to enable the UBT to be powered from this connector.

J40		
<u>Pins</u>	<u>Function</u>	<u>Direction</u>
1, 7 ___	Ground _____	N/A
2 ___	Received Data _____	In
3 ___	Transmit Data _____	Out
4 ___	Clear to send _____	In
5, 6 ___	Ready to send _____	Out
22 ___	+12VDC _____	Out

The cable for connecting a UBT to J40 is shown below.

<u>J40</u>	<u>UBT</u>
1	-Cable Screen
2	_____ 2
3	_____ 3
7	_____ 1
22	_____ 4

The cable for connecting a 9 or 25 pin serial touch screen to J40 is shown below. Note that standard serial cables and adapters can be used. All cables should be screened data cable.

J40	Touch Screen DB9	Touch Screen DB25
1 – Cable Screen		
2 _____	2 _____	3
3 _____	3 _____	2
4 _____	8 _____	5
5 _____	7 _____	4
6 _____	4 _____	20
7 _____	5 _____	7

11.1.8. J41 Desk In & J42 Desk Out

These two DB9 connectors are identically wired, although one is male, while the other is female.

Pin	J41, J42 Function
1 _____	N/C
2 _____	TX Data –
3 _____	Clock –
4 _____	RX Data +
5 _____	Ground
6 _____	N/C
7 _____	TX Data +
8 _____	Clock +
9 _____	RX Data –

Standard straight through 9 pin serial cables can be used to connect either of these connectors to another TS2 or the Accuscore Plus port on a Lane Interface Card or an SIU. Cables should have all pins wired straight through (1 & 6 not needed) and should use screened data cable with the connector shroud connected to the cable screen.

11.1.9. J43 18VAC In

This 3 way Mate-N-Lok female connector is used to supply power to TS2. A suitable mains adapter or wall transformer is required.

Most installations require 18 VAC @ 1.5 Amps.

J43 – 18VAC	
<u>Pin</u>	<u>Function</u>
1 _____	AC
2 _____	AC
3 _____	Ground

For some installations, 12VDC at 1 Amp may be used. See the section on *Installation* for details.

DO NOT CONNECT MAINS POWER DIRECTLY TO TS2!

18VAC should be applied across pins 1& 2. Pin 3 may be connected to ground. Do **NOT** connect it to a centre tap if provided on the mains adapter.

J43 – 12VDC	
<u>Pin</u>	<u>Function</u>
1 _____	+
2 _____	N/C
3 _____	Ground (-)

12VDC is applied across 1 (positive) and 3 (negative). Pin 2 is not connected.

In all cases, if an AMF camera is to be used, it must be powered from a separate supply.

The chassis of TS2 should be connected to ground.

11.1.10. J44 Ad Channel

This 15 way Mate-N-Lock female connector contains a number of output signals used for monitor control and for deployment of bumpers.

J44	
Pin	Function
1 ____	Keyway
2 ____	+16VDC (See below)
3 ____	Common
4 ____	Left Audio Enable
5 ____	Left Video Enable
6 ____	Left Monitor Enable
7 ____	Right Audio Enable
8 ____	Right Video Enable
9 ____	Right Monitor Enable
10 ____	Left Bumper +
11 ____	Left Bumper -
12 ____	+12VDC
13 ____	Right Bumper +
14 ____	Right Bumper -
15 ____	Ground

Each signal is isolated from TS2's internal circuits and is described below –

Common – this is the common for the Audio, Video and Monitor enables. For **A1** type TS2s, this is also connected to **GND**.

Left & Right Audio Enable – this signal is used to enable the audio output of the monitors. The audio, video and monitor enables are all optically isolated open collector outputs.

Left & Right Video Enable – this signal is used to enable the display of a video signal, rather the screen output from TS2.

Left & Right Monitor Enable – this signal is used to control the power to the monitors.

Left & Right Bumper +/-. These two signals connect to N/O contacts on relays in TS2. The contacts close and remained closed while the bumpers are in use. Maximum voltage is 30V AC or DC, @ 0.5 A.

+16VDC, +12VDC and GND – these signals are supplied to allow convenient wiring of relays etc. Maximum total current draw from should not exceed 100mA. The +16VDC pin is only available on Touch Scores with a serial number of 0026 or later.

Connecting a Monitor Power Control Switch. A mains control switch with a 12V trigger can be used to control the power to the monitors by using the **Monitor Enable** signal. Connect the 12 volt trigger input of the switch to TS2 as below.

For individual control of each monitor, connect –

J44-12 (12Volts)	to Left Power Switch +
J44-6 (Left Monitor Enable)	to Left Power Switch –
J44-3 (Common)	to J44-15 (GND)

J44-12 (12Volts)	to Right Power Switch +
J44-9 (Right Monitor Enable)	to Right Power Switch –

For paired control, connect –

J44-12 (12Volts)	to Power Switch +
J44-6 (Left Monitor Enable)	to Power Switch –
J44-3 (Common)	to J44-15 (GND)
J44-9 (Right Monitor Enable)	to J44-6(Left Monitor Enable)

Notes –

- **Use only approved switches with isolation between the 12volt trigger and the mains voltages. Mains voltages MUST NOT be allowed to connect with TS2. Consult an authorised contractor if in any doubt.**
- For **A1** or **A+** type TS2, both left and right **Monitor Enable** will be on if either lane is on. Individual monitor control is not possible.
- For **A1**, **COMMON** is internally connected to **GND**.
- Maximum current for the **Monitor Enable** signal is 50mA. If a greater current is needed to control the switch, an external relay will need to be fitted.

- Simple figure-8 cable can be used to connect J44 to the switch. For centres with AMF scoring previously installed, the existing cables can often be used. The required monitor control signals are often already present at the overheads and need only be connected to the switch. See the wiring for each TS2 type in the following sections.
- Ensure any other monitor control devices in the original AMF monitors are disconnected before connecting the new switch, or a short circuit may occur resulting in damage.

11.1.11. J45 Pin Sense

This 12 way female Mate-N-Lok connector provides a data connection to AMF cameras, and inputs for ball speed detection.

J45		
Pin	Function	Direction
1	TX Data +	Out
2	TX Data -	Out
3	Keyway, N/C	N/A
4	RX Data +	In
5	RX Data -	In
6	Ground	N/A
7	Left Speed +	In
8	Left Speed -	In
9	+16VDC	N/A
10	Right Speed +	In
11	Right Speed -	In
12	+12VDC (see below)	N/A

Each signal is described below –

TX Data +/-. This is the transmit data to a camera.

RX Data +/-. This is the received data from a camera.

Left & Right Speed +/-. These inputs are for use as ball speed detectors.

+16VDC, +12VDC and Ground – these signals may be used for powering a video camera or external relays, etc. Maximum current draw

is 100mA. The +12VDC pin is only available on Touch Scores with a serial number of 0026 or later. DO NOT USE THESE PINS for powering an AMF camera – use a separate 18VAC power supply

The wiring for a cable connecting to an AMF camera is shown below –

<u>AMF Camera</u>	<u>J45</u>
4 _____	2
3 _____	1
2 _____	5
1 _____	4
Shield _____	6

11.1.12. J46, J47, J48 Video In, Chain In & Pin Camera In

These three BNC connectors are used for video inputs. If a pin camera is not being used, **J48 (Pin Camera)** can be used as a general purpose video input.

J46 (Video) and **J48 (Pin Camera)** are standard video inputs. **J47 (Chain)** is a special input that has not been terminated internally, and can thus be used for daisy chaining many TS2s together. See the section on *Installation* for more information.

11.1.13. J51 18VAC Out

This 3 way Mate-n-Lok male connector provides power to an external device if required. It is connected to J43 via the internal fuse.

J51 will provide the same voltage as connected to J43, usually 18VAC.

J51	
<u>Pin</u>	<u>Function</u>
1 _____	AC
2 _____	AC
3 _____	Ground

The total current draw from both TS2 and any devices connected here must not exceed the capacity of the mains adapter powering TS2, and must not exceed the 3.15 Amp rating of the internal fuse.

11.2. Magicscore Model

This section details the connections specific to the Magicscore model.

11.2.1. J9 Communications

This 9 way male Mate-N-Lok connector provides Accuscore 1 style front desk communications and a frame counting input for the pinspotters.

J9		
<u>Pin</u>	<u>Function</u>	<u>Direction</u>
1	Left Count	In
2	TX Data	Out
3	Ground	N/A
4	N/C	N/A
5	Right Count	In
6	RX Data +	In
7	N/C	N/C
8	N/C	N/C
9	RX Data -	In

Each function is described below –

Left & Right Count – These inputs are used to count frames only when manual scoring is used. They are not normally required.

TX Data – this signal transmits data to the front desk

RX Data +/- this signal receives data from the front desk

The wiring for a cable to connect **J9** to either the Magicscore cable on a Lane Interface Card or the Accuscore 1 port on an SIU is shown below. Screened data cable should be used. All **J9s** on all lanes should be wired in parallel.

J9 Lane Interface Card or SIU	
2 _____	1
6 _____	2
9 _____	3
3 _____	4

11.2.2. J10 Pin Sense

This 6 way male Mate-N-Lok connector is used to connect to an APS.

J10	
<u>Pin</u>	<u>Function</u>
1 _____	APS +
2 _____	N/C
3 _____	Ground
4 _____	APS -
5 _____	N/C
6 _____	+5VDC

The wiring for a cable to connect **J10** to the APS is shown below. Screened data cable should be used.

<u>J10</u>	<u>APS</u>
1 _____	3
3 - Cable Screen	
4 _____	2

11.2.3. J13, J14, JLEFT and JRIGHT Keypads

Any of the supported AMF type keypads can be connected directly to these connectors.

The end of the connector nearest Pin 1 is denoted by the word STRIPE. The connector should be inserted so that the stripe on the cable is also at this end.

Extension cables can be made using ribbon cable and press-on IDC male and female connectors. These cables should not be more than 60 cm (2 feet) long.

11.3. Accuscore 1 Model

This section details the connections specific to the Accuscore 1 model.

11.3.1. J3 Desk & J4 Next Accuscore

These 6 way female Mate-N-Lok connectors provide Accuscore 1 style desk communications and are wired identically.

J3 & J4		
<u>Pin</u>	<u>Function</u>	<u>Direction</u>
1	RX Data +	In
2	TX Data	Out
3	Keyway	N/A
4	RX Data -	In
5	Ground	N/A
6	Ground	N/A

For a description of each signal, see the section on *Magicscore – J9* above.

The wiring for a cable to connect **J3** to a the Magicscore cable on a Lane Interface Card or the Accuscore 1 port on an SIU is shown below. Screened data cable should be used.

<u>J3</u>	<u>Lane Interface Card or SIU</u>
2 _____	1
1 _____	2
4 _____	3
5 _____	4

The cable for connecting **J4** on a TS2 to **J3** on the next TS2 is wired straight through (i.e. 1-1, 2-2 etc) with the shield connected to pin 5 or 6.

11.3.2. J7 APS/RPO

This 15 way female Mat-N-Lok connector contains connections for cycling the pinspotters, reading the APS, and counting pinspotter cycles.

J7		
<u>Pin</u>	<u>Function</u>	<u>Direction</u>
1 _____	APS + _____	In
2 _____	APS - _____	In
3, 4, 5, 6 ___	Ground _____	N/A
7 _____	Right Count + _____	In
8 _____	Right Count - _____	In
9 _____	Left RPO Out + _____	Out
10 _____	Left Count + _____	In
11 _____	Left Count - _____	In
12 _____	Left RPO Out - _____	Out
13 _____	Right RPO Out + _____	Out
14 _____	Right RPO Out - _____	Out
15 _____	Keyway _____	N/A

Each signal is described below.

APS +/- These signals carry pinfall data from the APS to TS2

Right & Left Count +/- These signals are used to count frames when manual scoring is used. They are not normally needed

Left & Right RPO Out +/- These two wires are connected to N/O relay contacts that close when TS2 requires a pinspotter cycle. Maximum voltage is 30V AC or DC @ 0.5 A.

11.3.3. J9 RPO In

This 9 way female connector allows connection of the relays on an Accuscore 1 keypad to cycle the pinspotters and activate the drinks light. An external RPO push button may also be connected here.

J9	
<u>Pin</u>	<u>Function</u>
1 _____	Left RPO In
2, 3, 5, 7 __	Ground
4 _____	Right RPO In
6,8 _____	Drinks
9 _____	Keyway

Each signal is described below –

Left & Right RPO In – When the relay in the Accuscore 1 Keypad connects this pin to ground, TS2 will cycle the pinspotters.

Drinks – This pin is connected directly to **J10**, Pin 1, so that when the relay in the Accuscore 1 Keypad connects this pin to ground, the drinks light will come on.

11.3.4. J10 Monitor Control

This 15 way female Mate-N-Lok connector connects to the upper monitors and lights.

J10	
<u>Pin</u>	<u>Function</u>
1 _____	Drinks Light
2 _____	Slow Bowling Light
3, 6, 9, 13, 14 __	+12VDC
4 _____	Left Audio Enable
5 _____	Right Audio Enable
7 _____	Left Video Enable
8 _____	Right Video Enable
10 _____	Monitor Enable
11 _____	Keyway
12 _____	Ground

Each function is described below –

Drinks Light – the drinks light connects between this pin and +12VDC. It is controlled by the drinks relay on the keypad connected to **J9**, it is NOT controlled by TS2.

Slow Bowling Light – the slow bowling light connects between this pin and +12VDC

Left & Right Audio Enable – See the section on *Standard – J44*

Monitor Enable – This signal controls power to the monitors as a pair. It is driven to +16VDC to turn both monitors on, and 0V to turn them off.

11.4. Accuscore 2 Model

This section details the connections specific to the Accuscore 2 model.

11.4.1. J6 Accutrak & J7 Next Accuscore

These 12 way female Mate-N-Lok connectors are used for Accuscore Plus style desk communications. The data and clock signals are identical to those on **J41** and **J42** on the Standard model.

J6 & J7		
J6 Pin	J7 Pin	Function
1 _____	1 _____	TX Data +
2 _____	2 _____	TX Data –
3 _____	3 _____	RX Data +
4 _____	4 _____	RX Data –
5 _____	5 _____	Clock +
6 _____	6 _____	Clock –
7 _____	7 _____	Feed Thru
8 _____	8 _____	Feed Thru
9 _____	10 _____	Keyway
12 _____	11 _____	Ground
_____	9 _____	+5VDC
9, 10, 11 _____	10, 12 _____	N/C

11.4.2. J8 Ad Channel

This 12 way female Mate-N-Lok connector contains various monitor control signals. The video and audio enable signals are identical to those on **J44** on the Standard model

J8	
Pin	Function
1	Common
2	Common
3, 11, 12	Pull up to +16VDC
4	Left Audio Enable
5	Right Audio Enable
6	Left Video Enable
7	Right Video Enable
8	Keyway
9	Ground
10	Common

11.4.3. J9 Odd Machine & J10 Even Machine

These 15 way female Mate-N-Lok connectors contain the pinspotter interface for each machine. Both **J9** and **J10** are wired identically. For a description of each signal see the section on *Standard – J10+ & J11+*.

J9 & J10	
<u>Pin</u>	<u>Function</u>
1	Start +
2	Start -
3	Ball 2 +
4	Ball 2 -
5	Foul +
6	Foul -
7	Data
8	J9=N/C, J10=Key
9	Clock
10	Common
11	RPO Out +
12	RPO Out -
13	J9=Key, J10=N/C
14	N/C
15	Ground

11.4.4. J11 Power Control

This 12 way female Mate-N-Lok connector contains the connections for an RPO push button. On an Accuscore 2, it may also be used to control power to the chassis, but that function is not supported by TS2. For a description of each signal see the section on *Standard - J10+ & J11+*.

J11	
<u>Pin</u>	<u>Function</u>
1	Keyway
2	Right RPO In +
3	Right RPO In -
4, 5	N/C
6	Left RPO In +
7	Left RPO In -
8, 9, 10, 11, 12	N/C

11.4.5. J13 Bowler Terminal

This 9 way female Mate-N-Lok connector provides communication and power to the bowler terminal board.

J13	
<u>Pin</u>	<u>Function</u>
1 _____	TX Data +
2 _____	RX Data +
3 _____	+16VDC
4, 9 ___	Ground
5, 6 ___	N/C
7 _____	TX Data –
8 _____	RX Data –

11.5. Accuscore Plus Model

This section details the connections specific to the Accuscore Plus model.

11.5.1. J2 Ad Channel

This 6 way AMP SDL connector contains the monitor control signals. For a description of each signal see the section on *Standard – J44*.

J2	
<u>Pin</u>	<u>Function</u>
1 _____	Left Audio Enable
2 _____	Right Audio Enable
3 _____	Left Video Enable
4 _____	Right Video Enable
5 _____	Common
6 _____	Monitor Enable (Pair)

11.5.2. J3 Accutrak & J4 Next Accuscore

These 6 way AMP SDL connectors provide Accuscore Plus style front desk communications. Both connectors are wired identically, but each

connector is keyed so that the wrong plug cannot be inserted. For a description of each signal see the section on *Standard – J41 & J42*.

J3 & J4	
<u>Pin</u>	<u>Function</u>
1 _____	RX Data +
2 _____	RX Data –
3 _____	TX Data +
4 _____	TX Data –
5 _____	Clock +
6 _____	Clock –

11.5.3. J7 & J8 Bowler Terminal

This 4 way AMP SDL connector provides communications to and from an Accuscore Plus bowler terminal board.

J7 & J8	
<u>Pin</u>	<u>Function</u>
1 _____	RX Data +
2 _____	RX Data –
3 _____	TX Data +
4 _____	TX Data –

11.5.4. J9 Pinsense

This 4 way AMP SDL connector provides communications to and from an AMF Accuscore Plus camera. These signals are identical to those in *Standard – J45*.

J9	
<u>Pin</u>	<u>Function</u>
1 _____	RX Data +
2 _____	RX Data –
3 _____	TX Data +
4 _____	TX Data –

